REDUCING DUI-RELATED COLLISIONS: EVALUATING THE EFFECTIVENESS OF ENHANCED DUI ENFORCEMENT

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By
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CERTIFICATION OF APPROVAL

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DEDICATION

This thesis is dedicated to my father who, though gone from this world, continues to teach me that anything is possible…the impossible just takes a little more effort.

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I would like to thank all of the people who made the completion of this thesis a reality. Though there is only one author listed, I would not have been able to complete this project without the help and support of several individuals. I would like to thank the members of my thesis committee for their input and guidance through the entire process and would like to extend a note of appreciation to my thesis chairman for remaining ‘semi-retired’ during the completion of this paper. Finally, I would like to thank my loving wife for putting up with the late night hours of research and for always providing the highest level of support and encouragement. Her strength and patience continues to inspire me.

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ABSTRACT

The purpose of this study was to determine whether a correlation existed between a city's DUI rate and DUI Crash rate. The author's hypothesis was that an increase in DUI arrest rate would lead to a decrease in DUI-related collisions. Arrest data, crash data and population data were drawn from RAND California for all cities in the State of California for the years of 2000 to 2009. This data were utilized to create variables for the percent change in DUI arrest rate and DUI crash rate from the first half of the decade (2000 to 2004) to the second half of the decade (2005-2009). These percent change variables were correlated using a Pearson's bi-variate analysis. The results showed a weak positive correlation between the percent change in DUI arrest rates and DUI crash rates. This indicates that as DUI arrests increase, DUI-related crashes increase as well. Due to the limitations of this research model and the resulting weak positive correlation, further research will need to be conducted to determine, with greater certainty, the correlation between enhanced DUI enforcement and DUI-related collisions.

CHAPTER I

INTRODUCTION TO THE STUDY

Background

A constant threat to the safety of drivers, passengers and pedestrians continues to be the prevalence of alcohol-impaired driving. While many resources have been allocated to the prevention of impaired driving, alcohol-involved crashes continue to be a major cause of traffic-related fatalities. According to the 2010 National Highway Traffic Safety Administration (NHTSA) fact sheet, an average of one alcohol-impaired-driving fatality occurred every 51 minutes for a total of 10,228 deaths (United States Department of Transportation, 2012b). While this figure was lower than the more than 15,000 alcohol-related deaths from 2008 and 10,759 in 2009, these deaths still accounted for 31% of all traffic deaths in the United States (United States Department of Transportation, 2012b). Even more concerning is the impact that alcohol-impaired driving has on children. According to the 2010 NHTSA Fact sheet, 17% of all fatal traffic accidents resulting in the death of a child were the result of alcohol-impaired driving. Furthermore, while many argue that a person who drives drunk is only putting their life at risk, 35% of all alcohol-related victims were passengers of the drunk driver, occupants of other vehicles, or pedestrians (United States Department of Transportation, 2012b). Drunk drivers are not just taking their lives into their own hands; they are threatening the lives of anyone near them. In California, one of the most populous states, the DUI problem is just as serious.

According to the California Highway Patrol's 2010 Statewide Integrated Traffic Records System (SWITRS) there were over 1,200 alcohol related injury collisions per month with as many as 1,563 a month. This resulted in 16,884 injury collisions for the year with 972 of the collisions resulting in at least one fatality (California Highway Patrol, 2010). While the total number of collisions alone is alarming, the number of individuals killed or injured in alcohol related collisions is even more staggering. The 2010 SWITRS reports that 24,343 individuals were injured in alcohol related crashes while 1,072 individuals perished in the same type of collision (California Highway Patrol, 2010). Additionally, similar to the nationwide statistics, it is clear that individuals who choose to drink and drive are not just endangering their own lives. The 2010 SWITRS reports that 12,208 individuals were injured in an alcohol related collision in which they had not been drinking. 3,852 were passengers in the intoxicated driver's vehicle, 4,326 were drivers of another vehicle, 463 were pedestrians, 180 were bicyclists, and 3,387 were passengers in the non-intoxicated driver's vehicle. 305 of these innocent individuals were killed. To further emphasize the risk drunk driver's pose to the general public, the 2010 SWITRS shows that while 49.9% of alcohol related injury collisions resulted in the intoxicated individual being injured, 50.1% of the same type of collision resulted in a non-intoxicated individual sustaining injuries (California Highway Patrol, 2010). This indicates that a drunk driver is more likely to injure another person than themselves when the collision is not fatal.

In response to this prevailing problem of alcohol-impaired driving, agencies across the country are spending money on research and enforcement in an effort to reduce alcohol-related-traffic fatalities. However, with a vast amount of money being spent, it is important that it is being spent in the most effective manner. According to the 2009 NHTSA budget proposal, $12,694,000 was requested to be spent on the research and implementation of various impaired driving programs. Furthermore, $2,513,000 was requested to be spent on enforcement and justice service as well as law enforcement training. While this may seem like a large amount of money, it is actually $186,000 less than what was actually spent in 2008 (United States Department of Transportation, 2008). Again, due to the size of the population, California is also spending a considerable amount of money on the DUI problem.

In August of 2012, the California Office of Traffic Safety announced that it had been awarded $77 million in federal funding that will be used to support traffic safety grants at the state, county, and local level. While funding will not be spent solely on impaired driving enforcement, the OTS asserts that this funding will be used to "build upon programs aimed at combating the leading killer on California's roadways – alcohol and drug-impaired driving" (State of California, 2012).

Some approaches to reducing drunk driving are to increase enforcement, awareness, as well as the perception of risk. The NHTSA attempted to increase drunk driving awareness with their 2008 campaign "Drunk Driving: Over the limit. Under Arrest" and recently rolled out their newest campaign "They'll See You Before You See Them. Don't Drink and Drive. Drive Sober or Get Pulled Over" (United States

Department of Transportation, 2012a). Both programs aim to increase public awareness and to increase enforcement. The most recent program directs agencies to set up sobriety checkpoints in the late afternoon or early evening (generally between 4pm and 9pm) due to the highest number of traffic fatalities taking place between 3pm and midnight. Additionally, agencies are instructed to increase roving patrols and sobriety checkpoints during late night hours (9pm to 3am) due to an overwhelming number of alcohol-related-driving fatalities taking place between those hours (United States Department of Transportation, 2012a). With these programs, however, a large amount of money is being spent on the logistical implementation of the various checkpoints and law enforcement officials are being allocated to drunk-driving related enforcement rather than other crime reduction tasks. Because of this, one would want to be certain that increased enforcement has a significant effect on reducing alcohol-related-driving.

In California, funding is also being used in both an enforcement and an educational facet. One educational approach that California currently uses is a program called *Every 15 Minutes*. This program focuses on educating juniors and seniors in high school on the dangers of driving under the influence. Conducted over two days, the first day consists of a different student being removed from class every 15 minutes. This student is considered a casualty of drunk driving. Additionally, the first day includes the simulation of a drunk driving accident. The students that are 'killed' join the other students who have been removed from class while the 'drunk' student is sent to jail and processed. All student participants who have 'died' sleep

over night at a retreat away from their friends and family to simulate the impact that drunk driving can have. The second day consists of an assembly with all students where the ‘deceased’ students read letters that were written on their retreat that discuss what it would be like to die prematurely without getting a chance to say goodbye. Law Enforcement officials and local officials also present and discuss DUI statistics as well as the consequences of drunk driving (California Highway Patrol, 2012a). The program is meant to be emotional and shocking to ensure students understand the risks associated with driving under the influence. In addition to educational programs, California aggressively combats drunk driving through enforcement.

Just as the NHTSA has increased sobriety checkpoints, the California Highway Patrol continues to increase sobriety checkpoint efforts. Conducted on a regular basis, CHP checkpoints are highly visible and well publicized in an effort to raise DUI awareness as well as deter potential DUI offenders. In recent years, the CHP has also instructed officers to check for valid drivers licenses to reduce the number of unlicensed drivers. To further deter drunk drivers and alert the public to their presence, the CHP has utilized grant-funded overtime programs to increase the amount of officers on patrol at a given time. The intended result would be a decrease in drunk driving to a raised perception of risk. Additionally, the CHP has implemented DUI task force operations in areas that have historically had high DUI occurrences. These operations generally take the form of ‘saturation patrols’ in which

increased police presence in the worst areas is aimed at raising the perception of risk (California Highway Patrol, 2012b).

It is important to note that the CHP is spending a considerable amount of money on these enforcement programs under the belief that an increase in presence as well as an increase in apprehension will deter drunk driving, thereby decreasing alcohol related accidents. Because of this, it is important to determine whether these enforcement programs actually produce the intended benefits. If an increase in police activity and an increase in DUI arrests reduce drunk driving and drunk driving accidents, these programs should continue to receive maximum funding. However, if the desired results are not being obtained, money should be allocated to programs and efforts that can lower the prevalence of drunk driving.

Purpose of the Study

To determine whether funding to combat drunk driving is being spent efficiently, this study will aim to determine whether there is a correlation between increased drunk-driving enforcement and the reduction in drunk-driving-related fatalities. By analyzing crash data, arrest data, as well as population data obtained from RAND California for each county in California between the years of 2000 and 2009, the author will determine whether an increase in DUI arrest rate results in more or less DUI fatalities. If the increase in arrest rate results in a lower fatality rate, then one would conclude that funding should continue to be utilized on aggressive enforcement efforts. However, if an increase in DUI arrest rates results in either no change or a rise in fatality rates, then the one would conclude that funding should be

allocated towards a more effective program. The author's hypothesis will be that an increase in DUI arrest rate will result in a decrease in the DUI crash rate.

CHAPTER II

REVIEW OF THE LITERATURE

Theoretical Review

The idea that an increase in arrests will lead to fewer drunk drivers, and thus, fewer alcohol-related fatalities is drawn from deterrence theory; a criminological theory that falls under the Classical School of Criminology. Classical criminology argues that individuals exercise free will and make a rational decision when deciding whether to commit a crime. The potential offender weighs the costs and benefits of the crime as well as the certainty that he will be caught and will make his decision accordingly (Bernard, Gerould & Snipes, 2010). If the benefit of committing the crime outweighs the potential punishment, he or she will be more likely to commit the crime. If the likelihood of being caught is low, the potential criminal will be more likely to offend.

The father of Classical criminology, Cesare Beccaria, outlined in his 1764 essay *On Crimes and Punishments* several principals to developing an effective criminal justice system based on the Classical criminological model. One of these principals was the idea that punishment should be certain. Beccaria argued that a moderate punishment that was certain would be more effective in deterring potential offenders than a severe punishment that was less likely to happen (cited in Bernard et al., 2010). This principal correlates with the current study.

The goal of increasing DUI arrests is to increase the public's perception of the risk of getting caught. By arresting more people and utilizing more DUI checkpoints, potential drunk drivers may begin to believe that their chances of getting caught are high, thus reducing their likelihood of driving drunk. Conversely, if there was no enforcement of drunk driving, one would expect to see more drunk drivers due to the low possibility of getting caught.

Deterrence theory, much like the classical school it emerged from, contends that individuals are rational beings, want to maximize pleasure while minimizing pain, and will engage in criminal activity if it benefits them. Deterrence theory can be broken down into two distinct types: specific deterrence and general deterrence. Specific deterrence details the effect that punishment has on an individual (Agnew & Cullen, 2011). For example, if a person is punished once for stealing a candy bar, they may determine that stealing a candy bar is not worth being punished again and will refrain from stealing in the future. Conversely, general deterrence details the effect that one person's punishment has on the general public (Agnew & Cullen, 2011). An example of general deterrence would be the death penalty. While the person receiving the punishment will obviously not commit the crime again, the goal of the death penalty is for others to realize how severe the punishment is for capital crimes, understand that the consequences outweigh the benefits, and refrain from committing similar crimes. Again, the issue of DUI enforcement can draw on both forms of deterrence.

If a law enforcement agency was to increase DUI enforcement, a specific deterrent effect would be seen amongst those that were arrested as a result of the increased enforcement. Those arrested would receive the financial and legal ramifications of a DUI conviction and would hopefully realize that the consequences of drunk driving outweigh the benefits. For the general public, a general deterrent effect could be seen as a result of the increased visibility of DUI checkpoints and the increase in police patrol. Additionally, those that have been arrested are likely to tell friends and family of their ordeal. This could raise the general public's perceived level of risk, thus resulting in a deterrent effect.

It is worth noting that some believe that deterrence cannot be simply divided into specific and general deterrence. Stafford and Warr argue that most people have direct and indirect exposure to the elements of deterrence. They argue that an individual contemplating committing a crime may have already been punished for a similar crime, may have known someone who has been punished for the same crime, and may also know someone who eluded punishment for the same crime (cited in Agnew & Cullen, 2011). Each of these factors plays a role in the individual's decision to commit the deviant act. One can certainly draw from this 'reconceptualization' of deterrence theory to predict the effect of increased DUI enforcement. If a person is arrested and convicted of driving under the influence, they will have experienced the ordeal first hand and may begin to lend more weight to the consequences of the crime rather than the benefits (specific deterrence). If they know someone else who has also been arrested and convicted of a DUI, their perception of risk should go up due to the

knowledge of others who have also been caught (general deterrence). However, if they know several people who drink and drive and have not been caught, they may believe that they were simply ‘unlucky’ and their perceived level of risk will be diminished.

While deterrence theory has many supporters and has been tested many times, it is not without its short comings. The biggest shortcoming deterrence theory has in regards to the current study is whether those who drive drunk are actually in the right state of mind to make a rational decision. If they are already drunk, one may wonder if they are able to accurately weigh the costs and benefits or accurately gauge the level of risk. Critics of theories based on the ideas of rational choice as well as cost and benefit analysis argue that deterrence theory becomes less applicable due to the prevalence of drugs and alcohol in the criminal environment (Bernard et al., 2010). However, one could argue that the decision to drive while intoxicated is made before a person begins to drink, such as a person who takes their own vehicle to a bar with no intention of utilizing a designated driver.

Empirical Review

Several studies have been conducted to determine whether deterrence, both general and specific, has an effect on an individual’s decision to drive drunk. In one such study, Kenkel (1993) compares deterrence based DUI programs to alcohol-control based programs to determine which is more practical and successful. By utilizing data from the Health Promotion and Disease Prevention (HPDP) supplement

to the 1985 Health Interview Survey, the author created equations that included variables such as legal drinking age, level of DUI enforcement, amount of heavy drinking, and admission to prior drunk driving. These equations were used to test the effects of deterrence laws such as mandatory sentencing for first time offenders, administrative per se laws, preliminary breathalyzer tests, sobriety checkpoint enforcement and anti-plea bargaining laws. The author found a negative DUI correlation for males in all categories. However, a positive DUI correlation was found for females with anti-plea bargaining laws. In addition to the deterrence model equations, the author created equations that included variables associated with alcohol control such as minimum drinking age, price of alcohol, and availability of alcohol. With the deterrence based approach, Kenkel (1993) determined that DUI could be reduced by 18% for males and 20% for females and up to 23% overall. With an alcohol-control approach, the author determined that DUI could be reduced by 14% for males and 21% for females. However, to reach reduction levels close to a deterrence approach, the author concluded that the alcohol tax percentage would have to increase by 23%. Overall, the author determined that both models have an effect on DUI. However, it is implied that deterrence can have a larger effect. This would support my hypothesis.

Another study that was seeking to determine whether deterrence based programs were more effective than other types of programs was conducted in 2011 by Ritchey and Nicholson-Crotty. The authors performed a study to determine the deterrence effect reduced speed limit laws have on traffic fatalities. The authors

collected data from the Federal Highway Administration for 48 states. Hawaii was excluded due to an incomparable highway patrol organization in comparison to the other states and Arkansas was excluded because it did not report the number of state troopers for the period of study (2011). The authors designated the dependent variable as traffic fatalities for every 100,000 vehicle miles traveled (VMT). The independent variables were the change in speed limit (55 mph, 65 mph, 70 mph) as well as different deterrence factors including number of state troopers per mile (certainty of getting caught) and maximum amount of fine (severity of punishment). Finally, the authors utilized control variables including average temperature, population density, and average income. For their study, Ritchey and Nicholson-Crotty (2011) conducted a cross sectional time series due to the data reflecting 48 states over 17 years. While speed limits alone appear to reduce traffic fatalities, both 55 mph limits and 70 mph have a greater reduction when accounting for the deterrent effects. With the 65 mph limit, the difference of 5.7% indicates that the prevention of approximately 54 deaths per year is being mistakenly attributed to lower speed limits rather than deterrence. Consequently, the authors determined that deterrence plays a significant part in reducing traffic fatalities when speed limits are changed. However, the authors were quick to note that while severity of punishment can play a part in deterrence, it is only meaningful when the probability of getting caught is high. While this study does not directly relate to drunk driving, the deterrent effects support my hypothesis.

Benson, Mast & Rasmussen (2000) do not carry out their own empirical study to determine the effect police have on DUI prevalence but instead analyze several

different groups of data and make a theoretical determination of whether police can deter drunk drivers. The authors cite data from several countries between 1973 and 1992 in which police DUI enforcement was raised considerably and determine that pro-active police efforts help deter drunk drivers. To further this claim, the authors cite data from Illinois between 1984 and 1989. During this time, DUI arrests fell by 22.5% while traffic fatalities rose 10.4%. Nationally, DUI arrests fell by less than 1% while traffic fatalities rose by 0.8%. This suggests that DUI arrests have an affect on traffic fatalities. In addition to police enforcement, the authors contend that DUI reduction can be achieved by increasing the probability of arrest. This can be achieved by enacting laws that prohibit open containers in automobiles, consumption of alcohol in automobiles, as well as pre-determined blood-alcohol limits. Additionally, laws that allow for a preliminary breathalyzer test to be conducted in the field can increase the probability of arrest. These factors increase the probability of arrest because a police officer is presented with more reasons for arresting someone. Due to the belief that increased police enforcement and attention can reduce drunk driving, this article would support my hypothesis.

Because perception of risk is a cornerstone of deterrence theory, several studies have been conducted to determine what effect perception of risk has on an individual's decision to drive under the influence. Loughran, Paternoster, Piquero & Pogarsky (2011) conducted a study to determine whether a potential offender's uncertainty of the risk of arrest (ambiguity) has more of a deterrent effect than a known level of certainty. The authors first analyzed data from the Pathways to

Desistance study, a longitudinal investigation of serious adolescent offenders transitioning from adolescence to adulthood. The sample contained 1,354 adolescents aged 14 to 17. In addition to a baseline interview given at the beginning of the program, participants were interviewed in 6 month intervals for a total of 36 months. At each interview, the participant was asked to rate their perceived level of risk at getting caught for an array of criminal activities. The activities were broken down into "no-one around crime" (NOA) and "face-to-face crime" (FF). NOA crimes included breaking and entering, stealing, theft, and vandalism. FF crimes included fighting, stabbing, and robbery with a gun. Additionally, participants were asked to self-report on 17 different offenses that were also broken down into NOA and FF crimes. The authors utilized the responses from the previous interview session as indicators for criminal activity that had occurred between the previous and current interview period. The authors calculated the perceived ambiguity by determining the variance of perceived risk for both NOA and FF crimes. Finally, Loughran et al. (2011) analyzed the perceived risk, ambiguity and self-reported behavior over the 36 month period and determined that for NOA crimes with a low perceived risk, ambiguity had a stronger deterrent effect. However, for NOA crimes with a high perceived risk, higher levels of ambiguity actually increased the probability of offending. For FF crimes, ambiguity at low levels of perceived risk enhanced probability of offending where there was no significant effect on crimes with a high perceived risk of arrest. The authors contend that the implications could be that law enforcement officials keep the same level of enforcement for NOA crimes, thus

keeping the actual risk of enforcement low, but increasing the randomness where enforcement occurs, thereby increasing ambiguity. This study could support my hypothesis due to law enforcement's ability to perform a DUI stop at random locations. Because offenders generally will not know the exact location of the police officers, there level of ambiguity may go up, thus resulting in a greater deterrent effect.

Furthering the argument that perception of risk affects the decision to drive drunk, Freeman and Watson (2006) conducted a study to determine what deterrence factors affect recidivating drunk drivers. The authors obtained data from a sample of 166 recidivist drunk drivers who were volunteer participants. The participants were given surveys that were broken down into a demographic portion and a deterrence portion. The demographic portion asked for information such as age, employment, and marital status but also asked questions relating to a participants drinking behavior over their lifetime as well as the past 6 months. Additionally, this portion of the survey asked for the participant's intention to drink and drive in the future. The deterrence questionnaire asked questions regarding the participants' perception of severity of punishment, perception of the swiftness of punishment, perception of certainty of punishment as well as direct and indirect punishment avoidance. The authors determined that direct punishment avoidance would best predict whether a person would reoffend. If a person is able to consistently commit the crime without being caught, their perceived certainty of punishment goes down. This could support my hypothesis. By increasing enforcement and increasing DUI arrests, those that

have been avoiding arrest may eventually be caught, thus raising their perceived level of certainty.

Another study focusing on perceived risk was conducted in 2003 by Pogarsky and Piquero. The authors conducted a study to determine whether punishment of an individual can actually have a positive effect on future criminal activity through a re-setting effect. The resetting effect in question is an individual's belief that they are less likely to be caught again in the future because they have already been caught. They believe the odds of them being caught twice are low. To determine the effect resetting has on individuals, the authors collected data from a survey given to students from a large public university in the southwestern United States. Respondents were given a scenario where they were drunk, knowingly over the limit, lived 10 miles away, worked the next morning, and would have to return early to retrieve their car if it was left over night. They were then asked an array of questions based this scenario including their perceived certainty of punishment, their likelihood of driving drunk, and prior DUI stops. Additionally, to measure the respondents risk status, they were asked questions regarding their drinking behavior, prior offense history of other crimes, impulsivity, peer influence, and gender. Pogarsky and Piquero (2003) determined that respondents who had previously been punished for DUI were 10.46% more likely to drive drunk than respondents who had not previously been punished. While the authors did confirm that perceived certainty of arrest has a negative correlation with likelihood of offending, they also determined that there was a negative correlation with punishment and perceived certainty. As a person is

increasingly punished, their perceived level of certainty goes down. However, through further analysis, the authors determined that the resetting effect occurred most often with individuals who had a lower original risk of offending score. This study supports my hypothesis. Pogarsky & Piquero (2003) contend that DUI offenders are generally individuals who partake in heavy drinking, thus raising their risk of offending. If police enforcement is increased and they are caught, they would most likely not experience a resetting effect since they are not considered a low risk offender.

Another study indicating a link between perceived risk and deterrence was conducted in 2011 by Wikstrom, Tseloni & Karlis. The authors discuss a portion of a seven year longitudinal study in which a cohort of 716 boys and girls were observed beginning when they were 11-12 years old. The initial observation was completed through an interview with the child's caregiver and the subsequent annual observations were conducted through interviewer-led small group questionnaires. The portion discussed by Wikstrom et al. (2011) was conducted during the fourth year of observation when the subjects were 15-16 years old. The questionnaires asked questions regarding the subject's actual criminal involvement (whether they had actually committed an array of crimes) as well as their propensity to commit an array of crimes (whether they had been tempted to do so, whether they had followed through or not). Additionally, the subjects were asked to rate their perceived risk of getting caught if they were to commit one of the crimes. The authors determined that there were two types of children: crime-prone and crime-averse. Crime-averse

children did not see a criminal act as a viable option. Crime-prone children, however, did consider criminal activities as viable options. For the crime-averse children, level of deterrence was not relevant because they did not consider committing a crime in the first place. The crime-prone children reported behavior consistent with deterrence theory in that they were more likely to commit crimes when the probability of getting caught was low. When the probability of getting caught went up, their propensity to commit the crime went down. Additionally, when a crime would result in a very light punishment, the probability of getting caught had little if any effect on their propensity to commit the crime. This study appears to support my hypothesis in that probability of punishment affects propensity to commit crime. However, because many DUI offenders do not participate in other criminal behavior, one would wonder whether crime averse DUI offenders are affected by deterrence levels.

Because multiple variables can affect a person's decision to drive drunk Wechsler, Lee, Nelson & Lee (2003) conducted a study to determine the effect that these different variables have on college students' decision to drink and drive and/or ride as passengers with a drunk driver. Variables included underage drinking vs. legal drinking, local and state laws governing the sale, distribution and consumption of alcohol, as well as the level of law enforcement. In contrast to previous studies that were only able to draw samples from individual schools or a few schools from the same state, this study utilized the 2001 Harvard School of Public Health (HSPH) College Alcohol Study (CAS) to draw a large sample of students from four-year Universities across the United States. 140 schools were chosen using probability

sampling proportionate to size. 20 of these schools were not ultimately used due to the schools' inability to provide a random sample of students' addresses in time for the study. To measure the rate of drunk driving or riding with a drunk driver, students from the sample schools were given a self-administered questionnaire that asked for demographic information as well as questions regarding their drinking behavior. Questions regarding drinking were formed using dichotomized variables (never vs. 1-or more). In addition to the questionnaire, the authors analyzed the amount of laws in place as well as the level of law enforcement assigned to reducing drunk driving. Information regarding state laws was taken from a report from the University of Minnesota while local laws were determined by contacting the local city halls. Ratings for the level of law enforcement were taken from reports developed by Mothers Against Drunk Driving. Wechsler et al. (2003) utilized the data to perform a multiple logistic regression analysis to give the authors insight to the effect that three different variables have on students' decision to drink and drive: student characteristics, school characteristics, and alcohol control policies. The last variable can be used to gain insight as to whether this author's hypothesis is correct. Wechsler et al. (2003) determined that a high level of enforcement, accompanied by multiple alcohol-related laws were successful in reducing the amount of students who drove while intoxicated as well as students who rode as passengers with drunk drivers. This study would support my hypothesis.

While the above studies tend to support my hypothesis, the following studies have not clearly done so. However, these studies suggest that there is the possibility

that an increase in arrests can decrease DUI fatalities. Beck (2009) conducted a program evaluation of Maryland's Checkpoint Strikeforce Campaign. This campaign focused on an increased use of sobriety checkpoints where law enforcement officials could systematically stop drivers to check for possible impairment. If a law enforcement official found a driver suspicious of impairment, they could conduct a field sobriety test. The desired deterrent effect would be the elevation of the public's perceived risk of arrest. In addition to the increased use of sobriety checkpoints, Maryland utilized a media campaign highlighting the risk of drunk driving and advertising the increased use of sobriety checkpoints. To determine the effectiveness of the campaign, the author obtained fatality data from FARS for the 3 years prior to the start of the campaign and compared it to the first three years after the campaign was implemented. Additionally, phone interviews were conducted twice a year after the start of the campaign to measure respondent's knowledge of the campaign, their exposure to the sobriety checkpoints, as well as their likelihood to drink and drive. The data obtained showed that the campaign had no effect on the amount of fatalities. In fact, fatalities actually increased during the first three years of the program. Additionally, the telephone surveys indicated that the media campaign did not increase driver's perception of risk. On the contrary, the public's perception of risk declined during the first three years. Beck (2009) notes that a major flaw in the campaign was law enforcement's failure to increase DUI arrests. This study neither supports nor rejects my hypothesis. However, as Beck (2009) notes, an actual increase in arrests may increase the public's perceived risk of arrest. If this is true,

one could infer from the previous studies regarding perception of risk that an increased use of checkpoints would lower the prevalence of drunk driving.

Weatherburn and Moffatt (2011) conducted a study to determine whether higher fines had a deterrent effect repeat drunk-driving offenders. The authors utilized a two-stage least-squares analysis of the specific deterrent effect of high fines on drunk-driving offenders in New South Wales, Australia. Weatherburn and Moffatt (2011) utilized data from the New South Wales Bureau of Crime Statistics and Research Reoffending database (ROD). For this study, they used all prescribed concentration of alcohol (PCA) cases assigned to the New South Wales Local Court in 2003 and 2004. Data was taken from the 2003 group to determine the severity of the fine; the independent variable. To control for outside affects, the authors utilized seven control variables: Age, Gender, Location, severity of PCA offense, whether they plead guilty or not guilty, whether they had legal representation, and whether they had prior PCA convictions. After running the analysis, the authors concluded that the severity of the fine had no significant effect on an offender's decision to re-offend. Much like Ritchey and Nicholson-Crotty (2011), the authors suggested that the probability of being caught is too low for the severity of punishment to have an effect. This study doesn't necessarily support my hypothesis, but does suggest that the probability of arrest portion of deterrence may have an effect.

Freeman and Watson (2009) conducted a study to determine whether formal and informal sanctions have a deterrent effect on drinking and driving. The authors created a self-report survey that included demographic information, attitudes toward

DUI activity, and self-report information on DUI activity and alcohol consumption. Utilizing trained data collectors, 5,525 possible respondents were contacted by telephone across the Queensland area. Of that pool, only 780 individuals participated (341 male, 439 female). The survey addressed both legal and non-legal methods of deterrence. Legal methods included arrest and suspension of license while non legal methods included fear of hurting someone else and not wanting to break social norms. As expected, individuals who perceived legal and non legal sanctions as unlikely were more likely to drink and drive. After completing data analysis, the authors determined that the legal deterrence methods had no significant effect on individuals' decision to drink and drive. However, as with other studies, they suggest that fear of apprehension was a significant variable. Additionally, Freeman and Watson (2009) indicated that non-legal methods of deterrence were indicators of DUI. Unfortunately, the degree to which they are effective is unclear. Again, this study does not directly support my hypothesis, but does suggest that an increase in apprehension may help with deterrence.

Kingsnorth, Alvis & Gavia (1993) conducted a study to determine whether an increase in the severity of DUI punishments had an effect on DUI offenses and subsequent recidivism rates. The authors obtained data from a systematic random sample of 1,231 DUI court cases in Sacramento County in the years 1980 (404 cases), 1984 (408 cases), and 1988 (419 cases). Each case was coded with an array of variables including age, gender, type of attorney representation, year of arrest, number of prior DUI convictions, means of adjudication, failure to appear, conviction

charge, blood alcohol content, fine and penalty assessment, and whether the offender was placed in an alcohol treatment program (Kingsnorth et al., 1993). The authors obtained recidivism data from the California Department of Motor Vehicles. The authors analyzed the data by comparing court cases to current policies in the different years. To assess recidivism, each sample group was followed up on for 24 months. Additionally, the 1980 and 1984 groups were followed up on for a six year period while the former group was followed up on for ten years to determine the long term deterrent effects. Kingsnorth et al. (1993) determined that there was no significant effect of increased severity on DUI recidivism over the course of the study. However, the authors suggest that this could be due to the lack of policies aimed at increasing the certainty of arrest. If proven, the latter argument would support my hypothesis.

Finally, the following studies contradict my hypothesis and raise doubt as to whether an increase in DUI arrests can reduce DUI fatalities. Wagenaar, Maldonado-Molina, Erickson, Ma, Tobler & Komro (2007) conducted a study to determine the effects of mandatory fine and jail penalties. The authors utilized a quasi-experimental time series design where 324 monthly observations were taken between January, 1976 and December, 2002. During this time period 26 states implemented mandatory minimum fines for DUI convictions while 18 states implemented mandatory jail penalties for first time DUI offenders. During the time series, the authors separated drivers in alcohol-related fatal crashes into four different groups: single-vehicle night time crashes (SVN: crashes that involved one vehicle and no pedestrians or bicyclists), low BAC (0.01-0.07), medium BAC (0.08-0.14), and high BAC ($\geq$0.15).

Wagenaar et al. (2007) also tracked non-alcohol related crashes during the same period as a control group to control for other factors. Data on alcohol related traffic crashes were obtained from the Fatality Analysis Reporting System (FARS) which is maintained by the National Highway Traffic Safety Administration (NHTSA). A crash is reported to FARS if it results in a fatality within 30 days of the accident. Significant effects were observed on medium and high BAC crash involvement with an average decline of 1.06 fatal crashes per month. While significant effects were not observed in SVN crashes, the correlation observed was in the hypothesized direction. Furthermore, the amount of the fine imposed was only significant in SVN crashes. For the states that implemented mandatory jail sentences, few showed significant declines in fatal alcohol-related crashes. Additionally, two of those states changed multiple DUI policies during the same period making it impossible to attribute the entire decline to the jail policy. Overall, the authors contend that mandatory fine policies have the potential to deter drunk drivers. However, mandatory jail sentences do not appear to have any effect on deterring drunk drivers.

Briscoe (2004) conducted a study to determine whether the increase in the severity of DUI punishments (higher fines and jail time) in New South Wales had a deterrent effect on DUI offenses. The author obtained data from the New South Wales Roads and Traffic Authority (RTA) for a period of 8 years from 1994 to 2001. Briscoe (2004) focused on accidents that resulted in either a fatality or an injury to at least one person. Furthermore, the author focused on two subgroups (1. all fatal accidents, 2. single-vehicle night time accidents) as well as a control group (multiple-

vehicle day-time accidents). Using an interrupted time series, the author calculated accident data for each of the four groups. The intervention point (date when the increased penalties were implemented) took place in October 1998. This allowed the author to track data for almost 5 years prior to the intervention and for over three years after. After analyzing the data, Briscoe (2004) determined that the severity of punishment did not result in a decrease in alcohol related accidents and instead resulted in an increase. However, the author is quick to note that due to the design of the study (interrupted time series), one cannot reliably determine the rise in accidents. In any case, this study would contradict my hypothesis.

Dula, Dwyer & LeVerne (2007) conducted a study to determine whether proactive DUI arrests have an effect on lowering DUI related crashes. The authors obtained alcohol-related crash data for every county in Tennessee for 2001 and 2003 from the state's motor-vehicle crash database. They then collected DUI data for the same time periods from the Tennessee Incident Based Reporting System. Additionally, Dula et al. (2007) collected drivers license data for each county in Tennessee from the Tennessee Department of Safety. The authors combined the data 2001 and 2003. To determine an accurate proactive DUI arrest amount, the authors subtracted 90% of the total DUI crash number from the DUI arrest number for each county. Their reasoning was that not every crash results in a DUI. Dula et al. (2007) then divided the proactive DUI arrest amount by the combined number of licensed drivers for each county and multiplied the result by 1,000 to determine the pro active arrest rate. To determine the DUI crash rate, the authors divided the total amount of

DUI crashes for each county by the total combined amount of licensed drivers and multiplied the result by 1,000. By calculating a Pearson product moment correlation, Dula et al. (2007) found that proactive DUI arrests do not affect DUI related crashes nor do they affect DUI related crashes involving fatalaties. This study, while similar to my proposed study, contradicts my hypothesis.

Through a theoretical and empirical review, one can find support both for and against the author's hypothesis. However, it is worth noting that the studies that did not directly support the author's hypothesis left room for additional analysis to confirm details that could support the author's hypothesis. Furthermore, the majority of studies found relating to deterrence and DUI support the idea that an increase in DUI arrest rate will lead to fewer DUI occurances. This would lead one to expect the current study to indicate a negative correlation between DUI arrest rate and DUI related crashes.

CHAPTER III

METHODOLOGY

This research is a quantitative study drawing on the analysis of a modified one group before and after, non-experimental design. The group being studied is a collection of all incorporated cities in the state of California for the years of 2000 to 2009. However, the fifty-two cities listed in Appendix A were eliminated from this study due to incomplete or non-reported data. The data for population, misdemeanor DUI, and DUI related automobile collisions was obtained from RAND California.

To determine whether a higher DUI arrest rate resulted in a lower DUI collision rate, the author first developed sets of variables to determine the average number of misdemeanor DUI arrests and DUI-related collisions as well as the average population for the first half of the decade (2000 to 2004) and the second half of the decade (2005 to 2009). The selection for the different time periods was chosen due to a pre-analysis indicating an increase in DUI arrests during the second half of the decade. The two variables created to represent the average number of misdemeanor DUI arrests for the years of 2000 to 2004 and 2005 to 2009 were labeled MISDUI1 and MISDUI2, respectively. The two variables created to represent the average number of DUI related collisions were labeled DUICRASH1 and DUICRASH2. For this study, the author combined fatal DUI collisions and injury DUI collisions to create a single DUI related crash statistic. Finally, the two variables created to

represent the average population for the first and second halves of the decade were POP1 and POP2.

Once the averages of DUI arrests, DUI crashes and population were determined, the author created sets of variables to determine the DUI collision rate and DUI arrest rate for the first and second halves of the decade. For the average DUI collision rate, the author divided the average number of DUI related collisions for the particular time period by the average population during that time period. The resulting number was then multiplied by 1000 to produce a DUI collision rate per 1000 residents. The resulting variables were @CRASHRATE1 and @CRASHRATE2. The average DUI arrest rate was created the same way, replacing the average number of DUI arrests for DUI related collisions. The resulting variables were @DUIRATE1 and @DUIRATE2.

The final variables created were percentdiffDUI and percentdiffCRASH which were used to calculate the percent difference in change between the DUI crash rate/DUI arrest rate from the first half of the decade and the second half of the decade. The percentdiffDUI variable was calculated by subtracting @DUIRATE1 from @DUIRATE2 and then dividing by @DUIRATE1. The percentdiffCRASH variable was calculated by subtracting @CRASHRATE1 from @CRASHRATE2 and then dividing by @CRASHRATE1. The percent change for both DUI arrests and DUI related collisions was utilized to determine whether cities saw an increase or decrease in the two halves of the decade and at what rate.

To determine whether the author's hypothesis was correct, a Pearson's R bi-variate correlation was run with variables percentdiffDUI and percentdiffCRASH. If the author's hypothesis was correct, one would expect to see a negative correlation coefficient populate. This would indicate that as DUI arrests increase, DUI related collisions decrease. However, if the author's hypothesis is incorrect, one would expect to see a positive correlation coefficient. This would indicate that as DUI arrests increase, DUI related collisions also increase.

As stated before, the analysis was conducted utilizing a modified one group before and after test. While there was no actual treatment, the author is comparing the misdemeanor DUI and DUI crash data from the first half of the decade to that of the second half. Bi-decade averages and rates were used to minimize the possibility that certain years could have extreme increases or decreases in either statistic; thus giving an inaccurate representation of the effect that DUI arrests have on DUI crashes. Prior to analysis, the following cities were eliminated for having an unusually high DUI arrest rate: Sand City, Colma, Sonora, Trinidad, Huron. Additionally, the following cities were eliminated for having an unusually high DUI crash rate and an unusually high DUI arrest rate: Vernon, Irwindale and Industry.

CHAPTER IV

RESULTS AND DISCUSSION

Results

The goal of this study was to determine whether an increase in DUI arrests leads to a decrease in DUI related crashes. However, it is important to assess the descriptive statistics of the two variables being utilized to assess the correlation between DUI arrests and alcohol-related crashes to determine whether the data is normally distributed and can be used to predict the results of future analyses.

Table 1. Descriptive statistics of DUI percentage rate change

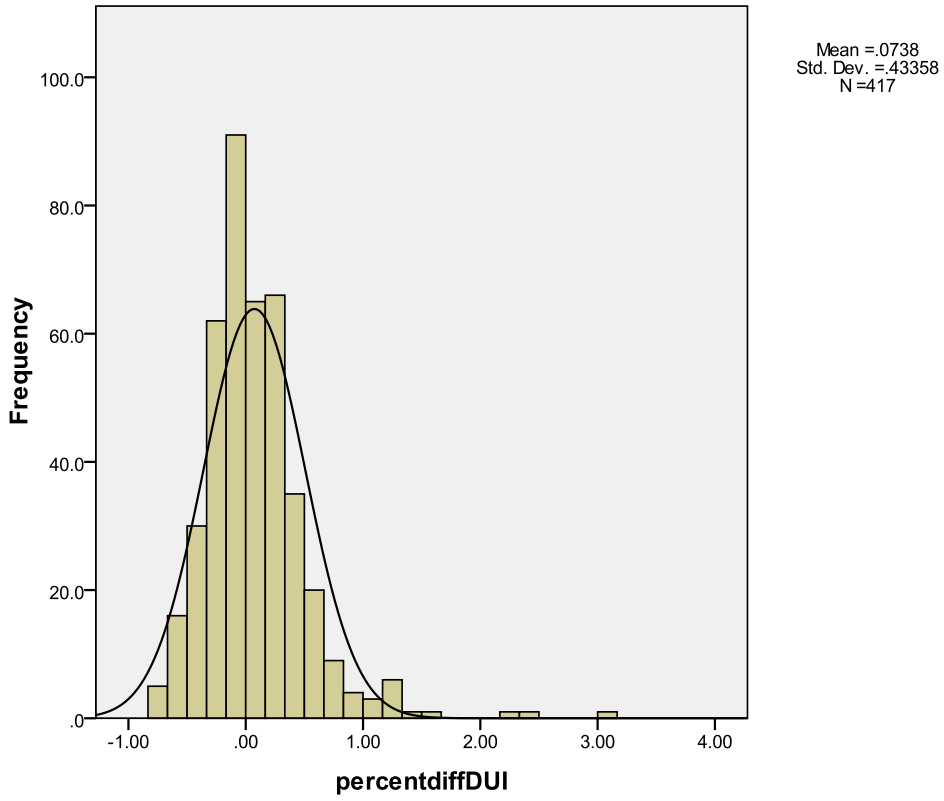
	Statistic	Std. Error
N	417	
Range	3.98	
Minimum	-.82	
Maximum	3.15	
Mean	.0738	.02123
Std. Deviation	.43358	
Skewness	1.998	.120
Kurtosis	9.196	.238

This univariate analysis of percentdiffDUI presented in Table 1 shows that out of the 417 cities in the state of California that were studied, there was an average of a 7.4% increase in misdemeanor DUI arrest rates. The largest decrease in DUI arrest

rate was an 82% decrease in the city of Coalinga while the largest increase was a 315% increase in the city of Piedmont. Though the skewness and kurtosis of percentdiffDUI are both high and are greater than twice their respective standard errors, indicating a non-normal distribution, one can invoke the central limit theorem due to the sample size being greater than 50 (417 different cities). This allows us to treat this data set as a normal distribution with 68.26% of percentdiffDUI values falling between a 36% decrease and a 50.7% increase (one standard deviation). The range of the data indicates that the difference between the minimum and maximum values of percentdiffDUI was 3.98 percentage points.

The histogram presented in Figure 1 confirms that the curve is fairly normal with positive skewness and kurtosis values. The positive skewness value is a result of the tail trailing off to the right, indicating a larger group of outliers on the higher end of percentdiffDUI. The positive kurtosis value is a result of the majority of percentdiffDUI data falling within the peak zone of the histogram. This indicates that, while there are some outliers, the majority of the data fell within a relatively close range.

Figure 1. Histogram of DUI rate change distribution



The boxplot presented in Figure 2 indicates that there are roughly 12 outliers that are higher than the highest non-outlier value. There appears to be an even distribution between the highest non-outlier and the lowest non-outlier and the median appears to be close to the middle of the interquartile range. Additionally, the boxplot indicates that any percent difference greater than a 99% increase or a 90% decrease would be considered an outlier. These outliers will addressed after the initial analysis.

Figure 2. Boxplot of DUI rate change distribution

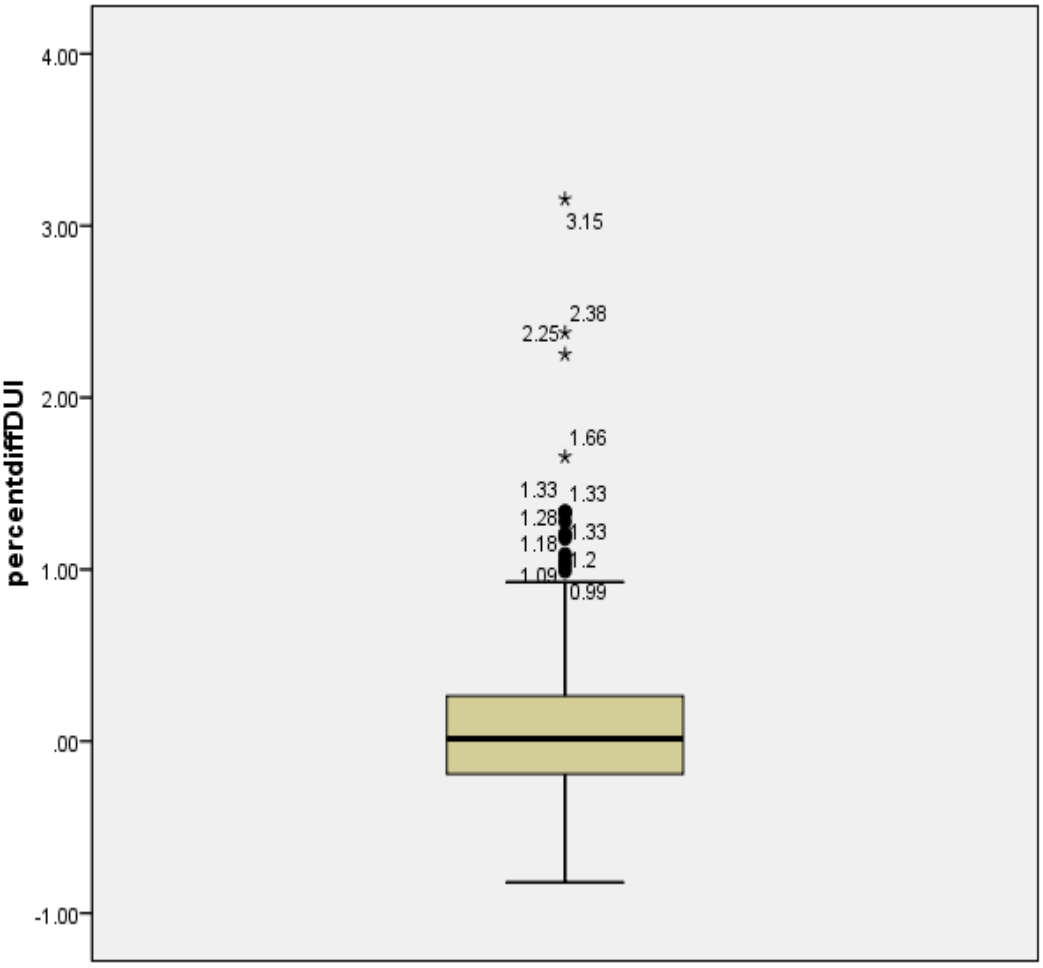


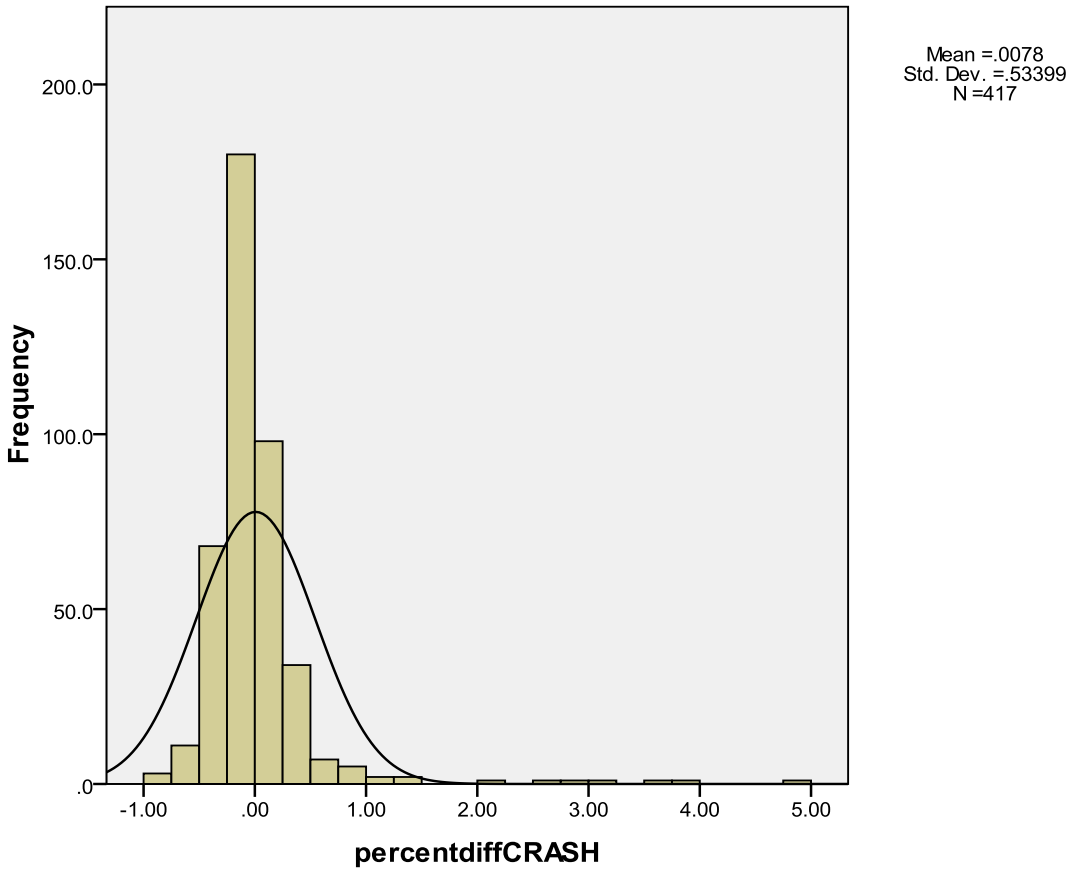
Table 2. Descriptive statistics of Crash percentage rate change

	Statistic	Std. Error
N	417	
Range	5.99	
Minimum	-1.00	
Maximum	4.99	
Mean	.0078	
Std. Deviation	.53399	
Skewness	4.992	.120
Kurtosis	34.946	.238

The univariate analysis of percentdiffCRASH presented in Table 2 shows that out of the 417 cities in the state of California that were studied, there was an average of a 0.8% increase in alcohol-related crash rates. The largest decrease in alcohol-related crash rates was a 100% decrease in the cities of Del Rey Oaks and Dos Palos while the largest increase was a 499% increase in the city of Piedmont. Though the skewness and kurtosis of percentdiffCRASH are both high and are greater than twice their respective standard errors, indicating a non-normal distribution, one can again invoke the central limit theorem due to the sample size being greater than 50 (417 different cities). This allows us to treat this data set as a normal distribution with 68.26% of percentdiffCRASH values falling between a 52.6% decrease and a 54.2% increase (one standard deviation). The range of the data indicates that the difference between the minimum and maximum values of percentdiffDUI was 5.99 percentage points.

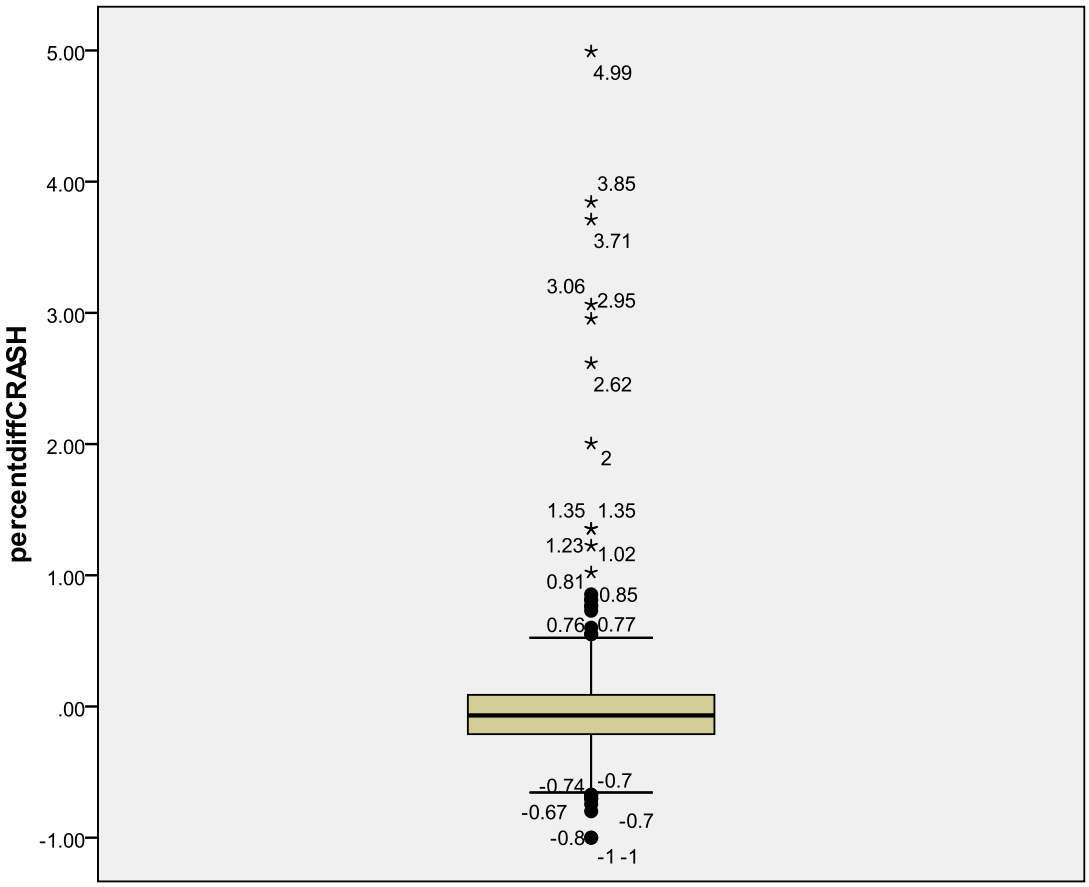
The histogram presented in Figure 3 confirms that the curve is fairly normal with positive skewness and kurtosis values. The positive skewness value is a result of the tail trailing off to the right, indicating a larger group of outliers on the higher end of percentdiffCRASH. The positive kurtosis value is a result of the majority of percentdiffCRASH data falling within the peak zone of the histogram. This indicates that, while there are some outliers, the majority of the data fell within a relatively close range.

Figure 3. Histogram of Crash rate change distribution



The boxplot presented in Figure 4 indicates that there are roughly 22 outliers that are higher than the highest non-outlier value. There appears to be an even distribution between the highest non-outlier and the lowest non-outlier and the median appears to be close to the middle of the interquartile range. Additionally, the boxplot indicates that any percent difference greater than a 76% increase or a 70% decrease would be considered an outlier. As with percentdiffDUI, these outliers will addressed after the initial analysis.

Figure 4. Boxplot of Crash rate change distribution



Though percentdiffDUI and percentdiffCRASH both have a high amount of outliers, they are both drawn from a large sample size and appear to be normally distributed. This would make an initial bivariate analysis beneficial to help the author determine the effect that these outliers have on the correlation between percentdiffDUI and percentdiffCRASH. The following bivariate analysis was conducted to assess the initial correlation between percentdiffDUI and percentdiffCRASH prior to the removal of the respective outliers.

Table 3. Correlation between DUI percent change and crash rate change

		percentdiffDUI	percentdiffCRASH
percentdiffDUI	Pearson Correlation	1	.272**
	Sig. (2-tailed)		.000
	N	417	417
percentdiffCRASH	Pearson Correlation	.272**	1
	Sig. (2-tailed)	.000	
	N	417	417

**. Correlation is significant at the 0.01 level (2-tailed).

The Pearson coefficient of .272, shown in Table 3, indicates a weak-to-moderate positive correlation between percentdiffDUI and percentdiffCRASH. In relation to this study, this would indicate that as a city's DUI arrest rate increases, so does the alcohol-related crash rate. This contradicts the author's initial hypothesis. However, as noted with the previous univariate analyses, percentdiffDUI and

percentdiffCRASH both had a high number of outliers. The removal of these outliers can result in a more accurate understanding of the correlation between percentdiffDUI and percentdiffCRASH. A total of 53 cities were eliminated to remove the outlier values for the two variables.

Table 4. Revised descriptive statistics of DUI percentage rate change

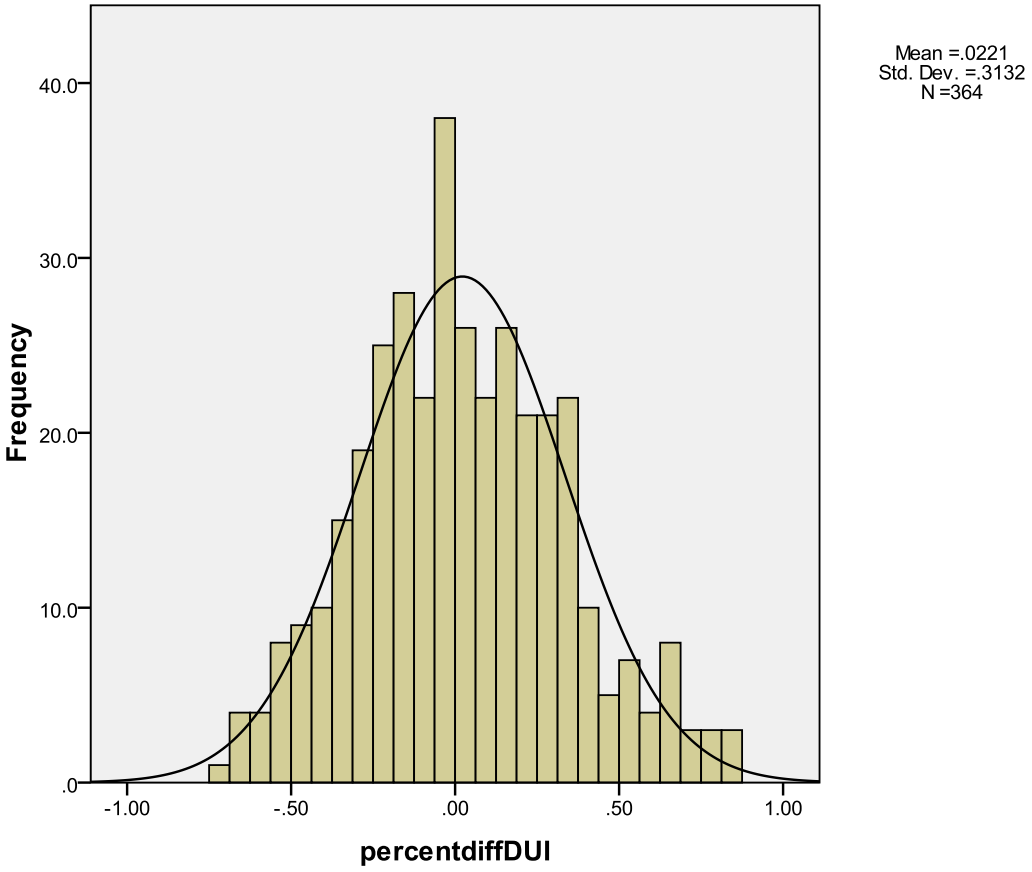
	Statistic	Std. Error
N	364	
Range	1.56	
Minimum	-.69	
Maximum	.87	
Mean	.0221	
Std. Deviation	.31320	
Skewness	.224	.128
Kurtosis	-.160	.255

The revised univariate analysis of percentdiffDUI presented in Table 4 shows that out of the 364 remaining cities that were studied, there was an average of a 2.2% increase in misdemeanor DUI arrest rates. The largest decrease in DUI arrest rate was a 69% decrease in the city of Richmond while the largest increase was an 87% increase in the city of Hercules. The skewness and kurtosis of percentdiffDUI both fall within acceptable ranges and are less than twice their respective standard errors, indicating a normal distribution. This suggests that 68.26% of percentdiffDUI values fall between a 29% decrease and a 33.5% increase (one standard deviation). The

range of the data indicates that the difference between the minimum and maximum values of percentdiffDUI was 1.56 percentage points.

The histogram presented in Figure 5 confirms that the curve is normal with acceptable skewness and kurtosis values. The tail does not taper in either direction due to the lack of outliers and there is no extreme peak due to the normal kurtosis value. This indicates that the majority of the data fell within a relatively close range.

Figure 5. Revised histogram of DUI rate change distribution



The boxplot presented in Figure 6 confirms the elimination of all outliers. There appears to be a slightly larger gap between the upper outlier and the

interquartile range than the lower outlier. However, it still indicates a near even distribution and the median appears to be close to the middle of the interquartile range. Additionally, the boxplot indicates that any percent difference greater than a 90% increase or a 75% decrease would be considered an outlier.

Figure 6. Revised boxplot of DUI rate change distribution

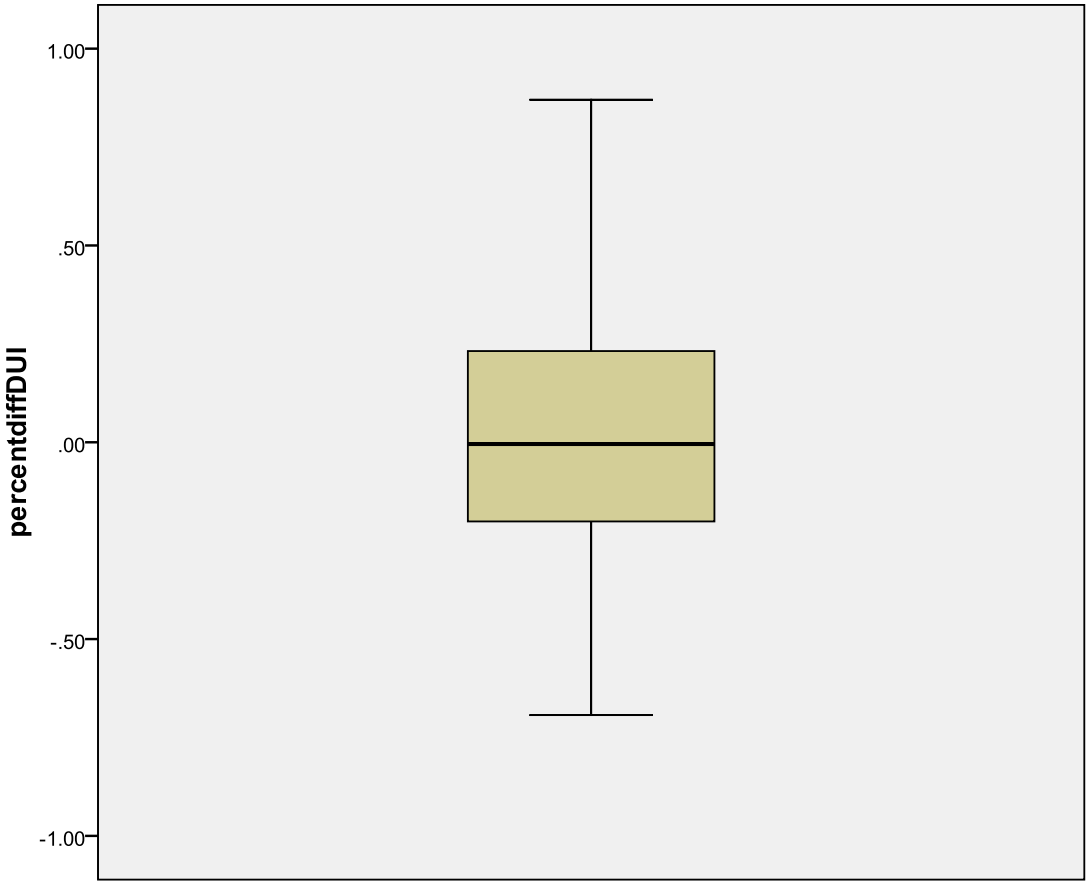


Table 5. Revised descriptive statistics of Crash percentage rate change

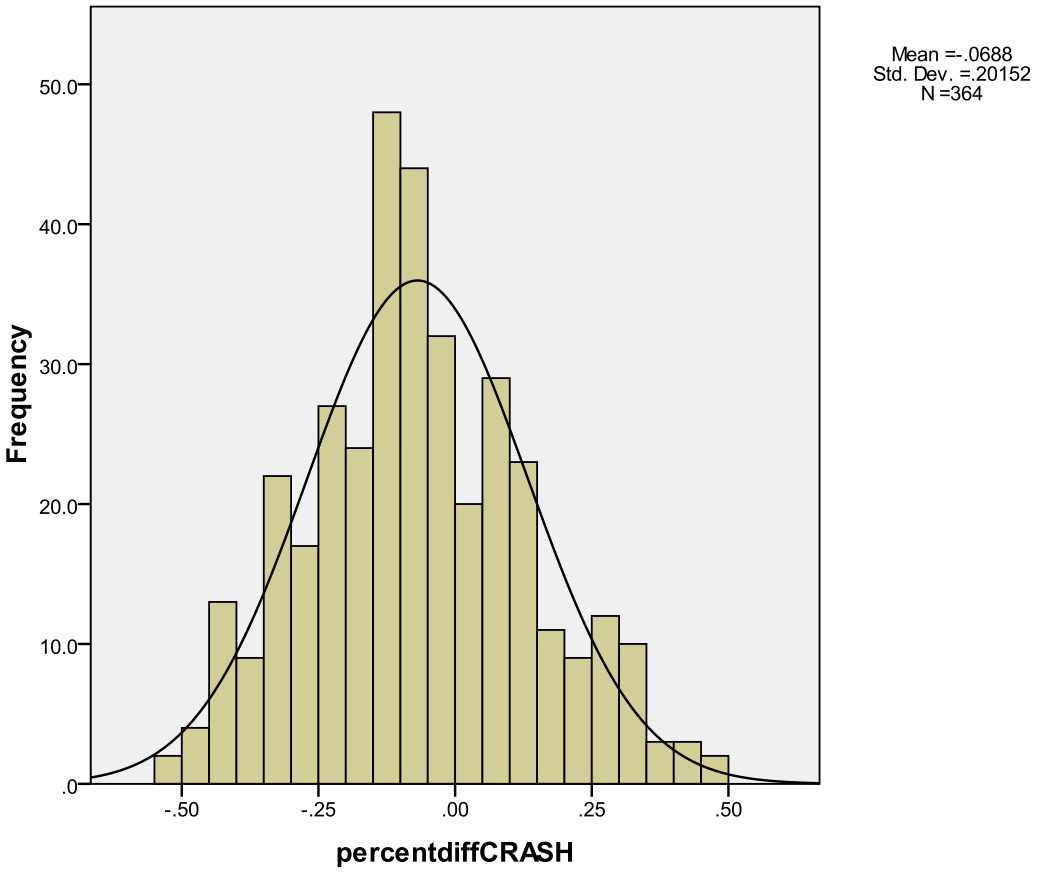
	Statistic	Std. Error
N	364	
Range	.98	
Minimum	-.51	
Maximum	.46	
Mean	-.0688	
Std. Deviation	.20152	
Skewness	.244	.128
Kurtosis	-.226	.255

The revised univariate analysis of percentdiffCRASH presented in Table 5 shows that out of the 364 remaining cities that were studied, there was an average of a 6.9% decrease in alcohol-related crash rates. The largest decrease in alcohol-related crash rate was a 51% decrease in the city of Rio Dell while the largest increase was a 46% increase in the cities of Anaheim and Moreno Valley. The skewness and kurtosis of percentdiffCRASH both fall within acceptable ranges and are less than twice their respective standard errors, indicating a normal distribution. This suggests that 68.26% of percentdiffCRASH values fall between a 27% decrease and a 27% increase (one standard deviation). The range of the data indicates that the difference between the minimum and maximum values of percentdiffCRASH was 0.98 percentage points.

The histogram presented in Figure 7 confirms that the curve is normal with acceptable skewness and kurtosis values. The tail does not taper in either direction

due to the lack of outliers and there is no extreme peak due to the normal kurtosis value. This indicates that the majority of the data fell within a relatively close range.

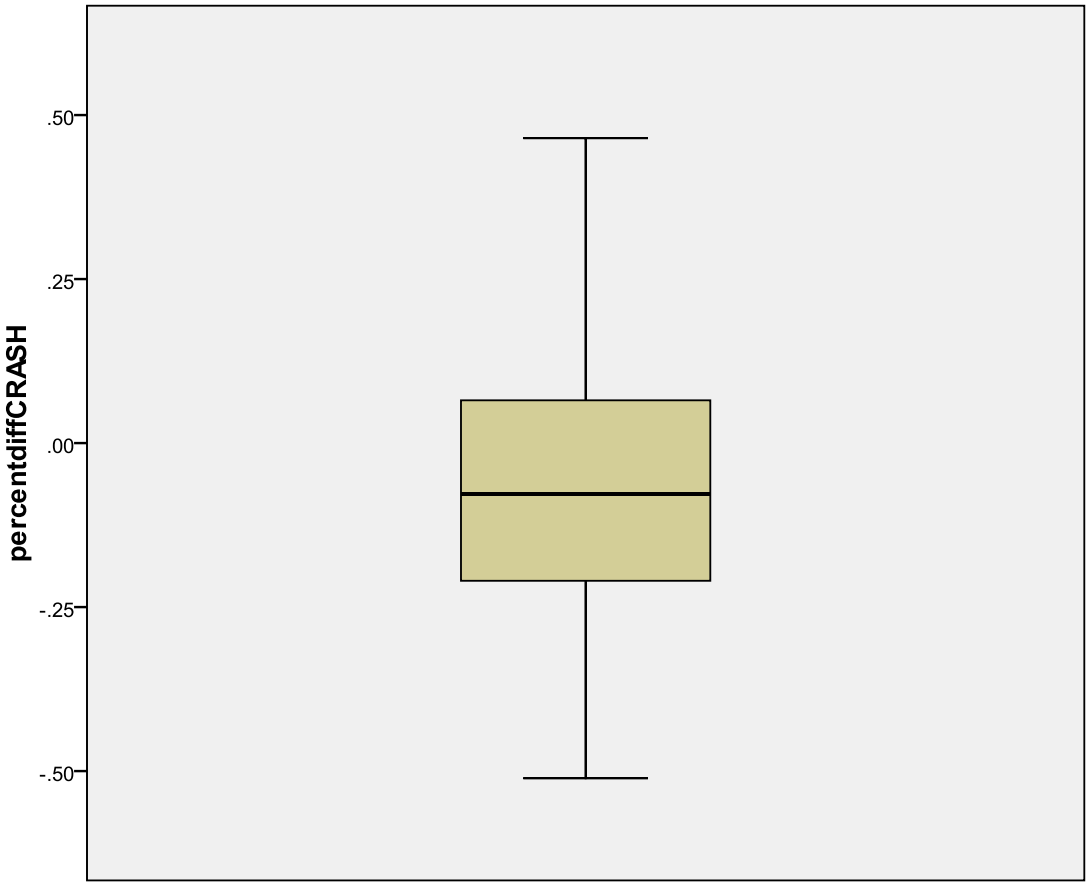
Figure 7. Revised histogram of Crash rate change distribution



The boxplot presented in Figure 8 confirms the elimination of all outliers. As with percentdiffDUI, there appears to be a slightly larger gap between the upper outlier and the interquartile range than the lower outlier. However, it still indicates a near even distribution and the median appears to be close to the middle of the

interquartile range. Additionally, the boxplot indicates that any percent difference greater than a 50% increase or a 50% decrease would be considered an outlier.

Figure 8. Revised boxplot of Crash rate change distribution



By eliminating the outliers for percentdiffDUI and percentdiffCRASH, the data set appears to have a more normal distribution and should produce a more accurate and informative correlation coefficient.

Table 6. Revised correlation between DUI percent change and crash rate change

		percentdiffDUI	percentdiffCRASH
percentdiffDUI	Pearson Correlation	1	.169**
	Sig. (2-tailed)		.001
	N	364	364
percentdiffCRASH	Pearson Correlation	.169**	1
	Sig. (2-tailed)	.001	
	N	364	364

**. Correlation is significant at the 0.01 level (2-tailed).

The revised Pearson coefficient of 0.169, presented in Table 6, indicates a somewhat weaker-positive correlation between percentdiffDUI and percentdiffCRASH. Though slightly weaker than the coefficient obtained with the outliers included, the coefficient still indicates that as a city's DUI arrest rate increases, the alcohol-related crash rate also increases.

Discussion

With the data from this study contradicting the hypothesis of the author, one may be able to find reasons for this contradiction through a theoretical explanation. The foundation of deterrence theory is that humans make a rational choice to either commit a crime or refrain from doing so. If the certainty of punishment is increased, which is the goal of enhanced DUI enforcement, one must wonder whether a person

who is inebriated is in the correct state of mind to appreciate the increase in certainty and react accordingly. If inebriated people are unable to accurately weigh the cost and benefits of a crime and experience the intended deterrent effects, increasing DUI enforcement will certainly result in more arrests simply because there will be more officers available to arrest these individuals who are unable to make the rational decision to avoid drinking and driving.

Another factor to consider in regards to deterrence theory is the extent to which certainty is truly being increased. As indicated in Table 4, the average increase in DUI arrest rate was only 2.2%. Even if inebriated individuals are able to react accordingly to deterrent effects, one must wonder whether such a small increase is enough to increase the perceived risk of punishment among those choosing to drive drunk. Though law enforcement agencies may be increasing the amount of officers allocated to DUI enforcement, such a low increase in DUI arrest rate will likely be too insignificant to affect the public's perceived risk of punishment. Without a significant increase in risk perception, one cannot expect to see a decrease in DUI arrest rate.

Finally, as previous studies have suggested, punishment can possibly result in a resetting affect for individuals. The DUI data obtained from RAND California merely shows the total amount of DUI arrests and does not indicate which arrests were repeat offenders and which were first time offenders. If a resetting effect does occur, it is possible that individuals are arrested and punished for a DUI and subsequently experience a diminished perceived risk of getting caught again. With an

increase in DUI enforcement, this would lead to additional DUI arrests, thereby increasing the DUI arrest rate.

CHAPTER V

LIMITATIONS AND CONCLUSIONS

Limitations

The results from this study contradict the author's hypothesis that an increase in DUI arrest rate would result in a decrease in DUI crash rate. Though explanations have been discussed regarding the contradicting results, it is important to understand the limitations of this study to determine whether these findings can be used to predict future empirical results. Additionally, recommendations for future studies on the effectiveness of enhanced DUI enforcement can be drawn from the limitations of this study.

Due to the fact that only one "group" was analyzed, one could possibly see an external threat to validity arise. As discussed in Campbell & Stanley's *Experimental and Quasi-experimental Designs for Research* (1969), a threat to external validity arises when results from one study cannot be utilized to predict outcomes with other "groups." In this study, though only one collective group was used, the group was made up of over 400 individual cities providing a more broad range of data to analyze and compare. While the large data set can assist in reducing the negative effects of a one-group test, the study still focused on one group as a whole: cities in the State of California. While these cities are patrolled by a wide range of police departments and sheriff departments, they are all patrolled by the California Highway Patrol (CHP). Though other states have state-run law enforcement agencies, these agencies may not

operate in a similar fashion to the CHP. This would leave the author unable to predict with 100% certainty that the results obtained from this study would be obtained from identical studies in another state.

In regards to data reliability, the results of this study could be affected due to differences in how cities classify alcohol-related collisions. For example, city 'A' may consider a collision a DUI-related collision if the driver has any level of alcohol in their blood, even if he or she is under the legal limit. City 'B,' however, may only consider the same collision a DUI-related collision if the driver had a blood-alcohol content over the legal limit. This may result in some cities appearing to have an effective DUI arrest policy when in reality, the DUI-collision rate is low simply because they do not report in the same manner as other cities. In addition to reliability, an internal threat to validity due to instrumentation may have affected the results. Instrumentation affects internal validity when the measurement of the data is changed during the course of the study (Campbell & Stanley, 1969). If individual cities changed the way they reported data or how they classiffied DUI-related collisions during ten year period of study, the internal validity would be greatly affected..

As with the threat to external validity, this study's internal validity and reliability are strengthened by the large sample size. Even if some cities were to report differently or change reporting methods in the middle of the study, the vast amount of data from each city would help mitigate the negative effects. To further help mitigate the negative affects of instrumentation and reliability, future studies

could separate cities into groups based on similar methods of DUI classification. Additionally, future studies may want to determine which cities changed reporting methods mid-study and eliminate those cities.

Finally, this study's internal validity could also be questioned due to history. History arises when researchers have to question whether the results they have obtained from a particular treatment are actually a result of that treatment or some unknown factor (Campbell & Stanley, 1969). In regards to this study, one would have to question whether a city's decrease in DUI-related crashes was actually a result of an increase in DUI arrests or some other factor. During the ten year period of analysis some cities may have seen a decrease in licensed drivers. With fewer licensed drivers, there would be fewer drivers willing to drive drunk. Though enhanced DUI enforcement would certainly result in a higher DUI arrest rate, the decrease in DUI related crashes would not be contributed to the DUI enforcement but the decrease in available drivers. Conversely, an increase in licensed drivers would provide a greater number of individuals willing to drive drunk which could result in more DUI related crashes, despite an increase in DUI arrests. To alleviate this threat to history, future studies should calculate the DUI arrest rate and DUI crash rate utilizing the number of licensed drivers per city rather than the total population.

Conclusions

Though this analysis indicates that enhanced DUI enforcement results in an increase in DUI related crashes, it is important to note that these results should not imply a need to simply abandon DUI enforcement and assume the process fails in

reducing drunk drivers. This study has not shown a strong positive correlation between DUI arrest rate and DUI crash rate and the removal of data outliers further reduced the strength of the correlation. While increased DUI enforcement may not lead to fewer crashes, future studies will need to be conducted to determine with greater certainty the effect that an increase in DUI arrests has on DUI related collisions. Future studies should attempt to include a control group to improve the external validity of the analysis and utilize licensed drivers as opposed to total population when calculating rates. Additionally, future analysis regarding deterrence theory and the effects of drugs and alcohol should be conducted to determine whether increased punishment and patrol is the best course of action for reducing drunk driving.

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APPENDIX

APPENDIX A

ELIMINATED CITIES

The following cities were eliminated from this study for having incomplete or non reported data:

1. Amador
2. Angels Camp
3. Biggs
4. Blue Lake
5. Bradbury
6. Calipatria
7. Citrus Heights
8. Colfax
9. Corte Madera
10. Dorris
11. Dunsmuir
12. Elk Grove
13. Etna
14. Ferndale
15. Fort Jones
16. Goleta
17. Hidden Hills
18. Isleton
19. Laguna Woods
20. Lake Elsinore
21. Larkspur
22. Lathrop
23. Live Oak
24. Loomis
25. Loyalton
26. Maricopa
27. McFarland
28. Mendota
29. Mission Viejo
30. Montague
31. Mountain View
32. Oakley
33. Orange Cove
34. Plymouth

35. Point Arena
36. Portola
37. Portola Valley
38. Rancho Cordova
39. Rancho Santa Margari
40. Rolling Hills
41. San Joaquin
42. San Juan Batista
43. Shasta Lake
44. St. Helena
45. Tehachapi
46. Tehama
47. Truckee
48. Tulelake
49. Wasco
50. Westmoreland
51. Wheatland
52. Woodside