NDSU UPPER GREAT PLAINS TRANSPORTATION INSTITUTE

Department Publication No. 300
September 2018

Effects of Regular Alcohol Monitoring on North Dakota Impaired Drivers

Prepared by:

Kimberly Vachal, Associate Professor
Laurel Benson, Research Project Specialist
Andrew Kubas, Consulting Faculty

The Effects of Regular Alcohol Monitoring on North Dakota Impaired Drivers

Andrew Kubas, Consulting Faculty
Kimberly Vachal, Program Director
Donald Malchose, Research Scientist

Upper Great Plains Transportation Institute
North Dakota State University
Fargo, North Dakota

September 2018

Acknowledgements

The authors are especially grateful for the efforts of the North Dakota Bureau of Criminal Investigation and the North Dakota Department of Transportation. Both agencies displayed a strong willingness to share data; this collaborative effort has undoubtedly improved insights into impaired driving and overall traffic safety in North Dakota. We are particularly thankful for the support provided by Duane Stanley, Mandy Nagel, Monica Sebastian, Karin Mongeon, Sandy Wilson, and Glenn Jackson. Thank you!

Disclaimer

The contents of this report reflect the views of the authors, who are responsible for the facts and the accuracy of the information presented. This document is disseminated under the sponsorship of the North Dakota Department of Transportation in the interest of information exchange. The North Dakota Department of Transportation assumes no liability for the contents or use thereof.

ABSTRACT

The 24/7 Sobriety Program is an intervention strategy mandating that impaired driving offenders remain sober as a condition of bond or pre-trial release. The goal is to monitor the most at-risk offenders in North Dakota and require that these individuals remain sober in order to keep roadways safe from hazardous drivers. As a component of the program, offenders are required to submit to twice-a-day blood alcohol concentration tests, ankle bracelet monitoring, drug patches, or urinalysis as a monitoring technique. If a program participant fails to remain sober, the individual is sent directly to jail. In 2013, House Bill 1302 – which mandated longer enrollment periods for repeat DUI offenders – went into effect. This project seeks to understand three areas: if before-and-after deterrent effects arise upon program enrollment; if House Bill 1302 had a stronger deterrent effect on program participants; and, if some factors contribute to recidivism more than others. Results show that participants significantly improve crash and citation metrics after enrolling in the program. Longer sentencing periods have stronger deterrent effects on DUI-related citations. Individuals participating in the program more than once have higher odds of relapsing into impaired driving behavior. Additional treatment for these individuals may be appropriate as they likely represent the North Dakota driver population which has issues with alcohol abuse and self-control.

TABLE OF CONTENTS

LIST OF FIGURES

LIST OF TABLES

1. INTRODUCTION

Impaired driving is an endemic safety and public health problem in the United States (Voas and Fell 2011). The seriousness is evident in the involvement of impaired drivers in fatal crashes. Impaired drivers create unnecessary financial and societal costs on other road users in the form of lost lives and medical expenses (NHTSA 2010). Alcohol-impaired driving poses a threat to drivers who operate vehicles while impaired and sober drivers sharing the roadway. The effects of alcohol on drivers are multifaceted and include slowed reaction time, vision impairment, interference with concentration, dulling of judgment, and creating a false sense of confidence (NDDOT 2010). In the United States, motor vehicle crashes are the leading cause of death for people between the ages of 3 and 34 (Subramanian 2009). North Dakota has roughly 100 such fatal crashes per year (Figure 1.1). Mothers Against Drunk Driving (2015) estimates the burden on North Dakota taxpayers for drunken driving fatalities is $303 million annually. Clearly, there are both public health and economic benefits if impaired driving is deterred and roadways are made safer in North Dakota.

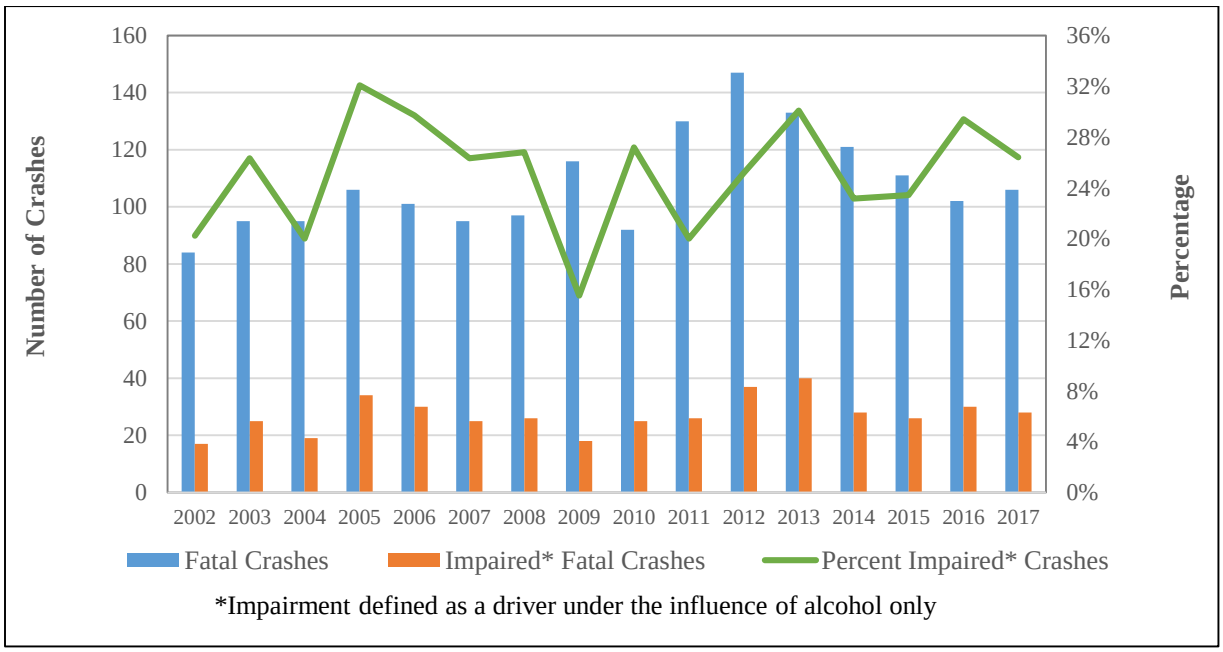

Figure 1.1 Drivers Under the Influence of Alcohol in North Dakota Fatal Crashes, 2002-2017

The State of North Dakota utilizes nationally-accepted strategies to deter instances of impaired driving. Legislation supports these strategies and includes an illegal per se law, implied consent law, preliminary breath test law, punishment for refusal, administrative license suspensions, minimum mandatory ("hard") suspension periods, and open container laws, among others (NHTSA 2007). Nonetheless, criminal fines and punishment associated with impaired driving in North Dakota have been perceived as lenient compared to other states (VanWechel, Vachal, and Benson 2008).

Traditionally, North Dakota legislators passed changes to impaired driving law via piecemeal legislation. In the first few months of 2013, however, comprehensive impaired driving reform was enacted via North Dakota House Bill 1302, one of the first pieces of legislation passed during the legislative session. Passage of this comprehensive reform was attributed to two impaired driving events that gained statewide publicity after taking place within days of one another (Birst and Pettit Venhuizen 2014). In early July 2012, an impaired pickup truck driver traveling the wrong way on I-94 near Jamestown collided head-on with the vehicle of a young family. The impaired driver and all three travelers in the other car – a

husband, pregnant wife, and 18-month-old daughter – were killed. A few days later at a campground near the Canada-North Dakota border, an impaired driver got behind the wheel of a pickup truck, lost control of the vehicle, and drove over a tent being used by a father, his two young sons, and one of their close friends. The two brothers – a five-year-old and a nine-year-old – were killed. It is widely accepted that these two events propelled legislators to reconsider the fines and punishment associated with impaired driving. These events also accelerated the process for passing impaired driving reform and helped make the issue a priority among legislators (Birst and Pettit Venhuizen 2014).

Included in House Bill 1302 was expanded use of the 24/7 Sobriety Program. Although the program had been in use for a few years in the state – it was introduced in pilot study form in 2008 and extended statewide in 2010 – enrollment in the program was largely contingent upon judicial discretion. Whereas the 24/7 Sobriety Program was used mostly as a condition of pre-trial release for repeat offenders prior to 2013 (Smith 2013), House Bill 1302 mandated enrollment for repeat offenders. As part of the legislation enacted in 2013, second-time offenders now have a mandatory 12-month enrollment period in the 24/7 Sobriety Program. Third-time offenders also have a mandatory 12-month enrollment in the program but are further subjected to supervised probation. Fourth-and-subsequent offenders are required by law to be enrolled in the program for 24 months in addition to being placed on supervised probation. This law went into effect on August 1, 2013.

The following paper discusses trends among DUI offenders enrolled in the program. Section 2 provides contextual background for impaired driving prevention and intervention. Section 3 outlines methodologies used by the research team to conceptualize and operationalize program data. Section 4 examines results of statistical analyses in an attempt to answer the research questions that guided the overall study. Section 5 concludes with relevant insights into utilizing the 24/7 Sobriety Program moving forward.

2. BACKGROUND

According to the National Highway Traffic Safety Administration (NHTSA), alcohol-impaired motor vehicle crashes account for an estimated $37 billion in economic costs each year. During 2010, NHTSA reported more than 10,000 deaths caused by alcohol-impaired driving, which accounts for one-third of all traffic crashes. Several interventions and countermeasures have been used to reduce losses caused by impaired drivers. These strategies focus on minimizing losses for both the driver choosing to operate a vehicle while impaired and for sober roadway users impacted by someone else's flawed decision to drive while impaired. Countermeasures are typically coupled in these efforts as states work to stop alcohol-impaired driving. For instance, confounding effects may be found with policies that levy penalties such as fines, licensure loss, and incarceration, along with public education deterrence efforts. Other efforts may focus on enforcement, such as high-visibility enforcement or sustained enforcement programs. In rare cases, some states have deployed programs designed to provide interventions for individual drivers.

In North Dakota, impaired driving is an endemic public safety problem. On average, state law enforcement personnel arrest between 5,000 and 7,000 individuals for DUI each year (NDDOT 2014). Of these arrested drivers, only about 80% will be convicted of operating a vehicle while impaired. North Dakota is among the national leaders in terms of impaired driving arrests and convictions per capita.

According to the North Dakota Department of Transportation, impairment by alcohol and/or drugs was one of the leading contributing factors in fatal crashes in the 2016 calendar year (NDDOT 2017a). Moreover, North Dakota is among the top 10 states with the highest rates of alcohol-related motor vehicle fatal crashes (NDDOT 2011). In North Dakota, repeat DUI offenders account for approximately one-quarter of all DUI offenses (NDDOT 2017b). Because of the high share of repeat DUI offenders, it may be particularly beneficial to understand the success of driver-based interventions that can be targeted at specific offender groups. Although early in its implementation, the goal here is to conduct an assessment of one such program in North Dakota – the 24/7 Sobriety Program – which was first introduced during a 2008 pilot study.

2.1 Impaired Driving in the United States

A seminal study surveying impaired driving attitudes and behaviors estimated that 85.5 million drinking-driving trips were taken in 2008 (Drew et al. 2010). A separate study found that 2% of randomly selected nighttime weekend drivers in the United States had illegal blood alcohol content levels (Lacey et al. 2009). The detection and apprehension rate of impaired drivers is low (Hause, Voas, and Chavez 1982) and there is less than one arrest for every 300 trips by drivers with illegal blood alcohol concentrations (Beitel, Sharp, and Glauz 2000). A study by the NHTSA (2006) showed even lower apprehension rates and estimated that there are between 500 and 2,000 DUI violations committed for every DUI violator arrested. In addition to trips taken by impaired drivers, there is also the threat of impaired drivers being involved in more serious crashes, such as those that result in injuries or fatalities. Alcohol-impaired driving crashes injure 200,000 Americans and accrue roughly $130 billion in societal costs annually in the United States (Zaloshnja and Miller 2009). The latest estimates released by the FBI (2017) show that 1,017,808 drivers were arrested for DWI or DUI in the United States in 2016.

Making smart decisions with regard to driving after drinking is a major safety and public health concern in a nation where one-third of the population consumes alcohol (Voas and Fell 2011). The National Survey of Drinking and Driving Attitudes and Behaviors conducted by the NHTSA found that one in five of those surveyed aged 16 or older reported driving within two hours after drinking (NHTSA 2010). Between 1982 and 1997, the enactment of basic impaired driving laws decreased alcohol-related crash fatalities, but no major declines have occurred since (Voas and Fell 2011) and the alcohol-impaired

driving fatality rate per 100 million VMT has remained relatively unchanged since 2009 (NHTSA 2016). These laws commonly included a 0.08 g/dL BAC legal limit, license revocation or suspension for BAC higher than the legal limit, a minimum legal drinking age of 21, and the zero-tolerance law for drivers younger than 21 with alcohol in their systems (Voas and Fell 2011). Currently all 50 states and the District of Columbia have a 0.08 g/dL BAC legal limit as well as vehicle sanctions for repeat offenders (Voas and Fell 2011). On December 30, 2018, Utah will set a stricter BAC limit of 0.05 g/dL (GHSA 2017). Even with these laws in place, the current crash, court, and incarceration literature suggests that more must be done to reduce impaired driving incidence as this activity is still occurring at dangerous rates (Voas and Fell 2011).

A 2010 survey to assess the prevalence of alcohol-impaired driving among adults found 2.8% of respondents reported at least one episode of alcohol-impaired driving. The four million respondents yielded an estimated 112,116,000 episodes of alcohol-impaired driving in the United States for the 2010 calendar year. The results showed that impaired driving was highest among ages 21-24, binge drinkers, and among those less likely to wear seat belts (Bergen, Shults, and Rudd 2011). The impaired driving trends were also analyzed for regions and states and showed that the Midwest region had the highest rate of impaired driving with 643 episodes per 1,000 population. The state with the highest self-reported impaired driving rate in the Midwest region was North Dakota (Bergen, Shults, and Rudd 2011). A recent survey of North Dakota drivers also shows great propensity with 34.6% of the population reporting they had operated a vehicle within two hours of consuming one or two alcoholic beverages (Vachal, Benson, and Kubas 2018).

2.2 Reasons for Drinking, Treatment, and Sobriety

Reasons for drinking are diverse and vary on an individual basis. Interviews with 12 compulsory alcohol abusers found problem denial and lack of treatment to be two common themes for abusing alcohol (Ekendahl 2009). A survey of first-time and repeat DUI offenders in North Dakota discovered that inebriated drivers often did not have a passenger present in the vehicle at the time of arrest, which suggests that some individuals may be drinking alone for escapism (Huseth and Kubas 2012). Other respondents showed behaviors indicative of alcoholism and/or issues with self-control. For example, repeat offenders were more likely to also have used illicit drugs on the same day as their DUI arrest (Huseth and Kubas 2012). In a study in which counselors interviewed DWI recidivists about why they continued to drive after a DWI conviction, offenders reported a need for thorough alcohol use assessment, self-commitment to dealing with problems, personalized treatment, and continued contact with caring individuals as factors needed to reinforce positive lifestyle changes (Wiliszowski et al. 1996). DWI courts also emphasize these principles (Fell, Tippetts, and Ciccel 2010).

A study examining the effectiveness of multiple screening instruments – "CAGE," "AUDIT," and "MAST" – to gauge social and behavioral aspects of alcohol problems noted that patients with alcohol dependence "typically require more intensive counseling in alcohol treatment programs than patients with less severe alcohol problems" (Fiellin, Reid, and O'Connor 200: 820-821). An inextricable link between culture, spirituality, and one's sense of "native community" as it related to the ultimate goal of sobriety was found in a study of treatment and sobriety in Alaskan native communities (Hazel and Mohatt 2001). In this case study, recovering men typically reported seven reasons for resisting temptation and staying sober: acknowledging the benefits of sobriety, fearing the consequences of drinking, a conscious desire for sobriety, support from family, formal support programs, keeping active, and religion or spirituality. Focus groups with recovering men determined that sobriety was related to four themes – spirit, thought, physical, and feelings – at the individual, family, community, and world/environment levels. A survey about one's experiences with drinking and sobriety administered afterward identified a pivotal event,

cognitive appraisal, social support, culture, and spirituality as key factors that guide alcoholics toward the "sobriety path" (Hazel and Mohatt 2001: 552-555).

2.3 Recidivism

Many studies have examined how impaired driving is related to recidivism. Approximately 35% of all DUI convictions are for drivers with a previous DUI conviction in the prior seven years (Schell, Chan, and Morral 2006). This is reaffirmed by Fell (1995), who found that roughly one-third of drivers arrested for DWI are repeat offenders. It is known that DUI recidivists carry a higher risk of future DUI arrest (Gould and Gould 1992), have a higher risk of involvement in alcohol-related and non-alcohol-related crashes (Perrine, Peck, and Fell 1988), and have a higher risk of being involved in fatal crashes (Fell and Klein 1994). In a sample of 3,884 convicted impaired drivers, repeat offenders were more likely to have a prior criminal history, less education, and greater rates of substance use than first-time offenders (DeMichele and Lowe 2011). Gender, unemployment, and ethnicity are also determinants of DUI recidivism (Nochajski and Stasiewicz 2006). Males are more likely to be recidivists than females (Nochajski and Stasiewicz 2006). There is regional variation in ethnic recidivism rates; whereas the majority of repeat DUI offenders are white in the Midwest, Northeast, Northwest, and South, most recidivists are Hispanic or Native American in the Southwest (Nochajski and Stasiewicz 2006).

The NHTSA (2006) developed a guide explaining appropriate sentencing for DWI offenders. Working collaboratively with the National Institute on Alcohol Abuse and Alcoholism (NIAAA), six factors were identified as critically important to reduce recidivism:

- Evaluating offenders for alcohol-related problems and recidivism risk
- Selecting appropriate sanctions and remedies for each offender
- Including provisions for appropriate alcohol abuse or alcohol-dependent treatment in the sentencing order for offenders who require such treatment
- Monitoring the offender's compliance with the sanctions and treatment
- Acting swiftly to correct noncompliance
- Imposing vehicle sanctions, where appropriate, that make it difficult for offenders to drink and drive during said period

It has been posited that recidivism is a common characteristic of impaired drivers in fatal crashes because the current parole system largely fails to rehabilitate the parolee's behavior (Kleiman and Hawken 2008). Moreover, the habitual abuse of alcohol is common among the incarcerated population as more than two-thirds of jail inmates met substance dependence or abuse criteria (Karberg and James 2005). With this failure, it is important to find ways to address this problem as a potential means to reduce impaired driving, especially with repeat offenders. It has been suggested that the best way to deter recidivism is to use certainty over severity – responding to violations quicker and communicating the deterrent threat to the likely violators minimizes repeat offenses (Kleiman and Hawken 2008).

These strategies are used in programs such as the HOPE program and the South Dakota 24/7 Sobriety Project, and have shown positive results in reducing recidivism among parolees who participate (Kleiman and Hawken 2008). These community corrections programs conduct alcohol and drug screenings, paid by the offender, which are less costly than long-term jail sentences (Voas et al. 2011). Such alcohol treatment has been shown to reduce impaired driving and alcohol-related crashes among offenders who receive mandatory interventions (Dill and Wells-Parker 2006). It has been further suggested that alcohol-related intervention and treatment in combination with licensing actions is the best strategy to reduce recidivism (Dill and Wells-Parker 2006). Advances in technology, such as the use of electronic monitoring devices for home detention and remote BAC monitoring, are other sanction options that can further decrease DUI recidivism (Dill and Wells-Parker 2006).

Note that DUI interventions do not necessarily work for every individual convicted of impaired driving. For example, in a limited assessment of North Dakota drivers, 2.8% of individuals participating in the 24/7 Sobriety Program had at least one DUI during program enrollment (Kubas 2016). Interventions do, however, show different results for recidivism among those who complete an intervention program. A study highlighting driver performance in England and Wales examined 144 individuals in an intervention program and compared them to both a control group and a subgroup of participants who did not complete the intervention program (Palmer et al. 2012). The rate of recidivism was higher among those who did not complete the intervention than for the other groups – those who completed the program and those in the control group (Palmer et al. 2012). The study recommended highlighting the factors associated with non-completion of the program and high rates of reconviction, and also advocated directing resources to those at high-risk for reconviction rather than those who are at a lower risk for reconviction.

The failure of the parole system to deter recidivism in impaired drivers has led to new versions of parole systems in some regions that use certainty over severity. These new systems respond to violations quicker and communicate the deterrent threat with the belief that violators will subsequently minimize recidivism (Kleiman and Hawken 2008). Two ongoing programs with positive initial results are the Hawaii Opportunity Probation with Enforcement (HOPE) program and the South Dakota 24/7 Sobriety Project. These programs have the sole purpose of making roads and communities safer. These interventions, which are focused on individual drivers and rehabilitation, have been implemented as strategies to reduce recidivism. The HOPE program is broader and has been used with criminal offenses beyond impaired driving. The 24/7 Sobriety Project has been targeted specifically at impaired drivers.

2.3.1 The HOPE Program

The Hawaii Opportunity Probation with Enforcement (HOPE) program was started in 2004 to break the cycle of repeating offenses (Office of National Drug Control Policy 2011). The program engages rigorous principles to keep probationers at high-risk of failure from breaking probation terms and being sent back to prison. It is carried out by imposing "swift, certain, and short jail sanctions" for every violation of probation terms (Office of National Drug Control Policy 2011).

The program's principles are to identify probationers who are at high-risk for probation violation and to notify them that for every probation violation there will be an immediate penalty. The program conducts frequent and random drug tests and imposes short jail sanctions for each detected violation. It also refers participants to drug treatment upon request. Those on probation who do not abstain from drugs while under sanctions are referred to drug treatment (Office of National Drug Control Policy 2011).

The HOPE program is estimated to cost $2,500 per program participant, which is more than standard probation terms but saves money compared to re-arrests and re-incarceration. The program was evaluated in 2009 by the National Institute of Justice, which concluded that the more than 1,500 HOPE program participants analyzed were 55% less likely to be arrested for new crimes, 72% less likely to use drugs, 61% less likely to miss appointments with their probation officer, and 53% less likely to have their probation revoked as compared with a control group.

Literature on the HOPE program outlines the positive effects it has on the participants as well as its cost effectiveness. The program's swiftness leads to longer-lasting change compared to typical treatment programs (Kiyabu, Steinberg, and Yoshida 2010; DuPont and Skipper 2012). Specific HOPE program impacts with regard to alcohol-impaired driving were not found.

2.3.2 The South Dakota 24/7 Sobriety Project

Another program that uses tactics similar to HOPE in targeting recidivist DUI offenders is the South Dakota 24/7 Sobriety Project. North Dakota and other states have developed impaired driving intervention programs modeled after this South Dakota initiative. A pilot program was started under former Attorney General Larry Long in 2005 because of South Dakota's high rate of alcohol- and drug-related incarcerations. Between 1999 and 2007, 59% of the nearly 25,000 recorded felonies in South Dakota were related to drugs and alcohol (Long 2009) and 13.6% of those incarcerated were DUI offenders (Loudenburg, Drube, and Leonardson 2010). The South Dakota 24/7 Sobriety Project was started as an alternative for DUI incarceration, but as of 2009 only 59% of the participants were DUI offenders and the remaining 41% were enrolled in the program for other offenses (Loudenburg, Drube, and Leonardson 2010).

As a requirement of their probation, the program mandated that participants be tested for alcohol by measures such as reporting twice daily for breath testing, wearing an ankle bracelet to electronically monitor alcohol, and using a drug patch or urine testing (Voas et al. 2011). The project has strict enforcement: if offenders pass the alcohol screening tests, they carry on as usual. However, if they fail an alcohol screening test or do not show up to take it, the offenders go directly to jail (Chavers 2008).

An early evaluation of the program demonstrated that it has some success and suggested further studies be conducted on its effectiveness as more data become available (Loudenburg, Drube, and Leonardson 2010). Since then, the program has been monitored across a number of academic disciplines. A comparison analysis on recidivism found that participants in the 24/7 Sobriety Project had a 74%, 44%, and 31% reduction in recidivism on their second, third, and fourth DUI, respectively (Loudenburg, Drube, and Leonardson 2010). The reductions in DUI recidivism exceed the reported reductions for other interventions such as educational interventions and sanctions found throughout the literature. DUI offenders in the 24/7 Sobriety Project also had lower rates of DUI recidivism when compared with control groups not enrolled in the program (DuPont and Skipper 2012). When the presence of the 24/7 Sobriety Project was treated as an intervention variable, counties with the program had a 12% reduction in repeat DUI arrests, a 9% reduction in domestic violence arrests, and mixed results for traffic crashes (Kilmer et al. 2013). These findings have been reaffirmed by Midgette (2014) who also determined that males between age 18 and 40 may have fewer incidences of traffic crashes upon enrollment in the course.

South Dakota's 24/7 Sobriety Project is now imitated in North Dakota, Montana, and parts of Wyoming (Brown 2012) and is being tested for urban scalability in Jacksonville, Florida (Midgette 2016). The U.S. Department of Justice has labeled the 24/7 Sobriety Project initiative as a "promising" program (Midgette et. al, 2013; Midgette and Kilmer, 2015; Midgette 2016). At an international level, the program has also been introduced in pilot form in the United Kingdom (Kilmer and Humphreys 2013). The North Dakota 24/7 Sobriety Program was one of six programs chosen for a Secure Continuous Remote Alcohol Monitoring (SCRAM) study by the National Highway Traffic Safety Administration and the Pacific Institute for Research and Evaluation. The case study found that transdermal alcohol monitoring was beneficial to courts and probation and parole departments in all the case study sites, and that research is needed to study whether transdermal alcohol monitoring reduces drinking and DUI recidivism among offenders (McKnight, Fell, and Auld-Owens 2012).

2.4 Implementing the 24/7 Sobriety Program in North Dakota

North Dakota's 24/7 Sobriety Program is modeled directly after the South Dakota program. Program authorization is granted by North Dakota Century Code 54-12-27 through 54-12-31. These statutes grant the Attorney General the ability to use the program, establish program fees, create program funding, and

establish the program's use as conditions of bond for offenders (North Dakota Century Code 54-12-27 through 54-12-31). A pilot program was first authorized by the North Dakota legislature in 2007 to administer breath tests for alcohol offenders in select parts of the state (Fisher, McKnight, and Fell 2013). On January 1, 2008, the pilot program began in 12 counties near the South Central Judicial District (Figure 2.1), and statewide implementation was completed in August 2010 based on the success of the pilot study (Fisher, McKnight, and Fell 2013).

Figure 2.1 2008 Pilot Program Counties

For the majority of the program's existence, DUI offenders were assigned to the program at the discretion of judges. This allowed for individuals with other alcohol-related offenses – such as domestic violence or abuse/neglect of a child – to also be enrolled in the program. Legislation implemented on August 1, 2013, mandates that any repeat DUI offender be required to participate in the program as a condition of bond or pre-trial release (Fisher, McKnight, and Fell 2013).

Like South Dakota's 24/7 Sobriety Project, North Dakota DUI offenders are required to have twice-daily breath tests or, alternatively, urinalysis and/or ankle bracelet monitoring. Some offenders may also be required to wear a drug-monitoring patch if deemed necessary by the judge. Like the South Dakota model, DUI offenders in North Dakota are also required to pay for each breath test or alcohol monitoring system. This makes the program self-sustainable as it is fully funded by DUI offenders. The most recently available data indicate that 95.82% of the individuals placed in the 24/7 Sobriety Program successfully complete it (North Dakota Attorney General's Office 2016).

In September of 2016 the National Highway Traffic Safety Administration sent a technical assessment team to Bismarck to conduct a comprehensive assessment of the state's impaired driving program. The team met with a variety of North Dakota stakeholders dedicated to impaired driving prevention and intervention. Individuals included those in planning, prevention, criminal justice, communication, treatment and rehabilitation, and data/records management. Ultimately, the team had 18 priority recommendations to improve the North Dakota impaired driving prevention/intervention program (Burch et al. 2016). One of these recommendations is directly related to this project:

- Expand the evaluation of the *24/7 Sobriety Program* to include comparison groups (e.g., test failure, treatment, geography) as a way to determine the general effectiveness of the program in addition to the internal process effectiveness.

In conjunction with this assessment, the NDDOT subsequently released its *Impaired Driving Strategic Plan for North Dakota* which reaffirms the priority areas (NDDOT 2017c). Detailed throughout this plan are strategies for performance measurement, descriptions of current activities and projects, and a detailed discussion of the recommendations made by the NHTSA assessment team. Included in this plan is continued support to evaluate the 24/7 Sobriety Program and its effectiveness on traffic safety metrics.

A prior assessment of the 24/7 Sobriety Program in North Dakota found positive results. The program appeared to have a stronger deterrent effect on females and the legislation enacted by House Bill 1302 was more effective at reducing impaired driving events (Kubas, Kayabas, and Vachal 2015). There were some limitations to this study via probabilistic matching and tracking participants in equal intervals before and after completing the program. The forthcoming analysis is more robust as it includes an improved participant probabilistic matching process and a higher volume of participants. The following research questions guided the work:

- Is there a before-and-after deterrent effect when examining program entrants?
- Is there a difference in crash and citation rates for enrolled participants factoring for House Bill 1302?
- Can a model be developed to assist practitioners in identifying enrollees most likely to recidivate?

This study contributes to the literature by assessing the efficacy of legislation and evaluating traffic safety performance by a diverse set of program participant groups. Gender, region, geography, repeat DUI offenders, multi-entry participants, and participation length are factors considered throughout the report.

3. METHODS

Individual records were obtained from two data sets. First, the North Dakota Bureau of Criminal Investigation (BCI) provided historical records of North Dakotans enrolled in the 24/7 Sobriety Program. This database encompassed 10 years of driver records from January 2008 to December 2017. Per the data agreement between NDSU and the BCI, once the data were cleaned and useful variables were created, personal identification information was removed from the database to protect the anonymity of DUI offenders. The first record in the database started the program on January 8, 2008, during the pilot program era. The most recent records from the latter months in 2017 were not used because the research team only had access to crash data through calendar year 2017. Because each participant was tracked for a minimum of 60 days after starting the program, this meant that participants beginning the program after November 1, 2017, were not included in the analysis as they were incapable of being tracked for the minimum study period. Therefore, the last valid record had a program start date of October 30, 2017.

The original data transfer consisted of 26,350 entries with 26,341 valid record start dates between January 1, 2008, and December 31, 2017. Within these records, enrollment was DUI-related for 15,524. Of these, 14,615 were study eligible because they reported North Dakota addresses. Duplicate entries for a participant, based on the same start date and unique identifier, were removed, resulting in 10,883 valid 24/7 Sobriety Program participant records. In summary, parameters for removing entries from the final data set included data entry errors, enrollment periods outside of the study timeframe, under age of 18, and out-of-state participant address.

Valid 24/7 Sobriety Program participant records were matched to driver's license records provided to the research team by the North Dakota Department of Transportation. This driver's license database includes both crash and conviction information for North Dakota drivers. Thus, if a link is established connecting these two databases, it becomes possible to track individual drivers enrolled in the 24/7 Sobriety Program with regard to crashes and convictions before, during, and after enrollment in the program.

Deterministic matching was used to link 24/7 Sobriety Program records with driver's license records. The North Dakota Department of Transportation provided the research team with a unique numeric code (hereafter referred to as the "Record ID") corresponding to each individual driver. This file containing each driver's Record ID also included the last four digits of their social security number. Working backward, the research team first linked the Record ID to the 24/7 Sobriety Program participant list provided by the North Dakota Bureau of Criminal Investigation as both data sources contained the last four digits of the individual's social security number. Once the Record ID was linked to program participants, this new database was linked a second time to driver records as both of these sources contained the Record ID variable. The matching rate for this process was 90.3%. In other words, 9,830 participant entries were linked from a possible 10,883 records meeting study criteria.

Once records were matched, the database was cleaned and a series of variables were created for use in various statistical analyses. These variables include DUI history, crash history, DUI-related citation history, non-DUI-related citation history, the date of enrollment in the 24/7 Sobriety Program, the type of alcohol monitoring system used by the offending driver, and demographic information such as age, gender, and regional/geographic characteristics. For each participant, the DUI, crash, and citation records were tracked for 60-, 365-, and 730-day intervals before and after starting the program. These study periods were purposely used as they relate directly to sentencing timeframes mandated by law. Prior to passage of House Bill 1302, individuals were commonly sentenced to the program for 60 days. After the enactment of this legislation, second- and third-time offenders were required to participate in the program for 365 days and fourth-or-subsequent offenders for 730 days.

One variable highlighted the type of monitoring system being used to track program participants. Within this variable, it was discovered that 242 participants were tracked using only a drug patch. Because the focus of this research paper is on understanding alcohol-impaired driver behavior, these 242 records were eliminated from the database as they were not specific to alcohol-impaired driving. The final database consisted of 8,477 alcohol-impaired driving-related records.

It is possible for a participant to have an impaired driving event, be sentenced to the program, successfully complete the program, have another impaired driving event in the future, and be sentenced to the program for a second (or subsequent) time. For the purposes of this study, statistical analyses are pertinent to the number of program entries as it is possible for participants to enter the program multiple times. In sum, there were 6,447 individuals who accounted for 8,477 program entries.

3.1 Data Characteristics

3.1.1 Program Start Year

As expected, enrollment in the 24/7 Sobriety Program expanded once it was scaled statewide. Participation in the program grew noticeably after 2013, which may be associated with legislation mandating that repeat offenders participate in the 24/7 Sobriety Program (Table 3.1).

Table 3.1 Program Start Year

Start Year	Number of Entries	Percent of Sample
2008[1]	128	1.5%
2009[1]	203	2.4%
2010[2]	528	6.2%
2011	811	9.6%
2012	744	8.8%
2013	958	11.3%
2014	1,382	16.3%
2015	1,380	16.3%
2016	1,301	15.3%
2017[3]	1,042	12.3%

[1] 24/7 Sobriety Program was used only in pilot form
[2] 24/7 Sobriety Program was used statewide starting on August 1, 2010
[3] Figure is based on enrollment through October 31, 2017

3.1.2 Demographic Information

In this sample of DUI offenders, men outnumbered women at roughly a four-to-one ratio based on program entries. Males were 78.7% of the entries compared to 21.3% who were female. This is consistent with other studies of DUI offenders in the state (Huseth and Kubas 2012; Kubas, Kayabas, and Vachal 2016). Younger drivers had a higher representation in the sample than older drivers (Table 3.2). A majority (57.2%) in the sample were under the age of 34, which parallels other statewide studies finding that 18-to-34-year-olds exhibit behaviors at odds with traffic safety goals, such as operating a vehicle after consuming alcohol more frequently than others (Vachal, Benson, and Kubas 2018). This is especially true for male drivers, as this particular group has been labeled as high-risk throughout the literature. Note that in this sample drivers in one age cohort – those over the age of 75 – have fewer than 30 entries in their age group. Sample sizes smaller than 30 are not considered reliable when conducting tests of significance and cannot be extrapolated to fit the entire demographic being studied. Therefore,

any conclusions made in this report about the 75+ cohort cannot be considered representative of all DUI offenders in that age group in North Dakota. To account for this shortcoming, the 65-to-74 and the 75+ age cohorts were aggregated to create one larger 65-and-above cohort used throughout statistical analyses.

Table 3.2 Age of Participant at Time of Entry

Age Cohort	Number of Entries	Percent of Sample
18-24	1,713	20.2%
25-34	3,140	37.0%
35-44	1,780	21.0%
45-54	1,259	14.9%
55-64	509	6.0%
65-74	65	0.8%
75+	11	0.1%

Participation in the 24/7 Sobriety Program was not evenly distributed across region and geography (Table 3.3). Roughly half of program entries (49.5%) were from urban counties in the western half of the state. This makes sense considering that most of the 12 pilot counties were located in the western half of the state and included the cities of Bismarck and Mandan – the urban hub of the region. Because this area has had the program in place for the longest period of time, it is reasonable to assume that a higher-than-average number of program entries would meet these regional and geographic categorizations.

Table 3.3 Program Entries, by Region and Geography

		GEOGRAPHY		
		Urban	Rural	**Total**
REGION	East	2,652 (31.3%)	699 (8.2%)	**3,351 (39.5%)**
	West	4,198 (49.5%)	928 (10.9%)	**5,126 (60.5%)**
	Total	**6,850 (80.8%)**	**1,627 (19.2%)**	**8,477**

The regional definition was created by aggregating state health regions into two areas representing an east/west division. The geography definition includes an urban/rural dichotomy. Urban participants are from counties with the largest urban population according to the most recently published data estimates from the US Census Bureau (2016). Six urban counties are located in the east and another six are located in the west based on population density metrics in the study (Figure 3.1). These counties represent the majority of the urban population in the state.

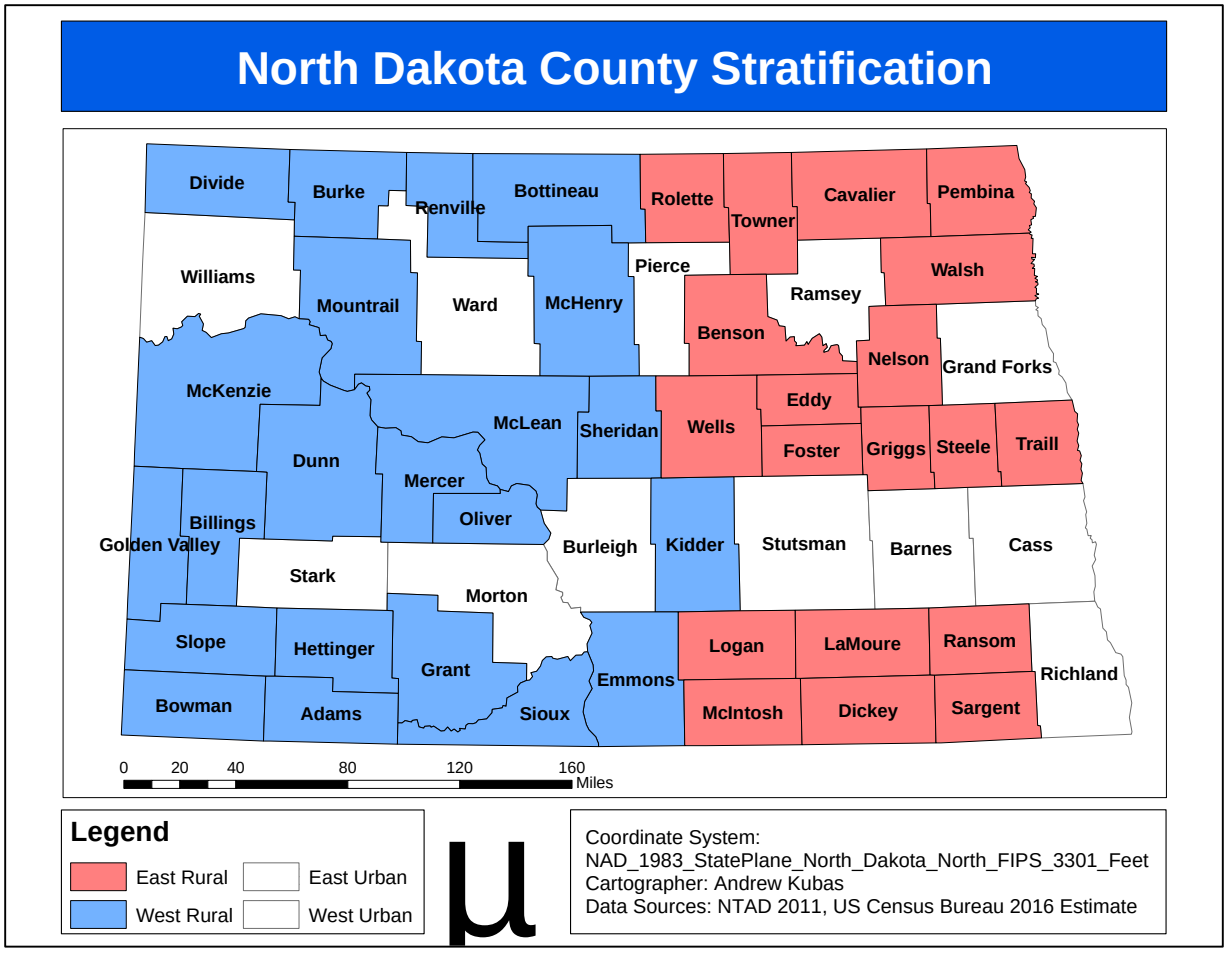

Figure 3.1 North Dakota County Stratification

3.1.3 Monitoring System

Once enrolled in the 24/7 Sobriety Program, participants must remain sober for the duration of the enrollment period. For the offender to stay accountable and remain sober in the program, regular alcohol testing occurs. In North Dakota, multiple alcohol monitoring systems are utilized as part of the 24/7 Sobriety Program. These systems include twice-a-day preliminary breath tests, ankle bracelet monitoring, and urinalysis testing. (Some respondents, as advocated by judicial discretion, may be subjected to additional monitoring via drug patches capable of monitoring illegal substances in a participant's sweat.) "SCRAM" (secure continuous remote alcohol monitoring) ankle bracelets vary by function and are not a truly continuous monitoring device. In general, the bracelet takes a test roughly every 30 minutes. This data remains stored and may require hard line/Ethernet, machine, or wireless capability to upload data to a database. This information is downloaded to track compliance to sobriety, but the download frequency varies. Of the 8,477 entries in this sample, roughly two-thirds (65.5%) were monitored with only one type of alcohol-testing system. Roughly half (47.8%) of participants in this sample were monitored with twice-a-day preliminary breath tests only (Table 3.4). Of the remaining 2,922 entries with two or more alcohol-monitoring systems, 92.9% were monitored by both the twice-a-day preliminary breath tests and SCRAM ankle bracelets. It should be clarified that these individuals were never monitored by two devices at once; these participants switched monitoring devices at some point in the program. Just 81 entries (1.0%) were tracked by three or more monitoring systems. Once again, no participant was subjected to being

monitored by more than one alcohol-monitoring device at once. It is possible that the drug patch was used simultaneously with an alcohol monitoring device.

Table 3.4 Monitoring System

Monitoring System*	Number of Entries	Percent
Preliminary Breath Test Only	4,055	47.8%
Preliminary Breath Test and SCRAM	2,715	32.0%
SCRAM Only	1,494	17.6%
Drug Patch and Preliminary Breath Test	69	0.8%
Drug Patch, Preliminary Breath Test, and SCRAM	59	0.7%
SCRAM and SCRAM Wireless	25	0.3%
Drug Patch and SCRAM	16	0.2%
Preliminary Breath Test, SCRAM, and SCRAM Wireless	10	0.1%
Preliminary Breath Test and Urinalysis	9	0.1%
Preliminary Breath Test, SCRAM, and Urinalysis	8	0.1%
Urinalysis Only	6	0.1%
SCRAM and Urinalysis	5	0.1%
Drug Patch, Preliminary Breath Test, SCRAM, and Urinalysis	3	<0.1%
Preliminary Breath Test and Scram Wireless	1	<0.1%
Drug Patch and Urinalysis	1	<0.1%
Drug Patch, SCRAM, and Urinalysis	1	<0.1%

*Data provided to the research team included some individuals tracked by drug patch only. These entries are excluded from the analysis as this report of 24/7 Sobriety Program entries requires at least one alcohol monitoring system

3.1.4 Recidivist Status

Most studies monitoring the behaviors and patterns of alcohol abusers define recidivists as anyone who relapses into repetitive criminal behaviors. With regard to driving under the influence of alcohol, repeat DUI offenders are considered to be among the most dangerous drivers as their habitual use of alcohol and subsequent decisions to drive while impaired pose a major threat on the roadway. Studies throughout the literature validate that these drivers pose a safety threat to other drivers sharing the road. For the purposes of this study, however, "recidivist" refers to drivers in the 24/7 Sobriety Program who receive a DUI citation after enrolling in the program. This definition will be used because the agencies supporting this research are most interested in determining how the program affects traffic safety. Other alcohol-related citations neither guarantee that an individual was operating a vehicle at the time of the citation nor guarantee that the individual was impaired. In this sample of 24/7 Sobriety Program entries, about four-fifths (80.3%) had a DUI as the triggering event mandating initial participation in the program (Table 3.5).

Table 3.5 Offense Type Triggering Enrollment in 24/7 Sobriety Program

Offense Type	Number of Entries	Percent
Actual Physical Control	1,369	16.1%
Driving Under Suspension	79	0.9%
Minor in Possession/Control	213	2.5%
DUI 1st Offense	1,468	17.3%
DUI 2nd Offense	3,596	42.4%
DUI 3rd Offense	1,105	13.0%
DUI 4th+ Offense	647	7.6%

Based on this study's definition of a recidivist driver, three levels of recidivism will be examined: high-risk recidivists, moderate-risk recidivists, and post-program recidivists. High-risk recidivists are classified as those drivers receiving an impaired driving citation within 60 days of entering the 24/7 Sobriety Program. A period of 60 days was intentionally chosen because – prior to the latest legislative changes made in House Bill 1302 – this represents the typical time a DUI offender was sentenced to the program (McKnight, Fell, and Auld-Owens 2012). All entries in the data set used for the analysis were subjected to the program for a minimum of 60 days. Moderate-risk recidivists are categorized as those drivers who received an impaired driving citation while enrolled in the program at some point after day 61 of participation. Only those drivers who began the program after the passing of House Bill 1302 can be categorized as moderate-risk recidivists as enrollees in the program pre-House Bill 1302 would not have typically been required to remain sober for more than 60 days. Post-program recidivists are those who successfully remain sober while enrolled in the program but have an impaired driving violation at some point after completing the 24/7 Sobriety Program.

In this sample of entries, 47 participants (0.6%) received a citation for impaired driving within 60 days of starting the program and are considered high-risk recidivists. A larger share of 135 entries (1.6%) received an impaired driving citation at some point while enrolled in the program after day 61. These individuals represent moderate-risk recidivists in this sample. A much larger share of 297 entries (3.5%) received an impaired driving citation at some point after completing the program and are considered post-program recidivists. There is independence of observations among these three recidivist types.

Note that although the conceptualization of these variables remains consistent with previous assessments, the operationalization of these variables is markedly different. Whereas prior assessments of the 24/7 Sobriety Program included citations for actual physical control, driving under suspension/revocation, and minor in possession/control among the impaired-driving-related program failures, the 2018 assessment only includes citations for driving under the influence of alcohol when referencing "DUI citations." These changes are most pertinent to Section 4.5.3 through Section 4.5.3.3 of this report which model predictors of DUI recidivism. Table 3.6 explains the conceptualization and operationalization of the DUI citation, DUI-related citation, Non-DUI-related traffic citation, and crash variables used in this study.

Table 3.6 Conceptualization and Operationalization of Impaired Driving Data

Variable	Conceptualization	Operationalization	Uses in Report
DUI Citation	An offender receives a citation for driving under the influence of alcohol that would trigger enrollment (or re-enrollment) into the program	Drivers in the 60, 365, and 730 days before (or after) starting the program are coded as a "1" if they have the following citations in those time periods: • DUI 1st offense • DUI 2nd offense • DUI 3rd offense • DUI 4th+ offense All other drivers are coded as "0"	Sections: • 4.5.3 • 4.5.3.1 • 4.5.3.2 • 4.5.3.3
DUI-Related Citation	An offender receives a citation related to driving under the influence of alcohol that would trigger enrollment (or re-enrollment) into the program	Drivers in the 60, 365, and 730 days before (or after) starting the program are coded as a "1" if they have the following citations in those time periods: • DUI 1st offense • DUI 2nd offense • DUI 3rd offense • DUI 4th+ offense • Actual physical control • Driving under susp./revoc. • Minor in possession/control All other drivers are coded as "0"	Sections: • 4.1.1 • 4.2.1 • 4.2.2 • 4.2.3 • 4.2.4 • 4.2.5 • 4.2.6 • 4.3 • 4.4
Non-DUI-Related Traffic Citations	An offender receives a citation for a traffic offense unrelated to driving under the influence of alcohol	Drivers in the 60, 365, and 730 days before (or after) starting the program are coded as "1" if they have the following citations in those time periods: • Speeding • Reckless driving • Failure to obey stop sign • Other traffic offenses All other drivers are coded as "0"	Sections: • 4.1.2 • 4.2.1 • 4.2.2 • 4.2.3 • 4.2.4 • 4.2.5 • 4.2.6 • 4.3 • 4.4 • 4.5.1
Crashes	An offender has a crash event	Drivers in the 60, 365, and 730 days before (or after) starting the program are coded as "1" if they have the following crashes in those time periods: • Fatal crash • Injury crash • Property-damage-only crash All other drivers are coded as "0"	Sections: • 4.1.3 • 4.2.1 • 4.2.2 • 4.2.3 • 4.2.4 • 4.2.5 • 4.2.6 • 4.3 • 4.4 • 4.5.2

4. RESULTS

Data will be reported both in terms of general trends and specific differences between driver groups. Descriptive consideration must occur to account for overall patterns among impaired driving offenders. Beyond these overall trends, different hypothesis testing statistical procedures – Chi-square tests, one-way ANOVAs, and binary logistic regression models – will be used to determine if there are differences in DUI offenders when factoring for various participant groups. This information will be provided to highlight possible differences in impaired driving events, non-DUI-related citations, and crash rates. Recidivism will be discussed based on earlier definitions and binary logistic regression models will attempt to identify factors associated with increased risk of the entrant relapsing into illegal behavior.

4.1 Descriptive Statistics

4.1.1 DUI-Related Citation Events

With regard to DUI-related citations, this sample of 24/7 Sobriety Program entries was responsible for 7,459 citations committed by 5,762 entrants in the two years prior to entering the program. After starting the program, there were just 784 DUI-related citations committed by 715 program entrants in the two-year period following enrollment into the program. Before-and-after improvements were made in the two-year, one-year, and sixty-day intervals used in the analysis (Figure 4.1). The number of impaired driving-related citations is not the best metric to measure program performance as having an impaired driving-related event is a prerequisite for program entry. Nonetheless, the rate at which DUI citations are issued per program entry does show that offenders have a lower rate of DUI citations after entering the program.

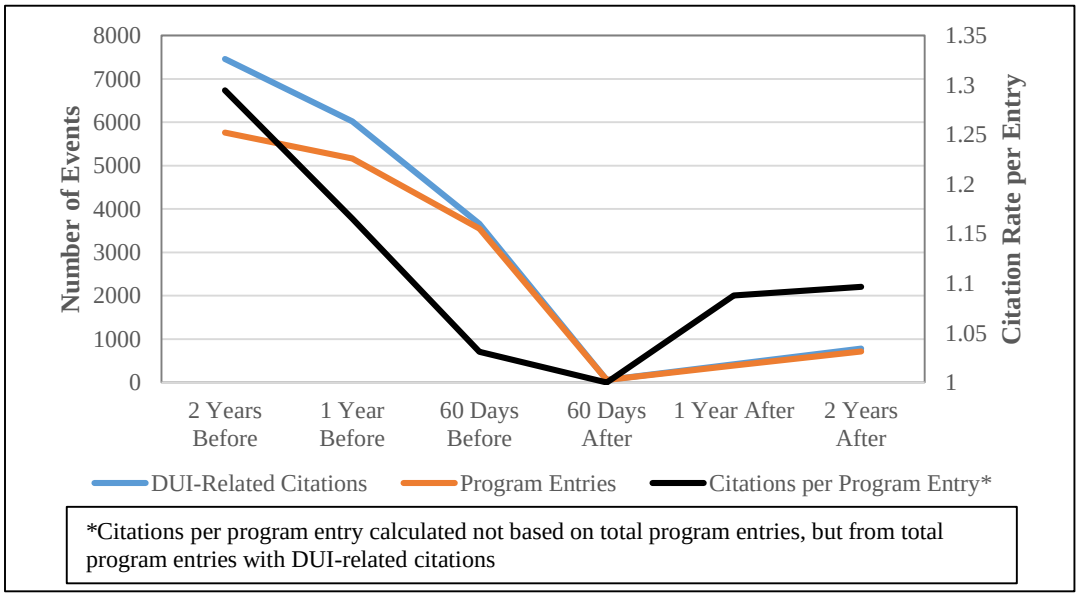

Figure 4.1 DUI-Related Citation Events

4.1.2 Non-DUI-Related Traffic Citation Events

A similar trend emerged when analyzing non-DUI-related traffic citations. In all time intervals studied in this report, both the number of citations and the rate in which citations are issued per program entry was smaller after starting the 24/7 Sobriety Program (Figure 4.2). Because non-DUI-related traffic citations do not necessarily trigger a legislatively-mandated enrollment into the program, this demonstrates a positive

aspect of the program: it appears as though entrance into the 24/7 Sobriety Program has some deterrent effect on participants that extends to non-DUI-related traffic crime.

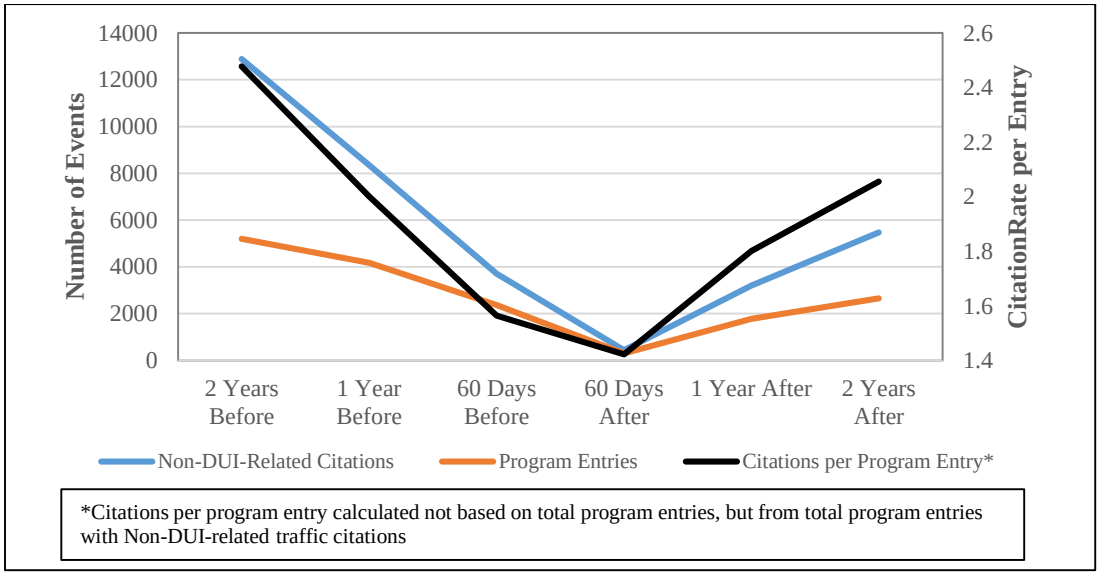

Figure 4.2 Non-DUI-Related Traffic Citation Events

4.1.3 Crashes

Crashes serve as another metric with noticeable improvement after individuals begin the 24/7 Sobriety Program. The volume of fatal, injury, and property-damage-only crashes declines significantly after participants are enrolled in the program (Table 4.1). For instance, program participants were responsible for 15 fatal crashes in the two years before starting the intervention. The number of fatal crashes declined to just five in the two years after a participant entered the program. Similar reductions took place for the other crash severity levels. One limitation is that travel for individual participants was not tracked by vehicle miles traveled and therefore an exposure rate is unknown.

Table 4.1 Crash Severity Before and After Starting 24/7 Sobriety Program

Severity	2 Years Before	1 Year Before	60 Days Before	60 Days After	1 Year After	2 Years After
Fatal	15	12	7	1	3	5
Injury	635	482	239	20	98	110
Property Damage Only	1,202	894	420	36	250	252

One method for normalizing crash rates is to examine the number of crashes per program entry (Figure 4.3). This method determined that the rate at which crashes occur does generally decline after an individual enters the 24/7 Sobriety Program.

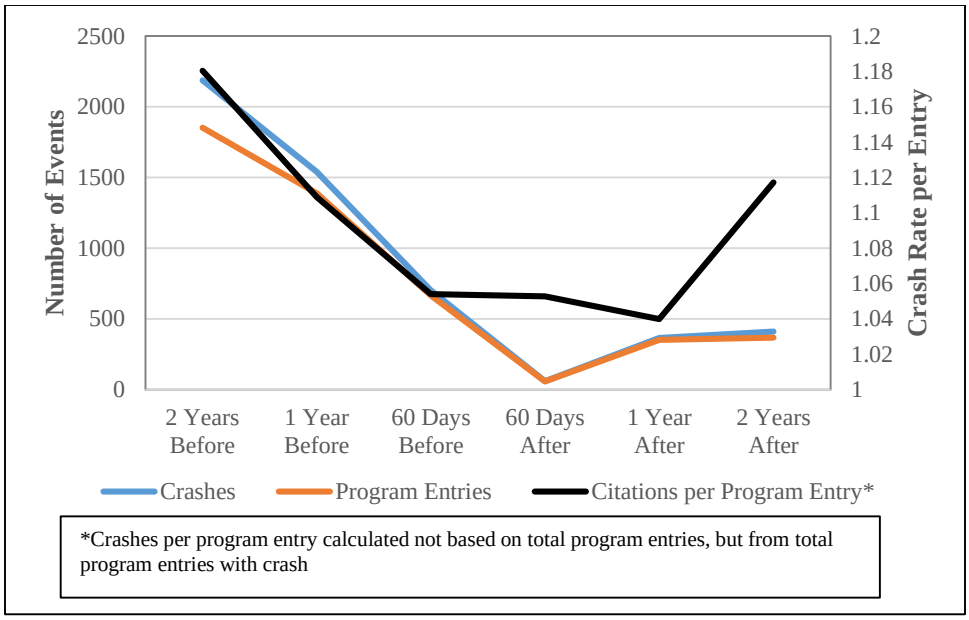

Figure 4.3 Crash Events

4.2 Participant Groups

It is important to analyze the response of different variables – DUI-related citations, non-DUI-related traffic citations, and crashes – when factoring for individual driver groups. Differences across groups can help explain behavior and can also be used to target safety strategies to high-risk groups. Six participant groups will be examined: gender, age, region, geography, multi-time program entrants, and repeat DUI offenders.

4.2.1 Gender

Results across gender were largely expected (Table 4.2). Males, on average, had more DUI-related citations than females did after starting the 24/7 Sobriety Program for the 2-year ($F=9.856$, $df=1$, $p=0.002$) time interval. This is consistent other studies which indicate that men tend to have higher rates of impaired driving than women, even after completing interventions specifically geared toward deterring alcohol abuse (Kubas, Kayabas, and Vachal 2015; Kubas, Kayabas, and Vachal 2016; Kubas, Kayabas, and Vachal 2017). Males were also found to have more non-DUI-related traffic citations in both the 1-year and 2-year intervals before starting the program. However, after starting the program, men perform at levels that are on-par with women for non-DUI-related traffic citations. This suggests that the program may have a stronger deterrent effect on males for this metric. Women were more likely to have had a traffic crash 60 days before ($F=21.995$, $df=1$, $p<0.001$), one year before ($F=9.904$, $df=1$, $p=0.002$), and two years before ($F=11.084$, $df=1$, $p=0.001$) enrolling in the intervention. However, these same females generally crashed at rates that were on-par with their male counterparts after completing the program. This indicates that there may be a stronger deterrent effect on females with regard to traffic crashes.

Table 4.2 Mean Values Displaying Total Violations Across Program Entries, by Gender

Metric	Mean Value		Sig.
	Male	Female	
DUI-Related Citations, 60 Days Before Program Start	0.43	0.45	#
DUI-Related Citations, 60 Days After Program Start	0.01	0.01	
DUI-Related Citations, 1 Year Before Program Start	0.70	0.69	
DUI-Related Citations, 1 Year After Program Start	0.05	0.04	
DUI-Related Citations, 2 Years Before Program Start	0.86	0.88	
DUI-Related Citations, 2 Years After Program Start	0.11	0.08	##
Non-DUI-Related Traffic Citations, 60 Days Before Program Start	0.45	0.40	
Non-DUI-Related Traffic Citations, 60 Days After Program Start	0.05	0.06	
Non-DUI-Related Traffic Citations, 1 Year Before Program Start	1.00	0.84	##
Non-DUI-Related Traffic Citations, 1 Year After Program Start	0.39	0.37	
Non-DUI-Related Traffic Citations, 2 Years Before Program Start	1.47	1.31	##
Non-DUI-Related Traffic Citations, 2 Years After Program Start	0.69	0.63	
Crashes, 60 Days Before Program Start	0.08	0.11	##
Crashes, 60 Days After Program Start	0.01	0.01	#
Crashes, 1 Year Before Program Start	0.17	0.21	##
Crashes, 1 Year After Program Start	0.04	0.05	
Crashes, 2 Years Before Program Start	0.23	0.29	##
Crashes, 2 Years After Program Start	0.05	0.06	

##Significant at the 1% level for 1-way ANOVA
#Significant at the 5% level for 1-way ANOVA

4.2.2 Age

Some patterns occurred when examining violations across age cohorts (Table 4.3). For example, non-DUI-related traffic citations generally declined across age groups: the 18-24-year-old cohort had the highest average number of violations and the 65+ age cohort generally had the lowest average number of these citations. The differences were statistically significant at the 1% level across all three time periods both before and after starting the 24/7 Sobriety Program. This is a plausible finding because 18-34-year-old North Dakotans more commonly exhibit behaviors at-odds with traffic safety goals and less regularly engage in safe driving practices (Vachal, Benson, and Kubas 2018). In terms of traffic crashes, a multimodal distribution was evident as those in the youngest (18-24) and oldest (65+) cohorts typically had the highest average number of crashes. This makes sense, considering novice drivers are often more dangerous behind-the-wheel (Mayhew, Simpson, and Pak 2003) and elderly drivers have slower reaction times which put them at a higher propensity to be in a crash (Svetina 2016).

Table 4.3 Mean Values Displaying Total Violations Across Program Entries, by Age

Metric	Mean Value						Sig.
	18-24	25-34	35-44	45-54	55-64	65+[1]	
DUI-Related Citations, 60 Days Before	0.41	0.44	0.44	0.41	0.44	0.47	
DUI-Related Citations, 60 Days After	0.01	0.01	0.01	0.00	0.00	0.00	
DUI-Related Citations, 1 Year Before	0.67	0.71	0.73	0.64	0.67	0.77	##
DUI-Related Citations, 1 Year After	0.06	0.05	0.06	0.05	0.04	0.02	
DUI-Related Citations, 2 Years Before	0.86	0.86	0.92	0.78	0.80	0.86	##
DUI-Related Citations, 2 Years After	0.12	0.11	0.10	0.10	0.08	0.04	
Non-DUI-Related Traffic Citations, 60 Days Before	0.51	0.44	0.41	0.39	0.41	0.28	##
Non-DUI-Related Traffic Citations, 60 Days After	0.08	0.05	0.05	0.04	0.03	0.03	##
Non-DUI-Related Traffic Citations, 1 Year Before	1.26	0.97	0.89	0.76	0.78	0.63	##
Non-DUI-Related Traffic Citations, 1 Year After	0.50	0.40	0.35	0.28	0.22	0.31	##
Non-DUI-Related Traffic Citations, 2 Years Before	2.00	1.40	1.31	1.09	0.99	0.70	##
Non-DUI-Related Traffic Citations, 2 Years After	0.88	0.69	0.62	0.52	0.40	0.44	##
Crashes, 60 Days Before	0.09	0.09	0.07	0.07	0.08	0.09	
Crashes, 60 Days After	0.02	0.01	0.00	0.00	0.01	0.01	##
Crashes, 1 Year Before	0.22	0.18	0.15	0.13	0.15	0.24	##
Crashes, 1 Year After	0.06	0.04	0.03	0.03	0.05	0.05	##
Crashes, 2 Years Before	0.32	0.24	0.21	0.20	0.20	0.30	##
Crashes, 2 Years After	0.08	0.05	0.04	0.04	0.05	0.04	##

[1]The 65-74 and 75+ age cohorts were merged because there were fewer than 30 drivers in the 75+ age cohort
##Significant at the 1% level for 1-way ANOVA

4.2.3 Region

There are regional discrepancies in driver performance (Table 4.4). Program participants from the western half of the state are generally more dangerous than those from the east. With the exception of the 60-day interval after starting the 24/7 Sobriety Program, drivers from the west are statistically more likely to have a DUI-related citation in every other time period studied in this report. Similarly, 24/7 Sobriety Program participants from western counties in North Dakota have more non-DUI-related traffic citations in all time frames except for the 60 days ($F=1.137$, $df=1$, $p=0.286$) and 365 days ($F=3.509$, $df=1$, $p=0.061$) before program enrollment. It is clear that these individuals engage in illegal activity more often than their eastern counterparts. Although the western residents performed poorly for DUI-related citations and non-DUI-related traffic citations, crash patterns were generally similar statewide.

Table 4.4 Mean Values Displaying Total Violations Across Program Entries, by Region

Metric	Mean Value		Sig.
	East	West	
DUI-Related Citations, 60 Days Before Program Start	0.39	0.46	##
DUI-Related Citations, 60 Days After Program Start	0.01	0.01	
DUI-Related Citations, 1 Year Before Program Start	0.66	0.72	##
DUI-Related Citations, 1 Year After Program Start	0.04	0.06	##
DUI-Related Citations, 2 Years Before Program Start	0.78	0.91	##
DUI-Related Citations, 2 Years After Program Start	0.09	0.12	#
Non-DUI-Related Traffic Citations, 60 Days Before Program Start	0.43	0.45	
Non-DUI-Related Traffic Citations, 60 Days After Program Start	0.04	0.06	#
Non-DUI-Related Traffic Citations, 1 Year Before Program Start	0.93	0.99	
Non-DUI-Related Traffic Citations, 1 Year After Program Start	0.31	0.43	##
Non-DUI-Related Traffic Citations, 2 Years Before Program Start	1.31	1.52	##
Non-DUI-Related Traffic Citations, 2 Years After Program Start	0.58	0.73	##
Crashes, 60 Days Before Program Start	0.08	0.08	
Crashes, 60 Days After Program Start	0.01	0.01	
Crashes, 1 Year Before Program Start	0.18	0.17	
Crashes, 1 Year After Program Start	0.04	0.05	#
Crashes, 2 Years Before Program Start	0.23	0.25	
Crashes, 2 Years After Program Start	0.05	0.06	

##Significant at the 1% level for 1-way ANOVA
#Significant at the 5% level for 1-way ANOVA

4.2.4 Geography

Results for traffic violations are consistent when factoring for geography: urban residents exhibit more dangerous behaviors than do their rural counterparts (Table 4.5). Urban participants on average had more DUI-related citations in the 60 days ($F=24.787$, $df=1$, $p<0.001$), 365 days ($F=8.630$, $df=1$, $p=0.003$) and 730 days ($F=11.621$, $df=1$, $p=0.001$) before enrolling in the intervention. These same entrants had more crashes than rural North Dakotans in the 60 days ($F=7.903$, $df=1$, $p=0.005$), 365 days ($F=5.664$, $df=1$, $p=0.017$) and 730 days ($F=4.937$, $df=1$, $p=0.026$) prior to starting the program. However, urban residents committed violations for these three metrics on-par with rural residents after starting the 24/7 Sobriety Program. This suggests that it may have a stronger deterrent effect on urban North Dakotans as they have a more significant behavior change for DUI-related citations and traffic crashes.

In contrast to these improvements, urban residents regressed in terms of non-DUI-related traffic citations. Whereas these individuals were typically on-par with their rural counterparts before starting the intervention program, these same program entrants had more non-DUI-related citations on average in the 365-day ($F=4.277$, $df=1$, $p=0.039$) interval following the program.

This demonstrates a dichotomy in program effectiveness factoring for geographic discrepancies. The program appears to have a stronger deterrent effect for urban residents for DUI-related citations and crashes. However, the same group commits a statistically higher number of non-DUI-related violations on average than their rural counterparts after the presence of the 24/7 Sobriety Program as an intervening variable is taken into consideration. There may be room for improvement as the program does not appear to effectively deter urban residents from committing non-DUI-related citations.

Table 4.5 Mean Values Displaying Total Violations Across Program Entries, by Geography

Metric	Mean Value		Sig.
	Urban	Rural	
DUI-Related Citations, 60 Days Before Program Start	0.45	0.37	##
DUI-Related Citations, 60 Days After Program Start	0.01	0.00	
DUI-Related Citations, 1 Year Before Program Start	0.71	0.65	##
DUI-Related Citations, 1 Year After Program Start	0.05	0.04	
DUI-Related Citations, 2 Years Before Program Start	0.88	0.79	##
DUI-Related Citations, 2 Years After Program Start	0.11	0.11	
Non-DUI-Related Traffic Citations, 60 Days Before Program Start	0.45	0.40	#
Non-DUI-Related Traffic Citations, 60 Days After Program Start	0.05	0.05	
Non-DUI-Related Traffic Citations, 1 Year Before Program Start	0.97	0.98	
Non-DUI-Related Traffic Citations, 1 Year After Program Start	0.39	0.34	#
Non-DUI-Related Traffic Citations, 2 Years Before Program Start	1.44	1.41	
Non-DUI-Related Traffic Citations, 2 Years After Program Start	0.69	0.62	
Crashes, 60 Days Before Program Start	0.09	0.06	##
Crashes, 60 Days After Program Start	0.01	0.00	
Crashes, 1 Year Before Program Start	0.18	0.15	#
Crashes, 1 Year After Program Start	0.05	0.04	
Crashes, 2 Years Before Program Start	0.25	0.21	#
Crashes, 2 Years After Program Start	0.06	0.05	

##Significant at the 1% level for 1-way ANOVA
#Significant at the 5% level for 1-way ANOVA

4.2.5 Multi-Time Program Entrants

As discussed in the methods section, it is possible for an individual to enroll in the program multiple times. It was hypothesized that there might be differences between individuals who have been enrolled in the intervention just once and those who have been sentenced to the program two or more times. Perhaps the program has a stronger deterrent effect on those who only participated in the course once and there is knowledge to be gained about recidivism. Conversely, perhaps external factors such as a legitimate addiction or issues with self-control are factors which best explain why participants may be enrolled in the program multiple times. Understanding differences across these groups contributes to the existing literature as to why the same intervention may be successful for some but not others.

Those who have been enrolled in the program multiple times were much more likely to have DUI-related citations in the 1-year ($F=130.129$, $df=1$, $p<0.001$) and 2-year ($F=273.688$, $df=1$, $p<0.001$) intervals after enrollment (Table 4.6). This indicates that there are some patterns of alcohol abuse among offenders in this sample. Additional efforts should be targeted toward individuals entering the program for a second-or-subsequent time as these enrollees exhibit dangerously higher impaired driving rates relative to one-time enrollees.

In general, these same multi-entry individuals are more likely to have DUI-related citations, non-DUI-related citations, and crashes after starting the program. Multi-entry offenders revert to both alcohol-related and non-alcohol-related illegal activity more regularly after starting the 24/7 Sobriety Program. If the program does have a deterrent effect on multi-entry offenders, it is short lived as it diminishes somewhere after the first 60 days of starting the program.

Table 4.6 Mean Values Displaying Total Violations Across Program Entries, by Multi-Time Entrants

Metric	Mean Value		Sig.
	Multi-Entrant	Single-Entrant	
DUI-Related Citations, 60 Days Before Program Start	0.45	0.42	##
DUI-Related Citations, 60 Days After Program Start	0.01	0.01	
DUI-Related Citations, 1 Year Before Program Start	0.71	0.69	
DUI-Related Citations, 1 Year After Program Start	0.09	0.02	##
DUI-Related Citations, 2 Years Before Program Start	0.93	0.80	##
DUI-Related Citations, 2 Years After Program Start	0.19	0.04	##
Non-DUI-Related Traffic Citations, 60 Days Before Program Start	0.48	0.41	##
Non-DUI-Related Traffic Citations, 60 Days After Program Start	0.04	0.06	#
Non-DUI-Related Traffic Citations, 1 Year Before Program Start	1.03	0.92	##
Non-DUI-Related Traffic Citations, 1 Year After Program Start	0.46	0.33	##
Non-DUI-Related Traffic Citations, 2 Years Before Program Start	1.62	1.29	##
Non-DUI-Related Traffic Citations, 2 Years After Program Start	0.81	0.56	##
Crashes, 60 Days Before Program Start	0.09	0.08	
Crashes, 60 Days After Program Start	0.01	0.01	
Crashes, 1 Year Before Program Start	0.19	0.17	
Crashes, 1 Year After Program Start	0.06	0.04	##
Crashes, 2 Years Before Program Start	0.26	0.23	
Crashes, 2 Years After Program Start	0.05	0.06	#

##Significant at the 1% level for 1-way ANOVA
#Significant at the 5% level for 1-way ANOVA

4.2.6 Repeat DUI Offenders

On average, entrants with multiple DUI-related citations on record had more DUI arrests before starting the program in each time interval. This is logical, as first-time offenders would never have more than one DUI-related arrest but repeat DUI offenders are required to have at least two DUI-related arrests to be categorized as a multiple-DUI offender (Table 4.7). The fact that these individuals receive DUI-related citations on-par with their first-time offender counterparts indicates that the structure the program provides to the enrollees does improve behavior with regard to alcohol-related citations.

Repeat DUI offenders had more non-DUI-related traffic citations in the 60 days ($F=28.117$, $df=1$, $p<0.001$) before starting the program. After starting the sobriety intervention, these individuals received non-DUI-related traffic citations at rates that were on-par with their first-time offender counterparts ($F=1.650$, $df=1$, $p=0.199$). This suggests that there may be a deterrent effect on repeat DUI offenders for non-DUI-related traffic citations, although it is only present in the 60 days immediately following program enrollment.

For crashes, there were no statistically significant differences between first-time and repeat DUI-related citation offenders. This finding is in contrast with current literature which contends that drivers with two or more impaired driving events on record are more dangerous than first-time offenders. It should be mentioned that this study only examines non-DUI-related traffic citations and total crashes as dependent variables relevant to repeat and first-time DUI offenders. It is possible that other traffic safety metrics – seat belt use, acceleration time, reaction time, and emotional decisions, among other factors – could be worse for repeat DUI offenders compared to first-time DUI arrestees. Because the research team only had access to crash and conviction records, these other factors related to traffic safety could not be examined in-depth and is a limitation of this study.

Table 4.7 Mean Values Displaying Total Violations Across Program Entries, by DUI Recidivist Status

Metric	Mean Value		Sig.
	Repeat Offender	First-Time Offender	
DUI-Related Citations, 60 Days Before Program Start	0.48	0.34	##
DUI-Related Citations, 60 Days After Program Start	0.01	0.01	
DUI-Related Citations, 1 Year Before Program Start	0.75	0.61	##
DUI-Related Citations, 1 Year After Program Start	0.05	0.05	
DUI-Related Citations, 2 Years Before Program Start	0.94	0.72	##
DUI-Related Citations, 2 Years After Program Start	0.11	0.11	
Non-DUI-Related Traffic Citations, 60 Days Before Program Start	0.48	0.37	##
Non-DUI-Related Traffic Citations, 60 Days After Program Start	0.05	0.06	
Non-DUI-Related Traffic Citations, 1 Year Before Program Start	0.99	0.93	
Non-DUI-Related Traffic Citations, 1 Year After Program Start	0.37	0.40	
Non-DUI-Related Traffic Citations, 2 Years Before Program Start	1.47	1.39	
Non-DUI-Related Traffic Citations, 2 Years After Program Start	0.67	0.68	
Crashes, 60 Days Before Program Start	0.09	0.08	
Crashes, 60 Days After Program Start	0.01	0.01	
Crashes, 1 Year Before Program Start	0.18	0.17	
Crashes, 1 Year After Program Start	0.04	0.05	
Crashes, 2 Years Before Program Start	0.24	0.25	
Crashes, 2 Years After Program Start	0.05	0.06	

[##]Significant at the 1% level for 1-way ANOVA
[#]Significant at the 5% level for 1-way ANOVA

4.3 Before-and-After Program Effects

All participant groups studied in this report had positive before-and-after effects when enrollment in the 24/7 Sobriety Program is treated as an intervention. Each driver group decreased the average number of DUI-related citations, non-DUI-related traffic citations, and crashes in the 60-day, 1-year, and 2-year before-and-after intervals. All improvements were statistically significant at the 1% level.

With regard to DUI citations, just 2.1% of entries received such a citation during program enrollment. Moreover, for those individuals who successfully completed the program, 96.5% did not commit another DUI citation at any point after program completion. A detailed discussion of before-and-after averages is provided in the Appendix.

4.4 Program Entry Patterns Related to House Bill 1302

House Bill 1302 became effective August 1, 2013. The legislative changes mandated by this bill included longer enrollment periods in the 24/7 Sobriety Program for repeat offenders: second-time and third-time offenders were required to remain sober for one year and fourth-or-subsequent offenders were mandated to participate in the program for two years. In sum, 5,627 entries (66.4% of the sample) started the program after the new legislation was implemented. Of these, 3,011 were enrolled because of a second or third impaired driving citation and were required to participate for one year. A smaller number – 637 entries – were for fourth-or-subsequent offenders mandated by law to be in the program for two years.

To adequately compare groups, a binary variable was created based on legislatively-mandated enrollment times. Entries were labeled as either enrolled for 60 days ("0") or enrolled for more than 365 days ("1"). Comparisons were made across groups as anyone enrolled for 365 or 730 days was adhering to the more stringent standards created by House Bill 1302.

Results demonstrate that longer sentencing to the program only has a deterrent effect on DUI-related citation events (Table 4.8). Individuals enrolled in the program for 60 days commit more DUI-related citations, on average, in the 365 days ($F=38.315$, $df=1$, $p<0.001$), and 730 days ($F=36.529$, $df=1$, $p<0.001$) after starting the program. They commit these violations at rates that are approximately double those of participants who are required to be in the program for at least one year.

Table 4.8 Mean Values Displaying Total Violations Across Program Entries, by Enrollment Length

Metric	Mean Value		Sig.
	Enrolled 60 Days	Enrolled 365+ Days	
DUI-Related Citations, 60 Days After Program Start	0.01	0.01	
DUI-Related Citations, 1 Year After Program Start	0.07	0.04	##
DUI-Related Citations, 2 Years After Program Start	0.14	0.08	##
Non-DUI-Related Traffic Citations, 60 Days After Program Start	0.06	0.05	#
Non-DUI-Related Traffic Citations, 1 Year After Program Start	0.30	0.43	##
Non-DUI-Related Traffic Citations, 2 Years After Program Start	0.58	0.75	##
Crashes, 60 Days After Program Start	0.01	0.01	
Crashes, 1 Year After Program Start	0.04	0.05	##
Crashes, 2 Years After Program Start	0.06	0.05	

##Significant at the 1% level for 1-way ANOVA
#Significant at the 5% level for 1-way ANOVA

These findings signify a powerful component of the program: more stringent sentencing deters both medium- and long-term DUI-related illegal behavior. Individuals required to participate in the program for 60 days relapse via an alcohol-related triggering event at greater rates after starting the intervention. It is possible that those sentenced to the program for 365 days have a lingering deterrent effect created by longer exposure to the 24/7 Sobriety Program. Moreover, those sentenced to the program for 730 days presumably have lower rates of illegal behavior due to program compliance. Any duration of program enrollment has positive benefits to traffic safety, but longer enrollment periods clearly result in safer impaired driving-related conditions on North Dakota roadways.

In the 365 and 730 days following the program start, this deterrent effect does not exist with regard to non-DUI-related traffic citations and crashes. Individuals sentenced to the sobriety intervention for a minimum of 365 days were more likely to receive a non-DUI-related traffic citation in the one-year ($F=32.527$, $df=1$, $p<0.001$) and two-year ($F=25.314$, $df=1$, $p<0.001$) intervals after starting the program. These individuals were also more likely to have a crash in the 365-day window following the start of the program ($F=6.887$, $df=1$, $p=0.009$). It can be argued that these findings are fully expected. At its core, the program is designed to ensure that an individual does not consume alcohol after receiving an impaired driving-related citation. The program does not specifically target non-DUI-related traffic citations or crashes; these are merely residual benefits that can plausibly emerge from an individual mandated to a period of sobriety. Therefore, the results associated with DUI-related citations validate one of the program's core goals: the prevention of future impaired driving events. In other words, longer legislatively-mandated periods of sobriety result in a greater likelihood of sober driving by participants.

4.5 Logistic Regression Models

Another exercise in the assessment is the development of logistic regression models to better understand safety outcomes. This type of model measures the relationship between dependent and independent variables while recognizing simultaneous effects among the independent variables. The log-odd ratios provide measures of association that are indicative of the relative likelihood that enrollees will exhibit safe behavior. The dependent and independent variables considered in the original model are presented in Table 4.9. The independent variables are gender, region, geography, repeat DUI offender, multi-entry participant, and program participation length. The dependent variables are non-DUI-related traffic citations, crashes, and DUI citations as defined in Table 3.6. The DUI citation definition has three levels of recidivism: high-risk, or those who had a DUI citation in the first 60 days of program enrollment; moderate-risk, or those who had a DUI citation at any point between day 61 and day 730 of program enrollment; and post-program recidivists, or those who had a DUI citation after successfully completing the program.

Three models were developed for each dependent variable and represent the time of the study intervals (60-day, 1-year, and 2-year) for each safety outcome. Because enrollment in the 24/7 Sobriety Program was considered the intervention in this experimental design, safety outcomes were only modeled for the time periods after starting the program. This was the best indicator of which variables have effects on safe driving behavior post-intervention.

Table 4.9 24/7 Sobriety Program Safety Outcome Model Variables

Variable Name	Definition
Independent Variables	
Gender	Female (0) or Male (1)
Region	West (0) or East (1) as defined in Figure 3.2
Geography	Rural (0) or Urban (1) as defined in Figure 3.2
Repeat DUI Offender	First-Time Offender (0) or Repeat DUI Offender (1)
Multi-Entry Participant	Single-Entrant (0) or Multi-Entrant (1)
Participation Length	60 Days (0) or 365+ Days (1) of program enrollment
Dependent Variables	
Non-DUI Traffic Citation	No Citations (0) or One or More Citations (1)
Crash	No Crashes (0) or One or More Crashes (1)
High-Risk Recidivist	No DUI in Program (0) or One or More DUI from Day 1 to 60 (1)
Moderate-Risk Recidivist	No DUI in Program (0) or One or More DUI from Day 61 to 730 (1)
Post-Program Recidivist	No DUI in Program (0) or One or More DUI After Exiting Program (1)

4.5.1 Non-DUI-Related Traffic Citations

The non-DUI-related traffic citation outcome model was fairly consistent based on time interval studied (Table 4.10). The multi-entry participant and participation length variables were statistically significant across all three time periods, but the directionality of the differences varied with time. In the 60-day time interval, those enrolled in the program multiple times and those enrolled for at least 365 days were less likely to have a non-DUI-related traffic citation. However, this trend reversed for the 365-day interval: participants enrolled in the program multiple times and those sentenced to the program for at least 365 days were more likely to have non-DUI-related traffic citations. The same situation occurred in the 730-day window following the start of the program. This suggests that any deterrent effect generated by the program diminishes at some point after day 61 of enrollment.

Table 4.10 24/7 Sobriety Program Non-DUI-Related Traffic Citation Outcome Model

60-Day[1] Interval After Starting Course						
Parameter	Beta Value	S.E.	Wald	Sig.	Log Odds	95% C.I.
Gender	-0.290	0.132	4.807	*	0.748	0.578-0.970
Region	-0.230	0.127	3.274		0.795	0.620-1.019
Geography	-0.062	0.146	0.182		0.940	0.705-1.252
Repeat DUI Offender	0.195	0.151	1.667		1.215	0.904-1.634
Multi-Entry Participant	-0.389	0.123	10.012	**	0.678	0.533-0.862
Program Participation Length	-0.434	0.156	7.739	**	0.648	0.478-0.880
1-Year[2] Interval After Starting Course						
Parameter	Beta Value	S.E.	Wald	Sig.	Log Odds	95% C.I.
Gender	-0.067	0.069	0.941		0.935	0.817-1.071
Region	-0.366	0.062	35.189	**	0.694	0.615-0.783
Geography	0.080	0.074	1.155		1.083	0.936-1.252
Repeat DUI Offender	-0.405	0.080	25.409	**	0.667	0.569-0.781
Multi-Entry Participant	0.257	0.058	19.881	**	1.293	1.155-1.447
Program Participation Length	0.504	0.080	39.650	**	1.655	1.415-1.936
2-Year[3] Interval After Starting Course						
Parameter	Beta Value	S.E.	Wald	Sig.	Log Odds	95% C.I.
Gender	0.020	0.068	0.084		1.020	0.893-1.164
Region	-0.278	0.059	21.983	**	0.757	0.674-0.851
Geography	-0.070	0.070	0.988		0.932	0.812-1.070
Repeat DUI Offender	-0.255	0.071	12.817	**	0.775	0.674-0.891
Multi-Entry Participant	0.349	0.055	39.807	**	1.417	1.272-1.579
Program Participation Length	0.389	0.072	28.860	**	1.475	1.280-1.700

[1]N=8,477; Nagelkerke R^2=0.012; model correctly classified 96.4% of cases
[2]N=7,435; Nagelkerke R^2=0.018; model correctly classified 78.7% of cases
[3]N=6,134; Nagelkerke R^2=0.019; model correctly classified 67.2% of cases
**Statistically significant at the 1% level
*Statistically significant at the 5% level

4.5.2 Crashes

The crash outcome model provides some insight into determinants of crashes after starting the intervention (Table 4.11). There were no consistencies across the three time intervals studied.

In the 60 days following program entry, only gender was a statistically significant determinant of a crash as males were less likely to crash (C.I.=0.292, 0.873). In the 365 and 730 days following program enrollment, the odds of males and females being involved in a crash were comparable.

Four variables were statistically significant determinants of crash likelihood in the first year following program enrollment. Interestingly, repeat DUI offenders were 40.8% less likely to have a crash than first-time offenders (C.I.=0.501, 0.946). This is a contrast to other findings throughout the literature which suggest that these offenders are more dangerous than their first-time offender counterparts.

In the 365-day interval following the start of the program, multi-entry participants were 60.9% more likely to have a crash than those who only entered the program one time. Interestingly, these same individuals were 41.1% less likely to crash in the two years following the start of the program. It is unknown what causes safer driving habits during this longer follow-up period.

Table 4.11 24/7 Sobriety Program Crash Outcome Model

60-Day[1] Interval After Starting Course						
Parameter	Beta Value	S.E.	Wald	Sig.	Log Odds	95% C.I.
Gender	-0.684	0.279	5.992	*	0.505	0.292-0.873
Region	0.126	0.278	0.207		1.135	0.658-1.956
Geography	0.730	0.434	2.837		2.076	0.887-4.856
Repeat DUI Offender	-0.410	0.377	1.183		0.664	0.317-1.389
Multi-Entry Participant	-0.358	0.284	1.585		0.699	0.401-1.220
Program Participation Length	-0.166	0.403	0.169		0.847	0.384-1.868
1-Year[2] Interval After Starting Course						
Parameter	Beta Value	S.E.	Wald	Sig.	Log Odds	95% C.I.
Gender	-0.214	0.134	2.557		0.807	0.621-1.050
Region	-0.339	0.127	7.172	**	0.712	0.556-0.913
Geography	0.189	0.156	1.467		1.209	0.890-1.642
Repeat DUI Offender	-0.373	0.162	5.304	*	0.688	0.501-0.946
Multi-Entry Participant	0.444	0.116	14.561	**	1.558	1.241-1.957
Program Participation Length	0.378	0.162	5.440	*	1.459	1.062-2.004
2-Year[3] Interval After Starting Course						
Parameter	Beta Value	S.E.	Wald	Sig.	Log Odds	95% C.I.
Gender	-0.103	0.142	0.535		0.902	0.683-1.190
Region	-0.083	0.128	0.419		0.920	0.715-1.184
Geography	0.180	0.162	1.245		1.198	0.872-1.644
Repeat DUI Offender	-0.129	0.149	0.751		0.879	0.656-1.177
Multi-Entry Participant	-0.360	0.124	8.440	**	0.698	0.547-0.889
Program Participation Length	-0.140	0.161	0.762		0.869	0.634-1.191

[1]N=8,477; Nagelkerke R^2=0.023; model correctly classified 99.3% of cases
[2]N=7,435; Nagelkerke R^2=0.014; model correctly classified 95.7% of cases
[3]N=6,134; Nagelkerke R^2=0.008; model correctly classified 95.1% of cases
**Statistically significant at the 1% level
*Statistically significant at the 5% level

4.5.3 DUI Citations

Within two years of starting the 24/7 Sobriety Program, 479 entrants in this sample had at least one DUI citation (Table 4.12). These numbers do not represent unique individuals as it is possible that an entrant could have started the program multiple times due to having multiple DUI citations. Of the 479 entrants with a DUI citation, just 182 took place during enrollment in the program. This represents 38.0% of all DUI citations and only 2.1% of the overall sample. The remaining 297 entries with DUI citations committed the violation after successfully completing the program. The following sections discuss possible determinants of recidivism both during and after program enrollment.

Table 4.12 DUI Citations During and After Program Enrollment

Metric	Enrolled in Program	Completed Program	Total
Failed in First 60 Days	47*	-	47
Failed between Day 61 and Day 365	122**	102	224
Failed between Day 366 and Day 730	13**	195	208
Total	182	297***	**479**

*High-Risk Recidivists
**Moderate-Risk Recidivists
***Post-Program Recidivists

4.5.3.1 High-Risk Recidivists

As defined in the methods section, high-risk recidivists are those who received at least one DUI citation within 60 days of starting the 24/7 Sobriety Program. In this sample of entries, one variable was a statistically significant determinant of high-risk recidivism. Compared to those sentenced to the program for at least 365 days, entrants sentenced to the program for 60 days were 2.249 times more likely to have another DUI citation in the first 60 days after starting the program (C.I.=1.078, 4.695) (Table 4.13). This is a logical finding: longer sentences with swift and certain punishment – such as the threat of incarceration via a test failure in the 24/7 Sobriety Program – create a stronger deterrent effect and therefore a greater likelihood that participants maintain sobriety. This is especially true in North Dakota where longer program sentences generally result in safer driver behaviors (Kubas, Kayabas, and Vachal 2017).

Table 4.13 24/7 Sobriety Program High-Risk Recidivist Outcome Model

60-Day[1] Interval and Enrolled in Course

Parameter	Beta Value	S.E.	Wald	Sig.	Log Odds	95% C.I.
Gender	0.637	0.438	2.109		1.890	0.800-4.464
Region	0.278	0.309	0.812		1.321	0.721-2.419
Geography	0.146	0.390	0.139		1.157	0.538-2.486
Repeat DUI Offender	0.635	0.370	2.954		1.888	0.915-3.896
Multi-Entry Participant	-0.157	0.301	0.270		0.855	0.474-1.543
Program Participation Length	-0.811	0.375	4.662	*	0.445	0.213-0.928

[1]N=8,477 (47 high-risk recidivists); Nagelkerke R^2=0.013; model correctly classified 99.4% of cases
*Statistically significant at the 5% level

4.5.3.2 Moderate-Risk Recidivists

Moderate-risk recidivists are those who are enrolled in the 24/7 Sobriety Program and receive a DUI citation at some point between day 61 and day 730 of the intervention. Among the 135 entries which fit this definition, three variables were found to be statistically significant. Females were 40.3% more likely to recidivate than their male counterparts. Drivers from the eastern half of the state were 1.567 times more likely to recidivate than their western counterparts. North Dakotans enrolled in the program two or more times were 7.005 times more likely to relapse and have a DUI citation at some point while enrolled in the program (C.I.=4.455-11.014) (Table 4.14). Perhaps two or more entries into the 24/7 Sobriety Program could be treated as a proxy for individuals in need of additional, specialized treatment. Multi-time enrollees have higher odds of reoffending between days 61 and 730. It is clear that enrolling in the program more than once is associated with a strong increase in likelihood for relapse.

Table 4.14 24/7 Sobriety Program Moderate-Risk Recidivist Outcome Model

61-730 Day[1] Interval and Enrolled in Course						
Parameter[2]	Beta Value	S.E.	Wald	Sig.	Log Odds	95% C.I.
Gender	-0.392	0.196	3.984	*	0.676	0.460-0.993
Region	0.449	0.176	6.512	*	1.567	1.110-2.214
Geography	0.445	0.256	3.014		1.561	0.944-2.579
Multi-Entry Participant	1.947	0.231	71.053	**	7.005	4.455-11.014

[1]N=8,477 (135 moderate-risk recidivists); Nagelkerke R^2=0.083; model correctly classified 98.4% of cases

[2]The Repeat DUI Offender and Program Participation Length variables were removed from the model. Any participant subjected to the program for more than 61 days is a repeat offender. Similarly, all repeat offenders are sentenced to the program for at least 365 days. In other words, all participants enrolled for 61-730 days are repeat offenders sentenced to at least 365 days of sobriety.

**Statistically significant at the 1% level

*Statistically significant at the 5% level

4.5.3.3 Post-Program Recidivists

Among program entries with a DUI citation at any point after completing the 24/7 Sobriety Program, post-program recidivists were 1.471 times more likely to be from the western half of the state, 7.465 times more likely to be a multi-entry participant, and 1.296 times more likely to have been sentenced to the program for 60 days (Table 4.15).

The higher rate of recidivism for entrants who have been in the program multiple times demonstrates two key findings. First, there is a measurable deterrent effect when enrolled in the program for these participants. Based on the in-program binary logistic regression models presented in Tables 4.13 and 4.14, multi-time program entrants re-offend at much lower rates when enrolled in the program. This model, however, suggests that the participants in this group noticeably change behavior for the worse after completing the program. This once again validates the effectiveness of the program and its ability to keep participants sober during enrollment. Nonetheless, it should be reiterated that these entrants are still significantly more likely to relapse into negative behavior compared to those who are only enrolled in the program once. Second, it is once again these very multi-entry individuals who could benefit from additional targeted anti-alcohol treatment as these are the individuals who most often relapse into repetitive illicit behavior. For these entrants, sobriety significantly diminishes after course completion.

Lastly, the post-program recidivist outcome model validates that longer program enrollment periods have stronger deterrent effects. Entrants who successfully complete the program after having participated in it for 60 days are 1.296 times more likely to have a DUI citation than entrants who successfully complete the program after participating in it for a minimum of 365 days. In other terms, when the odds ratio is calculated into a percentage, the legislative mandates imposed by House Bill 1302 reduce post-program recidivism by 43.6%, a notable improvement compared to a 60-day enrollment mandate.

Table 4.15 24/7 Sobriety Program Post-Program Recidivist Outcome Model

DUI Citation at Any Point After Completing Program						
Parameter[2]	Beta Value	S.E.	Wald	Sig.	Log Odds	95% C.I.
Gender	0.122	0.154	0.628		1.130	0.835-1.528
Region	-0.385	0.135	8.115	**	0.680	0.522-0.887
Geography	0.006	0.154	0.002		1.006	0.744-1.362
Multi-Entry Participant	2.010	0.162	153.365	**	7.465	5.431-10.261
Program Participation Length	-0.259	0.126	4.244	*	0.771	0.603-0.987

[1]N=8,477 (297 post-program recidivists); Nagelkerke R^2=0.108; model correctly classified 96.5% of cases
[2]The Repeat DUI Offender variable was removed from the model; it did not have independence of observations.
**Statistically significant at the 1% level
*Statistically significant at the 5% level

5. CONCLUSIONS

The 24/7 Sobriety Program in North Dakota has positive deterrent effects on program enrollees. This is evident when analyzing the three core research questions which guided this paper.

First, three metrics identified in this study – crashes, non-DUI-related citations, and DUI-related citations – all were significantly reduced in the 60-, 365-, and 730-day intervals following program enrollment. This means that, on average, individual enrollees improved illicit behavior after starting the 24/7 Sobriety Program.

Second, House Bill 1302 has had a clear deterrent effect on DUI-related citations. Compared to participants who were required to be in the program for 60 days, those mandated to the program for a minimum of 365 days receive DUI-related citations at a rate that is approximately half of their counterparts in the 365 and 730 days following initial arrest. In this sample of participants, the legislation did not reduce rates of non-DUI-related citations or crash likelihood.

Third, participants entering the program for the second-or-subsequent time were most likely to recidivate and have a DUI citation following program enrollment. If possible, these individuals should be targeted with additional treatment and intervention efforts in order to rehabilitate the offender and assist with a life of sobriety.

This study could be improved by extending the follow-up period for tracking participants. In North Dakota, a driver arrested for impaired driving is subjected to a seven-year look-back period when determining if he/she should be categorized as a repeat offender. The research team has access to all seven years of driving and citation data for participants prior to beginning the program. However, because the program was not scaled statewide until the latter portion of 2010, the majority of enrollees do not have seven years of post-program data. As such, the research team decided it would not be prudent to collate data for every enrollee for seven years before program enrollment and a less-than-seven-year period after starting the program. Instead, the researchers decided that all participants should be tracked for an equal amount of time before and after starting the intervention. The 60-day, 365-day, and 730-day intervals were chosen because they represent possible enrollment lengths as mandated by law. As the program ages and more follow-up data is acquired, it would behoove future assessments to include even longer before-and-after intervals as this would guarantee that findings could measure if any deterrent effect continues long after statutorily-mandated enrollment. The maximum two-year interval used in this study is undoubtedly robust, but includes some individuals (fourth-or-subsequent offenders) who are still enrolled in the program. A longer follow-up timeframe would guarantee that *all* participants are tracked for some period of time in which the program is no longer influencing their behaviors. Considering that statewide participation in the program began to grow noticeably in 2013, it is critical that this program be reevaluated for post-intervention effectiveness in the next few years as these future data points become viable.

Any enrollment time in the 24/7 Sobriety Program is worthwhile as the number of crashes, non-DUI-related citations, and DUI-related citations decrease upon entering the program. However, for those enrolled for only 60 days, the likelihood of relapsing into repetitive DUI-related behavior is much greater as they more commonly engage in alcohol-related illegal behavior in the one-year and two-year intervals after starting the program. Therefore, it can be argued that more stringent standards work as these individuals continue to have lower rates of DUI-related arrests. Even so, it should be stressed that any enrollment length in the 24/7 Sobriety Program is beneficial as these individuals outperformed a control group for both non-DUI-related traffic citations and DUI-related citations. It is clear that the program has improved safety on North Dakota's roadways.

REFERENCES

Beitel, G.A., M.C. Sharp, and W.D. Glauz. 2000. "Probability of Arrest While Driving Under the Influence of Alcohol." *Injury Prevention* 6:158-161. DOI:10.1136/ip.6.2.158.

Bergen, G., R.A. Shults, and R.A. Rudd. 2011. "Vital Signs: Alcohol-Impaired Driving Among Adults – United States, 2010." *Centers for Disease Control and Prevention Morbidity and Mortality Weekly Report* 60(39):1351-1356.

Birst, A. and K. Pettit Venhuizen. 2014. "HB 1302 – the New DUI Law." Presented at the 2014 North Dakota Law Enforcement Summit, Bismarck, ND.

Brown, T. 2012. "DUI Program Could Save Wyoming Big Bucks." *The Wyoming Tribune Eagle*, September 29. Retrieved November 15, 2013, (http://www.wyomingnews.com/articles/2012/09/30/news/20local_09-30-12.txt#.UyMUsvldVvA).

Burch, C.A., L.L. Chezem, P.S. Fischer, M.S. Iwai, and R.P. Lillis. 2016. *Impaired Driving Program Assessment*. National Highway Traffic Safety Administration, Washington, DC.

Chavers, M. 2008. "South Dakota DUI Offenders Get Sober." *Council of State Governments* 51(10):27.

DeMichele, M. and N.C. Lowe. 2011. "DWI Recidivism: Risk Implications for Community Supervision." *Federal Probation* 75(3):19-24.

Dill, P.L. and E. Wells-Parker. 2006. "Court-Mandated Treatment for Convicted Drinking Drivers." *Alcohol Research & Health* 29(1):41-48.

Drew, L., D. Royal, B. Moulton, A. Peterson, and D. Haddix. 2010. *Volume I: Summary Report National Survey of Drinking and Driving Attitudes and Behaviors: 2008*. Report No. DOT-HS-811-342. Washington, DC: National Highway Traffic Safety Administration.

DuPont, R.L. and G.E. Skipper. 2012. "Six Lessons from State Physician Health Programs to Promote Long-Term Recovery." *Journal of Psychoactive Drugs* 44(1):72-78. DOI:10.1080/02791072.2012.660106.

Ekendahl, M. 2009. "Alcohol Abuse, Compulsory Treatment and Successive Aftercare: A Qualitative Study of Client Perspectives." *International Journal of Social Welfare* 18:260-269. DOI:10.1111/j.1468-2397.2008.00596.x.

Federal Bureau of Investigation. 2017. *Uniform Crime Reports Table 18: Estimated Number of Arrests: United States, 2016*. Washington, DC: U.S. Department of Justice. Accessed online September 15, 2017, (https://ucr.fbi.gov/crime-in-the-u.s/2016/crime-in-the-u.s.-2016/tables/table-18).

Fell, J. 1995. *Repeat DWI Offenders in the United States*. Traffic Tech Series, No. 85. Washington, DC: National Highway Traffic Safety Administration.

Fell, J.C., A.S. Tippets, and J. DeCarlo Ciccel. 2010. "An Evaluation of Three Driving-Under-the-Influence Courts in Georgia." *Annals of Advances in Automotive Medicine* 55:301-312.

Fell, J.C. and T.M. Klein. 1994. "Update: Alcohol-Related Traffic Fatalities." *Morbidity and Mortality Weekly Report* 43(47):861.

Fiellin, D.A., M. Carrington Reid, and P.G. O'Connor. 2000. "Outpatient Management of Patients with Alcohol Problems." *Annals of Internal Medicine* 133(10):815-827. DOI:10.7326/0003-4819-133-10-200011210-00015.

Fisher, D.A., A.S. McKnight, and J.C. Fell. 2013. *Intensive DWI Supervision in Urban Areas – Feasibility Study*. Report No. DOT-HS-811-861. Washington, DC: National Highway Traffic Safety Administration.

Governors Highway Safety Association. 2017. *Alcohol Impaired Driving*. Washington, DC. Accessed online September 17, 2018, (https://www.ghsa.org/state-laws/issues/alcohol%20impaired%20driving).

Gould, L.A. and K. Herke Gould. 1992. "First-Time and Multiple-DWI Offenders: A Comparison of Criminal History Records and BAC Levels." *Journal of Criminal Justice* 20:527-539. DOI:10.1016/0047-2352(92)90062-E.

Hause, J., R. Voas, and E. Chavez. 1982. "Conducting Voluntary Roadside Surveys: The Stockton Experience." Proceedings of the Satellite Conference to the 8th International Conference on Alcohol, Drug, and Traffic Safety. Stockholm, Sweden.

Hazel, K.L. and G.V. Mohatt. 2001. "Cultural and Spiritual Coping in Sobriety: Informing Substance Abuse Prevention for Alaska Native Communities." *Journal of Community Psychology* 29(5):541-562. DOI:10.1002/jcop.1035.

Huseth, A. and A. Kubas. 2012. *Alcohol Consumption Patterns in North Dakota: Survey of DUI Offenders*. DP-254. Fargo, ND: Upper Great Plains Transportation Institute, North Dakota State University.

Karberg, J.C. and D.J. James. 2005. *Substance Dependence, Abuse, and Treatment of Jail Inmates, 2002*. Report No. NCJ 209588. Washington, DC: U.S. Department of Justice.

Kilmer, B. and K. Humphreys. 2013. "Losing Your 'License to Drink': The Radical South Dakota Approach to Heavy Drinkers Who Threaten Public Safety." *Brown Journal of World Affairs* XX(1):267-279.

Kilmer, B., N. Nicosia, P. Heaton, P., and G. Midgette. (2013). "Efficacy of Frequent Monitoring with Swift, Certain, and Modest Sanctions for Violations: Insights from South Dakota's 24/7 Sobriety Project, Am J Public Health. 2013 January; 103(1): e37–e43.

Kiyabu, R., J. Steinberg, and M. Yoshida. 2010. *Hawai'i's Opportunity Probation with Enforcement (HOPE): An Implementation Analysis*. Honolulu, HI: University of Hawaii at Manoa Public Administration Program.

Kleiman, M.A.R. and A. Hawken. 2008. "Fixing the Parole System." *Issues in Science & Technology* 24(4):45.

Kubas, A. 2016. “The 24/7 Sobriety Program in North Dakota: Participant Behavior during Enrollment.” Presentation at the North Dakota Strategic Highway Safety Plan Impaired Driving Committee. Bismarck, ND.

Kubas, A., P. Kayabas, and K. Vachal. 2015. “Assessment of the 24/7 Sobriety Program in North Dakota: Participant Behavior during Enrollment.” DP-279. Fargo, ND: Upper Great Plains Transportation Institute, North Dakota State University.

Kubas, A., P. Kayabas, and K. Vachal. 2016. “The Effects of Legislatively-Mandated Sobriety on First-Time and Repeat DUI Offenders in North Dakota.” DP-290. Fargo, ND: Upper Great Plains Transportation Institute, North Dakota State University.

Kubas, A., P. Kayabas, and K. Vachal. 2017. “Does the 24/7 Sobriety Program Positively Influence Driver Behaviors in North Dakota?” DP-296. Fargo, ND: Upper Great Plains Transportation Institute, North Dakota State University.

Lacey, J.H., T. Kelley-Baker, D. Furr-Holden, R.B. Voas, E. Romano, P. Torres, A.S. Tippetts, A. Ramirez, K. Brainard, and A. Berning. 2009. *2007 National Roadside Survey of Alcohol and Drug Use by Drivers: Alcohol Results*. Report No. DOT-HS-811-248. Washington, DC: National Highway Traffic Safety Administration.

Long, L. 2009. “The 24/7 Sobriety Project.” *Public Lawyer* 17:2-5.

Loudenburg, R., G. Drube, and G. Leonardson. 2010. *South Dakota 24/7 Sobriety Program Evaluation Findings Report*. Salem, SD: Mountain Plains Evaluation, LLC.

Mayhew, D.R., H.M. Simpson, and A. Pak. 2003. “Changes in Collision Rates among Novice Drivers during the First Months of Driving.” *Accident Analysis and Prevention* 35:683-691.

McKnight, A.S., J.C. Fell, and A. Auld-Owens. 2012. *Transdermal Alcohol Monitoring: Case Studies*. Report No. DOT-HS-811-603. Washington, DC: National Highway Traffic Safety Administration.

Midgette, G. 2014. “Monitoring with Swift, Certain, and Moderate Sanctions to Reduce Alcohol-Related Crime: The South Dakota 24/7 Sobriety Program.” UMI No. 3662275: ProQuest dissertation database.

Midgette, G. and Beau Kilmer, B. (2015). “The Effect of Montana's 24/7 Sobriety Program on DUI Re-arrest, Insights from a Natural Experiment with Limited Administrative Data,” Santa Monica, CA: RAND Corporation, WR-1083-MHP.

Midgette, G. 2016. “A New Approach to Reducing Heavy Drinking and Alcohol-Involved Crime?” Testimony to the California State Assembly.

Mothers Against Drunk Driving. 2015. “North Dakota.” Accessed online August 22, 2016, (http://www.madd.org/drunk-driving/state-stats/North_Dakota.html?referrer=https://www.google.com/).

National Highway Traffic Safety Administration. 2006. *DWI Detection and Standardized Field Sobriety Testing: Student Manual*. Report No. HS-178-R2/06. Washington, DC: U.S. Department of Transportation.

National Highway Traffic Safety Administration. 2007. *Digest of Impaired Driving and Selected Beverage Control Laws: Twenty-Fourth Edition*. Report No. DOT-HS-810-827. Washington, DC: U.S. Department of Transportation.

National Highway Traffic Safety Administration. 2010. *National Survey of Drinking and Driving Attitudes and Behaviors*. Washington, DC: U.S. Department of Transportation.

National Highway Traffic Safety Administration. 2016. *Alcohol-Impaired Driving*. Report No. DOT-HS-812-350. Washington, DC: U.S. Department of Transportation.

Nochajski, T.H. and P.R. Stasiewicz. 2006. "Relapse to Driving Under the Influence (DUI): A Review." *Clinical Psychology Review* 26(2):179-195.

North Dakota Attorney General's Office. *24/7*. Bismarck, ND: Accessed online September 12, 2016, (https://www.ag.nd.gov/TwentyFourSeven/ND247Program.pdf).

North Dakota Century Code 54-12-27. *Twenty-Four Seven Sobriety Program*. Bismarck, ND: State of North Dakota. Retrieved October 10, 2014, (http://www.legis.nd.gov/cencode/t54c12.pdf?20141010084151).

North Dakota Century Code 54-12-28. *Twenty-Four Seven Sobriety Program Guidelines and Program Fees*. Bismarck, ND: State of North Dakota. Retrieved October 10, 2014, (http://www.legis.nd.gov/cencode/t54c12.pdf?20141010084151).

North Dakota Century Code 54-12-29. *Twenty-Four Seven Sobriety Program Fund – Continuing Appropriation*. Bismarck, ND: State of North Dakota. Retrieved October 10, 2014, (http://www.legis.nd.gov/cencode/t54c12.pdf?20141010084151).

North Dakota Century Code 54-12-30. *Twenty-Four Seven Sobriety Program Fees*. Bismarck, ND: State of North Dakota. Retrieved October 10, 2014, (http://www.legis.nd.gov/cencode/t54c12.pdf?20141010084151).

North Dakota Century Code 54-12-31. *Bond Conditions*. Bismarck, ND: State of North Dakota. Retrieved October 10, 2014, (http://www.legis.nd.gov/cencode/t54c12.pdf?20141010084151).

North Dakota Department of Transportation. 2010. *Drinking and Driving Facts*. Bismarck, ND: Accessed online October 9, 2014, (http://www.dot.nd.gov/divisions/safety/drinking_driving.htm).

North Dakota Department of Transportation. 2011. *Highway Safety Plan: Federal Fiscal Year 2012*. Bismarck, ND: Accessed online November 18, 2013, (https://www.dot.nd.gov/divisions/safety/docs/2012-HSP-Final.pdf).

North Dakota Department of Transportation. 2014. Data request of North Dakota DUI convictions and arrests: 2003-2013.

North Dakota Department of Transportation. 2017a. *2016 North Dakota Crash Summary*. Bismarck, ND: Accessed online September 22, 2018, (https://www.dot.nd.gov/divisions/safety/docs/crash-summary.pdf).

North Dakota Department of Transportation. 2017b. Data request of repeat DUI offenders with offenses on file in the previous seven years: 2014-2016.

North Dakota Department of Transportation. 2017c. *Impaired Driving Strategic Plan for North Dakota*.

Office of National Drug Control Policy. 2011. *Alternatives to Incarceration: A Smart Approach to Breaking the Cycle of Drug Use and Crime*. Washington, DC: Executive Office of the President. Accessed online November 12, 2013, (http://www.whitehouse.gov/sites/default/files/page/files/alternatives_to_incarceration_fact_sheet_10-13-11.pdf).

Palmer, E.J., R.M. Hatcher, J. McGuire, C.A.L. Bilby, and C.R. Hollin. 2012. "The Effect of Reconviction of an Intervention for Drink-Driving Offenders in the Community." *International Journal of Offender Therapy and Comparative Criminology* 56(4):525-538. DOI:10.1177/0306624X11403894.

Perrine, M.W., R.C. Peck, and J.C. Fell. 1988. *Epidemiologic Perspectives on Drunk Driving*. Epidemiology and Data Management Background Papers, 35-76.

Schell, T.L., K.S. Chan, and A.R. Morral. 2006. "Predicting DUI Recidivism: Personality, Attitudinal, and Behavioral Risk Factors." *Drug and Alcohol Dependence* 82(1):33-40. DOI:10.1016/j.drugalcdep.2005.08.006.

Smith, N. 2013. "New DUI Law Highlights." *The Bismarck Tribune*. July 27. Accessed online October 9, 2014, (http://bismarcktribune.com/news/local/govt-and-politics/new-dui-law-highlights/article_55f46b48-f636-11e2-af7d-001a4bcf887a.html).

Subramanian, R. 2009. *Motor Vehicle Traffic Crashes as a Leading Cause of Death in the United Sates, 2006*. Report No. DOT-HS-811-226. Washington, DC: National Highway Traffic Safety Administration.

Svetina, M. 2016. "The Reaction Times of Drivers Aged 20 to 80 during a Divided Attention Driving." *Traffic Injury Prevention* 1-5. DOI:10.1080/15389588.2016.1157590.

United States Census Bureau. 2016. "Annual Estimates of the Resident Population: April 1, 2010 to July 1, 2016: 2016 Population Estimates" [data set]. Retrieved July 5, 2017, (https://factfinder.census.gov/faces/tableservices/jsf/pages/productview.xhtml?src=bkmk).

Vachal, K., L. Benson, and A. Kubas. 2018. "North Dakota Statewide Traffic Safety Survey, 2018: Traffic Safety Performance Measures for State and Federal Agencies." DP-299. Fargo, ND: Upper Great Plains Transportation Institute, North Dakota State University.

VanWechel, T., K. Vachal, and L. Benson. 2008. "Traffic Safety Issues in North Dakota Phase II: Driver Knowledge, Attitude, Behavior and Beliefs Focus Group: Young Male Drivers." MPC-08-204. Fargo, ND: Upper Great Plains Transportation Institute, North Dakota State University.

Voas, R.B. and J.C. Fell. 2011. "Preventing Impaired Driving: Opportunities and Problems." *Alcohol Research & Health* 34(2):225-235.

Voas, R.B., R.L. DuPont, S.K. Talpins, and C.L. Shea. 2011. "Towards a National Model for Managing Impaired Driving Offenders." *Addiction* 106:1221-1227. DOI:10.1111/j.1360-0443.2010.03339.x.

Wiliszowski, C., P. Murphy, R. Jones, and J. Lacey. 1996. *Determine Reasons for Repeat Drinking and Driving*. Report No. DOT-HS-808-401. Washington, DC: National Highway Traffic Safety Administration.

Zaloshnja, E. and T.R. Miller. 2009. "Cost of Crashes Related to Road Conditions, United States, 2006." *Annals of Advances in Automotive Medicine* 53:141-153.

APPENDIX. BEFORE-AND-AFTER DETAILED RESULTS

Table A-1 Before-and-After Results Factoring for Average Number of Events, Females

Metric	60 Days Before	60 Days After	Significance
DUI-Related Citations	0.45	0.01	**
Non-DUI-Related Traffic Citations	0.40	0.06	**
Crashes	0.11	0.01	**
	365 Days Before	365 Days After	Significance
DUI-Related Citations	0.69	0.04	**
Non-DUI-Related Traffic Citations	0.84	0.37	**
Crashes	0.21	0.05	**
	730 Days Before	730 Days After	Significance
DUI-Related Citations	0.88	0.08	**
Non-DUI-Related Traffic Citations	1.31	0.63	**
Crashes	0.29	0.06	**

**Statistically significant at the 1% level for paired-samples t-test

Table A-2 Before-and-After Results Factoring for Average Number of Events, Males

Metric	60 Days Before	60 Days After	Significance
DUI-Related Citations	0.43	0.01	**
Non-DUI-Related Traffic Citations	0.45	0.05	**
Crashes	0.08	0.01	**
	365 Days Before	365 Days After	Significance
DUI-Related Citations	0.70	0.05	**
Non-DUI-Related Traffic Citations	1.00	0.39	**
Crashes	0.17	0.04	**
	730 Days Before	730 Days After	Significance
DUI-Related Citations	0.86	0.11	**
Non-DUI-Related Traffic Citations	1.47	0.69	**
Crashes	0.23	0.05	**

**Statistically significant at the 1% level for paired-samples t-test

Table A-3 Before-and-After Results Factoring for Average Number of Events, Eastern Residents

Metric	60 Days Before	60 Days After	Significance
DUI-Related Citations	0.39	0.01	**
Non-DUI-Related Traffic Citations	0.43	0.04	**
Crashes	0.08	0.01	**
	365 Days Before	365 Days After	Significance
DUI-Related Citations	0.66	0.04	**
Non-DUI-Related Traffic Citations	0.93	0.31	**
Crashes	0.18	0.04	**
	730 Days Before	730 Days After	Significance
DUI-Related Citations	0.78	0.09	**
Non-DUI-Related Traffic Citations	1.31	0.58	**
Crashes	0.23	0.05	**

**Statistically significant at the 1% level for paired-samples t-test

Table A-4 Before-and-After Results Factoring for Average Number of Events, Western Residents

Metric	60 Days Before	60 Days After	Significance
DUI-Related Citations	0.46	0.01	**
Non-DUI-Related Traffic Citations	0.45	0.06	**
Crashes	0.08	0.01	**
	365 Days Before	365 Days After	Significance
DUI-Related Citations	0.72	0.06	**
Non-DUI-Related Traffic Citations	0.99	0.43	**
Crashes	0.17	0.05	**
	730 Days Before	730 Days After	Significance
DUI-Related Citations	0.91	0.12	**
Non-DUI-Related Traffic Citations	1.52	0.73	**
Crashes	0.25	0.06	**

**Statistically significant at the 1% level for paired-samples t-test

Table A-5 Before-and-After Results Factoring for Average Number of Events, Urban Residents

Metric	60 Days Before	60 Days After	Significance
DUI-Related Citations	0.45	0.01	**
Non-DUI-Related Traffic Citations	0.45	0.05	**
Crashes	0.09	0.01	**
	365 Days Before	365 Days After	Significance
DUI-Related Citations	0.71	0.05	**
Non-DUI-Related Traffic Citations	0.97	0.39	**
Crashes	0.18	0.05	**
	730 Days Before	730 Days After	Significance
DUI-Related Citations	0.88	0.11	**
Non-DUI-Related Traffic Citations	1.44	0.69	**
Crashes	0.25	0.06	**

**Statistically significant at the 1% level for paired-samples t-test

Table A-6 Before-and-After Results Factoring for Average Number of Events, Rural Residents

Metric	60 Days Before	60 Days After	Significance
DUI-Related Citations	0.37	0.00	**
Non-DUI-Related Traffic Citations	0.40	0.05	**
Crashes	0.06	0.00	**
	365 Days Before	365 Days After	Significance
DUI-Related Citations	0.65	0.04	**
Non-DUI-Related Traffic Citations	0.98	0.34	**
Crashes	0.15	0.04	**
	730 Days Before	730 Days After	Significance
DUI-Related Citations	0.79	0.11	**
Non-DUI-Related Traffic Citations	1.41	0.62	**
Crashes	0.21	0.05	**

**Statistically significant at the 1% level for paired-samples t-test

Table A-7 Before-and-After Results Factoring for Average Number of Events, First-Time DUI Offender

Metric	60 Days Before	60 Days After	Significance
DUI-Related Citations	0.34	0.01	**
Non-DUI-Related Traffic Citations	0.37	0.06	**
Crashes	0.08	0.01	**
	365 Days Before	365 Days After	Significance
DUI-Related Citations	0.61	0.05	**
Non-DUI-Related Traffic Citations	0.93	0.40	**
Crashes	0.17	0.05	**
	730 Days Before	730 Days After	Significance
DUI-Related Citations	0.72	0.11	**
Non-DUI-Related Traffic Citations	1.39	0.68	**
Crashes	0.25	0.06	**

**Statistically significant at the 1% level for paired-samples t-test

Table A-8 Before-and-After Results Factoring for Average Number of Events, Repeat DUI Offender

Metric	60 Days Before	60 Days After	Significance
DUI-Related Citations	0.48	0.01	**
Non-DUI-Related Traffic Citations	0.48	0.05	**
Crashes	0.09	0.01	**
	365 Days Before	365 Days After	Significance
DUI-Related Citations	0.75	0.05	**
Non-DUI-Related Traffic Citations	0.99	0.37	**
Crashes	0.18	0.04	**
	730 Days Before	730 Days After	Significance
DUI-Related Citations	0.94	0.11	**
Non-DUI-Related Traffic Citations	1.47	0.67	**
Crashes	0.24	0.05	**

**Statistically significant at the 1% level for paired-samples t-test

Table A-9 Before-and-After Results Factoring for Average Number of Events, First-Time Entrant

Metric	60 Days Before	60 Days After	Significance
DUI-Related Citations	0.42	0.01	**
Non-DUI-Related Traffic Citations	0.41	0.06	**
Crashes	0.08	0.01	**
	365 Days Before	365 Days After	Significance
DUI-Related Citations	0.69	0.02	**
Non-DUI-Related Traffic Citations	0.92	0.33	**
Crashes	0.17	0.04	**
	730 Days Before	730 Days After	Significance
DUI-Related Citations	0.80	0.04	**
Non-DUI-Related Traffic Citations	1.29	0.56	**
Crashes	0.23	0.06	**

**Statistically significant at the 1% level for paired-samples t-test

Table A-10 Before-and-After Results Factoring for Average Number of Events, Multi-Time Entrant

Metric	60 Days Before	60 Days After	Significance
DUI-Related Citations	0.45	0.01	**
Non-DUI-Related Traffic Citations	0.48	0.04	**
Crashes	0.09	0.01	**
	365 Days Before	365 Days After	Significance
DUI-Related Citations	0.71	0.09	**
Non-DUI-Related Traffic Citations	1.03	0.46	**
Crashes	0.19	0.06	**
	730 Days Before	730 Days After	Significance
DUI-Related Citations	0.93	0.19	**
Non-DUI-Related Traffic Citations	1.62	0.81	**
Crashes	0.26	0.05	**

**Statistically significant at the 1% level for paired-samples t-test