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The 24/7 Sobriety Program's Effects on Impaired Drivers in North Dakota: 2008-2018

Prepared by:

Andrew Kubas, Consulting Faculty
Kimberly Vachal, Program Director

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Andrew Kubas, Consulting Faculty
Kimberly Vachal, Program Director

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

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Disclaimer

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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. Enrollment lengths depend on one's prior impaired driving history. This project seeks to understand three areas: if before-and-after deterrent effects arise upon program enrollment; if longer enrollment lengths have stronger deterrent effects 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 for a second-or-subsequent time 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 that has issues with alcohol abuse and self-control.

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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 both drivers who operate vehicles while impaired and other 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 among people between the ages of three 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.

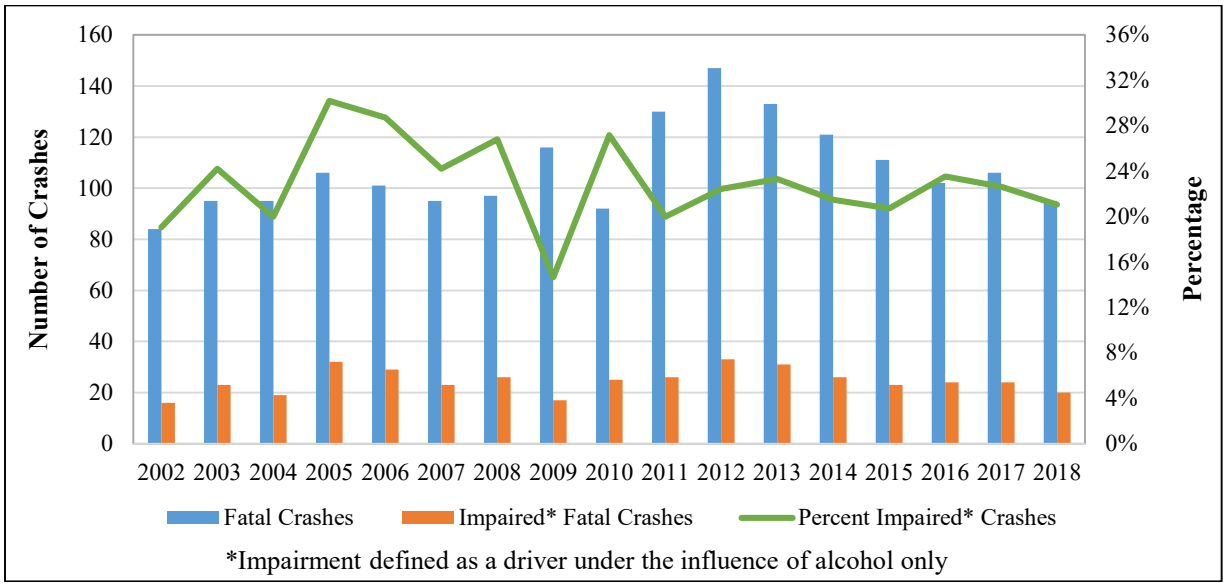

Figure 1.1 Drivers Under the Influence of Alcohol in North Dakota Fatal Crashes, 2002-2017

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 with 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. The successful passing 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. Chapter 2 provides contextual background for impaired driving prevention and intervention. Chapter 3 outlines methodologies used by the research team to conceptualize and operationalize program data. Chapter 4 examines results of statistical analyses in an attempt to answer the research questions that guided the overall study. Chapter 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. This is a serious problem facing the nation in promoting public health safety. 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 other 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 problem in public safety. 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 for 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 North Dakota initiative, 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 rare (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 there are between 500 and 2,000 DUI violations committed for every one 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 (2018) show that 990,678 drivers were arrested for driving under the influence in the United States in 2017.

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). Legislators in Utah chose to set a stricter BAC limit of 0.05 g/dL, which went into effect on December 30, 2018 (GHSA 2017). Even with these laws in place, the current crash, court, and incarceration literature suggest 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 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 the Midwest region had the highest rate of impaired driving with 643 episodes per 1,000 population. North Dakota had the highest self-reported impaired driving rate in the Midwest region Dakota (Bergen, Shults, and Rudd 2011). A recent survey of North Dakota drivers also shows great propensity with 35.2% of the population reporting they had operated a vehicle within two hours of consuming one or two alcoholic beverages (Vachal, Benson, and Kubas 2019).

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 have also 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 – Cut-Annoyed-Guilty-Eye (CAGE), the Alcohol Use Disorders Identification Test (AUDIT), and the Michigan Alcoholism Screening Test (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 2000: 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 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 Hawaii Opportunity Probation with Enforcement (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 for 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 with 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 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 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 resist abstaining 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 with 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 with 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. A pilot program was started under former Attorney General Larry Long in 2005 because of South Dakota's high 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, their days 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 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 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 to 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 Legislative Assembly 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 that comprise 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 early stages 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 patch if deemed necessary by a 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 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 involved 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, 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?
- Do longer sentence periods have stronger deterrent effects on impaired driving offenders?
- Can a model be developed to assist practitioners in identifying characteristics of enrollees which lead to one's recidivism?

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 11 years of driver records from January 2008 to December 2018. 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 of 2018 were not used because the research team only had access to crash data through the calendar year 2018. 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, 2018, 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 31, 2018.

The original data set was cleaned and entries were removed for numerous reasons. Parameters for removing entries from the final data set included non-DUI-related arrests, data entry errors, invalid program start dates, participants under the age of 18, out-of-state participants, participants who were matched via drug violations only, and an inability to match 24/7 Sobriety Program records to state crash and conviction databases.

Valid 24/7 Sobriety Program 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.

Probabilistic 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 his/her social security number. Working backwards, 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 one'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 87.8%, as 10,113 entries were linked from a possible 11,513 records meeting study criteria.

Once records were matched, the database was cleaned. First, 166 records of participants who enrolled after November 1, 2018, were removed, as these individuals were unable to be tracked for the minimum 60-day period. Second, it was discovered that 272 participants were tracked using only a drug patch. Because the focus of this research paper is on understanding alcohol-impaired driver behavior, these 272 records were expunged from the database, as they were not specific to alcohol-impaired driving. The final database consisted of 9,675 alcohol-impaired driving-related records.

After cleaning took place, a series of variables were created for use in 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 these relate directly to

sentencing timeframes mandated by law. Prior to the passing 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 360[1] days and fourth-or-subsequent offenders for 730 days.

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 7,227 individuals who accounted for 9,675 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 is probably attributed to the new 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	1.3%
2009[1]	203	2.1%
2010[2]	528	5.5%
2011	810	8.4%
2012	743	7.7%
2013	958	9.9%
2014	1,382	14.3%
2015	1,378	14.2%
2016	1,300	13.4%
2017	1,231	12.7%
2018[3]	1,014	10.5%

[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, 2018

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 78.5% of the entries, compared with just 21.5% who identified as female. This follows 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 (56.4%) in the sample were under age 35, 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 2019). 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 age 75 – had fewer than 30 entries in their age

[1]For the purposes of this report, 360-day participation interval is referred to as a one-year term to allow more concise wording in the report.

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-plus 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-plus 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	1,869	19.3%
25-34	3,588	37.1%
35-44	2,072	21.4%
45-54	1,450	15.0%
55-64	602	6.2%
65-74	81	0.8%
75+	13	0.1%

Participation in the 24/7 Sobriety Program was not evenly distributed across regions and geography (Table 3.3). Roughly half of program entries (48.1%) 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	3,004 (31.0%)	949 (9.8%)	**3,953 (40.9%)**
	West	4,656 (48.1%)	1,066 (11.0%)	**5,722 (59.1%)**
	Total	**7,660 (79.2%)**	**2,015 (20.8%)**	**9,675**

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 U.S. 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.

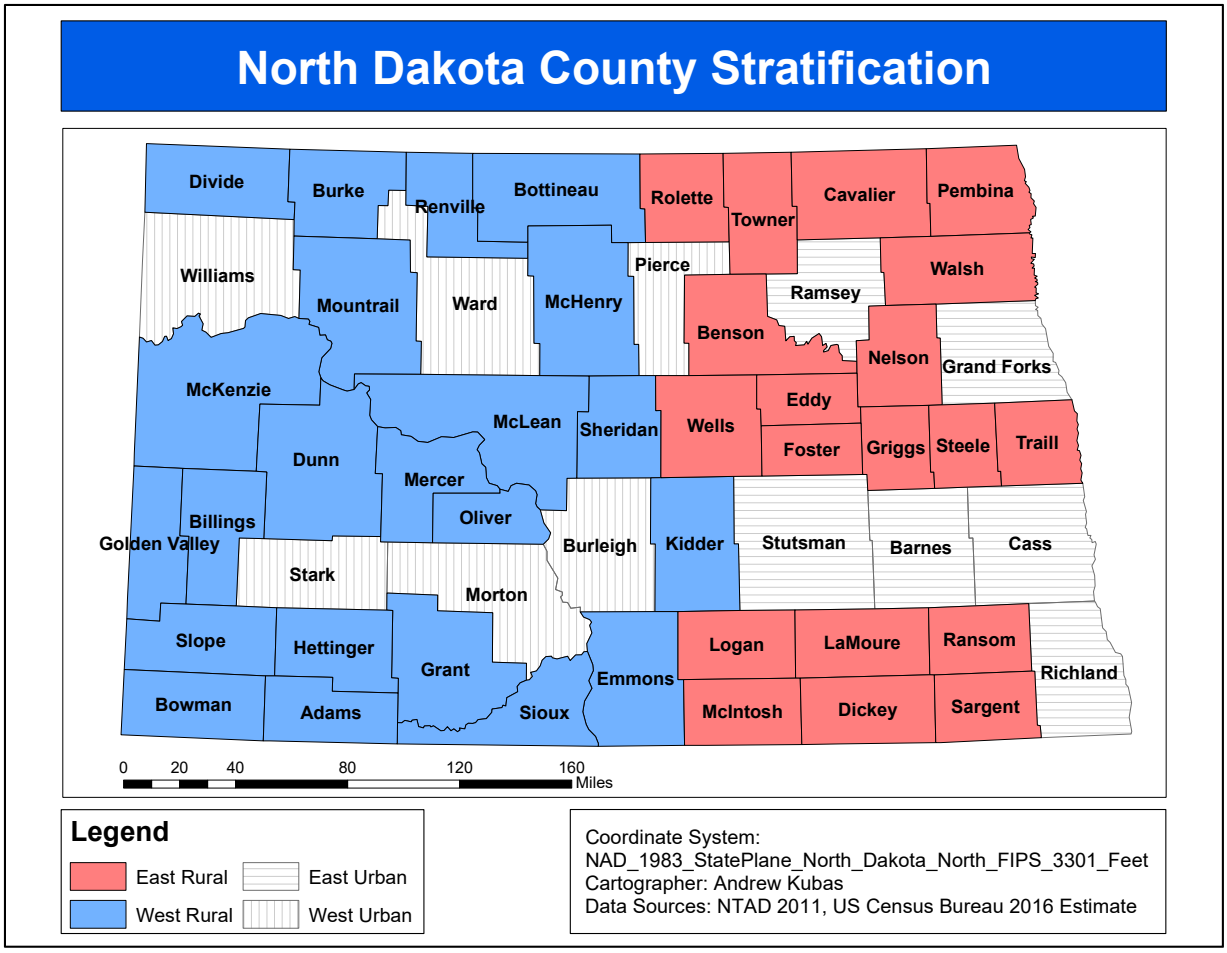

Figure 3.1 North Dakota County Stratification

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.) The secure continuous remote alcohol monitoring (SCRAM) ankle bracelets vary by function and are not a truly continuous monitoring device. In general, the bracelet takes a test roughly every 30 minutes. These data remain 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 9,675 entries in this sample, roughly two-thirds (64.3%) were monitored with only one type of alcohol-testing system. Roughly half (46.2%) of participants in this sample were monitored with twice-a-day preliminary breath tests only (Table 3.4). Of the remaining 3,457 entries with two or more alcohol-monitoring systems, 93.0% 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 95 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 a 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	4,470	46.2%
Preliminary Breath Test and SCRAM	3,214	33.2%
SCRAM Only	1,738	18.0%
Drug Patch and Preliminary Breath Test	80	0.8%
Drug Patch, Preliminary Breath Test, and SCRAM	70	0.7%
SCRAM and SCRAM Wireless	25	0.3%
Drug Patch and SCRAM	20	0.2%
Preliminary Breath Test and Urinalysis	15	0.2%
Preliminary Breath Test, SCRAM, and SCRAM Wireless	10	0.1%
Urinalysis Only	10	0.1%
Preliminary Breath Test, SCRAM, and Urinalysis	9	0.1%
SCRAM and Urinalysis	5	0.1%
Drug Patch, Preliminary Breath Test, SCRAM, and Urinalysis	4	<0.1%
Drug Patch and Urinalysis	2	<0.1%
Preliminary Breath Test, Drug Patch, and Urinalysis	1	<0.1%
Preliminary Breath Test and SCRAM Wireless	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 enrollment 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	1,543	15.9%
Driving Under Suspension	86	0.9%
Minor in Possession/Control	229	2.4%
DUI 1st Offense	1,651	17.1%
DUI 2nd Offense	4,118	42.6%
DUI 3rd Offense	1,249	12.9%
DUI 4th+ Offense	799	8.3%

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, since enrollees in the program prior to 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, 70 participants (0.7%) received a citation for impaired driving within 60 days of starting the program and are considered high-risk recidivists. A larger share of 164 entries (1.7%) 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 316 entries (3.3%) 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 2019 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 look at potential predictors for DUI recidivism likelihood. 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 8,646 citations committed by 6,682 entrants in the two years prior to entering the program. After starting the program, there were just 920 DUI-related citations committed by 840 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 because 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.

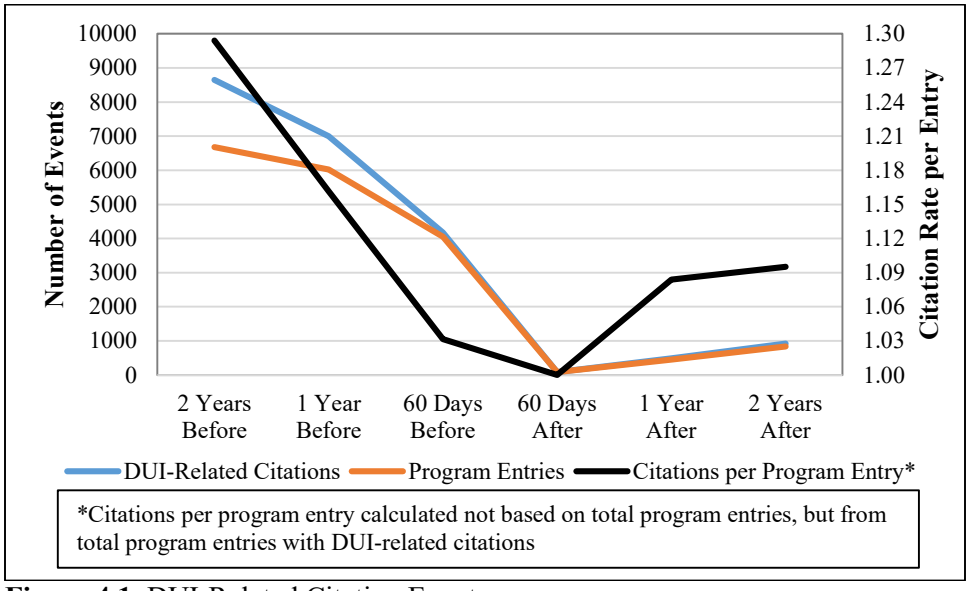

Figure 4.1 DUI-Related Citation Events

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 crimes.

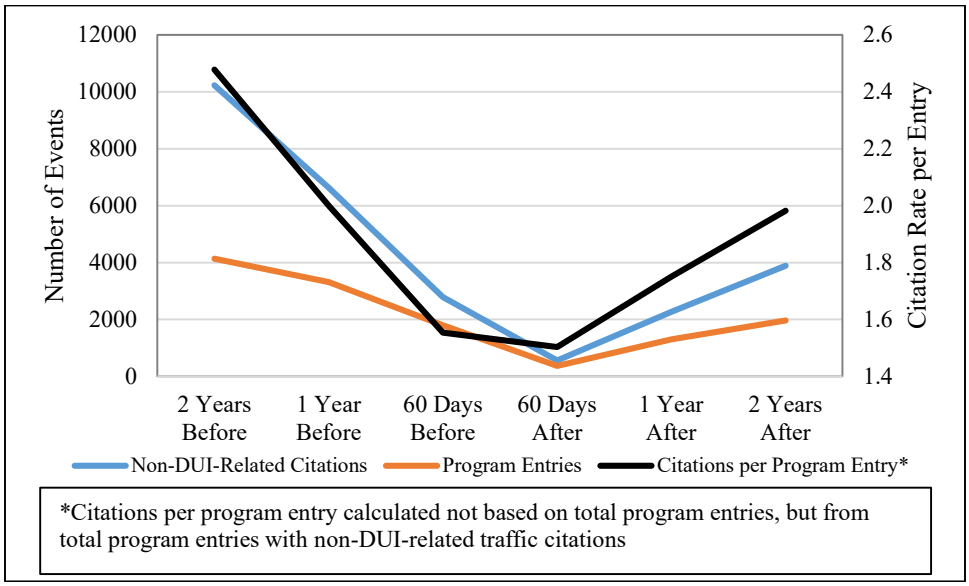

Figure 4.2 Non-DUI-Related Traffic Citation Events

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; 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	11	6	0	3	5
Injury	746	562	279	35	115	103
Property Damage Only	1,406	1,054	494	65	292	248

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.

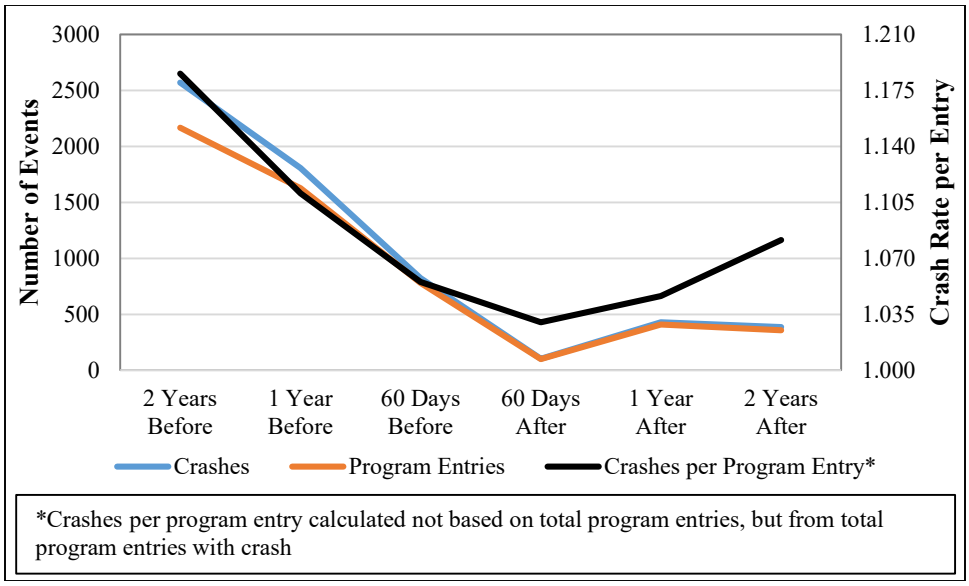

Figure 4.3 Crash Events

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 after starting the 24/7 Sobriety Program for the two-year time interval ($F=5.072$, $df=1$, $p=0.024$). This follows other studies that recognize 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; Kubas, Vachal, and Malchose 2018).

Women were more likely to have had a traffic crash 60 days before ($F=19.358$, $df=1$, $p<0.001$), one year before ($F=14.550$, $df=1$, $p<0.001$), and two years before ($F=15.610$, $df=1$, $p<0.001$) enrolling in the intervention. This propensity to be involved in a traffic collision continued after completing the program, as females had higher crash rates in the 60 days ($F=10.592$, $df=1$, $p=0.001$) and 365 days ($F=6.743$, $df=1$, $p=0.009$) following the program. There were no statistically significant differences in the two-year time period ($F=0.575$, $df=1$, $p=0.448$), which indicates there may be a modest deterrent effect on males with regard to traffic crashes in the short term, but it dissipates somewhere after the 365th day of program enrollment.

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	0.46	#
DUI-Related Citations, 60 Days After Program Start	0.01	0.01	
DUI-Related Citations, 1 Year Before Program Start	0.71	0.72	
DUI-Related Citations, 1 Year After Program Start	0.05	0.05	
DUI-Related Citations, 2 Years Before Program Start	0.86	0.87	
DUI-Related Citations, 2 Years After Program Start	0.11	0.09	#
Non-DUI-Related Traffic Citations, 60 Days Before Program Start	0.29	0.30	
Non-DUI-Related Traffic Citations, 60 Days After Program Start	0.06	0.06	
Non-DUI-Related Traffic Citations, 1 Year Before Program Start	0.69	0.66	
Non-DUI-Related Traffic Citations, 1 Year After Program Start	0.23	0.23	
Non-DUI-Related Traffic Citations, 2 Years Before Program Start	1.07	1.04	
Non-DUI-Related Traffic Citations, 2 Years After Program Start	0.41	0.42	
Crashes, 60 Days Before Program Start	0.08	0.11	##
Crashes, 60 Days After Program Start	0.01	0.02	##
Crashes, 1 Year Before Program Start	0.17	0.22	##
Crashes, 1 Year After Program Start	0.04	0.06	##
Crashes, 2 Years Before Program Start	0.24	0.30	##
Crashes, 2 Years After Program Start	0.04	0.04	

##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 occurred at comparable rates across age groups. 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+/	
DUI-Related Citations, 60 Days Before	0.41	0.44	0.44	0.42	0.45	0.43	
DUI-Related Citations, 60 Days After	0.01	0.01	0.01	0.01	0.00	0.01	
DUI-Related Citations, 1 Year Before	0.69	0.73	0.74	0.68	0.70	0.74	
DUI-Related Citations, 1 Year After	0.06	0.05	0.06	0.04	0.05	0.05	
DUI-Related Citations, 2 Years Before	0.87	0.87	0.92	0.80	0.81	0.87	##
DUI-Related Citations, 2 Years After	0.12	0.11	0.11	0.10	0.08	0.05	
Non-DUI-Related Traffic Citations, 60 Days Before	0.26	0.30	0.29	0.28	0.30	0.22	
Non-DUI-Related Traffic Citations, 60 Days After	0.06	0.07	0.05	0.05	0.04	0.06	
Non-DUI-Related Traffic Citations, 1 Year Before	0.68	0.70	0.68	0.66	0.68	0.64	
Non-DUI-Related Traffic Citations, 1 Year After	0.23	0.24	0.24	0.22	0.24	0.27	
Non-DUI-Related Traffic Citations, 2 Years Before	1.10	1.09	1.05	1.00	1.03	1.15	
Non-DUI-Related Traffic Citations, 2 Years After	0.38	0.42	0.44	0.39	0.40	0.46	
Crashes, 60 Days Before	0.09	0.09	0.08	0.08	0.09	0.11	
Crashes, 60 Days After	0.02	0.01	0.01	0.01	0.01	0.01	##
Crashes, 1 Year Before	0.23	0.19	0.16	0.14	0.16	0.26	##
Crashes, 1 Year After	0.06	0.04	0.04	0.03	0.05	0.03	##
Crashes, 2 Years Before	0.34	0.24	0.22	0.20	0.20	0.26	##
Crashes, 2 Years After	0.04	0.04	0.05	0.04	0.04	0.07	

/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 tend to crash at higher rates than their eastern counterparts. This was evident in the two years before starting the program ($F=4.254$, $df=1$, $p=0.039$), and the 60 days ($F=4.713$, $df=1$, $p=0.030$) and 365 days ($F=18.709$, $df=1$, $p<0.001$) after completing the program. Although the western residents performed poorly for DUI-related citations and crashes, non-DUI-related citation patterns were similar across statewide regions.

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	0.68	0.73	##
DUI-Related Citations, 1 Year After Program Start	0.04	0.06	##
DUI-Related Citations, 2 Years Before Program Start	0.80	0.91	##
DUI-Related Citations, 2 Years After Program Start	0.09	0.11	##
Non-DUI-Related Traffic Citations, 60 Days Before Program Start	0.28	0.29	
Non-DUI-Related Traffic Citations, 60 Days After Program Start	0.05	0.06	
Non-DUI-Related Traffic Citations, 1 Year Before Program Start	0.68	0.69	
Non-DUI-Related Traffic Citations, 1 Year After Program Start	0.24	0.23	
Non-DUI-Related Traffic Citations, 2 Years Before Program Start	1.06	1.07	
Non-DUI-Related Traffic Citations, 2 Years After Program Start	0.43	0.41	
Crashes, 60 Days Before Program Start	0.08	0.09	
Crashes, 60 Days After Program Start	0.008	0.013	#
Crashes, 1 Year Before Program Start	0.18	0.19	
Crashes, 1 Year After Program Start	0.03	0.05	##
Crashes, 2 Years Before Program Start	0.23	0.26	#
Crashes, 2 Years After Program Start	0.04	0.05	

##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 generally 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 ($F=5.849$, $df=1$, $p=0.016$) before enrolling in the intervention. These same entrants had more crashes than rural North Dakotans in the 60 days ($F=10.491$, $df=1$, $p=0.001$), 365 days ($F=14.512$, $df=1$, $p<0.001$) and 730 days ($F=7.124$, $df=1$, $p=0.008$) prior to starting the program. Urban residents still committed these violations at higher rates than rural drivers in the 60 days ($F=6.142$, $df=1$, $p=0.013$) and 365 days ($F=7.652$, $f=1$, $p=0.006$) after starting the program. It is not until the two-year interval after beginning the program that these drivers crash at rates on par with their rural counterparts ($F=0.165$, $df=1$, $p=0.684$).

The only metric for which rural residents performed worse than urban drivers pertained to non-DUI-related traffic citations in the 60 days prior to starting the program ($F=4.411$, $df=1$, $p=0.036$). In every other time period studied, urban and rural participants had similar rates of non-DUI-related citations. This may suggest that the program has a stronger deterrent effect on non-DUI-related crime for rural offenders.

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	0.44	0.41	#
DUI-Related Citations, 60 Days After Program Start	0.01	0.01	
DUI-Related Citations, 1 Year Before Program Start	0.72	0.69	
DUI-Related Citations, 1 Year After Program Start	0.06	0.04	
DUI-Related Citations, 2 Years Before Program Start	0.87	0.86	
DUI-Related Citations, 2 Years After Program Start	0.11	0.10	
Non-DUI-Related Traffic Citations, 60 Days Before Program Start	0.28	0.32	#
Non-DUI-Related Traffic Citations, 60 Days After Program Start	0.06	0.06	
Non-DUI-Related Traffic Citations, 1 Year Before Program Start	0.67	0.73	
Non-DUI-Related Traffic Citations, 1 Year After Program Start	0.23	0.24	
Non-DUI-Related Traffic Citations, 2 Years Before Program Start	1.06	1.10	
Non-DUI-Related Traffic Citations, 2 Years After Program Start	0.41	0.44	
Crashes, 60 Days Before Program Start	0.09	0.07	##
Crashes, 60 Days After Program Start	0.012	0.005	#
Crashes, 1 Year Before Program Start	0.19	0.15	##
Crashes, 1 Year After Program Start	0.05	0.03	##
Crashes, 2 Years Before Program Start	0.26	0.22	##
Crashes, 2 Years After Program Start	0.04	0.04	

##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 60-day ($F=20.584$, $df=1$, $p<0.001$), one-year ($F=161.444$, $df=1$, $p<0.001$), and two-year ($F=357.351$, $df=1$, $p<0.001$) 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 crash after starting the program. With regard to crashes, multi-entry offenders revert to levels on par with first-time enrollees two years after starting the 24/7 Sobriety Program. If the program does have a deterrent effect on multi-entry offenders, it is created over the long term and is not present in the first 60 to 365 days of enrollment. There were no statistically significant differences for non-DUI-related traffic citations in any of the time cohorts examined.

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	0.014	0.005	##
DUI-Related Citations, 1 Year Before Program Start	0.72	0.70	
DUI-Related Citations, 1 Year After Program Start	0.09	0.02	##
DUI-Related Citations, 2 Years Before Program Start	0.93	0.82	##
DUI-Related Citations, 2 Years After Program Start	0.19	0.04	##
Non-DUI-Related Traffic Citations, 60 Days Before Program Start	0.28	0.29	
Non-DUI-Related Traffic Citations, 60 Days After Program Start	0.05	0.06	
Non-DUI-Related Traffic Citations, 1 Year Before Program Start	0.67	0.70	
Non-DUI-Related Traffic Citations, 1 Year After Program Start	0.23	0.24	
Non-DUI-Related Traffic Citations, 2 Years Before Program Start	1.02	1.10	
Non-DUI-Related Traffic Citations, 2 Years After Program Start	0.41	0.42	
Crashes, 60 Days Before Program Start	0.09	0.08	
Crashes, 60 Days After Program Start	0.013	0.009	#
Crashes, 1 Year Before Program Start	0.19	0.18	
Crashes, 1 Year After Program Start	0.05	0.04	##
Crashes, 2 Years Before Program Start	0.27	0.24	#
Crashes, 2 Years After Program Start	0.04	0.04	

##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 since 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 after starting the program indicates that the structure the program provides to the enrollees does improve one's behavior with regard to alcohol-related citations.

For non-DUI-related traffic citations and crashes, there were no statistically significant differences between first-time and repeat DUI-related citation offenders. This finding contrasts 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 with 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 this serves as 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	0.35	##
DUI-Related Citations, 60 Days After Program Start	0.01	0.01	
DUI-Related Citations, 1 Year Before Program Start	0.77	0.62	##
DUI-Related Citations, 1 Year After Program Start	0.05	0.06	
DUI-Related Citations, 2 Years Before Program Start	0.94	0.75	##
DUI-Related Citations, 2 Years After Program Start	0.11	0.10	
Non-DUI-Related Traffic Citations, 60 Days Before Program Start	0.30	0.27	
Non-DUI-Related Traffic Citations, 60 Days After Program Start	0.06	0.06	
Non-DUI-Related Traffic Citations, 1 Year Before Program Start	0.68	0.69	
Non-DUI-Related Traffic Citations, 1 Year After Program Start	0.23	0.24	
Non-DUI-Related Traffic Citations, 2 Years Before Program Start	1.06	1.07	
Non-DUI-Related Traffic Citations, 2 Years After Program Start	0.42	0.41	
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	0.18	
Crashes, 1 Year After Program Start	0.04	0.05	
Crashes, 2 Years Before Program Start	0.25	0.25	
Crashes, 2 Years After Program Start	0.04	0.04	

##Significant at the 1% 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 into the 24/7 Sobriety Program was 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, one-year, and two-year before-and-after intervals. All improvements were statistically significant at the 1% level.

With regard to DUI citations, just 2.4% of entries received such a citation during program enrollment. Moreover, for those individuals who successfully completed the program, 96.7% as of December 2018 did not commit another DUI citation at any point after program completion. A detailed discussion of before-and-after averages is provided in Appendix A.

4.4 Program Entry Patterns Related to House Bill 1302

House Bill 1302 became effective on 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, 6,828 entries (70.6% of the sample) started the program after the new legislation was implemented. Of these, 3,678 were enrolled due to a second or third impaired driving citation and were required to participate for one year. A smaller number of entries, 789, 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 more stringent standards created by House Bill 1302.

In this sample, 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 60 days (F=5.823, df=1, p=0.016), 365 days (F=16.480, df=1, p<0.001), and 730 days (F=11.689, df=1, p=0.001) after starting the program.

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	0.011	0.006	#
DUI-Related Citations, 1 Year After Program Start	0.06	0.04	##
DUI-Related Citations, 2 Years After Program Start	0.12	0.09	##
Non-DUI-Related Traffic Citations, 60 Days After Program Start	0.06	0.06	
Non-DUI-Related Traffic Citations, 1 Year After Program Start	0.24	0.23	
Non-DUI-Related Traffic Citations, 2 Years After Program Start	0.41	0.41	
Crashes, 60 Days After Program Start	0.01	0.01	
Crashes, 1 Year After Program Start	0.05	0.05	
Crashes, 2 Years After Program Start	0.05	0.04	

##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 short-term, medium-term, and long-term DUI-related illegal behavior. Those who are 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 probable 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.

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 commit non-DUI-related traffic citations and crashes at rates comparable to those enrolled in the program for just 60 days.

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 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 status, 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, those who had a DUI citation in the first 60 days of program enrollment; moderate-risk, those who had a DUI citation at any point between day 61 and day 730 of program enrollment; and post-program recidivists, 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, one-year, and two-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 consistent based on the time interval studied (Table 4.10). None of the six dependent variables were statistically significant predictors of non-DUI-related citation behavior in any of the three time periods. Rates of non-DUI-related citations were similar regardless of one's gender, location, or past abuse of alcohol.

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	0.070	0.132	0.282		1.073	0.828-1.389
Region	-0.159	0.113	1.997		0.853	0.684-1.063
Geography	-0.133	0.127	1.105		0.875	0.683-1.122
Repeat DUI Offender	-0.128	0.156	0.667		0.880	0.648-1.194
Multi-Entry Participant	0.061	0.107	0.319		1.063	0.861-1.311
Program Participation Length	0.001	0.154	0.000		1.001	0.740-1.355
1-Year[2] Interval After Starting Course						
Parameter	Beta Value	S.E.	Wald	Sig.	Log Odds	95% C.I.
Gender	0.005	0.078	0.005		1.005	0.863-1.171
Region	0.031	0.067	0.212		1.031	0.905-1.175
Geography	-0.077	0.077	1.001		0.925	0.795-1.077
Repeat DUI Offender	-0.068	0.091	0.556		0.934	0.782-1.117
Multi-Entry Participant	-0.006	0.064	0.007		0.994	0.877-1.128
Program Participation Length	0.038	0.090	0.182		1.039	0.871-1.239
2-Year[3] Interval After Starting Course						
Parameter	Beta Value	S.E.	Wald	Sig.	Log Odds	95% C.I.
Gender	-0.024	0.070	0.116		0.976	0.851-1.120
Region	0.019	0.061	0.099		1.019	0.905-1.149
Geography	-0.111	0.070	2.500		0.895	0.780-1.027
Repeat DUI Offender	-0.025	0.078	0.105		0.975	0.837-1.136
Multi-Entry Participant	0.014	0.058	0.061		1.015	0.905-1.137
Program Participation Length	0.022	0.078	0.080		1.022	0.877-1.191

[1]N=9,675; Nagelkerke R^2=0.002; model correctly classified 96.2% of cases
[2]N=8,661; Nagelkerke R^2=0.000; model correctly classified 86.8% of cases
[3]N=7,430; Nagelkerke R^2=0.001; model correctly classified 79.4% of cases

4.5.2 Crashes

At some point after starting the program – somewhere between day 366 and 730 – any existing effect on crashes diminishes. In the two-year interval after starting the program there are no statistically significant predictors of crash likelihood. This is a noticeable contrast from the one-year interval after starting the program in which all six predictors are statistically significant in this regression model.

This sheds light into a very specific driver group that can be targeted for interventions with regard to crashes. In sum, 7.8% of female drivers from the six urban counties in the western half of the state who have been enrolled in the program at least one other time for either actual physical control, driven under suspension/revocation, or been a minor in possession of alcohol who have crashed at least once within a year of starting the program. When all of these identities are isolated, it is clear that this rate is higher than for all other drivers (F=4.009, df=1, p=0.045).

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	-0.690	0.212	10.622	**	0.502	0.331-0.760
Region	-0.358	0.226	2.506		0.699	0.449-1.089
Geography	0.725	0.322	5.075	*	2.064	1.099-3.879
Repeat DUI Offender	0.012	0.270	0.002		1.012	0.596-1.719
Multi-Entry Participant	0.377	0.203	3.436		1.458	0.979-2.173
Program Participation Length	-0.307	0.273	1.265		0.735	0.430-1.256
1-Year[2] Interval After Starting Course						
Parameter	Beta Value	S.E.	Wald	Sig.	Log Odds	95% C.I.
Gender	-0.339	0.119	8.148	**	0.712	0.564-0.899
Region	-0.528	0.118	20.048	**	0.590	0.468-0.743
Geography	0.351	0.145	5.861	*	1.420	1.069-1.886
Repeat DUI Offender	-0.470	0.157	8.941	**	0.625	0.459-0.850
Multi-Entry Participant	0.333	0.106	9.863	**	1.395	1.133-1.716
Program Participation Length	0.428	0.156	7.578	**	1.534	1.131-2.081
2-Year[3] Interval After Starting Course						
Parameter	Beta Value	S.E.	Wald	Sig.	Log Odds	95% C.I.
Gender	0.140	0.153	0.841		1.151	0.853-1.552
Region	-0.098	0.130	0.569		0.907	0.703-1.169
Geography	-0.061	0.148	0.171		0.941	0.704-1.256
Repeat DUI Offender	0.059	0.156	0.145		1.061	0.782-1.440
Multi-Entry Participant	0.036	0.122	0.087		1.037	0.817-1.316
Program Participation Length	-0.208	0.161	1.681		0.812	0.593-1.112

[1]N=9,675; Nagelkerke R^2=0.025; model correctly classified 99.0% of cases
[2]N=8,661; Nagelkerke R^2=0.020; model correctly classified 95.6% of cases
[3]N=7,430; Nagelkerke R^2=0.002; model correctly classified 96.1% of cases
**Statistically significant at the 1% level
*Statistically significant at the 5% level

4.5.3 DUI Citations

After starting the 24/7 Sobriety Program, 550 entrants in this sample had at least one DUI citation (Table 4.12). These numbers do not represent unique individuals because it is possible that an entrant could have started the program multiple times due to having multiple DUI citations. Of the 550 entrants with a DUI citation, 234 took place during enrollment in the program. This represents 42.5% of all DUI citations and only 2.4% of the overall sample. The remaining 316 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	70***	-	70
Failed between Day 61 and Day 365	144**	90	234
Failed between Day 366 and Day 730	20**	226	246
Total	234	316*	**550**

***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, four variables were statistically significant determinants of high-risk recidivism: gender, repeat offender status, number of entries into the program, and participation length.

Compared with female drivers, males were 2.422 times more likely to have another DUI citation in the first 60 days after starting the program (C.I.=1.106, 5.303) (Table 4.13). This aligns with other studies which demonstrate that drivers with repeat alcohol-related arrests are much more likely to be male (Schmitz et al. 2014).

As expected, those entering the program with a second-or-subsequent DUI arrest were 2.441 times more likely to relapse in the first 60 days of program enrollment when compared with those entering the program for a first-time DUI offense (C.I.=1.291, 4.611). This likely also explains why individuals who were entering the program for a second-or-subsequent time were 2.321 times more likely to recidivate in this time period (C.I.=1.408, 3.828), as these groups are not necessarily independent of one another.

In comparison to those sentenced to the program for at least 365 days, entrants sentenced to the program for 60 days were 2.041 times more likely to have another DUI citation in the first 60 days after starting the program (C.I.=1.147, 3.633). 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 one maintains sobriety. This is especially true in North Dakota where longer program sentences generally result in safer driver behaviors (Kubas, Vachal, and Malchose 2018).

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	0.885	0.400	4.894	*	2.422	1.106-5.303
Region	0.226	0.258	0.768		1.254	0.756-2.078
Geography	0.711	0.378	3.535		2.036	0.970-4.272
Repeat DUI Offender	0.892	0.325	7.554	**	2.441	1.292-4.611
Multi-Entry Participant	0.842	0.255	10.890	**	2.321	1.408-3.828
Program Participation Length	-0.714	0.294	5.889	*	0.490	0.275-0.872

$_1$N=9,675 (70 high-risk recidivists); Nagelkerke R^2=0.041; model correctly classified 99.3% of cases
**Statistically significant at the 1% level
*Statistically significant at the 5% level

4.5.3.2 Moderate-Risk Recidivists

Moderate-risk recidivists are those 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 164 entries that fit this definition, three variables were found to be statistically significant. Females were 59.7% more likely to recidivate than their male counterparts, which is surprising considering that a much larger share of males in North Dakota self-report driving after consuming alcohol than females (Vachal, Benson, and Kubas 2019). Drivers from urban counties were 1.805 times more likely to recidivate than their rural counterparts – another unexpected result given that these same drivers have greater exposure to messages about impaired driving prevention and intervention (Vachal, Benson, and Kubas 2019).

North Dakotans enrolled in the program for a second-or-subsequent time were 5.889 times more likely to relapse and have a DUI citation at some point while enrolled in the program (C.I.=3.969, 8.738) (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 a strong factor in increased likelihood of relapsing.

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	-0.394	0.178	4.897	*	0.674	0.475-0.956
Region	0.249	0.161	2.390		1.283	0.935-1.759
Geography	0.590	0.232	6.475	*	1.805	1.145-2.844
Multi-Entry Participant	1.773	0.201	77.576	**	5.889	3.969-8.738

[1]N=9,675 (164 moderate-risk recidivists); Nagelkerke R^2=0.073; model correctly classified 98.3% 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

Post-program recidivists are those sentenced to the program, successfully complete it without incident, but then receive another impaired driving violation at some point after completing the 24/7 Sobriety Program. These post-program recidivists were 60.8% more likely to be from the western half of the state and 88.8% more likely to be a multi-entry participant (Table 4.15).

The higher rate of recidivism for entrants who have been in the program multiple times reaffirms the findings in Tables 4.13 and 4.14. Just as they are more likely to reoffend while enrolled in the program, so too are these individuals more likely to recidivate upon successfully completing the program. It is once again recommended that these individuals receive additional targeted anti-alcohol treatment, as these are the individuals who most often relapse into repetitive illicit behavior. For these entrants, the chances of recidivating are strongest after course completion.

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	0.104	0.148	0.500		1.110	0.831-1.483
Region	-0.438	0.130	11.367	**	0.646	0.501-0.833
Geography	0.074	0.146	0.259		1.077	0.809-1.435
Multi-Entry Participant	2.071	0.163	162.155	**	7.933	5.767-10.911
Program Participation Length	-0.084	0.118	0.511		0.919	0.729-1.158

[1]N=9,675 (316 post-program recidivists); Nagelkerke R^2=0.107; model correctly classified 96.7% 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

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 that guided this paper.

First, three metrics identified in this study – crashes, non-DUI-related citations, and DUI-related citations – all were significantly lowered 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 for high-risk recidivists. Compared with participants required to be in the program for 60 days, those mandated to the program for a minimum of 365 days are 32.9% less likely to receive DUI-related citations in the 60 days after starting the program. In this sample of participants, the legislation was not associated with reduced 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. This pattern was constant for high-risk, moderate-risk, and post-program recidivists. In other words, these individuals were more likely to reoffend in the first 60 days of enrollment, at some point between day 61 and 730 of enrollment, and after successfully completing the program. 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.

5.1 Future Research

This study could be improved by extending the follow-up period tracking participants. In North Dakota, drivers arrested for impaired driving are subjected to a seven-year look-back period when determining if they should be categorized as repeat offenders. 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 period less than seven years 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 are acquired, it would behoove future assessments to include even longer before-and-after intervals; this would guarantee that findings could determine 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 when 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 re-evaluated for post-intervention effectiveness in the next few years as these future data points become viable.

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APPENDIX A. 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	0.46	0.01	**
Non-DUI-Related Traffic Citations	0.30	0.06	**
Crashes	0.11	0.02	**
	365 Days Before	365 Days After	Significance
DUI-Related Citations	0.72	0.05	**
Non-DUI-Related Traffic Citations	0.66	0.23	**
Crashes	0.22	0.06	**
	730 Days Before	730 Days After	Significance
DUI-Related Citations	0.87	0.09	**
Non-DUI-Related Traffic Citations	1.04	0.42	**
Crashes	0.30	0.04	**

**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	0.29	0.06	**
Crashes	0.08	0.01	**
	365 Days Before	365 Days After	Significance
DUI-Related Citations	0.71	0.05	**
Non-DUI-Related Traffic Citations	0.69	0.23	**
Crashes	0.17	0.04	**
	730 Days Before	730 Days After	Significance
DUI-Related Citations	0.86	0.11	**
Non-DUI-Related Traffic Citations	1.07	0.41	**
Crashes	0.24	0.04	**

**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	0.28	0.05	**
Crashes	0.08	0.01	**
	365 Days Before	365 Days After	Significance
DUI-Related Citations	0.68	0.04	**
Non-DUI-Related Traffic Citations	0.68	0.24	**
Crashes	0.18	0.03	**
	730 Days Before	730 Days After	Significance
DUI-Related Citations	0.80	0.09	**
Non-DUI-Related Traffic Citations	1.06	0.43	**
Crashes	0.23	0.04	**

**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	0.29	0.06	**
Crashes	0.09	0.01	**
	365 Days Before	365 Days After	Significance
DUI-Related Citations	0.73	0.06	**
Non-DUI-Related Traffic Citations	0.69	0.23	**
Crashes	0.19	0.05	**
	730 Days Before	730 Days After	Significance
DUI-Related Citations	0.91	0.11	**
Non-DUI-Related Traffic Citations	1.07	0.41	**
Crashes	0.26	0.05	**

**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	0.44	0.01	**
Non-DUI-Related Traffic Citations	0.28	0.06	**
Crashes	0.09	0.01	**
	365 Days Before	365 Days After	Significance
DUI-Related Citations	0.72	0.06	**
Non-DUI-Related Traffic Citations	0.67	0.23	**
Crashes	0.19	0.05	**
	730 Days Before	730 Days After	Significance
DUI-Related Citations	0.87	0.11	**
Non-DUI-Related Traffic Citations	1.06	0.41	**
Crashes	0.26	0.04	**

**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	0.41	0.01	**
Non-DUI-Related Traffic Citations	0.32	0.06	**
Crashes	0.07	0.01	**
	365 Days Before	365 Days After	Significance
DUI-Related Citations	0.69	0.04	**
Non-DUI-Related Traffic Citations	0.73	0.24	**
Crashes	0.15	0.03	**
	730 Days Before	730 Days After	Significance
DUI-Related Citations	0.86	0.10	**
Non-DUI-Related Traffic Citations	1.10	0.44	**
Crashes	0.22	0.04	**

**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	0.35	0.01	**
Non-DUI-Related Traffic Citations	0.27	0.06	**
Crashes	0.08	0.01	**
	365 Days Before	365 Days After	Significance
DUI-Related Citations	0.62	0.06	**
Non-DUI-Related Traffic Citations	0.69	0.24	**
Crashes	0.18	0.05	**
	730 Days Before	730 Days After	Significance
DUI-Related Citations	0.75	0.10	**
Non-DUI-Related Traffic Citations	1.07	0.41	**
Crashes	0.25	0.04	**

**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	0.30	0.06	**
Crashes	0.09	0.01	**
	365 Days Before	365 Days After	Significance
DUI-Related Citations	0.77	0.05	**
Non-DUI-Related Traffic Citations	0.68	0.23	**
Crashes	0.18	0.04	**
	730 Days Before	730 Days After	Significance
DUI-Related Citations	0.94	0.11	**
Non-DUI-Related Traffic Citations	1.06	0.42	**
Crashes	0.25	0.04	**

**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	0.29	0.06	**
Crashes	0.08	0.01	**
	365 Days Before	365 Days After	Significance
DUI-Related Citations	0.70	0.02	**
Non-DUI-Related Traffic Citations	0.70	0.24	**
Crashes	0.18	0.04	**
	730 Days Before	730 Days After	Significance
DUI-Related Citations	0.82	0.04	**
Non-DUI-Related Traffic Citations	1.10	0.42	**
Crashes	0.24	0.04	**

**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	0.28	0.05	**
Crashes	0.09	0.01	**
	365 Days Before	365 Days After	Significance
DUI-Related Citations	0.72	0.09	**
Non-DUI-Related Traffic Citations	0.67	0.23	**
Crashes	0.19	0.05	**
	730 Days Before	730 Days After	Significance
DUI-Related Citations	0.93	0.19	**
Non-DUI-Related Traffic Citations	1.02	0.41	**
Crashes	0.27	0.04	**

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