

Does the 24/7 Sobriety Program Positively Influence Driver Behaviors in North Dakota?



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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. In 2013, House Bill 1302 – which mandated longer enrollment periods for repeat DUI offenders – went into effect. This project seeks to understand four areas: if before-and-after deterrent effects arise upon program enrollment; if House Bill 1302 had a stronger deterrent effect on program participants; if some factors contribute to recidivism more than others; and, if program enrollees outperform a control group of other impaired drivers not subjected to the intervention. Results show that participants significantly improve crash and citation metrics after enrolling in the program. Longer sentencing periods have stronger deterrent effects on DUI-related citations. Individuals participating in the program more than once have higher odds of relapsing into impaired driving behavior. Additional treatment for these individuals may be appropriate as they likely represent the portion of the North Dakota driver population which has issues with alcohol abuse and self-control. Nonetheless, compared to a control group of DUI offenders, those enrolled in the 24/7 Sobriety Program are significantly less likely to recidivate: the 24/7 Sobriety Program reduces DUI-related recidivism by 29.7%, 34.2%, and 39.5% in the 60 days, 365 days, and 730 days following an impaired driving-related citation.

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EXECUTIVE SUMMARY

This report sought to answer four core research questions regarding the influence that the 24/7 Sobriety Program has on program participants:

- Is there a before-and-after deterrent effect when examining program entrants?
- Is there a difference in crash and citation rates for enrolled participants factoring for mandates in House Bill 1302?
- Can a model be developed to assist practitioners in identifying enrollees most likely to recidivate?
- Is there a difference in crash, citation, and recidivism rates controlling for those who did/did not enroll in the program?

Results from the analyses indicate that the program generally has positive deterrent effects on program entries. With regard to abstaining from impaired driving – the focal point of the study – just 1.6% of entries received a DUI citation during program enrollment. Another 96.1% did not commit such a violation at any point after successfully completing the program.

Findings:

- Before-and-after deterrent effect:
 - On average, program participants reduced the number of crashes, non-DUI-related traffic citations, and DUI-related citations in the 60-day, 365-day, and 730-day intervals
- Differences factoring for House Bill 1302:
 - Compared to those sentenced to the program for only 60 days, those sentenced to the program for 365 days were less likely to have a DUI-related citation in the 365 days following arrest
 - Compared to those sentenced to the program for only 60 days, those sentenced to the program for 365 days were less likely to have a DUI-related citation in the 730 days following arrest
- Model predicting recidivism:
 - Repeat DUI offenders were 2.346 times more likely to have a DUI citation within 60 days of starting the program
 - Those who enrolled in the program multiple times were 3.097 times more likely to have a DUI citation between days 61 and 730 of program enrollment
 - Those who enrolled in the program multiple times were 9.200 times more likely to have a DUI citation after successfully completing the program
 - It is recommended that these individuals receive additional treatment beyond the 24/7 Sobriety Program to reduce instances of recidivism
- Control group results:
 - 24/7 Sobriety Program participants were 29.7% less likely to recidivate in the 60 days following an impaired driving-related citation
 - 24/7 Sobriety Program participants were 34.2% less likely to recidivate in the 365 days following an impaired driving-related citation
 - 24/7 Sobriety Program participants were 39.5% less likely to recidivate in the 730 days following an impaired driving-related citation

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 for people between the ages of 3 and 34 (Subramanian 2009). Nationally, about 31% of all motor vehicle crash fatalities are related to alcohol impairment (NHTSA 2012) although this number has declined modestly in recent years (NHTSA 2016; CDC 2017). This rate is often greater in North Dakota and has been exceeded in 10 of the last 15 years (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.

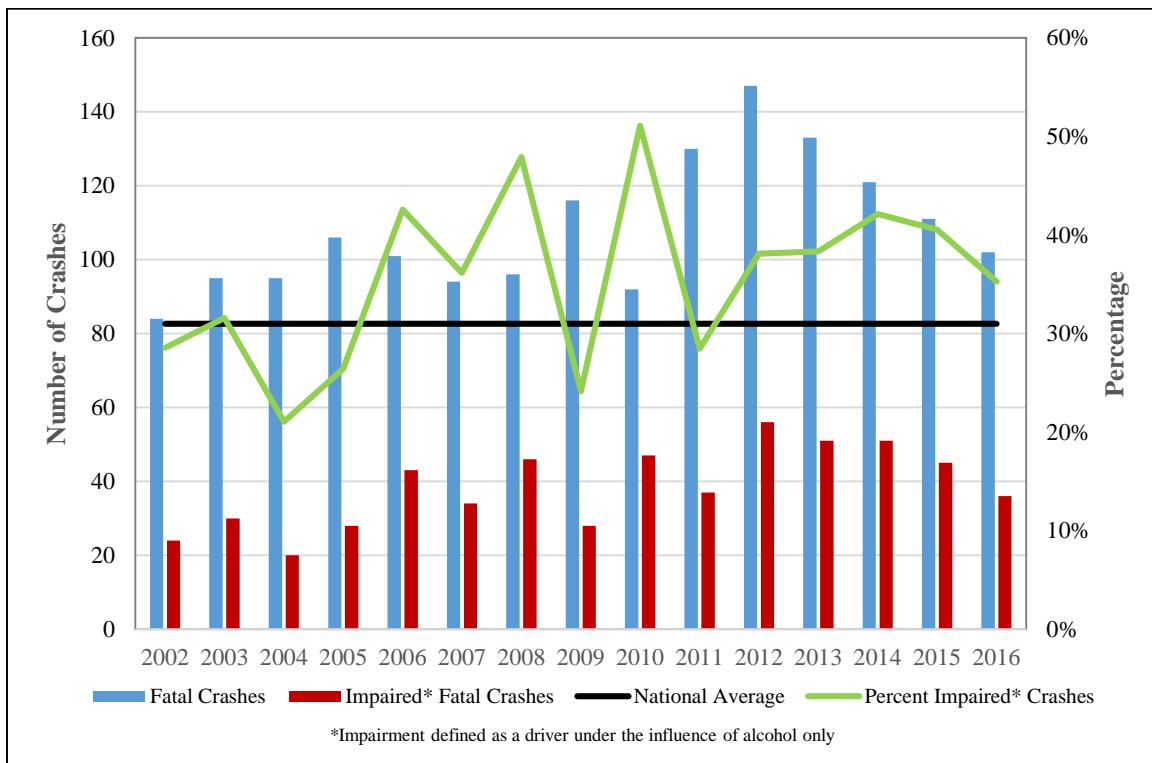


Figure 1.1 Drivers Under the Influence of Alcohol in North Dakota Fatal Crashes, 2002-2016

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 when compared to other states (VanWechel, Vachal, and Benson 2008).

Traditionally, North Dakota legislators passed changes to impaired driving law via piecemeal legislation. However, in the first few months of 2013 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, 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 the leading contributing factor in fatal crashes in the 2015 calendar year (Levi et al. 2016). 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 2017a). 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 program in North Dakota – the 24/7 Sobriety Program – which was first introduced during a 2008 pilot study.

2.1 Impaired Driving in the United States

A seminal study surveying impaired driving attitudes and behaviors estimated that 85.5 million drinking-driving trips were taken in 2008 (Drew et al. 2010). A separate study found that 2% of randomly selected nighttime weekend drivers in the United States had illegal blood alcohol content levels (Lacey et al. 2009). The detection and apprehension rate of impaired drivers is 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 that 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 (2016) show that 1,089,171 drivers were arrested for DWI or DUI in the United States in 2015.

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). Even with these laws in place, the current crash, court, and incarceration literature suggests that more must be done to reduce impaired driving incidence as this activity is still occurring at dangerous rates (Voas and Fell 2011).

A 2010 survey to assess the prevalence of alcohol-impaired driving among adults found 2.8% of respondents reported at least one episode of alcohol-impaired driving. The four million respondents yielded an estimated 112,116,000 episodes of alcohol-impaired driving in the United States for the 2010 calendar year. The results showed that impaired driving was highest among ages 21-24, binge drinkers, and among those less likely to wear seat belts (Bergen, Shults, and Rudd 2011). The impaired driving trends were also analyzed for regions and states and showed that the Midwest region had the highest rate of impaired driving with 643 episodes per 1,000 population. The state with the highest self-reported impaired driving rate in the Midwest region was North Dakota (Bergen, Shults, and Rudd 2011). A recent survey of North Dakota drivers also shows great propensity with 32.5% of the population reporting they had operated a vehicle within two hours of consuming at least one alcoholic beverage (Vachal, Benson, and Kubas 2017).

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 – “CAGE,” “AUDIT,” and “MAST” – to gauge social and behavioral aspects of alcohol problems noted that patients with alcohol dependence “typically require more intensive counseling in alcohol treatment programs than patients with less severe alcohol problems” (Fiellin, Reid, and O’Connor 200: 820-821). An inextricable link between culture, spirituality, and one’s sense of “native community” as it related to the ultimate goal of sobriety was found in a study of treatment and sobriety in Alaskan native communities (Hazel and Mohatt 2001). In this case study, recovering men typically reported seven reasons for resisting temptation and staying sober: acknowledging the benefits of sobriety, fearing the consequences of drinking, a conscious desire for sobriety, support from family, formal support programs, keeping active, and religion or spirituality. Focus groups with recovering men determined that sobriety was related to four themes – spirit, thought, physical, and feelings – at the individual, family, community, and world/environment levels. A survey about one’s experiences with drinking and sobriety administered afterward identified a pivotal event, cognitive appraisal, social support, culture, and spirituality as key factors that guide alcoholics toward the “sobriety path” (Hazel and Mohatt 2001: 552-555).

2.3 Recidivism

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

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

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

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

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

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

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

2.3.1 The HOPE Program

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

The program’s principles are to identify probationers who are at high-risk for probation violation and to notify them that for every probation violation there will be an immediate penalty. The program conducts frequent and random drug tests and imposes short jail sanctions for each detected violation. It also refers participants to drug treatment upon request. Those on probation who 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 to re-arrests and re-incarceration. The program was evaluated in 2009 by the National Institute of Justice, which concluded that the more than 1,500 HOPE program participants analyzed were 55% less likely to be arrested for new crimes, 72% less likely to use drugs, 61% less likely to miss appointments with their probation officer, and 53% less likely to have their probation revoked as compared with a control group.

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

2.3.2 The South Dakota 24/7 Sobriety Project

Another program that uses tactics similar to HOPE in targeting recidivist DUI offenders is the South Dakota 24/7 Sobriety Project. North Dakota and other states have developed impaired driving intervention programs modeled after this South Dakota initiative. A pilot program was started under former Attorney General Larry Long in 2005 because of South Dakota's high 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 age 18 and 40 may have fewer incidences of traffic crashes upon enrollment in the course.

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

2.4 Implementing the 24/7 Sobriety Program in North Dakota

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

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



Figure 2.1 2008 Pilot Program Counties

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

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

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

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

In conjunction with this assessment, the NDDOT subsequently released its *Impaired Driving Strategic Plan for North Dakota* which reaffirms the priority areas (NDDOT 2017b). 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, a higher volume of participants, and created a viable control group of impaired drivers who did not enroll in the *24/7 Sobriety Program*. The following research questions guided the work:

- Is there a before-and-after deterrent effect when examining program entrants?
- Is there a difference in crash and citation rates for enrolled participants factoring for House Bill 1302?
- Can a model be developed to assist practitioners in identifying enrollees most likely to recidivate?
- Is there a difference in crash, citation, and recidivism rates controlling for those who did/did not enroll in the program?

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 nine years of driver records from January 2008 to December 2016. Per the data agreement between NDSU and the BCI, once the data were cleaned and useful variables were created, personal identification information was removed from the database to protect the anonymity of DUI offenders. The first record in the database started the program on January 8, 2008 during the pilot program era. The most recent records from the latter months in 2016 were not used because the research team only had access to crash data through the calendar year 2016. 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, 2016 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, 2016.

The original data transfer consisted of 21,258 entries. Of these, 12,123 were removed for numerous reasons. Parameters for removing entries from the final data set include non-DUI-related arrests, data entry errors, enrollment periods outside of the study timeframe, participants under the age of 18, out-of-state participants, participants with drug violations only, and an inability to match 24/7 Sobriety Program records to state crash and conviction databases (Figure 3.1).

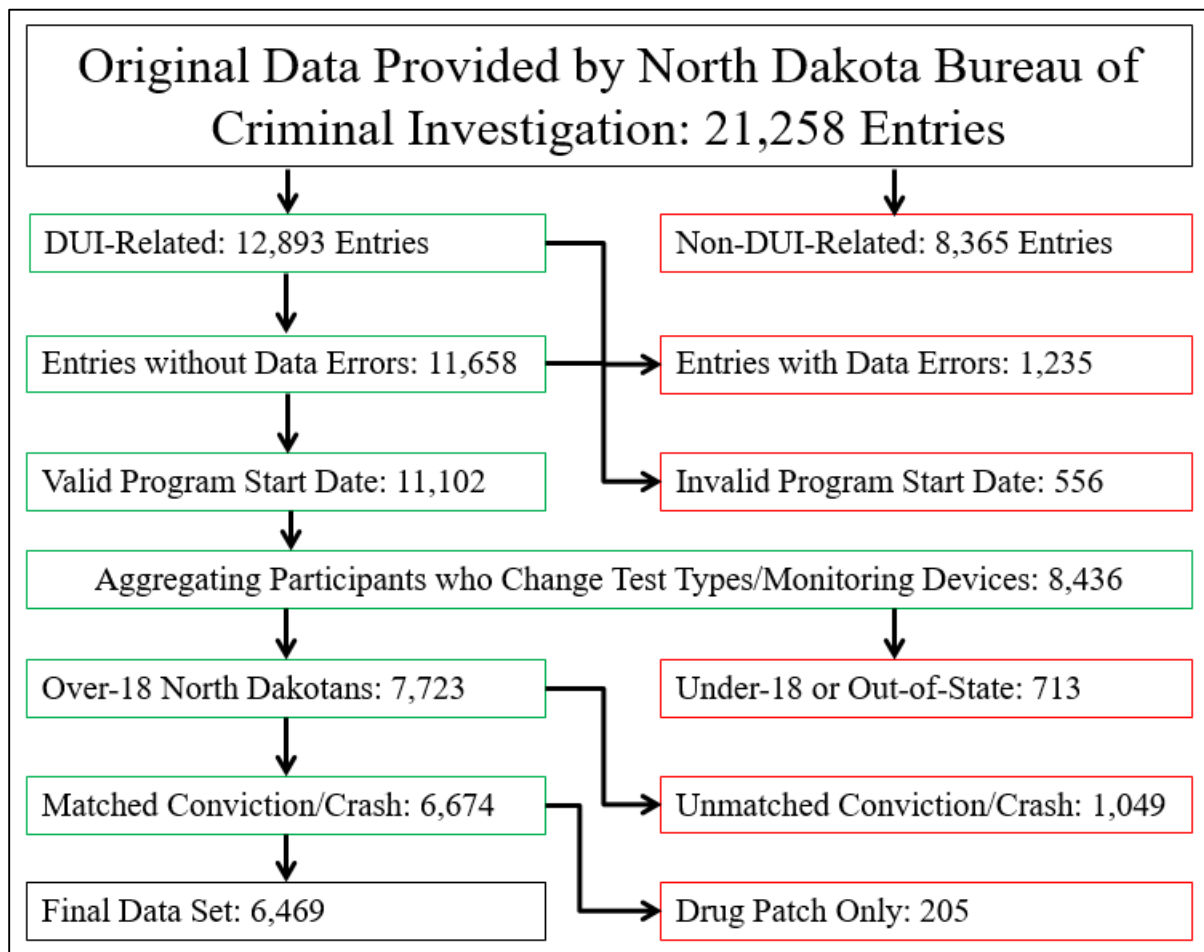


Figure 3.1 Data Matching Process

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 their 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 86.4% as 6,674 entries were linked from a possible 7,723 records meeting study criteria.

Once records were matched, the database was cleaned and a series of variables were created for use in various statistical analyses. These variables include DUI history, crash history, DUI-related citation history, non-DUI-related citation history, the date of enrollment in the 24/7 Sobriety Program, the type of alcohol monitoring system used by the offending driver, and demographic information such as age, gender, and regional/geographic characteristics. For each participant, the DUI, crash, and citation records were tracked for 60-, 365-, and 730-day intervals before and after starting the program. These study periods were purposely used as 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 365 days and fourth-or-subsequent offenders for 730 days.

One variable highlighted the type of monitoring system being used to track program participants. Within this variable, it was discovered that 205 participants were tracked using only a drug patch. Because the focus of this research paper is on understanding alcohol-impaired driver behavior, these 205 records were eliminated from the database as they were not specific to alcohol-impaired driving. The final database consisted of 6,469 alcohol-impaired driving-related records.

It is possible for a participant to have an impaired driving event, be sentenced to the program, successfully complete the program, have another impaired driving event in the future, and be sentenced to the program for a second (or subsequent) time. For the purposes of this study, statistical analyses are pertinent to the number of program entries as it is possible for participants to enter the program multiple times. In sum, there were 5,543 individuals who accounted for 6,469 program entries.

A component that is new to the 2017 evaluation of the 24/7 Sobriety Program is the introduction of a control group. Because the program has only been in existence since 2008, the research team was able to obtain electronic impaired driving and driver records for calendar years 2004 through 2007 to form a control group. However, the records from calendar year 2004 through 2006 had inconsistencies compared to other calendar years and these individuals were not tracked for 730, 365, and 60 days prior to receiving an impaired driving citation. Furthermore, because the sample of 24/7 Sobriety Program participants had 60-, 365-, and 730-day crash and citation data after starting the program, it was discovered that there was no congruity possible for drivers who had a DUI in calendar years 2006 or 2007. This incongruity occurred because it was possible for a driver with a DUI in calendar years 2006 or 2007 to be enrolled in the 24/7 Sobriety Program at some point within two years following the first DUI arrest. Therefore, only drivers who received a DUI during calendar year 2005 were considered as a control group.

These drivers were able to be tracked for 60, 365, and 730 days following their initial citation for DUI. To maintain consistency, the first DUI citation received by a driver in calendar year 2005 was equated to the initial DUI citation that triggered a 24/7 Sobriety Program participant’s enrollment into the program. Crashes, citations, and DUI arrests in the 60, 365, and 730 days following a control group member’s first DUI citation in 2005 were compared to crashes, citations, and DUI arrests in the 60, 365, and 730 days following a 24/7 Sobriety Program member’s arrest which triggered enrollment into the program. A total of 5,693 cases of impaired driving during calendar year 2005 were linked to crash and citation records and form the control group.

The driving conditions for those in the control and intervention groups are comparable; within the state, BAC levels, enforcement, citations issued, and rates of crashes per VMT are not determined based on whether or not one is enrolled in the intervention. In other words, possible outside influences were kept to a minimum when comparing driver activity in 2005 to driver activity between 2008 and 2016. In sum, 12,162 records form the combined sample of 24/7 Sobriety Program enrollees and control group members. These records constitute the final data set used in the analysis.

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 perhaps 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	122	1.9%
2009 ₁	183	2.8%
2010 ₂	475	7.3%
2011	719	11.1%
2012	680	10.5%
2013	861	13.3%
2014	1,205	18.6%
2015	1,187	18.3%
2016 ₃	1,037	16.0%

₁24/7 Sobriety Program was used only in pilot form

₂24/7 Sobriety Program was used statewide starting on August 1, 2010

₃Figure is based on enrollment through October 31, 2016

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 78.9% of the entries compared to just 21.1% who were female. This follows other studies of DUI offenders in the state (Huseuth 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 (58.2%) in the sample were under the age of 34, which parallels other statewide studies finding that 18-to-34-year-olds exhibit behaviors at odds with traffic safety goals, such as operating a vehicle after consuming alcohol more frequently than others (Vachal, Benson, and Kubas 2017). This is especially true for male drivers, as this particular group has been labeled as high-risk throughout the literature. Note that, in this sample, drivers in one age cohort – those over the age of 75 – have fewer than 30 entries in their age group. Sample sizes smaller than 30 are not considered reliable when conducting tests of significance

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

Table 3.2 Age of Participant at Time of Entry

Age Cohort	Number of Entries	Percent of Sample
18-24	1,382	21.4%
25-34	2,383	36.8%
35-44	1,321	20.4%
45-54	957	14.8%
55-64	371	5.7%
65-74	47	0.7%
75+	8	0.1%

Participation in the 24/7 Sobriety Program was not evenly distributed across region and geography (Table 3.3). A majority of program entries (52.1%) 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. Since 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
R	East	1,930	485	2,415
E		(29.9%)	(7.5%)	(37.4%)
G				
I	West	3,364	678	4,042
O		(52.1%)	(10.5%)	(62.6%)
N				
Total		5,294	1,163	6,457
		(82.0%)	(18.0%)	

Frequency Missing: 12

The regional definition was created by aggregating state health regions into two areas representing an east/west division. The geography definition includes an urban/rural dichotomy. Urban participants are from counties with the largest urban population according to the most recently published data estimates from the US Census Bureau (2016). Six urban counties are located in the east and another six are located in the west based on population density metrics in the study (Figure 3.2). These counties represent the majority of the urban population in the state.

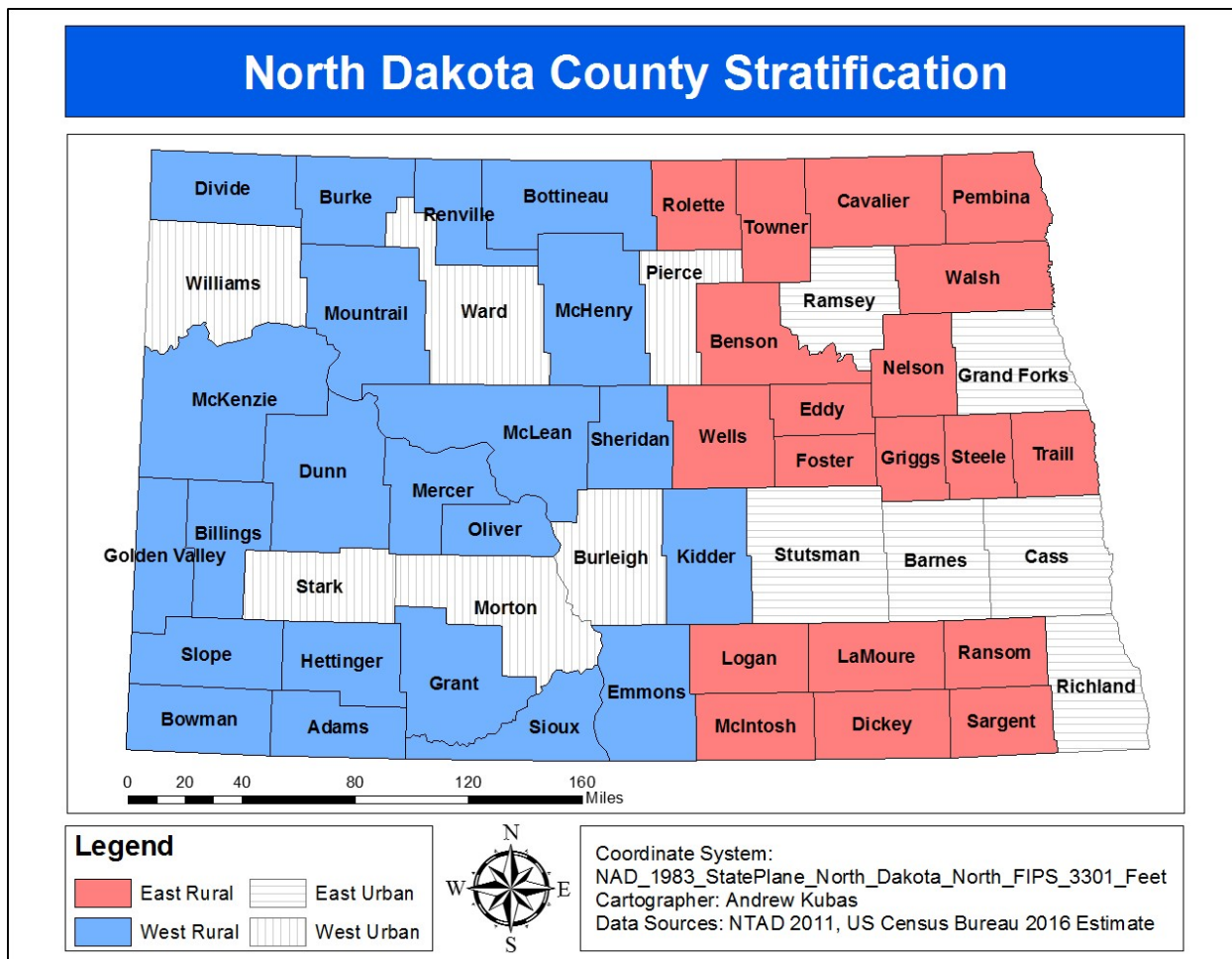


Figure 3.2 North Dakota County Stratification

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 “SCRAM” (secure continuous remote alcohol monitoring) ankle bracelets vary by function and are not a truly continuous monitoring device. In general, the bracelet takes a test roughly every 30 minutes. This data remains stored and may require hard line/Ethernet, machine, or wireless capability to upload data to a database. This information is downloaded to track compliance to sobriety, but the download frequency varies. Of the 6,469 entries in this sample, two-thirds (66.7% or 4,312 entries) were monitored with only one type of alcohol-testing system. The majority of participants (50.2%) in this sample were monitored with twice-a-day preliminary breath tests only (Table 3.4). Of the remaining 3,221 entries with two or more alcohol-monitoring systems, 93.1% 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 34 entries (0.7%) were tracked by three monitoring systems. Once again, no participant was

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

Table 3.4 Monitoring System

Monitoring System*	Number of Entries	Percent
Preliminary Breath Test Only	3,248	50.2%
Preliminary Breath Test and SCRAM	2,014	31.1%
SCRAM Only	1,058	16.4%
Preliminary Breath Test and Drug Patch	55	0.9%
Preliminary Breath Test, SCRAM, and Drug Patch	32	0.5%
SCRAM and SCRAM Wireless	20	0.3%
SCRAM and Drug Patch	13	0.2%
Preliminary Breath Test, SCRAM, and SCRAM Wireless	9	0.1%
Urinalysis Only	6	0.1%
Preliminary Breath Test, SCRAM, and Urinalysis	6	0.1%
Preliminary Breath Test and Urinalysis	3	<0.1%
SCRAM and Urinalysis	2	<0.1%
Preliminary Breath Test, SCRAM, Drug Patch, and Urinalysis	2	<0.1%
SCRAM, Drug Patch, 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. However, for the purposes of this study, “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 (79.5%) had a DUI as the triggering event mandating initial participation in the program (Table 3.5).

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

Offense Type	Number of Entries	Percent
Actual Physical Control	1,069	16.5%
Driving Under Suspension	72	1.1%
Minor in Possession/Control	184	2.8%
DUI 1 st Offense	1,144	17.7%
DUI 2 nd Offense	2,735	42.3%
DUI 3 rd Offense	861	13.3%
DUI 4 th + Offense	404	6.2%

Based on this study’s definition of a recidivist driver, three levels of recidivism will be examined: high-risk recidivists, moderate-risk recidivists, and post-program recidivists. High-risk recidivists are classified as those drivers receiving an impaired driving citation within 60 days of entering the 24/7 Sobriety Program. A period of 60 days was intentionally chosen because – prior to the latest legislative changes

made in House Bill 1302 – this represents the typical time a DUI offender was sentenced to the program (McKnight, Fell, and Auld-Owens 2012). All entries in the data set used for the analysis were subjected to the program for a minimum of 60 days. Moderate-risk recidivists are categorized as those drivers who received an impaired driving citation while enrolled in the program at some point after day 61 of participation. Only those drivers who began the program after the passing of House Bill 1302 can be categorized as moderate-risk recidivists as enrollees in the program pre-House Bill 1302 would not have typically been required to remain sober for more than 60 days. Post-program recidivists are those who successfully remain sober while enrolled in the program but have an impaired driving violation at some point after completing the 24/7 Sobriety Program.

In this sample of entries, 50 participants (0.8%) received a citation for impaired driving within 60 days of starting the program and are considered high-risk recidivists. A slightly larger share of 52 entries (0.8%) 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 250 entries (3.9%) received an impaired driving citation at some point after completing the program and are considered post-program recidivists.

Note that although the conceptualization of these variables remains consistent with previous assessments, the operationalization of these variables is markedly different. Whereas the 2015 and 2016 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 2017 assessment only includes citations for driving under the influence of alcohol when referencing “DUI citations.” These changes are most pertinent to Section 4.5.3 through Section 4.5.3.3 of this report which model predictors of DUI recidivism. Table 3.6 explains the conceptualization and operationalization of the DUI citation, DUI-related citation, Non-DUI-related traffic citation, and crash variables used in this study.

Table 3.6 Conceptualization and Operationalization of Impaired Driving Data

Variable	Conceptualization	Operationalization	Uses in Report
DUI Citation	An offender receives a citation for driving under the influence of alcohol that would trigger enrollment (or re-enrollment) into the program	Drivers in the 60, 365, and 730 days before (or after) starting the program are coded as a “1” if they have the following citations in those time periods: <ul style="list-style-type: none"> • DUI 1st offense • DUI 2nd offense • DUI 3rd offense • DUI 4^{th+} offense All other drivers are coded as “0”	Sections: <ul style="list-style-type: none"> • 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: <ul style="list-style-type: none"> • DUI 1st offense • DUI 2nd offense • DUI 3rd offense • DUI 4^{th+} offense • Actual physical control • Driving under susp./revoc. • Minor in possession/control All other drivers are coded as “0”	Sections: <ul style="list-style-type: none"> • 4.1.2 • 4.2.1 • 4.2.2 • 4.2.3 • 4.2.4 • 4.2.5 • 4.2.6 • 4.2.7 • 4.3 • 4.4 • 4.6.1 • 4.6.2
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 a “1” if they have the following citations in those time periods: <ul style="list-style-type: none"> • Speeding • Reckless driving • Failure to obey stop sign • Other traffic offenses All other drivers are coded as “0”	Sections: <ul style="list-style-type: none"> • 4.1.3 • 4.2.1 • 4.2.2 • 4.2.3 • 4.2.4 • 4.2.5 • 4.2.6 • 4.2.7 • 4.3 • 4.4 • 4.5.1 • 4.6.1 • 4.6.2
Crashes	An offender has a crash event	Drivers in the 60, 365, and 730 days before (or after) starting the program are coded as a “1” if they have the following crashes in those time periods: <ul style="list-style-type: none"> • Fatal crash • Injury crash • Property-damage-only crash All other drivers are coded as “0”	Sections: <ul style="list-style-type: none"> • 4.1.4 • 4.2.1 • 4.2.2 • 4.2.3 • 4.2.4 • 4.2.5 • 4.2.6 • 4.2.7 • 4.3 • 4.4 • 4.5.2 • 4.6.1 • 4.6.2

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 – 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 Test Failures

Due to cost-prohibitive time constraints, individual test failures were unable to be linked to individual entries in the 24/7 Sobriety Program. Individual SCRAM data was unavailable for use by the research team. Per Table 3.4, the majority of entries were tracked using twice-per-day preliminary breath tests; program compliance for this intervention method is presented in Figure 4.1. No other intervention methods were mapped due to low numbers of entries being tracked by these techniques.

Nearly all counties using the 24/7 Sobriety Program have compliance rates over 97% for those tracked with twice-a-day preliminary breath tests. Just four counties – Burke (53.1%), Wells (57.1%), Stark (89.8%), and Cass (92.2%) – fall below this threshold. In these four counties, it is incorrect to say that there were an abnormally high number of failed tests. Instead, these four counties had unusually high numbers of no shows which led to a lower-than-normal passing rate.

The inclusion of these data is meant to display regional and geographic compliance rates. Figure 4.1 serves in part as supplementary data advocated for by NHTSA's *Impaired Driving Program Assessment* (see Burch et al. 2016) and aids in determining the general effectiveness of the program.

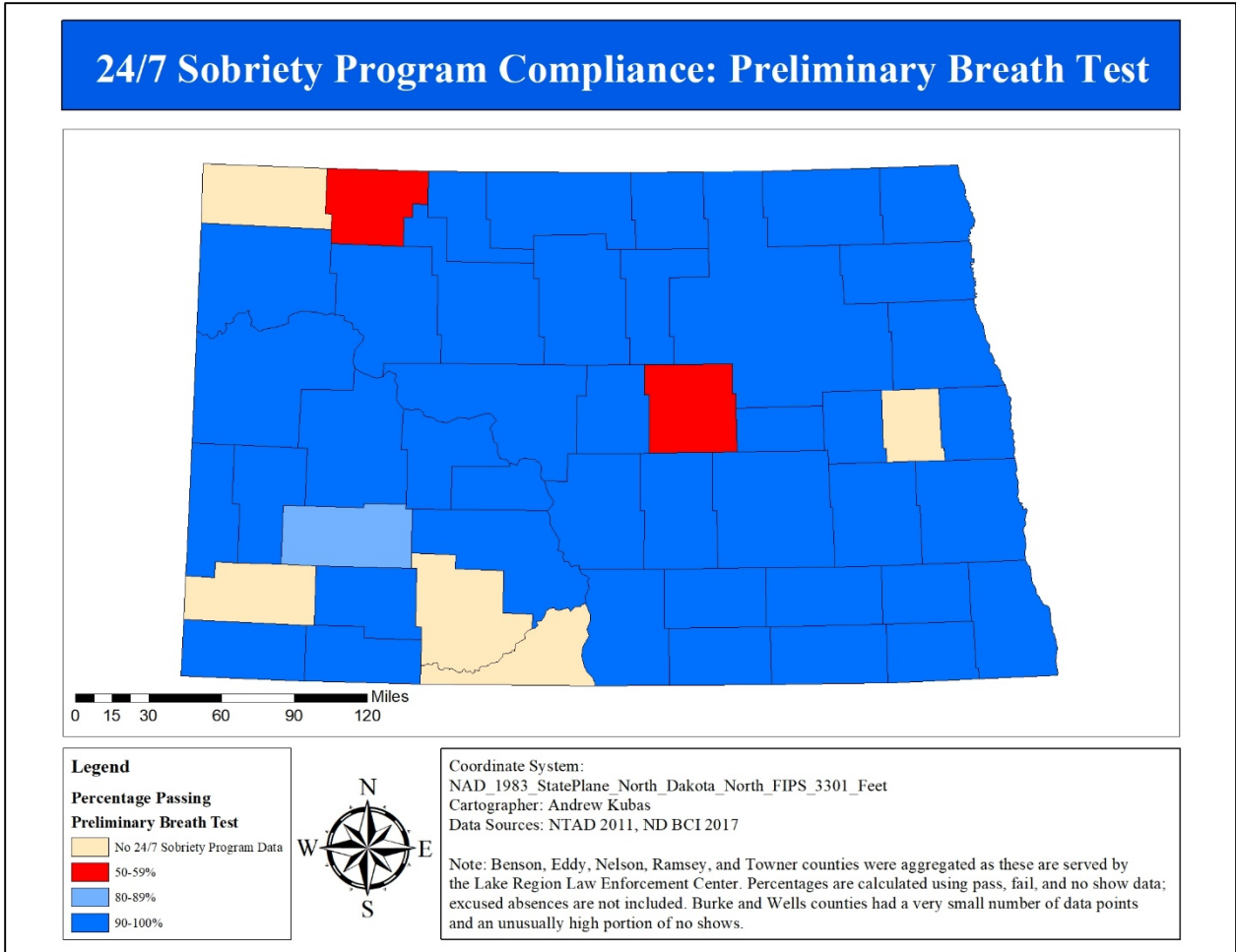


Figure 4.1 County-Level Program Compliance Rates for Twice-a-Day Preliminary Breath Tests

4.1.2 DUI-Related Citation Events

With regard to DUI-related citations, this sample of 24/7 Sobriety Program entries was responsible for 6,521 citations committed by 4,844 entrants in the two years prior to entering the program. After starting the program, there were just 614 DUI-related citations committed by 566 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 4.2). The number of impaired driving-related citations is not the best metric to measure program performance as having an impaired driving-related event is a prerequisite for program entry. Nonetheless, the rate at which DUI citations are issued per program entry does show that offenders have a lower rate of DUI citations after entering the program.

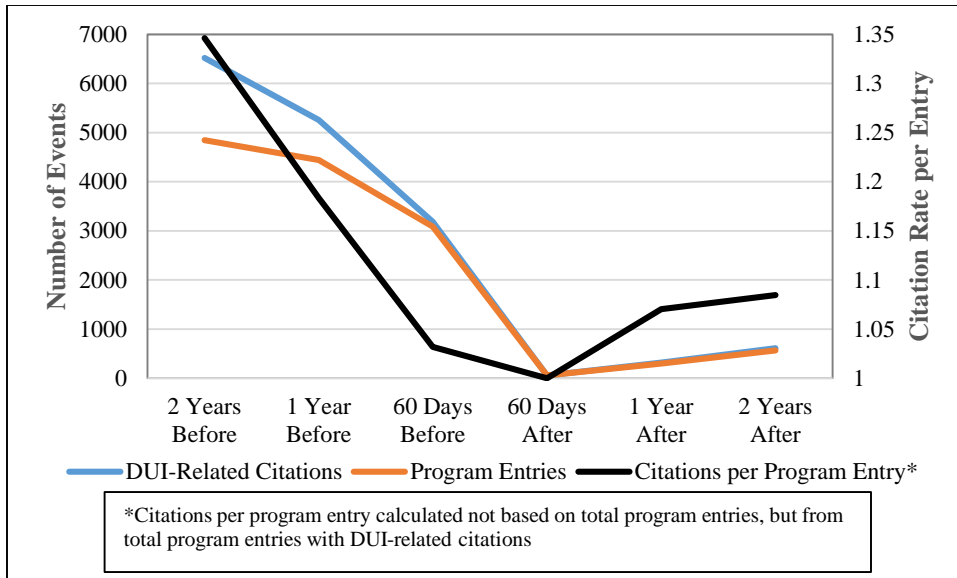


Figure 4.2 DUI-Related Citation Events

4.1.3 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 4.3). Because non-DUI-related traffic citations do not necessarily trigger a legislatively-mandated enrollment into the program, this demonstrates a positive aspect of the program: it appears as though entrance into the 24/7 Sobriety Program has some deterrent effect on participants that extends to non-DUI-related traffic crime.

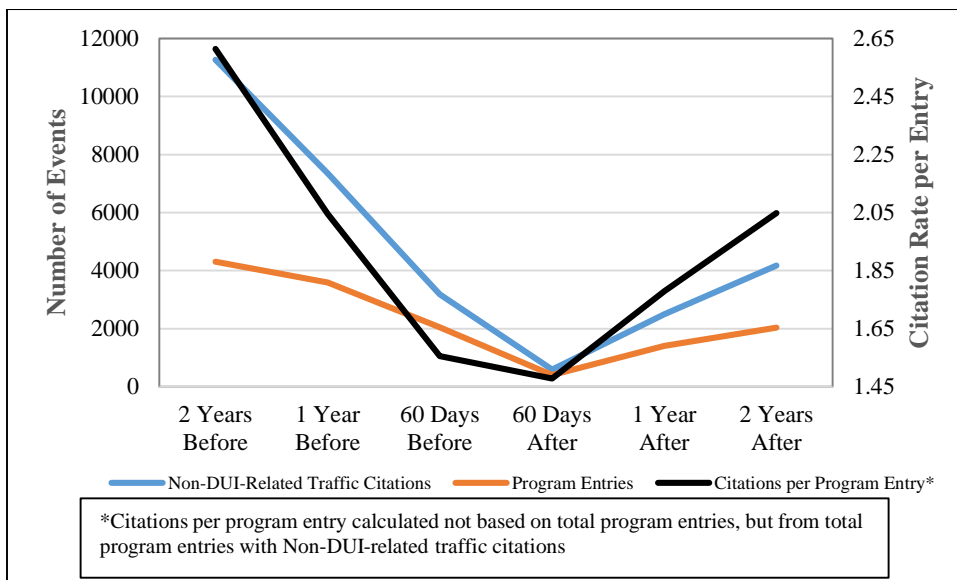


Figure 4.3 Non-DUI-Related Traffic Citation Events

4.1.4 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 nine fatal crashes in the two years before starting the intervention. The number of fatal crashes declined to just four 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	9	7	5	0	3	4
Injury	571	440	220	19	86	157
Property Damage Only	1,024	746	355	52	191	322

One method for normalizing crash rates is to examine the number of crashes per program entry (Figure 4.4). This method determined that the rate at which crashes occur does generally decline after an individual enters the 24/7 Sobriety Program.

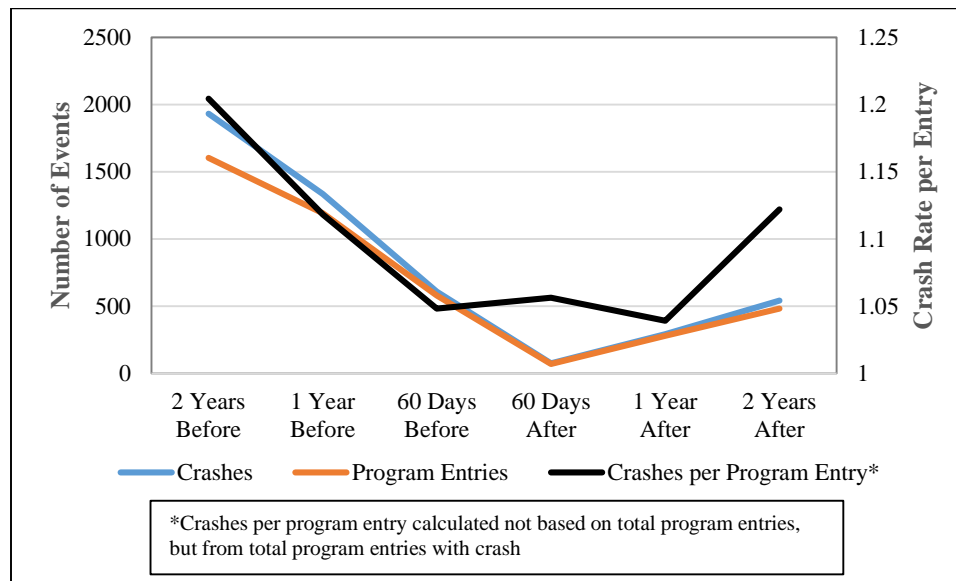


Figure 4.4 Crash Events

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. Seven participant groups will be examined: gender, age, region, geography, multi-time program entrants, repeat DUI offenders, and monitoring device type.

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 1-year ($F=7.123$, $df=1$, $p=0.008$) and 2-year ($F=15.234$, $df=1$, $p<0.001$) time periods. This is consistent with other studies which recognize that men tend to have higher rates of impaired driving than women, even after completing interventions specifically geared toward deterring alcohol abuse (Kubas, Kayabas, and Vachal 2015; Kubas, Kayabas, and Vachal 2016). Males were also found to have more non-DUI-related traffic citations in both the 1-year and 2-year intervals before starting the program. After starting the program, however, men perform at levels that are on-par with women for non-DUI-related traffic citations; this suggests that the program may have a stronger deterrent effect on males for this metric. Women were more likely to have had a traffic crash 60 days before ($F=8.925$, $df=1$, $p=0.001$), one year before ($F=9.790$, $df=1$, $p=0.002$), and two years before ($F=9.704$, $df=1$, $p=0.002$) enrolling in the intervention. These same females, however, generally crashed at rates that were on-par with their male counterparts after completing the program. This indicates that there may be a stronger deterrent effect on females with regard to traffic crashes.

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

Metric	Mean Value		Sig.
	Male	Female	
DUI-Related Citations, 60 Days Before Program Start	0.49	0.51	
DUI-Related Citations, 60 Days After Program Start	0.01	0.01	
DUI-Related Citations, 1 Year Before Program Start	0.82	0.83	
DUI-Related Citations, 1 Year After Program Start	0.06	0.04	##
DUI-Related Citations, 2 Years Before Program Start	1.04	1.07	
DUI-Related Citations, 2 Years After Program Start	0.14	0.09	##
Non-DUI-Related Traffic Citations, 60 Days Before Program Start	0.50	0.47	
Non-DUI-Related Traffic Citations, 60 Days After Program Start	0.09	0.10	
Non-DUI-Related Traffic Citations, 1 Year Before Program Start	1.17	0.98	##
Non-DUI-Related Traffic Citations, 1 Year After Program Start	0.42	0.39	
Non-DUI-Related Traffic Citations, 2 Years Before Program Start	1.81	1.58	##
Non-DUI-Related Traffic Citations, 2 Years After Program Start	0.78	0.70	
Crashes, 60 Days Before Program Start	0.09	0.12	##
Crashes, 60 Days After Program Start	0.01	0.02	##
Crashes, 1 Year Before Program Start	0.20	0.25	##
Crashes, 1 Year After Program Start	0.05	0.05	
Crashes, 2 Years Before Program Start	0.29	0.36	##
Crashes, 2 Years After Program Start	0.10	0.10	

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

4.2.2 Age

Some patterns occurred when examining violations across age cohorts (Table 4.3). DUI-related citations were fairly uniform across age groups, but those over the age of 65 typically had more of these violations, on average, than other participants in the 60 days ($F=2.233$, $df=5$, $p=0.048$) and 730 days ($F=2.482$, $df=5$, $p=0.030$) before beginning the program. Non-DUI-related traffic citations generally declined across age groups: the 18-24-year-old cohort had the highest average number of violations and the 65+ age cohort had the lowest average number of these citations. The differences were statistically significant at the 1% level across all three time periods both before and after starting the 24/7 Sobriety Program. This is a plausible finding as 18-34-year-old North Dakotans more commonly exhibit behaviors at-odds with traffic safety goals and less regularly engage in safe driving practices (Vachal, Benson, and Kubas 2017). In terms of traffic crashes, a multimodal distribution was evident as those in the youngest (18-24) and

oldest (65+) cohorts typically had the highest average number of crashes. This makes sense considering novice drivers are often more dangerous behind-the-wheel (Mayhew, Simpson, and Pak 2003) and elderly drivers have slower reaction times which put them at a higher propensity to be in a crash (Svetina 2016).

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

Metric	Mean Value						Sig.
	18-24	25-34	35-44	45-54	55-64	65+ ¹	
DUI-Related Citations, 60 Days Before	0.47	0.50	0.51	0.50	0.46	0.65	#
DUI-Related Citations, 60 Days After	0.01	0.01	0.01	0.01	0.01	0.00	
DUI-Related Citations, 1 Year Before	0.80	0.82	0.85	0.83	0.79	1.02	
DUI-Related Citations, 1 Year After	0.06	0.05	0.06	0.06	0.05	0.02	
DUI-Related Citations, 2 Years Before	1.01	1.04	1.13	1.05	0.98	1.09	#
DUI-Related Citations, 2 Years After	0.13	0.13	0.14	0.12	0.12	0.06	
Non-DUI-Related Traffic Citations, 60 Days Before	0.58	0.47	0.49	0.46	0.44	0.33	##
Non-DUI-Related Traffic Citations, 60 Days After	0.13	0.08	0.09	0.06	0.08	0.05	##
Non-DUI-Related Traffic Citations, 1 Year Before	1.44	1.10	1.06	0.96	0.87	0.70	##
Non-DUI-Related Traffic Citations, 1 Year After	0.57	0.41	0.38	0.31	0.27	0.23	##
Non-DUI-Related Traffic Citations, 2 Years Before	2.28	1.71	1.65	1.44	1.20	0.85	##
Non-DUI-Related Traffic Citations, 2 Years After	1.02	0.77	0.66	0.60	0.48	0.27	##
Crashes, 60 Days Before	0.11	0.09	0.08	0.09	0.10	0.11	
Crashes, 60 Days After	0.02	0.01	0.01	0.00	0.01	0.02	#
Crashes, 1 Year Before	0.27	0.20	0.19	0.18	0.19	0.34	##
Crashes, 1 Year After	0.07	0.05	0.04	0.03	0.05	0.05	##
Crashes, 2 Years Before	0.39	0.27	0.28	0.26	0.27	0.45	##
Crashes, 2 Years After	0.13	0.10	0.08	0.08	0.07	0.12	#

¹The 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

#Significant at the 5% 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. Drivers from the west are statistically more likely to have a DUI-related citation in every time period studied in this report. Similarly, 24/7 Sobriety Program participants from western counties in North Dakota have more non-DUI-related traffic citations in all time frames except for the year before program enrollment ($F=2.772$, $df=1$, $p=0.096$). It is clear that these individuals engage in illegal activity more often than their eastern counterparts. Although the western residents performed poorly for DUI-related citations and non-DUI-related traffic citations, crash patterns were 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	0.42	0.53	##
DUI-Related Citations, 60 Days After Program Start	0.01	0.01	#
DUI-Related Citations, 1 Year Before Program Start	0.77	0.85	##
DUI-Related Citations, 1 Year After Program Start	0.04	0.06	##
DUI-Related Citations, 2 Years Before Program Start	0.95	1.10	##
DUI-Related Citations, 2 Years After Program Start	0.11	0.14	#
Non-DUI-Related Traffic Citations, 60 Days Before Program Start	0.46	0.51	##
Non-DUI-Related Traffic Citations, 60 Days After Program Start	0.06	0.11	##
Non-DUI-Related Traffic Citations, 1 Year Before Program Start	1.08	1.15	
Non-DUI-Related Traffic Citations, 1 Year After Program Start	0.33	0.46	##
Non-DUI-Related Traffic Citations, 2 Years Before Program Start	1.66	1.81	#
Non-DUI-Related Traffic Citations, 2 Years After Program Start	0.63	0.82	##
Crashes, 60 Days Before Program Start	0.09	0.10	
Crashes, 60 Days After Program Start	0.01	0.01	
Crashes, 1 Year Before Program Start	0.21	0.21	
Crashes, 1 Year After Program Start	0.05	0.05	
Crashes, 2 Years Before Program Start	0.28	0.32	
Crashes, 2 Years After Program Start	0.09	0.10	

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

4.2.4 Geography

Results for traffic violations are consistent when factoring for geography: urban residents exhibit more dangerous behaviors than do their rural counterparts (Table 4.5). Urban participants on average had more DUI-related citations in the 60 days ($F=16.536$, $df=1$, $p<0.001$) and two years ($F=5.705$, $df=1$, $p=0.017$) before enrolling in the intervention. These same entrants had more crashes than rural North Dakotans in the 60 days ($F=6.665$, $df=1$, $p=0.010$), one year ($F=4.113$, $df=1$, $p=0.043$) and two years ($F=5.705$, $df=1$, $p=0.017$) prior to starting the program. However, urban residents committed violations for these three metrics on-par with rural residents after starting the 24/7 Sobriety Program. This suggests that it may have a stronger deterrent effect on urban North Dakotans as they have a more significant behavior change.

In contrast to these improvements, urban residents regressed in terms of non-DUI-related traffic citations. Whereas these individuals were on-par with their rural counterparts before starting the intervention program, these same program entrants had more non-DUI-related citations on average in the 60-day ($F=5.291$, $df=1$, $p=0.021$) and 1-year ($F=5.449$, $df=1$, $p=0.020$) intervals following the program.

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

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

Metric	Mean Value		Sig.
	Urban	Rural	
DUI-Related Citations, 60 Days Before Program Start	0.50	0.44	##
DUI-Related Citations, 60 Days After Program Start	0.01	0.01	
DUI-Related Citations, 1 Year Before Program Start	0.83	0.79	
DUI-Related Citations, 1 Year After Program Start	0.06	0.06	
DUI-Related Citations, 2 Years Before Program Start	1.06	0.98	#
DUI-Related Citations, 2 Years After Program Start	0.13	0.13	
Non-DUI-Related Traffic Citations, 60 Days Before Program Start	0.50	0.46	
Non-DUI-Related Traffic Citations, 60 Days After Program Start	0.10	0.07	#
Non-DUI-Related Traffic Citations, 1 Year Before Program Start	1.13	1.11	
Non-DUI-Related Traffic Citations, 1 Year After Program Start	0.43	0.35	#
Non-DUI-Related Traffic Citations, 2 Years Before Program Start	1.79	1.63	
Non-DUI-Related Traffic Citations, 2 Years After Program Start	0.78	0.67	
Crashes, 60 Days Before Program Start	0.10	0.07	#
Crashes, 60 Days After Program Start	0.01	0.01	
Crashes, 1 Year Before Program Start	0.22	0.18	#
Crashes, 1 Year After Program Start	0.05	0.05	
Crashes, 2 Years Before Program Start	0.31	0.26	#
Crashes, 2 Years After Program Start	0.10	0.09	

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

4.2.5 Multi-Time Program Entrants

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

Those who have been enrolled in the program multiple times were much more likely to have DUI-related citations in the 1-year ($F=133.313$, $df=1$, $p<0.001$) and 2-year ($F=377.793$, $df=1$, $p<0.001$) intervals after enrollment (Table 4.6). This is logical as an impaired driving-related arrest is typically the event which triggers participation into the program. As such, this metric may not be useful in explaining some differences between these groups.

Multi-entry offenders engage in non-alcohol-related crime at rates that are significantly higher than single-entry participants. Multi-entry individuals are more likely to have a non-DUI-related citation for both before and after timeframes in the 1-year and 2-year intervals. Based on these analyses, it is clear that multi-entry offenders revert to both alcohol-related and non-alcohol-related illegal activity more regularly after starting the 24/7 Sobriety Program. If the program does have a deterrent effect on multi-entry offenders, it is short lived as it diminishes somewhere after the first 60 days of starting the program.

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

Metric	Mean Value		Sig.
	Multi-Entrant	Single-Entrant	
DUI-Related Citations, 60 Days Before Program Start	0.46	0.50	##
DUI-Related Citations, 60 Days After Program Start	0.01	0.01	##
DUI-Related Citations, 1 Year Before Program Start	0.80	0.83	
DUI-Related Citations, 1 Year After Program Start	0.12	0.03	##
DUI-Related Citations, 2 Years Before Program Start	1.15	1.01	##
DUI-Related Citations, 2 Years After Program Start	0.29	0.06	##
Non-DUI-Related Traffic Citations, 60 Days Before Program Start	0.51	0.48	
Non-DUI-Related Traffic Citations, 60 Days After Program Start	0.11	0.09	
Non-DUI-Related Traffic Citations, 1 Year Before Program Start	1.23	1.09	##
Non-DUI-Related Traffic Citations, 1 Year After Program Start	0.50	0.39	##
Non-DUI-Related Traffic Citations, 2 Years Before Program Start	1.98	1.67	##
Non-DUI-Related Traffic Citations, 2 Years After Program Start	0.95	0.68	##
Crashes, 60 Days Before Program Start	0.08	0.10	#
Crashes, 60 Days After Program Start	0.01	0.01	
Crashes, 1 Year Before Program Start	0.21	0.21	
Crashes, 1 Year After Program Start	0.05	0.05	
Crashes, 2 Years Before Program Start	0.33	0.29	#
Crashes, 2 Years After Program Start	0.11	0.09	

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

4.2.6 Repeat DUI Offenders

On average, entrants with multiple DUI-related citations on record had more DUI arrests before starting the program in each time interval. This is logical as first-time offenders would never have more than one DUI-related arrest but repeat DUI offenders are required to have at least two DUI-related arrests to be categorized as a multiple-DUI offender (Table 4.7).

There were mixed results based on non-DUI-related traffic citations and crashes. Repeat DUI offenders had more non-DUI-related traffic citations in the 60 days ($F=18.340$, $df=1$, $p<0.001$), 365 days ($F=6.024$, $df=1$, $p=0.013$), and 730 days ($F=4.426$, $df=1$, $p=0.035$) before starting the program but had fewer non-DUI-related traffic citations in the 730 days ($F=4.709$, $df=1$, $p=0.030$) following course completion. This suggests that there may be a deterrent effect on repeat DUI offenders for non-DUI-related traffic citations, although it is not present in the first year immediately following program enrollment.

For 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 to first-time DUI arrestees. Because the research team only had access to crash and conviction records, these other factors related to traffic safety could not be examined in depth and this serves as a slight 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	0.55	0.39	##
DUI-Related Citations, 60 Days After Program Start	0.01	0.01	
DUI-Related Citations, 1 Year Before Program Start	0.90	0.69	##
DUI-Related Citations, 1 Year After Program Start	0.05	0.06	
DUI-Related Citations, 2 Years Before Program Start	1.16	0.86	##
DUI-Related Citations, 2 Years After Program Start	0.12	0.14	
Non-DUI-Related Traffic Citations, 60 Days Before Program Start	0.53	0.43	##
Non-DUI-Related Traffic Citations, 60 Days After Program Start	0.09	0.10	
Non-DUI-Related Traffic Citations, 1 Year Before Program Start	1.17	1.06	#
Non-DUI-Related Traffic Citations, 1 Year After Program Start	0.39	0.45	##
Non-DUI-Related Traffic Citations, 2 Years Before Program Start	1.81	1.67	#
Non-DUI-Related Traffic Citations, 2 Years After Program Start	0.72	0.82	#
Crashes, 60 Days Before Program Start	0.10	0.09	
Crashes, 60 Days After Program Start	0.01	0.01	
Crashes, 1 Year Before Program Start	0.21	0.22	
Crashes, 1 Year After Program Start	0.05	0.06	
Crashes, 2 Years Before Program Start	0.30	0.31	
Crashes, 2 Years After Program Start	0.09	0.11	

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

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

4.2.7 SCRAM Monitoring Device

Section under review due to inaccurate information about definitions and detail on the monitoring system assignments in the secondary data source when completing the analysis.

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 is treated as an intervention. Each driver group decreased the average number of DUI-related citations, non-DUI-related traffic citations, and crashes in the 60-day, 1-year, and 2-year before-and-after intervals. All improvements were statistically significant at the 1% level.

With regard to DUI citations, just 1.6% of entries received such a citation during program enrollment. Moreover, for those individuals who successfully completed the program, 96.1% 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, 3,887 entries (60.1% of the sample) started the program after the new legislation was implemented. Of these, 2,084 were enrolled due to a second or third impaired driving citation and were required to participate for one year. A smaller number – 395 entries – were for fourth-or-subsequent offenders mandated by law to be in the program for two years.

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

Results demonstrate that longer sentencing to the program only has a deterrent effect on DUI-related citation events (Table 4.8). Individuals enrolled in the program for 60 days commit more DUI-related citations, on average, in the 365 days ($F=39.326$, $df=1$, $p<0.001$), and 730 days ($F=25.702$, $df=1$, $p<0.001$) after starting the program. They commit these violations at rates that are approximately double those of participants who are required to be in the program for at least one year.

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

Metric	Mean Value		Sig.
	Enrolled 60 Days	Enrolled 365+ Days	
DUI-Related Citations, 60 Days Before Program Start	0.50	0.48	
DUI-Related Citations, 60 Days After Program Start	0.01	0.01	
DUI-Related Citations, 1 Year Before Program Start	0.81	0.84	
DUI-Related Citations, 1 Year After Program Start	0.07	0.03	##
DUI-Related Citations, 2 Years Before Program Start	1.05	1.06	
DUI-Related Citations, 2 Years After Program Start	0.15	0.08	##
Non-DUI-Related Traffic Citations, 60 Days Before Program Start	0.50	0.48	
Non-DUI-Related Traffic Citations, 60 Days After Program Start	0.09	0.09	
Non-DUI-Related Traffic Citations, 1 Year Before Program Start	1.13	1.12	
Non-DUI-Related Traffic Citations, 1 Year After Program Start	0.42	0.41	
Non-DUI-Related Traffic Citations, 2 Years Before Program Start	1.77	1.72	
Non-DUI-Related Traffic Citations, 2 Years After Program Start	0.77	0.73	
Crashes, 60 Days Before Program Start	0.09	0.09	
Crashes, 60 Days After Program Start	0.01	0.01	
Crashes, 1 Year Before Program Start	0.21	0.21	
Crashes, 1 Year After Program Start	0.05	0.05	
Crashes, 2 Years Before Program Start	0.31	0.30	
Crashes, 2 Years After Program Start	0.10	0.09	

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

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

4.5 Logistic Regression Models

Another exercise in the assessment is the development of logistic regression models to better understand safety outcomes. This type of model measures the relationship between dependent and independent variables while recognizing simultaneous effects among the independent variables. The log-odd ratios provide measures of association that are indicative of the relative likelihood that enrollees will exhibit

safe behavior. The dependent and independent variables considered in the original model are presented in Table 4.9. The independent variables are gender, region, geography, repeat DUI offender, multi-entry participant, program participation length, and monitoring type. The dependent variables are non-DUI-related traffic citations, crashes, and DUI citations as defined in Table 3.6. The DUI citation definition has three levels of recidivism: high-risk, or those who had a DUI citation in the first 60 days of program enrollment; moderate-risk, or those who had a DUI citation at any point between day 61 and day 730 of program enrollment; and post-program recidivists, or those who had a DUI citation after successfully completing the program.

Three models were developed for each dependent variable and represent the time of the study intervals (60-day, 1-year, and 2-year) for each safety outcome. Since 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
Monitoring Type	Never Used SCRAM (0) or Monitored by SCRAM (1)
Dependent Variables	
Non-DUI Traffic Citation	No Citations (0) or One or More Citations (1)
Crash	No Crashes (0) or One or More Crashes (1)
High-Risk Recidivist	No DUI in Program (0) or One or More DUI from Day 1 to 60 (1)
Moderate-Risk Recidivist	No DUI in Program (0) or One or More DUI from Day 61 to 730 (1)
Post-Program Recidivist	No DUI in Program (0) or One or More DUI After Exiting Program (1)

4.5.1 Non-DUI-Related Traffic Citations

The non-DUI-related traffic citation outcome model was fairly consistent based on time interval studied (Table 4.10). Region was the only variable consistent across all three time periods: regardless of whether a 60-day, 1-year, or 2-year time period was studied, entries from the western half of the state were more likely than those from the east to have a non-DUI-related traffic citation after starting the program.

Participants who were monitored by SCRAM at some point after beginning enrollment were less likely to have a non-DUI-related traffic citation in the 60-day (OR=0.661, C.I.=0.529, 0.825) and the 365-day (OR=0.612, C.I.=0.478, 0.784) periods after starting the program. This could stem from the constant threat of being sent to jail for not adhering to program mandates. This perceived threat, however, diminishes at some point between day 366 and 730 of program enrollment.

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

60-Day ₁ Interval After Starting Course						
Parameter	Beta Value	S.E.	Wald	Sig.	Log Odds	95% C.I.
Gender	-0.183	0.121	2.259		0.833	0.657-1.057
Region	-0.505	0.121	17.501	**	0.603	0.476-0.764
Geography	0.161	0.147	1.196		1.174	0.881-1.565
Repeat DUI Offender	-0.143	0.137	1.101		0.866	0.663-1.133
Multi-Entry Participant	-0.008	0.118	0.004		0.992	0.787-1.251
Program Participation Length	0.168	0.147	1.309		1.183	0.887-1.579
Monitored by SCRAM	-0.414	0.113	13.346	**	0.661	0.529-0.825
1-Year ₂ Interval After Starting Course						
Parameter	Beta Value	S.E.	Wald	Sig.	Log Odds	95% C.I.
Gender	-0.183	0.131	1.947		0.833	0.644-1.077
Region	-0.471	0.131	12.873	**	0.624	0.483-0.808
Geography	0.150	0.159	0.890		1.162	0.850-1.588
Repeat DUI Offender	-0.135	0.142	0.901		0.874	0.662-1.154
Multi-Entry Participant	0.004	0.126	0.001		1.004	0.784-1.286
Program Participation Length	0.264	0.156	2.883		1.302	0.959-1.767
Monitored by SCRAM	-0.491	0.126	15.178	**	0.612	0.478-0.784
2-Year ₃ Interval After Starting Course						
Parameter	Beta Value	S.E.	Wald	Sig.	Log Odds	95% C.I.
Gender	-0.220	0.145	2.308		0.802	0.604-1.066
Region	-0.464	0.152	9.341	**	0.629	0.467-0.847
Geography	0.200	0.180	1.225		1.221	0.857-1.739
Repeat DUI Offender	-0.105	0.150	0.487		0.901	0.672-1.208
Multi-Entry Participant	-0.005	0.139	0.002		0.995	0.758-1.306
Program Participation Length	0.178	0.176	1.030		1.195	0.847-1.687
Monitored by SCRAM	-0.258	0.142	3.284		0.773	0.585-1.021

₁N=6,457; Nagelkerke R²=0.017; model correctly classified 93.8% of cases
₂N=5,420; Nagelkerke R²=0.017; model correctly classified 93.7% of cases
₃N=4,233; Nagelkerke R²=0.012; model correctly classified 93.5% of cases
 **Statistically significant at the 1% level

4.5.2 Crashes

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

In the 60 days following program entry, only gender was a statistically significant determinant of a crash as males were 31.8% less likely to crash (C.I.=0.286, 0.762). In the 365 and 730 days following program enrollment, the odds of males and females being involved in a crash were comparable.

Two variables were statistically significant determinants of crash likelihood in the first year following program enrollment. Interestingly, repeat DUI offenders were 40.9% less likely to have a crash than first-time offenders (C.I.=0.497, 0.960). This is a contrast to other findings throughout the literature which suggest that these offenders are more dangerous than their first-time offender counterparts. There was one expected result in this time frame: those monitored by SCRAM were 41.4% less likely to have a crash than those not monitored by SCRAM (C.I.=0.535, 0.933). No variables were statistically significant determinants of crash likelihood in the two years following the program start date.

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	-0.761	0.250	9.302	**	0.467	0.286-0.762
Region	-0.376	0.277	1.846		0.687	0.399-1.181
Geography	-0.033	0.322	0.010		0.968	0.514-1.821
Repeat DUI Offender	-0.125	0.309	0.164		0.882	0.482-1.616
Multi-Entry Participant	0.061	0.271	0.051		1.063	0.625-1.808
Program Participation Length	0.009	0.341	0.001		1.009	0.517-1.969
Monitored by SCRAM	-0.367	0.263	1.951		0.693	0.414-1.160
1-Year ₂ Interval After Starting Course						
Parameter	Beta Value	S.E.	Wald	Sig.	Log Odds	95% C.I.
Gender	-0.018	0.158	0.012		0.983	0.721-1.339
Region	-0.160	0.142	1.257		0.852	0.645-1.127
Geography	-0.040	0.171	0.055		0.961	0.688-1.342
Repeat DUI Offender	-0.370	0.168	4.853	*	0.691	0.497-0.960
Multi-Entry Participant	0.158	0.143	1.222		1.171	0.885-1.551
Program Participation Length	0.315	0.187	2.839		1.371	0.950-1.978
Monitored by SCRAM	-0.347	0.142	5.978	*	0.707	0.535-0.933
2-Year ₃ Interval After Starting Course						
Parameter	Beta Value	S.E.	Wald	Sig.	Log Odds	95% C.I.
Gender	-0.077	0.132	0.338		0.926	0.715-1.200
Region	-0.029	0.123	0.055		0.972	0.763-1.236
Geography	0.071	0.150	0.227		1.74	0.801-1.440
Repeat DUI Offender	-0.254	0.132	3.687		0.775	0.598-1.005
Multi-Entry Participant	0.232	0.119	3.823		1.262	0.999-1.592
Program Participation Length	0.158	0.158	0.997		1.171	0.859-1.597
Monitored by SCRAM	-0.163	0.123	1.766		0.850	0.668-1.080

₁N=6,457; Nagelkerke R²=0.019; model correctly classified 98.9% of cases
₂N=5,420; Nagelkerke R²=0.007; model correctly classified 95.3% of cases
₃N=4,233; Nagelkerke R²=0.005; model correctly classified 91.4% of cases
**Statistically significant at the 1% level
*Statistically significant at the 5% level

4.5.3 DUI Citations

Within two years of starting the 24/7 Sobriety Program, 352 entrants in this sample had at least one DUI citation (Table 4.12). These numbers do not represent unique individuals as it is possible that an entrant could have started the program multiple times due to having multiple DUI citations. Of the 352 entrants with a DUI citation, just 102 took place during enrollment in the program. This represents 29.0% of all DUI citations and only 1.6% of the overall sample. The remaining 250 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	50*	0	50
Failed between Day 61 and Day 365	42**	97	139
Failed between Day 366 and Day 730	10**	153	163
Total	102	250***	352

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

4.5.3.1 High-Risk Recidivists

As defined in the methods section, high-risk recidivists are those who received at least one DUI citation within 60 days of starting the 24/7 Sobriety Program. In this sample of entries, one variable was a statistically significant determinant of high-risk recidivism. Repeat DUI offenders were 2.346 times more likely to have another DUI citation in the first 60 days after starting the program (C.I.=1.128, 4.879) (Table 4.13).

This is arguably a logical finding: those with multiple DUI offenses on record are significant hazards on the roadway. As discussed thoroughly in the literature, these types of recidivists are an especially dangerous group and often represent individuals facing serious addiction and issues with self-control. Perhaps this variable can be used as a proxy for additional treatment efforts moving forward. If an individual enters into the program and has had two or more DUI arrests on record, that participant could be given specialized treatment plans beyond the 24/7 Sobriety Program to promote a stronger, more holistic effort to rehabilitate the offender. As demonstrated by the data here, this characteristic greatly increases the likelihood that one will relapse – yet again – without even successfully completing the program for a minimum of 60 days.

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

60-Day _i Interval and Enrolled in Course						
Parameter	Beta Value	S.E.	Wald	Sig.	Log Odds	95% C.I.
Gender	0.904	0.474	3.641		2.470	0.976-6.254
Region	-0.367	0.351	1.094		0.693	0.349-1.378
Geography	-0.186	0.375	0.245		0.831	0.398-1.733
Repeat DUI Offender	0.853	0.374	5.212	*	2.346	1.128-4.879
Multi-Entry Participant	0.565	0.294	3.692		1.760	0.989-3.132
Program Participation Length	-0.384	0.369	1.087		0.681	0.331-1.402
Monitored by SCRAM	-0.574	0.329	3.043		0.563	0.295-1.074

_iN=6,457 (50 high-risk recidivists); Nagelkerke R²=0.043; model correctly classified 99.2% of cases
*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 52 entries which fit this definition, those who have been enrolled in the program two or more times were 3.097 times more likely to relapse and have a DUI citation at some point while enrolled in the program (C.I.=1.770-5.419) (Table 4.14). This lends credence to the idea that this categorization could also be used as a proxy to provide additional, specialized treatment to offenders. 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 determinant of increasing one's odds of relapsing.

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

Parameter ₂	Beta Value	S.E.	Wald	Sig.	Log Odds	95% C.I.
Gender	-0.189	0.332	0.323		0.828	0.432-1.588
Region	0.380	0.288	1.739		1.462	0.831-2.572
Geography	0.355	0.412	0.745		1.427	0.637-3.197
Multi-Entry Participant	1.131	0.285	15.695	**	3.097	1.770-5.419
Monitored by SCRAM	0.166	0.284	0.340		1.180	0.676-2.059

₁N=6,457 (52 moderate-risk recidivists); Nagelkerke R²=0.029; model correctly classified 99.2% of cases

₂The 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

4.5.3.3 Post-Program Recidivists

Among program entries with a DUI citation at any point after completing the 24/7 Sobriety Program, post-program recidivists were 1.388 times more likely to be from the western half of the state (C.I.=1.014, 1.901), 9.200 times more likely to be a multi-entry participant (C.I.=6.804, 12.440) and 1.621 times more likely to have been sentenced to the program for 60 days (C.I.=1.176, 2.236) (Table 4.15).

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

Lastly, the post-program recidivist outcome model validates that longer program enrollment periods have stronger deterrent effects. Entrants who successfully complete the program after having participated in it for 60 days are almost two times more likely to have a DUI citation than entrants who successfully complete the program after participating in it for a minimum of 365 days. In other terms, when the odds ratio is calculated into a percentage, the legislative mandates imposed by House Bill 1302 reduce post-program recidivism by 38.2%, a notable improvement compared to a 60-day enrollment mandate.

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

DUI Citation at Any Point After Completing Program						
Parameter ₂	Beta Value	S.E.	Wald	Sig.	Log Odds	95% C.I.
Gender	0.054	0.172	0.099		1.055	0.754-1.477
Region	-0.328	0.160	4.179	*	0.720	0.526-0.987
Geography	0.072	0.186	0.149		1.074	0.746-1.547
Multi-Entry Participant	2.219	0.154	207.884	**	9.200	6.804-12.440
Program Participation Length	-0.483	0.164	8.680	**	0.617	0.447-0.851
Monitored by SCRAM	-0.177	0.146	1.465		0.838	0.629-1.116

¹N=6,457 (250 post-program recidivists); Nagelkerke R²=0.167; model correctly classified 96.1% of cases

²The Repeat DUI Offender variable was removed from the model; it did not have independence of observations.

**Statistically significant at the 1% level

*Statistically significant at the 5% level

4.6 Control Group Comparison

A final step in assessing the 24/7 Sobriety Program is comparing enrollees to a control group of drivers who received impaired driving violations but did not participate in the intervention. Like those enrolled in the 24/7 Sobriety Program, the research team wanted to track the control group for 60 days, 365 days, and 730 days following an initial DUI arrest. The research team had access to driver records for the calendar years 2002 through 2016. Because the 24/7 Sobriety Program first began in 2008, drivers with impaired driving arrests during calendar years 2006 and 2007 were not included as it was possible for them to experience the program intervention at some point in the 365- or 730-day period following the citation event. Unfortunately, electronic driver records for the calendar years 2002 through 2004 were aggregated and had numerous fields missing. These data were deemed unreliable and were excluded from the study. Therefore, the control group consists solely of drivers who received an impaired driving violation at some point during the 2005 calendar year. These individuals were tracked for the same 60-, 365-, and 730-day period as their 24/7 Sobriety Program enrollee counterparts. A total of 5,693 driver records were discovered with impaired driving arrests in calendar year 2015; these individuals form the control group used in this study.

One limitation for the control group data is that arrest records were not reported on a granular level similar to 24/7 Sobriety Program participants. Unlike the 24/7 Sobriety Program data, which clarifies if the citation pertained to actual physical control, driving under suspension, minor in possession/control, or a first, second, third, or fourth-or-subsequent arrest for impaired driving, the control group merely contained entries for driving under the influence as a violation of North Dakota Century Code 39-08-01. Therefore, it was not possible to delineate first-time and repeat offenders in the control group.

4.6.1 Comparison Across Treatment Groups

Compared to North Dakotans enrolled in the 24/7 Sobriety Program, North Dakota drivers receiving no legislatively-mandated sobriety intervention were more likely to receive non-DUI-related traffic citations and DUI-related citations after arrest (Table 4.16). These differences grow stronger in the 365-day and 730-day intervals following the initial impaired driving citation. There are no statistically significant differences when factoring for crash likelihood. This demonstrates that the program does have a deterrent effect with regard to the rate at which an impaired driver receives a citation.

Table 4.16 Mean Values Displaying Total Violations Across Participants, by Treatment Type

Metric	Mean Value		Sig.
	24/7 Participants	Control Group	
DUI-Related Citations, 60 Days After Program Start	0.01	0.02	**
DUI-Related Citations, 1 Year After Program Start	0.06	0.10	**
DUI-Related Citations, 2 Years After Program Start	0.13	0.19	**
Non-DUI-Related Traffic Citations, 60 Days After Program Start	0.09	0.10	
Non-DUI-Related Traffic Citations, 1 Year After Program Start	0.42	0.50	**
Non-DUI-Related Traffic Citations, 2 Years After Program Start	0.76	0.92	**
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	0.10	0.09	

**Significant at the 1% level for independent-samples t-test

4.6.2 Introducing Treatment Type into Binary Logistic Regression Models

Like procedures used in Section 4.5 of this report, binary logistic regression models were created to include the presence of the control group as a separate independent variable. In this case, those enrolled in the 24/7 Sobriety Program were assigned a value of “0” and the control group was categorized as “1.” Therefore, those involved in the intervention are treated as the comparison group.

Because of issues with how impaired driving citations were catalogued, the lack of information about repeat offenders forced some of the other independent variables to be removed from the models. The models in Table 4.17 only take into consideration gender, region, geography, and control group status; the repeat DUI offender, multi-entry participant, House Bill 1302 identifier, and SCRAM monitoring status variables were eliminated from the models. Note that results in Table 4.18 do not represent one model. Instead, these represent only the results of the control group for nine different models. A complete breakdown of each individual model is presented in Appendix B.

Table 4.17 Control Group Outcome Models

Dependent Variable	Beta	S.E.	Wald	Sig.	O.R.	95% C.I.
Non-DUI Traffic Citation, in 60 Days After ₁	0.239	0.074	10.420	**	1.270	1.009-1.469
Non-DUI Traffic Citation, in 365 Days After ₂	0.266	0.045	35.297	**	1.305	1.195-1.424
Non-DUI Traffic Citation, in 730 Days After ₃	0.322	0.043	56.105	**	1.380	1.268-1.501
Crash, in 60 Days After ₄	0.231	0.170	1.849		1.259	0.903-1.756
Crash, in 365 Days After ₅	0.033	0.092	0.130		1.034	0.864-1.237
Crash, in 730 Days After ₆	0.035	0.074	0.219		1.035	0.895-1.198
DUI-Related Citation, in 60 Days After ₇	0.862	0.163	28.004	**	2.369	1.721-3.260
DUI-Related Citation, in 365 Days After ₈	0.653	0.078	70.569	**	1.921	1.649-2.237
DUI-Related Citation, in 730 Days After ₉	0.426	0.061	47.970	**	1.531	1.357-1.727

**Statistically significant at the 1% level

₁See Table B.1 in Appendix B for individual model results

₂See Table B.2 in Appendix B for individual model results

₃See Table B.3 in Appendix B for individual model results

₄See Table B.4 in Appendix B for individual model results

₅See Table B.5 in Appendix B for individual model results

₆See Table B.6 in Appendix B for individual model results

₇See Table B.7 in Appendix B for individual model results

₈See Table B.8 in Appendix B for individual model results

₉See Table B.9 in Appendix B for individual model results

The results of the binary logistic regression models reaffirm the findings in Table 4.16: the program has a measurable effect on non-DUI-related traffic citations and DUI-related citations, but does not appear to improve driver performance with regard to crashes. In three time periods studied, drivers who did not participate in the 24/7 Sobriety Program were 1.270 times more likely (C.I.=1.009, 1.469), 1.305 times more likely (C.I.=1.195, 1.424), and 1.380 times more likely (C.I.=1.268, 1.501) to be issued a non-DUI-related traffic citation in the 60-day, 365-day, and 730-day intervals following the initial arrest, respectively.

The program has even stronger effects on DUI-related citations. Compared to 24/7 Sobriety Program enrollees, those who do not receive the intervention are 2.369 times more likely (C.I.=1.721, 3.260), 1.921 times more likely (C.I.=1.649, 2.237), and 1.531 times more likely (C.I.=1.357, 1.727) to have an impaired driving-related citation in the two-month, one-year, and two-year intervals following the initial impaired driving arrest. This is a substantial discovery: the 24/7 Sobriety Program reduces DUI-related recidivism by 29.7%, 34.2%, and 39.5% in the 60 days, 365 days, and 730 days following an impaired driving-related citation.

5. CONCLUSIONS

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

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

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

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

Lastly, when a control group of DUI offenders who did *not* participate in the 24/7 Sobriety Program were entered into a binary logistic regression model, it revealed that the program has a measureable deterrent effect on non-DUI-related citations and DUI-related citations. Not only does the program reduce the risk of an offender relapsing into DUI-related recidivism, but this deterrent effect extends to other traffic-related citations as well. The program does not, however, appear to influence crash likelihood.

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

The 24/7 Sobriety Program is one piece of a large impaired driving prevention puzzle. Perhaps its use in conjunction with other proven methods could exponentially enhance safety on North Dakota's roadways. Ignition interlock devices are another proven strategy for reducing impaired driving events. In New York,

all convicted DWI offenders – even those convicted for the first time – are required to install ignition interlock devices in their vehicles (Marutollo 2010). Multiple studies have determined that using these devices is effective. In a sample of drivers from Alberta, Canada, only 9% of DUI offenders who used ignition interlock devices as a method to regain full driving privileges were reconvicted in the four years following arrest (Marques, Tippets, and Voas 2003). In Maryland, repeat offenders who were assigned to use ignition interlock devices were 36% less likely to reoffend during a two-year intervention period and were 26% less likely to reoffend in the two years following the intervention when compared to a control group who received normal sanctions (Rauch et al. 2010). National estimates predict that – over a 15-year period – 85% of crash fatalities and approximately 1.25 million non-fatal injuries would be prevented if ignition interlock device technology were mandatory for new vehicles (Carter et al. 2015). These crashes were estimated to most commonly apply to drivers under the age of 44 (Carter et al. 2015).

Another study found that – compared to drivers who were only subjected to ignition interlock devices – those who had to use ignition interlock devices while receiving alcohol use disorder treatment were 32% less likely to recidivate once the interlock device was removed (Voas et al. 2016). It can be argued that the 24/7 Sobriety Program serves as one such comparable treatment program. Perhaps ignition interlock devices used in conjunction with the 24/7 Sobriety Program will further reduce rates of recidivism. Based on the findings of this report, it can be contended that multi-time entrants and repeat DUI offenders would most benefit from multiple (“enhanced”) interventions. Considering that the *Impaired Driving Strategic Plan for North Dakota* advocates for the use of ignition interlock devices – and suggests that a pilot study be conducted to assess the viability of such an intervention – it could further be recommended that the pilot study include analyzing those who receive *both* an ignition interlock device *and* the 24/7 Sobriety Program as impaired driving interventions.

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

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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	0.51	0.01	**
Non-DUI-Related Traffic Citations	0.47	0.10	**
Crashes	0.12	0.02	**
	365 Days Before	365 Days After	Significance
DUI-Related Citations	0.82	0.03	**
Non-DUI-Related Traffic Citations	0.98	0.37	**
Crashes	0.24	0.05	**
	730 Days Before	730 Days After	Significance
DUI-Related Citations	1.02	0.07	**
Non-DUI-Related Traffic Citations	1.58	0.59	**
Crashes	0.35	0.09	**

**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	0.49	0.01	**
Non-DUI-Related Traffic Citations	0.50	0.09	**
Crashes	0.09	0.01	**
	365 Days Before	365 Days After	Significance
DUI-Related Citations	0.81	0.05	**
Non-DUI-Related Traffic Citations	1.18	0.39	**
Crashes	0.20	0.04	**
	730 Days Before	730 Days After	Significance
DUI-Related Citations	1.00	0.10	**
Non-DUI-Related Traffic Citations	1.78	0.66	**
Crashes	0.28	0.08	**

**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	0.42	0.01	**
Non-DUI-Related Traffic Citations	0.46	0.06	**
Crashes	0.09	0.01	**
	365 Days Before	365 Days After	Significance
DUI-Related Citations	0.78	0.04	**
Non-DUI-Related Traffic Citations	1.10	0.30	**
Crashes	0.20	0.04	**
	730 Days Before	730 Days After	Significance
DUI-Related Citations	0.94	0.07	**
Non-DUI-Related Traffic Citations	1.64	0.50	**
Crashes	0.28	0.07	**

**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	0.53	0.01	**
Non-DUI-Related Traffic Citations	0.51	0.11	**
Crashes	0.10	0.01	**
	365 Days Before	365 Days After	Significance
DUI-Related Citations	0.83	0.06	**
Non-DUI-Related Traffic Citations	1.16	0.44	**
Crashes	0.21	0.05	**
	730 Days Before	730 Days After	Significance
DUI-Related Citations	1.05	0.11	**
Non-DUI-Related Traffic Citations	1.80	0.73	**
Crashes	0.31	0.09	**

**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	0.50	0.01	**
Non-DUI-Related Traffic Citations	0.50	0.10	**
Crashes	0.10	0.01	**
	365 Days Before	365 Days After	Significance
DUI-Related Citations	0.82	0.05	**
Non-DUI-Related Traffic Citations	1.14	0.40	**
Crashes	0.21	0.05	**
	730 Days Before	730 Days After	Significance
DUI-Related Citations	1.02	0.10	**
Non-DUI-Related Traffic Citations	1.77	0.66	**
Crashes	0.31	0.09	**

**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	0.44	0.01	**
Non-DUI-Related Traffic Citations	0.46	0.07	**
Crashes	0.07	0.01	**
	365 Days Before	365 Days After	Significance
DUI-Related Citations	0.77	0.05	**
Non-DUI-Related Traffic Citations	1.10	0.31	**
Crashes	0.17	0.04	**
	730 Days Before	730 Days After	Significance
DUI-Related Citations	0.94	0.09	**
Non-DUI-Related Traffic Citations	1.64	0.55	**
Crashes	0.25	0.08	**

**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	0.39	0.01	**
Non-DUI-Related Traffic Citations	0.43	0.10	**
Crashes	0.09	0.01	**
	365 Days Before	365 Days After	Significance
DUI-Related Citations	0.70	0.05	**
Non-DUI-Related Traffic Citations	1.08	0.42	**
Crashes	0.21	0.05	**
	730 Days Before	730 Days After	Significance
DUI-Related Citations	0.86	0.10	**
Non-DUI-Related Traffic Citations	1.69	0.69	**
Crashes	0.30	0.09	**

**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	0.55	0.01	**
Non-DUI-Related Traffic Citations	0.53	0.09	**
Crashes	0.10	0.01	**
	365 Days Before	365 Days After	Significance
DUI-Related Citations	0.88	0.05	**
Non-DUI-Related Traffic Citations	1.17	0.37	**
Crashes	0.20	0.04	**
	730 Days Before	730 Days After	Significance
DUI-Related Citations	1.10	0.09	**
Non-DUI-Related Traffic Citations	1.77	0.62	**
Crashes	0.30	0.08	**

**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	0.50	0.01	**
Non-DUI-Related Traffic Citations	0.48	0.09	**
Crashes	0.10	0.01	**
	365 Days Before	365 Days After	Significance
DUI-Related Citations	0.82	0.03	**
Non-DUI-Related Traffic Citations	1.11	0.36	**
Crashes	0.21	0.04	**
	730 Days Before	730 Days After	Significance
DUI-Related Citations	0.98	0.05	**
Non-DUI-Related Traffic Citations	1.67	0.57	**
Crashes	0.29	0.08	**

**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	0.46	0.01	**
Non-DUI-Related Traffic Citations	0.51	0.11	**
Crashes	0.08	0.01	**
	365 Days Before	365 Days After	Significance
DUI-Related Citations	0.79	0.11	**
Non-DUI-Related Traffic Citations	1.21	0.47	**
Crashes	0.20	0.05	**
	730 Days Before	730 Days After	Significance
DUI-Related Citations	1.09	0.23	**
Non-DUI-Related Traffic Citations	1.94	0.85	**
Crashes	0.31	0.10	**

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

APPENDIX B. DETAILED CONTROL GROUP BINARY LOGISTIC REGRESSION MODELS

Table B-1 Control Group Non-DUI-Related Traffic Citation Outcome Model

Non-DUI-Related Traffic Citation: 60-Day-After _t Interval						
Parameter	Beta Value	S.E.	Wald	Sig.	Log Odds	95% C.I.
Gender	-0.089	0.086	1.065		0.915	0.773-1.083
Region	-0.347	0.076	20.895	**	0.707	0.610-0.820
Geography	0.172	0.095	3.245		1.187	0.985-1.432
Control Group Participant	0.239	0.074	10.420	**	1.270	1.099-1.469

*t*N=12,149; Nagelkerke R²=0.007; model correctly classified 93.3% of cases
 **Statistically significant at the 1% level

Table B-2 Control Group Non-DUI-Related Traffic Citation Outcome Model

Non-DUI-Related Traffic Citation: 365-Day-After _t Interval						
Parameter	Beta Value	S.E.	Wald	Sig.	Log Odds	95% C.I.
Gender	-0.009	0.053	0.030		0.991	0.894-1.099
Region	-0.175	0.045	15.312	**	0.839	0.769-0.916
Geography	0.095	0.055	2.939		1.099	0.987-1.225
Control Group Participant	0.266	0.045	35.297	**	1.305	1.195-1.424

*t*N=11,112; Nagelkerke R²=0.006; model correctly classified 74.6% of cases
 **Statistically significant at the 1% level

Table B-3 Control Group Non-DUI-Related Traffic Citation Outcome Model

Non-DUI-Related Traffic Citation: 730-Day-After _t Interval						
Parameter	Beta Value	S.E.	Wald	Sig.	Log Odds	95% C.I.
Gender	0.095	0.050	3.595		1.099	0.997-1.212
Region	-0.218	0.042	26.396	**	0.804	0.740-0.874
Geography	0.052	0.052	1.026		1.053	0.953-1.165
Control Group Participant	0.322	0.043	56.105	**	1.380	1.268-1.501

*t*N=9,925; Nagelkerke R²=0.010; model correctly classified 60.1% of cases
 **Statistically significant at the 1% level

Table B-4 Control Group Crash Outcome Model

Crash Events: 60-Day-After _t Interval						
Parameter	Beta Value	S.E.	Wald	Sig.	Log Odds	95% C.I.
Gender	-0.328	0.186	3.127		0.720	0.500-1.036
Region	-0.316	0.173	3.320		0.729	0.519-1.024
Geography	-0.036	0.207	0.030		0.965	0.643-1.446
Control Group Participant	0.231	0.170	1.849		1.259	0.903-1.756

*t*N=12,149; Nagelkerke R²=0.005; model correctly classified 98.8% of cases

Table B-5 Control Group Crash Outcome Model

Crash Events: 365-Day-After _t Interval						
Parameter	Beta Value	S.E.	Wald	Sig.	Log Odds	95% C.I.
Gender	0.003	0.109	0.001		1.003	0.811-1.241
Region	-0.176	0.092	3.610		0.839	0.700-1.006
Geography	-0.029	0.111	0.067		0.972	0.781-1.209
Control Group Participant	0.033	0.092	0.130		1.034	0.864-1.237

N=11,112; Nagelkerke R²=0.001; model correctly classified 95.3% of cases

Table B-6 Control Group Crash Outcome Model

Crash Events: 730-Day-After _t Interval						
Parameter	Beta Value	S.E.	Wald	Sig.	Log Odds	95% C.I.
Gender	0.032	0.087	0.134		1.032	0.871-1.224
Region	-0.137	0.074	3.340		0.872	0.754-1.008
Geography	0.071	0.091	0.609		1.073	0.899-1.282
Control Group Participant	0.035	0.074	0.219		1.035	0.895-1.198

N=9,925; Nagelkerke R²=0.001; model correctly classified 91.4% of cases

Table B-7 Control Group DUI-Related Citation Outcome Model

Crash Events: 60-Day-After _t Interval						
Parameter	Beta Value	S.E.	Wald	Sig.	Log Odds	95% C.I.
Gender	0.465	0.211	4.869	*	1.592	1.053-2.407
Region	-0.346	0.157	4.844	*	0.708	0.520-0.963
Geography	0.141	0.195	0.523		1.152	0.785-1.688
Control Group Participant	0.862	0.163	28.004	**	2.369	1.721-3.260

N=12,149; Nagelkerke R²=0.021; model correctly classified 98.6% of cases
 **Statistically significant at the 1% level
 *Statistically significant at the 5% level

Table B-8 Control Group DUI-Related Citation Outcome Model

Crash Events: 365-Day-After _t Interval						
Parameter	Beta Value	S.E.	Wald	Sig.	Log Odds	95% C.I.
Gender	0.462	0.100	21.460	**	1.588	1.306-1.931
Region	-0.156	0.075	4.351	*	0.856	0.739-0.991
Geography	0.009	0.090	0.010		1.009	0.845-1.205
Control Group Participant	0.653	0.078	70.569	**	1.921	1.649-2.237

N=11,112; Nagelkerke R²=0.021; model correctly classified 92.7% of cases
 **Statistically significant at the 1% level
 *Statistically significant at the 5% level

Table B-9 Control Group DUI-Related Citation Outcome Model

Crash Events: 730-Day-After_i Interval

Parameter	Beta Value	S.E.	Wald	Sig.	Log Odds	95% C.I.
Gender	0.468	0.077	36.915	**	1.596	1.373-1.856
Region	-0.203	0.059	11.609	**	0.817	0.727-0.918
Geography	-0.033	0.071	0.221		0.967	0.842-1.111
Control Group Participant	0.426	0.061	47.970	**	1.531	1.357-1.727

_iN=9,925; Nagelkerke R²=0.016; model correctly classified 85.7% of cases
**Statistically significant at the 1% level
