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Evaluation of Rear-Seat Belt Laws

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16. Abstract <p>Recent upgrades to rear-seat belt law in two States were documented, based on information gathered from legislative websites, news articles, and other internet sources, as well as interviews with key observers. Successful strategies and challenges were identified. The main factors leading to success included engaging crash victims and their families to share their stories, identifying legislative sponsors, considering concessions during the legislative process, identifying people or organizations to lead broad-based coalitions of public and private partners to coordinate efforts and ensure consistent messaging, emphasizing safety and economic benefits of belt law upgrades rather than enforcement, and developing evidence-based summaries of the safety benefits of the law upgrades. An additional goal of this study was to evaluate the effect of adult rear-seat belt laws on rear-seat belt use. The researchers conducted observational surveys in nine States, all having a primary front-seat belt law. States were grouped into triads based on statewide front-seat belt use rate as well as geographical and demographic similarities. Each triad consisted of a primary, secondary, and “no” rear-seat belt law State. The researchers conducted observations at 120 sites per State, resulting in more than 8,000 adult rear-seat observations. Within each triad, rear-seat belt use was lowest in States without a rear-seat belt law, and it was significantly lower than rear-seat belt use in States with primary rear-seat belt laws. The impact of rear-seat secondary laws was less clear.</p>			
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Executive Summary

For many years, efforts to improve vehicle occupant protection focused primarily on the front seat. However, attention has increasingly focused on rear-seat safety. This includes increasing seat belt use among rear-seat passengers, which lags use among drivers and front-seat passengers (Enriquez, 2019). This discrepancy may result in part from gaps in many States' seat belt laws covering the rear seat, which do not cover adult occupants or allow only for secondary enforcement (law enforcement can issue a seat belt citation only if the driver was pulled over for another violation) rather than primary enforcement (law enforcement can stop a driver solely for not using a seat belt). The District of Columbia and all States except New Hampshire have laws requiring adult front-seat occupants to use seat belts (Insurance Institute for Highway Safety, 2020). All States including New Hampshire require seat belt use by children who have graduated from child safety seats. In contrast, as of September 2020, there were 31 States and the District of Columbia that have laws requiring adult rear-seat passengers to buckle up; this included 21 primary and 11 secondary enforcement law States. Observed belt use in the rear seat has been consistently higher in States with laws requiring seat belt use by occupants 8 and older in all seating positions than in States requiring belt use by occupants 8 and older only in front seats (Enriquez, 2019).

Despite the efforts of the highway safety community in the States without primary enforcement seat belt laws covering all vehicle occupants, only 4 substantially upgraded their laws since 2015. This project documented how two of these States achieved rear-seat belt upgrades and identified the factors in these States' successes. In addition, this project examined the effect of rear-seat belt laws using observations.

Researchers selected seat-belt law upgrades in Alabama and New York for study, first developing a summary for each State based on legislative websites and news articles, reports, and other public documents. They then sent the summary for each State to several key knowledgeable people in each State as well as its National Highway Traffic Safety Administration Regional Office. The researchers conducted follow-up interviews to verify that the draft summary for each State was accurate and complete, clarify any outstanding areas of confusion, and gain additional background and context. The interviewees included representatives of State agencies and highway safety advocacy groups as well as State legislators.

Although each State faced different challenges and employed different strategies, their successful approaches included the following:

- Engaging crash victims and the families of crash victims to share their experiences and highlight needed upgrades to the seat belt laws.
- Identifying legislative sponsors willing to push for the law with colleagues and in the media.
- Identifying and being willing to consider concessions if they are necessary to enact an upgrade.
- Identifying people or organizations to lead broad-based coalitions and to develop an overall strategy, coordinate efforts, and provide consistent messaging.
- Emphasizing the safety and economic benefits of seat-belt law upgrades rather than enforcement or citations.
- Developing evidence-based summaries of the benefits of seat-belt use and law upgrades.

The study also conducted observation surveys in nine States. Observations were of rear-seat passengers. The States were grouped into three triads, so that each triad contained a State with no rear-seat belt law, a primary rear-seat belt law, and a secondary rear-seat belt law. Triad-based analyses showed that rear-seat belt use was lowest in States without rear-seat laws, and it was significantly lower than rear-seat belt use in States with primary rear-seat laws. The impact of rear-seat secondary laws was less clear.

Introduction

For many years, efforts to improve vehicle occupant protection focused primarily on the front seat; this included efforts to increase seat belt use. However, attention has increasingly focused on rear-seat safety (Hedlund, 2019; Jermakian et al., 2019; National Transportation Safety Board, 2017). Although occupants of older model year passenger vehicles were safer in the rear seat than in the front seat overall, this did not seem to be the case in newer model vehicles due to occupant protection advancements in the front seat (Bilston et al., 2010; Durbin et al., 2015; Jermakian et al., 2019; Kahane, 2017). For occupants in both the front and rear seats, wearing a seat belt reduces the risk of death or injury to them as well as other occupants. The National Highway Traffic Safety Administration estimates that lap-shoulder belts are 45 percent effective in preventing fatalities in outboard front-seat positions in passenger cars and 60 percent effective in light trucks and vans (NCSA, 2020). The estimates of effectiveness are even higher in the rear seat. NHTSA estimates that lap-shoulder belts are 54 percent effective in preventing death in outboard rear-seat positions in cars and 75 percent effective in light trucks and vans and that lap-shoulder belts in the center rear seat reduce fatality risk by an estimated 58 percent in passenger cars and 75 percent in light trucks (Kahane, 2017). In a frontal crash, an unbelted rear-seat passenger sitting behind a belted driver increases the risk of death for the driver by 137 percent compared with a belted rear-seat passenger (Bose et al., 2013). Exposure to unbelted occupants increases the risk of injury or death to other occupants by 40 percent (MacLennan et al., 2004).

In a survey of adults who had ridden in the rear seat within the prior 6 months, those who did not wear a seat belt on every trip most often attributed this to a perception that the rear seat is safer than the front (Jermakian & Weast, 2018). Other common reasons were the type of trip (e.g., a short distance), that belt use is not a habit or forgetting to use it, and that belts are uncomfortable or poorly fitting. Using multivariable logistic regression analysis of NHTSA's 2016 Motor Vehicle Occupant Safety Survey (MVOSS), Taylor and Daily (2019) found that adults who supported rear-seat belt laws, reported front-seat belt use, and believed their State had a rear-seat belt law were significantly more likely to report full-time belt use in the rear seat. A multivariable regression analysis of the 2012 Consumer Styles online survey (Beck et al., 2019) found that the belief that belt use was very important was associated with the behavior of always using seat belts in the front passenger seat and in the rear seat.

To be effective, seat belts must be worn. Seat belts in front seats were standard equipment in all new passenger vehicles by 1964, but their use was low (Harris, 1996). Only after States began enacting, publicizing, and enforcing belt use laws did use increase substantially. All States except New Hampshire required adult belt use in the front seat by 1995 (IIHS, 2020). In 2018 observed front-seat belt use nationwide was 89.6 percent (Enriquez, 2019). Several studies documented how front-seat belt use increased after a State enacted a front-seat belt use law (e.g., Chaudhary et al., 2010; Preusser & Preusser, 1997; Solomon et al., 2001). Similar laws for rear-seat adult occupants may function to increase use rates in these seating positions.

Primary seat belt laws allow any unbelted occupant to be ticketed at any time. Secondary laws allow unbelted occupants to be ticketed only if law enforcement have another reason to stop the vehicle. As of September 2020, there were 34 States and the District of Columbia that had primary enforcement front-seat belt laws, and 15 States had secondary laws. Belt use in the front seat is higher in primary law States (Tison & Williams, 2010; IIHS, 2020). This may be in part because of enforcement campaigns (Solomon, 2002; Solomon et al., 2006, 2007) and the implementation differences (Tison & Williams, 2010). Primary laws may also increase

occupants' perceived risk of getting tickets for noncompliance compared to secondary law States (Chaudhary et al., 2004).

A large body of research has shown that the enactment and publicized enforcement of laws requiring seat belt use among front-seat occupants increase belt use and reduce crash deaths (Richard et al., 2018). Laws allowing primary enforcement are more effective than laws allowing only secondary enforcement. Seat belt use is higher in States with primary enforcement front-seat belt laws. Observed adult front-seat belt use rates in 2019 were 92.0 percent in primary enforcement States but only 86.2 percent in secondary enforcement States (National Center for Statistics and Analysis, 2019b). Both primary and secondary enforcement laws reduce deaths and injuries, but the reductions are larger with primary enforcement laws (Dinh-Zarr et al., 2001; Rivara et al., 1999).

Rear seats lag front-seat belt use and belt use laws. Rear-seat belts became standard equipment in all new vehicles in 1967 (Harris, 1996), but like front-seat belts, use was extremely low. Use has risen gradually, but still is substantially lower than use in the front seat. In 2018 observed belt use was 76 percent for rear-seat passengers 8 and older compared to 90 percent for front-seat occupants (Enriquez, 2019). In 2014 these same values were 73 percent in the rear seat versus 84 percent in the front seat (Pickrell et al., 2016). Fatalities among rear-seat passengers are also problematic. According to the National Center for Statistics and Analysis (2016), a greater percentage of rear-seat fatalities are unrestrained (58%) compared to front-seat fatalities (47% unrestrained).

As of September 2020, only 20 States and the District of Columbia had primary rear-seat belt laws. Another 11 States had secondary laws, and 19 States had no rear-seat belt law (IIHS, 2020). In the years 2016 to 2020, only three States adopted new rear-seat belt laws. Mississippi enacted a primary enforcement adult rear-seat law in 2017. Alabama enacted a secondary enforcement adult rear-seat belt law in 2019, and in 2020 New York amended its primary enforcement seat belt law to require adult rear-seat belt use in personal vehicles and belt use by occupants 8 and older in taxicabs and other for-hire vehicles. No State upgraded a secondary law to primary (IIHS, 2020).

Rear-seat belt use is higher in States with any type of belt use law than in States without these laws. NHTSA's National Occupant Protection Use Survey (NOPUS) documents this from observations: 81 percent compared to 69 percent (Enriquez, 2019). However, NOPUS does not distinguish primary and secondary rear-seat belt law States. FARS is the only national data source that provides State-level data to do this. In 2018 for occupants 8 and older with known belt use in a passenger vehicle involved in a fatal crash (i.e., occupants fatally injured as well as survivors), belt use overall was 75 percent in the front-seat and 64 percent in the rear seat. For rear-seat passengers, belt use was 69 percent in primary law States, 61 percent in secondary law States, and 60 percent in no-law States, although there was considerable variation across the States in each law category (Hedlund, 2019).

State seat belt laws vary in requirements for drivers and passengers of for-hire vehicles. According to the National Conference of State Legislatures, most States exclude taxicab drivers and their passengers from seat belt laws. However, some explicitly require passengers in for-hire vehicles to wear seat belts (Block, 2020). Rear-seat belt laws also vary with regard to the ages of occupants covered. Child restraint laws in all States require seat belt use by children who have

graduated from child safety seats. The upper age limit for these laws ranges from 14 to 18, and these laws vary whether primary enforcement is allowed.

The research on the effects of rear-seat belt laws on seat belt use rates and related crash injuries and deaths is not extensive. NOPUS provides evidence that rear-seat belt use is higher in States that require belt use in all seating positions. During the years from 2009 to 2018, observed belt use in the rear seat was higher in States with laws requiring seat belt use among occupants 8 and older in all seating positions than in States requiring belt use among occupants 8 and older only in front seats (Enriquez, 2019). A study of teenagers involved in fatal crashes while sitting in rear seats found that the presence of a rear-seat belt law was associated with higher belt use; belt use was higher with primary enforcement rear-seat laws than with secondary enforcement laws (Pressley et al., 2016). Among adults who had ridden in rear seats in the previous 6 months and did not always buckle up, 38 percent said they sometimes do not buckle up in rear seats because there is no law requiring it; 60 percent said a law would convince them to buckle up (Jermakian & Weast, 2018). A recent study compared the number of rear-seat fatalities in States that did and did not have primary enforcement rear-seat belt laws. It found that for every restrained rear-seat fatality, there were 0.45 more rear-seat fatalities in States without a primary rear-seat law than in States with such a law (Findley et al., 2018); the statistical significance of this difference was not tested.

As discussed above, only three States have upgraded their rear-seat belt laws in the last few years. This study provides case studies of two of these three States: Alabama and New York. In addition to examining legislative activities associated with recent rear-seat belt law passages, this study also provides rear-seat belt use statistics based upon observation data from nine States with three of each type of rear-seat belt law (primary, secondary, and no law).

The primary objectives of this study were to:

1. document how two States achieved upgrades to their rear-seat belt laws,
2. identify the factors affecting the timing of these States' successes, including the strategies used to overcome obstacles, and
3. conduct an outcome evaluation of primary and secondary rear-seat belt laws (compared to no law) on adult rear-seat belt use using observations.

Case Studies

This study documented recent belt law upgrades in two States and identified successful strategies as well as challenges. The hope is that the “lessons learned” can help other States secure upgrades. Researchers selected the rear-seat belt law upgrades in Alabama and New York for study.

On September 1, 2019, Alabama implemented a law requiring rear-seat passengers 16 and older to wear seat belts. Although Alabama’s seat belt law has provided for primary enforcement of the front-seat belt requirement since December 9, 1999, enforcement of the new rear-seat requirement is secondary.

On February 2, 2020, the governor of New York signed a law requiring seat belt use by occupants 8 or older in for-hire vehicles such as taxicabs. Then, on August 11, 2020, he signed a law requiring belt use by occupants of all ages in the rear seats of personal vehicles. Both laws were implemented on November 1, 2020. New York’s seat belt law allows primary enforcement.

The case studies included two phases. In the initial phase, researchers developed a summary for each State, based on an internet search of legislative websites and news articles, reports, and other documents. In the second phase, researchers sent the summary for each State to a few key people in the corresponding State as well as the NHTSA Regional Office, along with a short list of open-ended questions. Then, the researchers conducted follow-up conversations by telephone to verify that the draft summary was accurate and complete, clarify any outstanding areas of confusion, and gain additional background and context.

The initial list of contacts included the people who appeared to be most important to the passage of the rear-seat belt law upgrades, based on information gathered through the internet searches. The NHTSA Regional Offices reviewed and provided advice on the list of contacts. The final list of possible contacts included representatives of State agencies and highway safety advocacy groups, as well as State legislators. In total, nine interviews were conducted across the two States.

The following sections provide details of the two State law upgrades. The first part of each section summarizes the efforts to upgrade the law, based almost entirely on documentation gathered from the internet search. The second part summarizes the interviews of key people. A final section summarizes the differences and similarities of the efforts.

Alabama’s Adult Rear-Seat Belt Law

Background

Alabama’s first occupant restraint law took effect in 1982, when child restraint devices began to be required for children under age 3 (Alabama Department of Public Health, 2017c). On September 18, 1991, a secondary enforcement seat belt law applying to front-seat occupants took effect; violations of the law became primary offenses beginning on December 9, 1999 (IIHSS, 2020). The next major change occurred on July 1, 2006, when the age of children required to use a restraint system was raised to 15 years and specific types of child restraint devices were required for certain ages or weights of children (Alabama Department of Public Health, 2017a).

Then, on September 1, 2019, the Roderic Deshaun Scott Seat Belt Safety Act took effect in Alabama (Smith, 2019). This law requires restraints for all vehicle occupants regardless of

seating position or age and specifies that adult occupants will be charged with violations (Alabama Safety Belt Use Act of 1991, 1991 & rev. 2019). Previously, seat belts were required only for front-seat occupants and for rear-seat passengers who were 15 or younger and not subject to child restraint requirements. Whereas seat belt violations by front seat occupants and rear-seat passengers younger than 16 and child restraint violations are primary offenses, violations by rear-seat passengers 16 and older are secondary enforcement only (Alabama Safety Belt Use Act, 2019).

Alabama's seat belt law provides for a maximum fine of \$25. Violations cannot be recorded on driver's license records. A law enforcement officer may not search or inspect a motor vehicle, its contents, or the driver or passenger because of a violation, and all police departments must maintain statistical information on the race of motorists who are stopped. The law excludes a vehicle with a seating capacity of 11 or more passengers, people with documentation of medical exemption, rural mail carriers, drivers or passengers delivering mail or letters, and passengers in vehicles from MY 1965 or older (Alabama Safety Belt Use Act, 2019). The law does not appear to address seat belt use in taxicabs or other for-hire vehicles.

The child restraint law provides for a maximum fine of \$25 and the assessment of penalty points. The charges may be dismissed, and no court costs will be assessed with evidence that an appropriate child restraint device has been obtained. Taxicabs and motor vehicles with seating capacities of 11 or more passengers are excluded from the child restraint requirements (1989 Car Seat Law, 2014).

Enactment of Adult Rear-Seat Belt Law

The passage of Alabama's adult rear-seat belt law illustrates the persuasive power of a tragic crash in gaining support for traffic safety. In this case it was the death of 17-year-old Roderic Deshaun Scott on March 4, 2016, who sustained injuries the day before in a single-vehicle rollover crash on I-65 (Cason, 2017; Darrington, 2017; Edgemon, 2016). Scott was a standout basketball star from Robert E. Lee High School in Montgomery and was traveling with four other teenagers to a State basketball tournament in Birmingham. Scott and two others were riding unbelted in the rear seat and were ejected from the vehicle when it left the roadway and overturned. Two front-seat occupants were belted and not ejected.

Scott's death received widespread attention (Darrington, 2017; Pia, 2017; Young, 2017). He was an organ donor, and his donations helped save six lives. He had a strong academic record and had committed to playing basketball at Jacksonville State. The community honored him and the Roderic D. Scott Foundation was established. His parents, Rodney and Renita Scott, spoke openly about their deep sorrow over their son's death. His father, the assistant basketball coach at his son's school, expressed his regret that his son was unbuckled, and he actively advocated for extending Alabama's seat belt law to cover rear-seat passengers.

Consideration of Law Prior to 2019

During the first week of the State legislative session in February 2017, and nearly a year after Roderic Scott's death, State Senate Minority Leader Quinton T. Ross, Jr., introduced the Roderic Scott Seat Belt Safety Act (SB73), which required all vehicle occupants to be belted (Cason, 2017). Senator Ross represented the 26th election district that includes Roderic Scott's hometown of Montgomery. The bill passed the Senate on February 14 by a vote of 21-5 (Young,

2017). Representative Mike Homes sponsored the bill in the House, but it did not come to a vote (LEGISSCAN73/2017/Regular Session, 2017).

The story of Scott's fatal crash was highlighted in news stories about the proposed act, published during and after the legislative session. In a news story published on February 20, 2017, Scott's father said he was contacted by legislators after the fatal crash and asked about naming the proposed law after his son. "I thought it was a good idea, and his mom thought it was a good idea since he was a well-known guy here," Scott's father said (Young, 2017). News accounts also discussed the risks associated with not wearing a seat belt in the rear seat, including ejection from a vehicle and harm to other vehicle occupants (Cason, 2017; Pia, 2017). In a news story published on January 13, 2017, Senator Ross said that the law would save lives, partly by raising awareness of the need to wear seat belts. The article reported that 60 percent of the crash deaths in Alabama involved unbelted occupants and noted that the Alabama Department of Transportation supported the law (Cason, 2017). An editorial published on February 16, 2017, in *The Outlook* summarized evidence on the safety benefits of belt use and called a rear-seat belt law a "no-brainer" (Sneed, 2017).

An internet search uncovered no reports that the bill was re-introduced in 2018. This may have been in part because Senator Ross resigned in fall 2017 to become president of Alabama State University. A special election in December 2017 and a subsequent run-off election in May 2018 resulted in the election of Senator David Burkette to succeed Senator Ross.

Enactment of Law in 2019

On April 9, 2019, Senator Burkette introduced the Roderic Scott Safety Belt Use Act of 2019 (SB 254) (LEGISSCAN254/2019/Regular Session, 2019). As with the earlier bill, SB 254 required all vehicle occupants to have a safety belt properly fastened. Senator Burkette had a personal connection to the death of Roderic Scott; Scott's father and Senator Burkette played on opposing sports teams when they were growing up (D. Burkette, personal communication, July 22, 2020).

On May 21, the Senate approved an amended bill with a vote of 26 yes and 9 absent (LEGISSCAN254/2019/Regular Session, 2019; Bama Politics, n.d.). The amendments from the Transportation and Energy Committee provided that unbelted adult occupants would be charged with violations and allowed only secondary enforcement of the requirement for adult rear-seat passengers. Representative Chris Sells carried the House companion bill, which passed on May 30; the vote was 76 yes, 17 no, 5 abstain, and 6 absent. News reports did not discuss the reasons for opposition to the bill. It was signed into law by Governor Kay Ivey (R) on June 6, 2019, with an effective date of September 1, 2019 (Kamin, 2019).

There was little media coverage of the bill prior to its passage, but there was considerable coverage after the passage and surrounding the governor's signing of the bill. News accounts recalled Scott's fatal crash and noted the tribute to his memory that the law represented. According to Scott's father, "His name will be out there on the seat belt law. He will forever be with us" (Hudson, 2019). Representative Kelvin Lawrence, an advocate of the bill, recalled Roderic Scott's motto, "I will be something great, and I will do something great," and said that Scott is still "doing something good and something great." Representative Sells noted, "National data show us that seat belt use and compliance with seat belt laws may be the most effective safety measure we can take." Senator Burkette said he hoped that voluntary compliance with the

new law would save many lives. He noted, “I am saddened that it took such a tragedy to serve as the impetus for passing the law.” Enactment of the law also was lauded by Tony Harris, Government Relations Manager at the State Department of Transportation (Legislature passes seat belt bill to save lives on Alabama roads, 2019; Moseley, 2019; Ross, 2019).

Implementation of Law

News reports announced the implementation of the law on September 1 (Gore, 2019; Mims, 2019; Smith, 2019; Wetzel, 2019; Yeager, 2019), describing its provisions including that enforcement is secondary and that rear-seat passengers 16 and older can be issued citations for noncompliance. The articles also cited research findings regarding the safety benefits of rear-seat belt use, national statistics showing that belt use is lower in the rear seat than in the front seat, national estimates of the lives saved by seat belt use, and the statistic that 60 percent of crash deaths in Alabama involved unbuckled occupants. The articles quoted officials from the Alabama Department of Transportation, including the Coordinator of Drive Safe Alabama (drivesafealabama.org); local and State law enforcement officials; a representative from AAA Alabama; and State legislators.

Additional Perspective From Interviews

Based on the news accounts in Alabama, it appeared that the push for an adult rear-seat belt law began relatively recently and that the bill passed relatively quickly and quietly without strong opposition. Some of the interviewees’ comments reflected views of the legislative process and highway safety legislation in general, rather than first-hand knowledge of the enactment of the adult rear-seat belt law. Nevertheless, their observations provided additional context on the enactment of the law and may help explain why the law seemed to pass relatively quickly and with little evident opposition.

Interviewees were asked why an adult rear-seat belt law was not enacted sooner. One interviewee noted that the regular legislative session is limited to 105 days, which makes it difficult to consider all the important issues and become knowledgeable about them. Given the multitude of issues and the short time frame to consider them, even a little resistance can stop a bill. One interviewee said that unsuccessful efforts often are attributable to the lack of a sponsor. The interviewees were not aware of substantial efforts to enact an adult rear-seat belt law prior to 2017 and had no specific knowledge about why the 2017 effort was unsuccessful.

The interviewees believed that the high-profile crash death of Roderic Scott was the primary factor in the enactment of the law. They talked, sometimes at length and in detail, about the elements of the crash that made it so compelling. One factor was Scott himself, a “hometown, good kid with a bright future.” He was a “premier basketball player” at a prominent high school in the capital city of Montgomery, where legislators were exposed to extensive coverage of the crash by major media outlets. News reports highlighted the grief of Scott’s parents and their passionate advocacy for a rear-seat belt requirement. One interviewee believed that Scott’s age of 17 was important, observing that laws protecting the safety of young people can be easier to enact. He said that it was a “no-brainer” to extend the rear-seat belt law to older teenagers, and this helped pass a law that applied to all occupants 16 and older. Finally, Scott’s death occurred in a crash in which belt use clearly would have made a difference; the belted front-seat occupants were not ejected while all three unbelted rear-seat passengers were ejected. Interviewees noted that the fact that his death appeared preventable added to the poignancy and tragedy of it.

According to the interviewees, Scott's death provided a human connection to seat belt use. His death put a name and a face on the risks of not wearing a seat belt, and the lack of a law covering all rear-seat passengers was "placed front and center." One interviewee said that some people may have thought the law already covered rear-seat passengers of all ages.

Although the crash was viewed as the primary factor in the enactment of the law, other potential factors were mentioned. These included a trend over the past few years in legislators and the public becoming more open to, interested in, and knowledgeable about highway safety issues. One interviewee noted increases in information available through groups such as AAA Alabama, media coverage of safety issues, and community outreach efforts to get public support.

The interviewees were not aware of organized opposition to the law. The difficulty of mounting an argument against the emotional story of Roderic Scott was noted. One person observed that there can be "quiet opposition" to highway safety laws from legislators, whose constituents may find the laws unnecessary, restrictive, or in violation of their freedom of choice. Another interviewee believed that enacting rear-seat belt laws can be difficult due to a perceived lack of urgency and a lack of understanding of the public health benefits.

The interviewees viewed a secondary enforcement adult rear-seat belt law as a natural progression in Alabama's seat belt laws and consistent with the legislature's tendency to take an incremental approach. They recalled that the front-seat belt law began as a secondary enforcement law and then was upgraded to primary enforcement. Secondary enforcement laws were described as more palatable to people who are unsure about the severity of an offense or concerned about protecting personal liberty. Some legislators view a secondary enforcement provision as "safer," allowing for a "trial run," and a means to gauge the public's reaction to a new law. One interviewee noted that there is always a concern about highway safety laws being used for racial profiling, and a secondary enforcement constraint may help to allay these concerns.

Although the view was expressed that a primary enforcement law is easier to enact after a secondary enforcement law is on the books, the interviewees were not aware of planned efforts to upgrade the adult rear-seat belt requirement to primary enforcement.

New York State's Adult Rear-Seat Belt Law

Background

On December 1, 1984, the nation's first mandatory seat belt use law took effect in New York State. A 2016 AAA Northeast report, *Buckle Down on Safety: The Case for a Rear Seat Belt Law*, summarized the process of enactment (Slatky, 2016). The Senate's bill required only the driver and front-seat passengers to buckle up, whereas the assembly's bill covered all passengers and included larger fines and even possible jail time for violations. Ultimately, to ensure passage, the rear-seat requirement was dropped during negotiations and the less stringent penalties were retained. The final bill, which passed both houses, required seat belt use for all drivers, all front-seat passengers, and rear-seat passengers younger than 10. Enforcement of the provisions has always been primary.

Despite intense pressure from opponents of the measure, Governor Mario Cuomo signed the bill into law on July 12, 1984 (Skatky, 2016). Subsequent court challenges and repeal attempts

failed. When signing the bill, the governor approved a “chapter amendment” that exempted taxicabs, buses, livery vehicles, and large trucks, which was consistent with the intent of the original bill’s sponsor.

An important law change occurred in 2000 when rear-seat passengers 15 and younger were required to buckle up (Sklatky, 2016). Other changes included adding rural mail carriers to the list of exclusions in 1989, removing the exclusion for tractors and some large trucks in 1990, and adding a requirement for volunteer firefighters and EMS workers to wear belts in 2015. Effective November 1, 2017, seat belt use was required for drivers of taxicabs and other for-hire vehicles and their front-seat passengers 16 and older (Lovett, 2017). It is notable that New York’s graduated driver’s license law has required every occupant, regardless of age or seating position, to use a safety restraint when riding with a driver who holds either a learner’s permit or a junior (i.e., intermediate) license (New York State Department of Motor Vehicles, 2020).

As of October 2020, the law requires all children younger than 8 to be restrained in an appropriate child restraint system while riding in a motor vehicle. The law defines an appropriate child seat according to the child’s age or the height and/or weight specified by the restraint manufacturer (New York State Law enforcement, n.d.). Effective November 1, 2019, all children under age 2 must ride in a rear-facing car seat.

Prior to the most recent law changes in 2020, summarized below, drivers and front-seat passengers 16 and older in taxis and other for-hire vehicles were required to buckle up, but the law did not appear to require restraint use by other passengers (Operation of vehicles with safety seats and safety belts, 2020). A 2018 news story stated that young passengers in the rear seats of taxicabs and for-hire vehicles are exempt from laws requiring car seats or seat belts (Wolfe, 2018).

Major changes to the seat belt law occurred in 2020. Early in that year the legislature passed bills requiring seat belt use by occupants 8 and older of taxicabs and other for-hire vehicles, including limousines (New York State Senator Brad Hoylman’s Office, 2020) and by all occupants of personal vehicles (New York State Senator David Carlucci’s Office, 2020b). Governor Andrew Cuomo signed the bill pertaining to for-hire vehicles on February 2, 2020 (Senate Bill S7134, 2019-2020 Legislative Session, 2020), and signed the bill pertaining to personal vehicles on August 11, 2020 (New York State Office of the Governor, 2020b). Both laws were implemented on November 1, 2020.

Under New York law in October 2020, drivers and adult passengers are required to buckle up can be fined up to \$50 for violations, and drivers can be fined \$25 to \$100 and receive three driver’s license penalty points when passengers younger than age 16 are not legally restrained (New York State Department of Motor Vehicles, 2020). In addition to the exclusions noted above, belt use is not required in emergency vehicles or 1964 or older vehicles, by passengers in buses other than school buses (seat belt use may be required by the school district), or by people with evidence of a medical exemption. It appears that the fine for a first violation of the child restraint law that involves a child under 8 may be waived by the court with documentation that an appropriate child restraint device has been obtained (Operation of vehicles with safety seats and safety belts, 2020).

Attempts to Enact Adult Rear-Seat Belt Law Prior to 2019

For more than a decade prior to 2019, safety advocates worked to extend the seat belt law to cover passengers 16 and older in the rear seat. An adult rear-seat belt law was a legislative priority of AAA for many years; it appears from news reports that AAA was the most vocal advocacy organization (WGRZ-TV, 2019; Associated Press, 2019; Campbell, 2016; Lombardo, 2019a; Weiner, 2019). It is not clear from press reports why attempts prior to 2019 failed. There appears to have been public support for an adult rear-seat belt law. Based on an online survey conducted by AAA New York of a random sample of 800 New York drivers in December 2016 and January 2017, an adult rear-seat belt law was strongly supported by 44 percent of New York drivers and somewhat supported by 25 percent, somewhat or strongly opposed by 16 percent, and the remaining 16 percent either neutral or having no opinion (AAA New York State, 2017).

During the 2009-013 legislative sessions, adult rear-seat belt bills passed the assembly but did not pass the Senate, although they advanced to the third reading before voting (Senate Bill S1169B, 2009-2010 Legislative Session, 2010; Senate Bill S1337, 2011-2012 Legislative Session, 2012; Senate Bill S389, 2013-2014 Legislative Session, 2014). Bills did not come to a vote in either house during the 2014-2018 sessions (Senate Bill S389, 2013-2014 Legislative Session, 2014; Senate Bill S1535C, 2015-2016 Legislative Session, 2016; Senate Bill S298, 2017-2018 Legislative Session, 2018; Assembly Bill A2449, 2016; Assembly Bill A1582, 2018). A 2016 news article noted that the chances of passage during the 2016 session were “bleak” as the bill lacked a sponsor in the Senate (Campbell, 2016). News reports cited long support for the law by Governor Cuomo (Campbell, 2019). The law was part of the governor’s budget proposals in 2017 (Lore, 2017) and 2018 (Vaugh, 2018) but was not part of the final budgets.

Attempt to Enact Law in 2019

In 2019 a law requiring adult rear-seat passengers to buckle up came closer to enactment than ever before. Noting 2018 election results, a May 2019 news story quoted Assemblyman Walter Mosley, sponsor of the assembly bill to require rear-seat belt use: “With the change in dynamics here in Albany, we went from ‘Could this be passed?’ to [the question of] when it will be passed” (Lombardo, 2019b).

Another likely factor was the aftermath of a horrific limousine crash that drew attention to the fact that New York does not require adult rear-seat passengers to wear seat belts. On October 6, 2018, a stretch limousine lost control and ran off the road, killing all 17 passengers and the driver, plus two pedestrian bystanders (Rulison, 2019). Investigations by local and State authorities and the National Transportation Safety Board uncovered various problems with the limousine and the limousine company, including that the limousine was illegally on the road after being placed out-of-service for numerous safety violations. All the limousine passengers were unbelted. Although lap belts were available, they were under the bench seats and so were not visible or readily accessible to the passengers. In the final accident report, the NTSB determined that the probable cause of the crash was the limousine company’s “egregious disregard for safety” and that ineffective oversight by the State Departments of Transportation and Motor Vehicles contributed to the crash by allowing the unsafe vehicle to remain on the road (NTSB, 2020). The Board concluded that as a result of the failure of its brake system, the limousine traveled about 100 to 116 mph down a steep incline before it ran a stop sign, struck an unoccupied SUV that smashed into the two bystanders, and finally slammed into an embankment (Rulison, 2020).

As was the case in 2018, a rear-seat belt requirement was included in the governor's 2019 budget proposal but dropped from the final budget deal approved on April 1 (Gormley, 2019). However, both chambers considered identical rear-seat belt bills in the normal legislative process. Sponsored by Senator David Carlucci, S4336 was referred to the Transportation Committee on May 7 (Senate Bill S4336, 2019-2020 Legislative Session, 2020). It moved easily through that committee and the Rules Committee and was passed by the Senate on May 15 by a 51-7 vote (4 excused). Sponsored by Assemblyman Mosley, A6163 was referred to the Transportation Committee on February 28, moved through the Codes Committee, and advanced to the third reading on the assembly floor on May 2 (Assembly Bill A6163, 2020). However, it did not come to a vote before the Legislature adjourned on June 19, 2019.

There were numerous news stories about the adult rear-seat belt bills. News reports and remarks from the bill sponsors and other proponents emphasized research on the risks to unbelted rear-seat passengers (Gormley, 2018; Lombardo, 2019b; Pignataro, 2019), the risk that unbelted occupants pose to other vehicle occupants (Garcia, 2019; Lombardo, 2019b), the fact that seat belt use rates are lower in the rear seat (Lombardo, 2019a; Wolfe, 2018), and the effectiveness of laws in increasing belt use (Pignataro, 2019; Wolfe, 2018). News reports often cited statistics from the 2016 AAA Northeast report (Slatky, 2016), including the number of unbelted crash deaths in New York State (Vielkind, 2019; Weiner, 2019). News reports mentioned support from the AAA and the Medical Society of New York (Campbell, 2019a; Pignataro, 2019), and these organizations held a news conference in May 2019 to discuss their support for the bills (Associated Press, 2019). A group called Advocates for Highway and Auto Safety (2019) issued an alert calling upon supporters to contact legislators to urge passage of the bills.

The topic of rear-seat belt use remained in the news into fall 2019. On October 2, 2019, the NTSB (2019) released a report that summarized occupant protection issues that arose during its investigation of the limousine crash. It reiterated an earlier recommendation that New York State require seat belt use by occupants in all vehicle seat positions equipped with passenger restraint systems, including passenger seats in limousines.

Enactment of Law in 2020

In January 2020, the legislature and the governor agreed to a package of limousine safety reforms (Spector, 2020; Steininger, 2020; Villeneuve, 2020a; Williams, 2020) that passed the legislature on January 14, 2020. For these bills, there was no mention of seat belt use by adults in the rear seats of personal vehicles in the bill language or in the news coverage. On February 3, 2020, the governor signed the package of limousine reform bills into law (New York State Office of the Governor, 2020a).

Even with the passage of limousine safety reforms, efforts continued to extend the seat belt use requirement to occupants 16 and older sitting in the rear seat of personal vehicles. Senator Carlucci sponsored Senate Bill S4336, and Assemblyman Mosley sponsored Assembly Bill A6163. A press conference on February 11, 2020, called for passage of the bills (New York State Senator David Carlucci's Office, 2020a). The conference featured statements from the bill sponsors; Dr. Kurt Edwards, chief of trauma and critical care at Albany Medical Center; and Laura Casellini, who sustained catastrophic injuries when riding unbelted in the rear seat of a vehicle hit by a drunk driver. Explaining that she sustained a permanent brain injury in the crash, Casellini called on the legislature and the governor to "do the right thing ... before anyone else

has to suffer the way I did.” The press release explained that the proposed legislation would cover passengers in Lyft and Uber vehicles. It also noted that AAA New York State had spearheaded support for the bills and that 26 organizations representing traffic safety public health, health care, and the insurance industry endorsed a letter of support.

The assembly approved the bill on February 12, 2020, by a 105-39 vote (Assembly Bill A6163, 2020), and the Senate approved the bill on March 3, 2020, by a 54-8 vote (Senate Bill S4336, 2019-2020 Legislative Session. 2020). The law was to take effect on the first day of November following the signing of the bill into law. News releases and news stories published during the consideration of the bill (New York State Senator David Carlucci’s Office, 2020a; WRGB staff, 2020a) or after its approval (Associated Press, 2020b; Cafaro, 2020; New York State Senator David Carlucci’s Office, 2020b; Precious, 2020) cited statistics on belt use rates in the rear seat, the risk of serious injury or death for unbelted rear-seat passengers, the risk of death to front-seat occupants from unbelted rear-seat passengers, and the number of fatally injured rear-seat passengers who were unbelted.

Several days after the legislature approved the bill, the governor declared a disaster emergency due to the outbreak of COVID-19 in the State. In the following months, the normal operations of State government, including the legislature and the Office of the Governor, were interrupted to devote all resources to addressing the public health emergency. After the crisis abated, the legislature convened in a special session during the week of July 21. On July 29, a joint statement from a coalition of organizations urged the governor to sign the seat belt upgrade into law (Advocates for Highway and Auto Safety, 2020); the organizations represented traffic safety, public health and medical professionals, emergency responders, and the insurance industry. On August 11, the governor signed the bill into law. In a press release, the governor said, “We've known for decades that seat belts save lives and with this measure we are further strengthening our laws and helping to prevent needless tries. It was under my father's leadership that New York became the first State in the country to pass a seat belt law, and the nation followed his lead. Now we are building upon this legacy and helping to create a safer and stronger Empire State for all (New York State Office of the Governor, 2020b).” The press release also quotes Senator Carlucci: “Thank you to the advocates, including AAA, for their strong support of this legislation.” A news story announcing the new law cited the 2016 AAA report finding that 866 unbuckled rear-seat passengers died in crashes in New York over the previous 20 years (Robinson, 2020). It also noted that New York will join the list of 19 States that have primary enforcement belt laws covering rear seat as well as front-seat occupants.

Additional Perspective From Interviews

The interviewees were not aware of organized opposition to expanding the seat belt law to cover adult rear seat occupants. The interviewees did not attribute the failure to pass a bill sooner to organized opposition or arguments against the bill but rather to inertia, with an adult rear seat belt law not being a priority or “front and center.” One interviewee, a former law enforcement officer, mentioned that law enforcement expressed some concerns about the difficulties of enforcing a rear seat belt law as a possible contributing factor.

The interviewees did not believe that there was a clear reason why the bill failed to pass the assembly at the end of the 2019 legislative session. One interviewee noted that a bill can often falter in the closing days of a session due to competing priorities and the time crunch. She noted

that it was helpful that the bill remained on the calendar so that another vote on the floor of the chambers could be taken in 2020. It was noted that AAA realized in 2019 that more education was needed about the importance of having an adult rear seat belt law. The law needed to be seen not as a small traffic safety law, but as a larger public health issue, with the safety benefits highlighted more clearly. This realization led to a united approach by a large group of advocates working for the law, including the insurance industry, health and medical groups, highway safety groups, and others.

The interviewees said that the limousine crash was an important factor in the passage in 2020 because it facilitated conversations about New York's occupant protection laws. The interviewees noted the widespread and lasting media coverage of the crash, with the groups favoring a rear seat belt law "jumping on" the earned media. One interviewee noted other factors, including the AAA report detailing the dangers of not using seat belts in the rear seat, which received extensive media coverage; NTSB's preliminary report on the limousine crash and the reiteration of its recommendation that New York upgrade its seat belt law to cover all vehicle occupants; and the changes in Senate leadership that resulted in support for an adult rear-seat belt law by the Senate Transportation Committee.

With regard to information used with the legislature or in other advocacy efforts, one interviewee mentioned assistance by the NHTSA regional office in obtaining information on unbelted crash fatalities that was not available from the agency's online portal for FARS. In an email sent after the bill signing, one interviewee indicated that the advocates' press release urging the governor to sign the bill was helpful in securing his signature soon after the legislature adjourned.

Discussion of Case Study Results

Currently, some States have seat belt laws that have limited reach because they do not apply to all vehicle occupants or do not permit the primary enforcement of violations. The current study documented how two States achieved upgrades to their rear-seat belt laws. Alabama and New York State extended seat belt requirements to cover adult occupants in the rear seat in 2019 and 2020, respectively. An objective of the current study was to identify the factors in these States' successes, including the strategies used to overcome obstacles.

There are some common elements in the two belt law upgrades. The States shared some commonalities that appeared to contribute to the enactment of the laws. Both involved crash victims and their families, who shared emotional accounts of the life-saving benefits of seat belts. In both States, legislative sponsors not only guided the seat belt bills through the legislature but promoted the bills in the media. In each State, proponents emphasized the benefits of seat belts rather than enforcement or citations. Both States relied on research evidence on the safety benefits of the proposed laws. News coverage focused more extensively on proponents of the belt law upgrades and the arguments or evidence supporting the upgrades rather than the opposition or arguments against the upgrades. The coverage included research evidence on the reduced risk of death or injury with seat belts and the risks of non-use of seat belts to other occupants. News stories also mentioned the number of unbelted fatalities in the State.

Despite common elements for both States, there are several notable differences that influenced how each State achieved success. The differences illustrate that each State is unique in the following respects: occupant restraint laws; history of efforts to upgrade the laws; membership, leadership, resources, and strategic approaches of the law's proponents; availability of business partners or advocacy groups that can promote highway safety legislation; and various political, social, economic, and other factors. Here are summaries of some of the important differences and how these differences influenced strategies to achieve rear-seat belt law upgrades.

Regarding occupant restraint laws and the history of efforts to upgrade them, one notable difference was that there were long-standing, unsuccessful efforts to upgrade the seat belt laws in New York, whereas the upgrade effort in Alabama appeared to be relatively recent and achieved more easily. Another major difference was that Alabama amended the enforcement provisions (primary to secondary) to secure passage of the bills, whereas New York did not.

Although the interviews and news reports may not have fully captured the extent of the efforts of proponents of the laws, they suggest that the lead organizations, membership, and their efforts varied. In New York, AAA appears to have been the primary highway safety advocacy group promoting an adult rear-seat belt law, but their role in Alabama was smaller. While some States place constraints on the role of highway safety offices in promoting highway safety legislation, the New York example demonstrates highway safety advocacy groups can play critical roles, as can business, insurance, and medical and health care interest groups.

As far as social and political factors, the amount of news coverage on the efforts to secure the belt law upgrades also varied. There was more coverage in New York than in Alabama. Media references to opposition to the rear-seat belt law upgrades were seldom mentioned in New York and never mentioned in Alabama. Political opposition to an adult rear seat belt law occurred in New York, while the adult rear seat belt bill in Alabama faced little political opposition.

As described, there were several factors involved in the enactment of the rear-seat belt law upgrades, but their relative importance differed by State. Alabama and New York took different paths to achieving rear-seat belt law upgrades, and they illustrate that more than one strategy may be effective. The different strategies reflect the differences in the political and social conditions in each State at the time of the upgrade. One aim of this project was to identify which specific factors were most critical in each State. Although it is difficult to identify all the behind-the-scenes work that led to success, the following discussion briefly highlights specific factors that appeared to be most important.

Alabama

There appear to be three main factors in Alabama's enactment of an adult rear-seat belt law. The precipitating and likely most important factor was the death of 17-year-old Roderic Scott, who was riding unbelted in the rear seat and ejected when the vehicle overturned. The bill to enact an adult rear-seat belt law was introduced approximately 1 year after Scott's death and signed into law about 3 years later. The interviewees offered several reasons for why the story of his death was so powerful in garnering support for the law. These included his youthfulness, personal qualities, and stature as a premier athlete, as well as the vocal advocacy of his parents. Extensive news coverage in his hometown of Montgomery, the State capital, continued until after the law was implemented. It was clear from the circumstances of the crash that a seat belt very likely would have saved his life, and this provided a stark reminder of the life-saving benefits of rear-seat belt use. A second factor in the enactment of the law was the advocacy of the Senators Quinn and Burkette, who both represented Montgomery. A third factor was amending the bill to allow for only secondary enforcement, which interviewees described as critical to the bill's passage. There was a precedent for this approach in that the front-seat belt law provided for secondary enforcement when first implemented in 1991 and then was upgraded to primary enforcement in 1999.

New York

New York State implemented the first mandatory seat belt use law in the United States in 1984; the law always has been primary enforcement. Thus, it is surprising that until 2020 the State did not require rear-seat passengers 16 and older in personal vehicles to buckle up. There had been efforts to pass an adult rear-seat belt law for many years and came close in 2019 but failed in the last days of the legislative session; it finally succeeded in 2020. It is notable that the belt law changes require seat belt use not only by adult rear-seat passengers of personal vehicles (including Lyft and Uber vehicles) but also by passengers 8 and older in taxicabs, limousines, and other for-hire vehicles.

Three factors appear most important in New York's seat belt upgrade. The first was a change in the State Senate leadership because of the 2018 State elections. In recent years, efforts to pass the belt law upgrade had stalled in the Senate, and the new leadership signaled support for the upgrade. It is possible that this development alone would have been sufficient. However, a second important development in October 2018 changed the political landscape regarding the State's occupant protection laws. This was the horrific limousine crash in which all 17 passengers were unbelted and died. The crash received massive, continuing media coverage that focused in part on the fact that belt use is lower in rear seats than in front seats and on the State's lack of an adult rear-seat belt requirement. The media coverage increased in October 2019 when

an NTSB report concluded that some limousine passengers may have survived had they been wearing seat belts. The NTSB reiterated its recommendation that New York seat belt laws cover all seating positions in all vehicles. A final factor in New York's belt law upgrade was the long-time leadership of AAA, which published a frequently cited report on the benefits of rear-seat belt use in 2016 and was a vocal and persistent proponent of the law.

Summary

Although each State faced different challenges and employed different strategies, the strategies that appeared most successful included the following:

- Engaging crash victims and the families of crash victims to share their experiences and highlight needed upgrades to the seat belt laws.
- Identifying legislative sponsors willing to push for the law with colleagues and in the media.
- Identifying and being willing to consider concessions if they are necessary to enact an upgrade.
- Identifying a person or organization to lead a broad-based coalition and to develop an overall strategy, coordinate efforts, and provide consistent messaging.
- Emphasizing the safety and economic benefits of seat belt law upgrades rather than enforcement or citations.
- Developing evidence-based summaries of the benefits of seat belt use and law upgrades.

The case studies demonstrate how efforts to upgrade seat belt laws rely heavily on research evidence. For example, both States countered opposition arguments by pointing to the risk that an unbelted occupant poses to other occupants. Both cited the number of unbelted crash fatalities in their States. Some interviewees noted additional research that would be helpful, including data that were more current on the costs of traffic crashes, injuries, and fatalities, and the effects of adult rear-seat belt laws on seat belt use and traffic injuries and fatalities.

Observations

Rear-seat belt observations were conducted to evaluate rear-seat belt usage across States with differing rear-seat belt law types. These include States with no rear-seat belt laws, States with primary rear-seat belt laws, and States with secondary rear-seat belt laws. The researchers conducted observations at 120 sites per State, resulting in more than 8,000 adult rear-seat observations.

Methods

The design plan included the collection of data on rear-seat and front-seat adult occupants in nine States. Each State was part of a 3-State cluster (or triad). Each triad consisted of States with primary front-seat belt laws but each with a different rear-seat belt law. Specifically, one State in each triad had no adult rear-seat belt law; one had a secondary adult rear-seat belt law; and one had a primary adult rear-seat law.

State groupings were based on front-seat use rates at the time of selection. States being compared within triads had similar front-seat use as measured in their statewide survey. The researchers selected States to be geographically similar in so far as possible to account for extraneous variables. That is, occupants from different regions of the country or from States with different demographics may behave differently for reasons other than the laws. The inclusion of secondary law States addresses the question of whether a secondary rear-seat law would have similar effect of a primary rear-seat law. The researchers excluded States with secondary front-seat laws from the study because it would significantly complicate the research design and because no State exists that has a secondary front-seat law and primary rear-seat law.

The researchers designed the sampling plan to maximize the number of rear-seat observations made during data collection. The most important aspect of the design is that each triad, and all States in the study, had an identical data collection plan thus making it possible to compare differences. The sample design is complex in that it includes several counties, several roadway types, and both rural and urban counties.

Researchers selected nine States for this study, each being part of one of the three triads, to match as many factors as possible except for the laws. The primary focus for grouping into triads was front-seat belt use, but the researchers also examined some demographics data from the U.S. Census (see Table 1). Given the limited number of States from which to select (particularly among those with a secondary adult rear-seat belt law), the researchers deemed the following nine States to be the best triads for comparison of rear-seat belt use rates.

Table 1. Selected State Facts

Triad	State	Rear Law Type	Front Belt Use 2015	Front Belt Use 2016	2015 Population (millions)	Median Household Income (\$)	% Non-Hispanic White	% Urban
1	TX	Primary	90.5%	91.6%	27.5M	\$55,653	75.0%	84.7%
1	OK	No law	84.5%	86.6%	3.9M	\$48,568	72.6%	66.2%
1	KS	Secondary	82.1%	87.0%	2.9M	\$53,906	84.7%	74.2%
2	IL	Primary	95.2%	93.0%	12.8M	\$59,196	77.2%	88.5%
2	NY	No law	92.2%	91.8%	19.8M	\$60,850	63.8%	87.9%

Triad	State	Rear Law Type	Front Belt Use 2015	Front Belt Use 2016	2015 Population (millions)	Median Household Income (\$)	% Non-Hispanic White	% Urban
2	NJ	Secondary	91.4%	93.4%	9.0M	\$72,222	67.7%	94.7%
3	KY	Primary	86.7%	86.5%	4.4M	\$45,215	87.4%	58.4%
3	TN	No law	86.2%	88.9%	6.6M	\$47,275	77.7%	66.4%
3	NC	Secondary	89.9%	91.7%	10.0M	\$47,830	69.1%	66.1%

The researchers conducted an initial pilot study (during statewide survey data collection) in four States (Florida, Louisiana, Connecticut, and Arizona) to determine adult rear-seat incidence across varying site characteristics (urban versus non-urban, day of week, time of day). A full pilot (in Tennessee and Connecticut) then refined the proposed procedures, observation methodology, and determined study size and site makeup. Using clicker counts, the researchers estimated the proportion of vehicles with rear-seat passengers among a randomly selected sample of observed vehicles. The researchers used a site-selection mix of both urban and rural areas and observed sites on two day-of-week groupings (Monday–Wednesday and Thursday–Sunday) and three time-of-day groupings (morning, afternoon, and evening). Researchers did this to determine optimal time periods (days and time) to maximize collection of use information on rear-seat adult occupants. Based on the pilot finding, the researchers estimated that 120 one-hour site observations per State would be adequate to generate the volume of rear-seat passengers for our analytical purposes.

County selection started with counties already selected for use in each State’s NHTSA-approved statewide survey. The researchers selected these counties from among those in each State that contained 85 percent of the passenger vehicle occupant fatalities. However, this was not an attempt to develop a NHTSA-approved statewide survey design, as that was unnecessary for the purposes of this study. The seven counties used in each State were selected so that four were somewhat urban and three were rural. Counties were geographically spread throughout the State.

The researchers selected road segments from which to observe seat belt use in a manner that avoided selection bias. Samples came from all available roadway functional classes except local roadways, which typically have low traffic volumes. When selecting from other roadway functional classes, the researchers ensured that road segments had sufficient traffic volume to produce enough numbers of observations. Specifically, a minimum volume, either annual average daily traffic (AADT) or daily vehicle miles traveled (DVMT), included only segments making up at least 80 percent of the traffic volume in each grouping of functional classes (strata) within each State.

The researchers identified the qualifying route segments comprising the sampling population from the States’ Highway Performance Monitoring System (HPMS) or comparable databases. In the sampling, the researchers omitted from consideration all road segments identified as frontage roads and cul-de-sacs if these were not already omitted.

The researchers stratified segment selection across functional class. Specifically, researchers distributed segments across counties and road functional class strata based on the following considerations. First, the route segments from each of the survey counties were stratified into three groupings.

1. Interstates and Other Expressways

2. Other Principal Arterials and Minor Arterials
3. Collectors

This step was dependent upon all States within a triad providing functional class data. Other comparable stratification was necessary if such data were not available.

Within each county-road type stratum, the researchers chose road segments with probability proportional to size (PPS), where “size” is represented by segment DVMT. While DVMT is the preferred measure of size, for some States, AADT was substituted if segment lengths (or DVMT) could not be obtained. The target number of segments to be selected (240) was double the number of segments required for observation (120) in case some sites were unobservable.

For selection the researchers used a method developed for statewide survey site selection where the odds of a segment being selected were equal to that site’s proportion of the DVMT of the entire stratum to which that segment belongs. That is, sampling was proportionate to size where the measure of size is DVMT.

Two of the urban counties contained 25 sites and two contained 20 sites (90 urban sites total). Each of the three non-urban counties had 10 sites each (30 non-urban sites). The final sample contained 23 urban interstates, 22 urban arterials, and 45 urban collectors. There were also 4 non-urban interstates, 9 non-urban arterials, and 17 non-urban collectors.

Teams collected data during daylight hours between 7 a.m. and 6 p.m. The observation period at each site was 60 minutes in length. Each day, the teams observed two sites in the morning (7 a.m. to 10:45 a.m.), one at midday (10:45 a.m. to 2:30 p.m.), and two in the evening (2:30 p.m. to 6 p.m.). This framework was based on the profile of rear-seat adult occupation created during the pilot study. Table 2 below indicates the distribution of sites across day-of-week groupings. The researchers divided sites into rural and urban locations and distributed according to the profile as well. Specifically, the researchers determined that rural locations (in the pilot) had exceptionally low weekend adult rear-seat occupancy rates.

Table 2. Day of Week Distribution

Time/Location Group	% of Sites
Urban Thu-Sun	41.7%
Urban Mon-Wed	33.3%
Rural Thu-Sun	25.0%
Total	100%

Where possible, observation schedules included five sites making up a “cluster” to be completed within a single day. The researchers randomly selected the day’s first site within each cluster, and then scheduled the remaining sites to maximize travel efficiency while balancing road strata over time and day.

Data Collection

Observers consisted of eight experienced people, operating in pairs, for field data collection per each triad. All pairs of observers cycled through all States within a triad. All observers have experience conducting seat belt observations in previous studies, and all were trained to the specific requirements of this project’s belt use observations. Prior to any data collection, the

researchers reviewed the procedures with the observers in a training session that included on-street practice.

In addition to training on belt use observation requirements, the researchers trained observers to interpret electronic site location (“pin”) maps, select initial traffic direction, and document all pertinent decisions. Researchers also trained observers to deal with adverse conditions, such as bad weather or temporary traffic impediments, that could require rescheduling and how to reschedule sites. Researchers also gave observers procedures to obtain alternate sites should a primary site prove to be unusable. The same observers were used in each State within a triad. Each observer had the same proportion of sites to eliminate any observer biases. To the extent possible, observers remained blind to State laws and the general purpose of the study.

Two observers worked together. One observer noted seat belt use and non-use in the front-seat and the other observer doing the same for rear-seat use for the duration of each trial. The front-seat observer selected a safe observation point. This observer also chose the direction of travel to observe. The direction of travel to be observed was randomly selected (by a coin flip, except in cases where one direction was much safer or where belt use was much more readily observable such as due to sun glare). A non-random choice was not to be made lightly, but only in cases where attempting to observe in one direction could not be done safely or effectively. Observers recorded any site-specific details, including the specific location along the segment and the traffic direction to observe.

From this vantage point, the front-seat observer recorded the belt use or non-use of outboard front-seat occupants (driver and passenger) of qualifying vehicles while the rear-seat observer recorded rear-seat use and non-use. Qualifying vehicles included all passenger cars, pickup trucks, SUVs, and vans, whether private or commercial, with gross vehicle weight ratings of 10,000 lbs. or less. Observers excluded other vehicles such as large buses, larger trucks, farm equipment, and emergency vehicles (law enforcement, EMS, etc.).

Observers recorded the shoulder belt use/non-use of all outboard front-seat occupants and rear-seat passengers of qualifying vehicles. Proper placement of the shoulder belt qualified as restrained; nonuse or improper use (e.g., behind the back or under the arm) qualified as unrestrained. If shoulder belt position could not be determined, belt use was coded as unsure. All outboard front- and rear-seat passengers, regardless of age, were coded except infants in child safety seats. Children in booster seats were coded. Age ranges (15-17, 18-25, 26-59, and 60+ for drivers and 0-12, 13-17, 18-25, 26-59, and 60+ for passengers) and race categories (White, Black, Hispanic, and Other) were coded for both front- and rear-seat passengers. However, the focus of this study is rear-seat belt use, and thus the front-seat observations are not discussed below. Further, the study did not link the front- and rear-seat belt observations, so the study cannot compare behavior within the same vehicle.

Results

This section presents three sets of results. The first describes characteristics of the observed occupants, vehicles, and locations. The second examines rear-seat belt use by law type. The third uses multivariable logistic regression to examine rear-seat belt use by presence and law type while controlling for differences in the characteristics of the occupants and locations.

Descriptive Statistics

Observers made judgements of occupants' sex, age, and race as well as the type of vehicles in which they were traveling. Urban or rural was identified by the site location. Tables 3 through 7 show the frequency and distribution of observations across these variables.

Table 3. Rear-Seat Occupant Age by Triad by Presence and Law Type

		Triad 1		Triad 2		Triad 3	
Law Type	Age	N	%	N	%	N	%
Primary	18-25	403	37.5	335	36.9	175	26.7
	26-59	526	49.0	444	48.8	366	55.8
	60+	145	13.5	130	14.3	115	17.5
	Total	1,074	100.0	909	100.0	656	100.0
Secondary	18-25	496	35.0	189	33.9	267	24.6
	26-59	716	50.6	279	50.0	633	58.4
	60+	204	14.4	90	16.1	184	17.0
	Total	1,416	100.0	558	100.0	1,084	100.0
No Law	18-25	572	42.6	184	34.3	175	26.4
	26-59	622	46.3	300	56.0	365	55.1
	60+	149	11.1	52	9.7	122	18.4
	Total	1,343	100.0	536	100.0	662	100.0

Note: There were two cases with unknown age: one in Triad 1 primary and one in Triad 1 no law.

Table 4. Rear-Seat Occupant Sex by Triad by Presence and Law Type

		Triad 1		Triad 2		Triad 3	
Law Type	Sex	N	%	N	%	N	%
Primary	Male	550	51.2	512	56.3	358	54.6
	Female	523	48.7	397	43.7	298	45.4
	Unknown	1	0.1	0	0.0	0	0.0
	Total	1,074	100.0	909	100.0	656	100.0
Secondary	Male	726	51.3	315	56.5	502	46.3
	Female	687	48.5	241	43.2	580	53.5
	Unknown	3	0.2	2	0.4	2	0.2
	Total	1,416	100.0	558	100.0	1,084	100.0
No law	Male	699	52.0	340	63.4	313	47.3
	Female	643	47.9	196	36.6	348	52.6
	Unknown	1	0.1	0	0.0	1	0.2
	Total	1,343	100.0	536	100.0	662	100.0

Table 5. Rear-Seat Occupant Vehicle Type by Triad by Presence and Law Type

		Triad 1		Triad 2		Triad 3	
Law Type	Vehicle Type	N	%	N	%	N	%
Primary	Car	606	56.4	436	48.0	326	49.7
	Truck	134	12.5	200	22.0	80	12.2
	SUV	191	17.8	164	18.0	146	22.3
	Van	143	13.3	109	12.0	104	15.9
	Total	1,074	100.0	909	100.0	656	100.0
Secondary	Car	808	57.1	248	44.4	582	53.7
	Truck	185	13.1	90	16.1	84	7.7
	SUV	241	17.0	139	24.9	287	26.5
	Van	182	12.9	81	14.5	131	12.1
	Total	1,416	100.0	558	100.0	1,084	100.0
No law	Car	705	52.5	198	36.9	357	53.9
	Truck	170	12.7	135	25.2	52	7.9
	SUV	261	19.4	131	24.4	166	25.1
	Van	207	15.4	72	13.4	87	13.1
	Total	1,343	100.0	536	100.0	662	100.0

Table 6. Urban/Rural Rear-Seat Occupants by Triad by Presence and Law Type

		Triad 1		Triad 2		Triad 3	
Law Type	Pop. Dens.	N	%	N	%	N	%
Primary	Urban	844	78.6	765	84.2	397	60.5
	Rural	230	21.4	144	15.8	259	39.5
	Total	1,074	100.0	909	100.0	656	100.0
Secondary	Urban	1,131	79.9	425	76.2	798	73.6
	Rural	285	20.1	133	23.8	286	26.4
	Total	1,416	100.0	558	100.0	1,084	100.0
No law	Urban	1,079	80.3	392	73.1	423	63.9
	Rural	264	19.7	144	26.9	239	36.1
	Total	1,343	100.0	536	100.0	662	100.0

Table 7. Rear-Seat Occupant Race by Triad by Presence and Law Type

		Triad 1		Triad 2		Triad 3	
Law Type	Race	N	%	N	%	N	%
Primary	White	844	78.6	427	47.0	477	72.7
	Black	130	12.1	102	11.2	67	10.2
	Hispanic	60	5.6	343	37.7	78	11.9
	Unsure	40	3.7	37	4.1	34	5.0
	Total	1,074	100.0	909	100.0	656	100.0
Secondary	White	857	60.5	437	78.3	573	52.7
	Black	254	17.9	49	8.8	189	17.4
	Hispanic	209	14.8	34	6.1	156	14.4
	Unsure	96	6.8	38	6.8	168	15.5
	Total	1,416	100.0	558	100.0	1,086	100.0
No law	White	928	69.1	364	67.9	468	70.9
	Black	271	20.2	39	7.3	95	14.4
	Hispanic	113	8.4	57	10.6	52	7.9
	Unsure	31	2.2	76	14.2	45	6.8
	Total	1,343	100.0	536	100.0	660	100.0

Front-seat observation data are included for comparison. Because every vehicle contains at least one front-seat occupant (the driver), the number of observations for front-seat occupants vastly outweighed the rear-seat observations (particularly considering that these data included only those occupants judged to be at least 18 years old). Table 8 shows the number of front-seat observations made for adults by triad and law type as well as the percent restrained. While triads were selected for similar front-seat belt use, rates within each triad differed by 1.9 percent, 3.5 percent, and 4.4 percent.

Table 8. Front-Seat Belt Use by Triad

		Triad 1		Triad 2		Triad 3	
Law Type		N	%	N	%	N	%
Primary		87,198	87.9	27,110	86.5	25,309	89.1
Secondary		65,198	87.2	31,740	90.0	20,333	87.2
No law		72,030	89.1	28,348	87.0	19,556	84.7

Rear-Seat Analyses

Primary analyses used a “backward stepwise binary logistic regression” examining rear-seat belt use as a dichotomous categorical variable (belted or unbelted). Each analysis consisted of a rear-seat belt use by law type (i.e., presence and type of law) factorial design. Researchers also included vehicle type, sex, age, and urban/rural location for each observation. Each of these variables was included in the regression by itself and crossed (interacting) with law type. The purpose of including these variables and the interaction terms was to control for any potential

effect that these variables may have (by themselves) and to confirm that the law type variable, by itself, affected belt use. That is, an interaction effect with another variable did not cause any main effect of law type. The researchers excluded race from the regression because the percent “unsure” was relatively high (7% overall), and inclusion would have decreased the final number of observations.

The researchers conducted analyses on rear-seat adult (18+) occupants. Since the States within each triad were selected to be similar geographically, demographically, and for front-seat belt use, researchers conducted separate analyses for each triad to limit the impact of extraneous variables.

Table 9 shows rear-seat belt use for presence or law type in Triad 1. The logistic regression results indicated that the law type variable alone was a significant factor in predicting rear-seat belt use ($\chi^2 = 8.29; p < .05$). The results indicated that belt use was significantly greater for both primary ($\chi^2 = 3.978; p < .05$; OR 1.7) and secondary ($\chi^2 = 4.392; p < .05$; OR 1.6) rear-seat laws when compared to no rear-seat laws. There was no difference between primary and secondary ($\chi^2 = 0.00; p > .05$). The final multivariable logistic model included vehicle type ($p < .001$), sex ($p < .001$), and age ($p < .001$). The interactions between the law type variable and vehicle type ($p < .01$), law type and sex ($p > .05$) law type and age ($p < .01$), and law type and urban/rural ($p < .001$) also remained in the model. (See the appendix for the full model results.)

Table 9. Triad 1 Rear-Seat Belt Use by Presence and Law Type

Law Type	Primary	Secondary	No law
% Belted	53.4%	53.4%	52.7%
N	1,073	1,415	1,343

Table 10 shows rear-seat use rates by presence and law type for Triad 2. The logistic regression results also showed that the law type variable alone predicted rear-seatbelt use ($\chi^2 = 4.383; p < .001$). The results indicated that belt use was significantly greater for both primary ($\chi^2 = 21.094; p < .001$; OR 4.4) and secondary ($\chi^2 = 20.133; p < .001$; OR 5.8) rear-seat laws when compared to no rear-seat laws. There was a significant difference between primary and secondary ($\chi^2 = 4.792; p < .05$) such that secondary rear-seat use was *higher* than primary rear-seat use. Vehicle type ($p < .001$) and urban/rural ($p > .05$) also remained in the final multivariable logistic model. Additionally, the interactions between law type and: vehicle type ($p > .05$), sex ($p < .01$), age ($p < .05$), and urban/rural ($p < .05$) were all in the model. (See the Appendix for the full model results.)

Table 10. Triad 2 Rear-Seat Belt Use by Presence and Law Type

Law Type	Primary	Secondary	No law
% Belted	50.9%	56.8%	44.0%
N	909	558	536

Table 11 shows rear-seat belt use rates by presence and law type for Triad 3. The logistic regression results also showed that the law type variable on its own predicted rear-seat belt use ($\chi^2 = 39.200; p < .001$). Primary law rear-seat belt use differed significantly from no law ($\chi^2 = 37.253; p < .001$; OR = 6.4), but secondary law did not differ significantly from no law ($\chi^2 = 1.948; p > .05$) or primary law ($\chi^2 = 1.301; p > .05$). Vehicle type also remained a significant predictor ($p < .01$) in the final multivariable logistic model. Additionally, some factors interacted

with the law type variable remained as part of the model. Specifically, law type by vehicle type ($p < .01$), sex ($p < .001$), and age ($p < .01$) were included. (See the appendix for the full model results.)

Table 11. Triad 3 Rear-Seat Belt Use by Presence and Law Type

Law Type	Primary	Secondary	No law
% Belted	48.1%	45.3%	43.8%
Total N	655	1,115	630

Discussion of Rear-Seat Belt Observations

The presence or absence of a rear-seat law appears to be related to rear-seat belt use. Within all three triads, States without rear-seat laws had the lowest rear-seat belt use rate, and States with primary rear-seat laws had statistically significant higher use rates than those with no law. The magnitudes of the differences were 0.7 percent (Triad 1), 4.3 percent (Triad 3), and 6.9 percent (Triad 2). More importantly, for all triads, the presence or law type alone predicted rear-seat use even after accounting for the influence of other potential predictor variables.

The role of a secondary law is less clear. In Triad 1, adult rear-seat belt use did not differ between the primary and secondary States, but both showed significantly higher rear-seat belt use than the no-law State. In Triad 2, the State with the secondary law had the highest rear-seat belt use. In Triad 3, rear-seat belt use in the secondary State was between the primary State's and the no-law State's use rates, and the difference from the rate found in the no-law State was not statistically significant. While this suggests that the secondary laws increased rear-seat belt use over the no-law States in two of the three triads, the fact that one of the triads showed higher belt use under secondary than primary is unexpected.

This study attempted to control for factors other than law type that may have explained occupant belt use. States within a given triad were selected to be similar in many ways. There was an attempt to keep front-seat belt use similar among all States within a triad. Differences across occupants and observation site also were controlled in the multivariable logistic regression, but it may not have controlled for all differences (other than rear-seat belt laws) across States within a triad. For example, one issue of potential impact is strength of enforcement. This was not assessed in this project. It may be that different States give higher or lower priority to belt enforcement, which may also influence use rates. Additionally, this study focused solely on States that had primary front-seat belt laws. Although the results suggest that the presence of a rear-seat law increases rear-seat belt use, they may not generalize to States with secondary front-seat belt laws.

Conclusion

These results show strong support for the contention that rear-seat laws can lead to greater rear-seat belt use among adult occupants. Given the effectiveness of seatbelts at reducing injury risk, the expectation is that such a law would save lives and reduce injuries by increasing belt use. The fact that three separate groupings of States all showed the same effect—primary rear-seat law States have higher belt use in the rear seat than States with no rear-seat belt laws—adds validity to these results. And while it is unclear to what extent rear-seat belt enforcement takes place in States with rear-seat laws, the impact of the laws may be greater with well-publicized programs.

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Appendix A: Triad 1 Regression

Step 1 Triad 1

Variables	B	S.E.	Wald	Df	Sig.	Exp(B) (Odds Ratio)	95% C.I. for EXP(B)	
							Lower	Upper
Law Type			7.439	2	0.024			
Law Type (Primary v. No Law)	0.488	0.264	3.428	1	0.064	1.629	0.972	2.732
Law Type (Secondary v. No Law)	0.485	0.242	4.011	1	0.045	1.624	1.01	2.609
Vehicle Type			15.511	3	0.001			
Car	0.211	0.137	2.379	1	0.123	1.235	0.944	1.615
Truck	0.005	0.199	0.001	1	0.981	1.005	0.68	1.485
SUV	0.624	0.172	13.161	1	0	1.867	1.333	2.617
Sex	-0.573	0.113	25.621	1	0	0.564	0.451	0.704
Age			0.014	2	0.993			
18-25	0.017	0.159	0.011	1	0.916	1.017	0.744	1.39
26-59	0.006	0.15	0.001	1	0.971	1.006	0.75	1.348
Pop. Density	0.122	0.124	0.961	1	0.327	1.129	0.886	1.44
Law Type * Vehicle Type			18.88	6	0.004			
Law Type (Primary v. No Law) by Car	-0.63	0.238	7.001	1	0.008	0.533	0.334	0.849
Law Type (Primary v. No Law) by Truck	-1.082	0.324	11.142	1	0.001	0.339	0.18	0.64
Law Type (Primary v. No Law) by SUV	-0.517	0.289	3.199	1	0.074	0.596	0.338	1.051
Law Type (Secondary v. No Law) by Car	-0.67	0.22	9.256	1	0.002	0.512	0.332	0.788
Law Type (PS v. NO LAW) by Truck	-0.603	0.297	4.122	1	0.042	0.547	0.306	0.979
Law Type (Secondary v. No Law) by SUV	-0.69	0.268	6.607	1	0.01	0.502	0.296	0.849
Law Type * Sex			2.297	2	0.317			
Law Type (Primary v. No Law) by Sex	0.236	0.172	1.888	1	0.169	1.266	0.904	1.772
Law Type (Secondary v. No Law) by Sex	0.194	0.161	1.448	1	0.229	1.214	0.885	1.666
Age * Law Type			9.122	4	0.058			
18-25 by Law Type (Primary v. No Law)	-0.296	0.258	1.318	1	0.251	0.744	0.449	1.233
18-25 by Law Type (Secondary v. No Law)	-0.318	0.238	1.776	1	0.183	0.728	0.456	1.161
26-59 by Law Type (Primary v. No Law)	-0.158	0.248	0.406	1	0.524	0.854	0.526	1.388
26-59 by Law Type (Secondary v. No Law)	-0.562	0.227	6.117	1	0.013	0.57	0.365	0.89
Law Type * Pop. Density			11.108	2	0.004			
Law Type (Primary v. No Law) by Pop. Density(U)	0.328	0.199	2.697	1	0.101	1.387	0.939	2.051
Law Type (Secondary v. No Law) by Pop. Density(U)	0.616	0.186	11.025	1	0.001	1.852	1.287	2.665

Final Step (4) Triad 1

Variables	B	S.E.	Wald	df	Sig.	Exp(B) (Odds Ratio)	95% C.I. for EXP(B)	
							Lower	Upper
Law Type			8.298	2	0.016			
Law Type (Primary v. No Law)	0.521	0.261	3.978	1	0.046	1.684	1.009	2.811
Law Type (Secondary v. No Law)	0.503	0.24	4.392	1	0.036	1.654	1.033	2.648
Vehicle Type			32.508	3	0			
Car	0.25	0.082	9.176	1	0.002	1.284	1.092	1.509
Truck	-0.001	0.164	0	1	0.994	0.999	0.724	1.378
SUV	0.666	0.132	25.502	1	0	1.946	1.503	2.52
Sex	-0.432	0.066	42.45	1	0	0.649	0.57	0.739
Law Type * Vehicle Type			28.669	6	0			
Law Type (Primary v. No Law) by Car	-0.678	0.213	10.167	1	0.001	0.508	0.335	0.77
Law Type (Primary v. No Law) by Truck	-1.059	0.301	12.333	1	0	0.347	0.192	0.626
Law Type (Primary v. No Law) by SUV	-0.563	0.268	4.416	1	0.036	0.57	0.337	0.963
Law Type (Secondary v. No Law) by Car	-0.714	0.192	13.785	1	0	0.49	0.336	0.714
Law Type (PS v. NO LAW) by Truck	-0.582	0.27	4.645	1	0.031	0.559	0.329	0.949
Law Type (Secondary v. No Law) by SUV	-0.731	0.245	8.926	1	0.003	0.481	0.298	0.778
Age * Law Type			13.504	4	0.009			
18-25 by Law Type (Primary v. No Law)	-0.263	0.202	1.687	1	0.194	0.769	0.518	1.143
18-25 by Law Type (Secondary v. No Law)	-0.291	0.176	2.729	1	0.099	0.747	0.529	1.056
26-59 by Law Type (Primary v. No Law)	-0.136	0.197	0.479	1	0.489	0.873	0.593	1.284
26-59 by Law Type (Secondary v. No Law)	-0.546	0.17	10.271	1	0.001	0.579	0.415	0.809
Law Type * Pop. Density			37.183	2	0			
Law Type (Primary v. No Law) by Pop. Density(U)	0.457	0.156	8.553	1	0.003	1.579	1.163	2.145
Law Type (Secondary v. No Law) by Pop. Density(U)	0.74	0.138	28.653	1	0	2.096	1.598	2.748

Appendix B: Triad 2 Regression

Step 1 Triad 2

Variables	B	S.E.	Wald	df	Sig.	Exp(B) Odds Ratio	95% C.I. for EXP(B)	
							Lower	Upper
Law Type			41.227	2	0			
Law Type (Primary v. No Law)	1.478	0.322	21.094	1	0	4.383	2.333	8.235
Law Type (Secondary v. No Law)	1.753	0.391	20.133	1	0	5.771	2.684	12.41
Vehicle Type			19.424	3	0			
Car	-0.354	0.249	2.018	1	0.155	0.702	0.431	1.144
Truck	-1.241	0.296	17.552	1	0	0.289	0.162	0.517
SUV	-0.548	0.28	3.821	1	0.051	0.578	0.334	1.001
Sex	-0.009	0.187	0.002	1	0.963	0.991	0.687	1.43
Age			0.052	2	0.974			
18-25	0.044	0.258	0.03	1	0.863	1.045	0.631	1.732
26-59	0.003	0.244	0	1	0.989	1.003	0.622	1.619
Pop. Density	0.349	0.189	3.388	1	0.066	1.417	0.978	2.054
Law Type * Vehicle Type			11.758	6	0.068			
Law Type (Primary v. No Law) by Car	-0.363	0.339	1.143	1	0.285	0.696	0.358	1.353
Law Type (Primary v. No Law) by Truck	0.163	0.392	0.173	1	0.678	1.177	0.546	2.539
Law Type (Primary v. No Law) by SUV	0.485	0.387	1.575	1	0.21	1.625	0.761	3.467
Law Type (Secondary v. No Law) by Car	-0.792	0.398	3.962	1	0.047	0.453	0.208	0.988
Law Type (PS v. NO LAW) by Truck	-0.378	0.466	0.657	1	0.418	0.685	0.275	1.708
Law Type (Secondary v. No Law) by SUV	-0.346	0.435	0.631	1	0.427	0.708	0.302	1.66
Law Type * Sex			7.531	2	0.023			
Law Type (PP v. NO LAW) by Sex	-0.515	0.235	4.776	1	0.029	0.598	0.377	0.948
Law Type (PS v. NO LAW) by Sex	0.036	0.263	0.019	1	0.89	1.037	0.619	1.737
Age * Law Type			6.102	4	0.192			
18-25 by Law Type (Primary v. No Law)	-0.341	0.339	1.014	1	0.314	0.711	0.366	1.381
18-25 by Law Type (Secondary v. No Law)	-0.89	0.386	5.314	1	0.021	0.411	0.193	0.875
26-59 by Law Type (Primary v. No Law)	-0.377	0.323	1.362	1	0.243	0.686	0.364	1.292
26-59 by Law Type (Secondary v. No Law)	-0.604	0.367	2.714	1	0.099	0.547	0.266	1.121
Law Type * Pop. Density			6.217	2	0.045			
Law Type (Primary v. No Law) by Pop. Density(U)	-0.654	0.269	5.918	1	0.015	0.52	0.307	0.881
Law Type (Secondary v. No Law) by Pop. Density(U)	-0.189	0.282	0.447	1	0.504	0.828	0.476	1.44

Final Step (3) Triad 2

Variables	B	S.E.	Wald	df	Sig.	Exp(B) (Odds Ratio)	95% C.I. for EXP(B)	
							Lower	Upper
Law Type			41.227	2	0			
Law Type (Primary v. No Law)	1.478	0.322	21.094	1	0	4.383	2.333	8.235
Law Type (Secondary v. No Law)	1.753	0.391	20.133	1	0	5.771	2.684	12.41
Vehicle Type			27.585	3	0			
Car	-0.341	0.196	3.016	1	0.082	0.711	0.484	1.045
Truck	-1.237	0.238	27.024	1	0	0.29	0.182	0.463
SUV	-0.536	0.227	5.564	1	0.018	0.585	0.375	0.913
Pop. Density	0.351	0.181	3.756	1	0.053	1.421	0.996	2.027
Law Type * Vehicle Type			12.116	6	0.059			
Law Type (Primary v. No Law) by Car	-0.376	0.303	1.542	1	0.214	0.687	0.38	1.243
Law Type (Primary v. No Law) by Truck	0.159	0.35	0.207	1	0.649	1.173	0.59	2.33
Law Type (Primary v. No Law) by SUV	0.474	0.35	1.828	1	0.176	1.606	0.808	3.19
Law Type (Secondary v. No Law) by Car	-0.805	0.367	4.806	1	0.028	0.447	0.218	0.918
Law Type (Secondary v. No Law) by Truck	-0.381	0.431	0.782	1	0.377	0.683	0.293	1.591
Law Type (Secondary v. No Law) by SUV	-0.357	0.403	0.787	1	0.375	0.699	0.317	1.541
Law Type * Sex			13.371	2	0.001			
Law Type (Primary v. No Law) by Sex	-0.523	0.143	13.349	1	0	0.593	0.448	0.785
Law Type (Secondary v. No Law) by Sex	0.028	0.185	0.023	1	0.881	1.028	0.715	1.478
Age * Law Type			11.753	4	0.019			
18-25 by Law Type (Primary v. No Law)	-0.297	0.22	1.818	1	0.178	0.743	0.483	1.144
18-25 by Law Type (Secondary v. No Law)	-0.846	0.288	8.642	1	0.003	0.429	0.244	0.754
26-59 by Law Type (Primary v. No Law)	-0.374	0.212	3.106	1	0.078	0.688	0.454	1.043
26-59 by Law Type (Secondary v. No Law)	-0.601	0.274	4.816	1	0.028	0.548	0.321	0.938
Law Type * Pop. Density			6.463	2	0.039			
Law Type (Primary v. No Law) by Pop. Density(U)	-0.657	0.263	6.226	1	0.013	0.519	0.31	0.869
Law Type (Secondary v. No Law) by Pop. Density(U)	-0.191	0.277	0.478	1	0.489	0.826	0.48	1.421

Appendix C: Triad 3 Regression

Step 1 Triad 3

Variables	B	S.E.	Wald	df	Sig.	Exp(B) Odds Ratio	95% C.I. for EXP(B)	
							Lower	Upper
Law Type			36.035	2	0			
Law Type (Primary v. No Law)	1.903	0.32	35.317	1	0	6.706	3.58	12.561
Law Type (Secondary v. No Law)	0.216	0.254	0.717	1	0.397	1.24	0.753	2.043
Vehicle Type			6.644	3	0.084			
Car	-0.457	0.187	5.976	1	0.015	0.633	0.439	0.913
Truck	-0.52	0.337	2.381	1	0.123	0.595	0.307	1.151
SUV	-0.22	0.22	1.003	1	0.317	0.803	0.522	1.234
Sex	-0.019	0.162	0.013	1	0.908	0.982	0.715	1.348
Age			0.442	2	0.802			
18-25	-0.085	0.228	0.139	1	0.709	0.918	0.587	1.437
26-59	0.043	0.184	0.055	1	0.814	1.044	0.728	1.498
Pop. Density (1)	0.083	0.161	0.268	1	0.605	1.087	0.793	1.491
Law Type * Vehicle Type			19.275	6	0.004			
Law Type (PRIMARY v. No Law) by Car	-0.762	0.314	5.874	1	0.015	0.467	0.252	0.864
Law Type (PRIMARY v. No Law) by Truck	-0.613	0.47	1.7	1	0.192	0.542	0.215	1.361
Law Type (PRIMARY v. No Law) by SUV	-0.876	0.357	6.044	1	0.014	0.416	0.207	0.837
Law Type (SECONDARY v. No Law) by Car	0.384	0.272	1.995	1	0.158	1.468	0.862	2.5
Law Type (SECONDARY v. No Law) by Truck	0.612	0.443	1.912	1	0.167	1.845	0.775	4.394
Law Type (SECONDARY v. No Law) by SUV	0.624	0.306	4.152	1	0.042	1.867	1.024	3.404
Law Type * Sex			7.776	2	0.02			
Law Type (PRIMARY v. No Law) by Sex	-0.615	0.235	6.837	1	0.009	0.54	0.341	0.857
Law Type (SECONDARY v. No Law) by Sex	-0.458	0.205	4.982	1	0.026	0.633	0.423	0.946
Age * Law Type			7.916	4	0.095			
18-25 by Law Type (PRIMARY v. No Law)	-0.514	0.344	2.226	1	0.136	0.598	0.305	1.175
18-25 by Law Type (SECONDARY v. No Law)	-0.363	0.3	1.465	1	0.226	0.695	0.386	1.252
26-59 by Law Type (PRIMARY v. No Law)	-0.805	0.3	7.195	1	0.007	0.447	0.248	0.805
26-59 by Law Type (SECONDARY v. No Law)	-0.462	0.252	3.36	1	0.067	0.63	0.385	1.032
Law Type * Pop. Density			0.992	2	0.609			

Variables	B	S.E.	Wald	df	Sig.	Exp(B) Odds Ratio	95% C.I. for EXP(B)	
							Lower	Upper
Law Type (PRIMARY v. No Law) by Pop. Density(U)	-0.17	0.233	0.531	1	0.466	0.844	0.534	1.332
Law Type (SECONDARY v. No Law) by Pop. Density (NU)	0.043	0.215	0.041	1	0.84	1.044	0.686	1.59

Final Step Triad 3

Variables	B	S.E.	Wald	df	Sig.	Exp(B) (Odds Ratio)	95% C.I. for EXP(B)	
							Lower	Upper
Law Type			39.2	2	0			
Law Type (PRIMARY v. No Law)	1.85	0.303	37.253	1	0	6.363	3.512	11.527
Law Type (SECONDARY v. No Law)	0.318	0.228	1.948	1	0.163	1.374	0.88	2.146
Vehicle Type			17.569	3	0.001			
Car	-0.408	0.111	13.492	1	0	0.665	0.535	0.827
Truck	-0.49	0.291	2.823	1	0.093	0.613	0.346	1.085
SUV	-0.18	0.161	1.253	1	0.263	0.835	0.61	1.145
Law Type * Vehicle Type			18.928	6	0.004			
Law Type (PRIMARY v. No Law) by Car	-0.814	0.276	8.685	1	0.003	0.443	0.258	0.761
Law Type (PRIMARY v. No Law) by Truck	-0.637	0.439	2.112	1	0.146	0.529	0.224	1.249
Law Type (PRIMARY v. No Law) by SUV	-0.909	0.323	7.91	1	0.005	0.403	0.214	0.759
Law Type (SECONDARY v. No Law) by Car	0.319	0.226	2.004	1	0.157	1.376	0.884	2.141
Law Type (SECONDARY v. No Law) by Truck	0.556	0.408	1.855	1	0.173	1.744	0.783	3.88
Law Type (SECONDARY v. No Law) by SUV	0.565	0.266	4.498	1	0.034	1.76	1.044	2.966
Law Type * Sex			28.085	2	0			
Law Type (PRIMARY v. No Law) by Sex	-0.638	0.171	13.989	1	0	0.528	0.378	0.738
Law Type (SECONDARY v. No Law) by Sex	-0.473	0.126	14.096	1	0	0.623	0.487	0.798
Age * Law Type			16.766	4	0.002			
18-25 by Law Type (PRIMARY v. No Law)	-0.597	0.258	5.373	1	0.02	0.55	0.332	0.912
18-25 by Law Type (SECONDARY v. No Law)	-0.437	0.194	5.08	1	0.024	0.646	0.441	0.945
26-59 by Law Type (PRIMARY v. No Law)	-0.759	0.237	10.27	1	0.001	0.468	0.294	0.745
26-59 by Law Type (SECONDARY v. No Law)	-0.412	0.171	5.782	1	0.016	0.662	0.473	0.927

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