DRIVER BEHAVIOR & PERFORMANCE

**TECHNICAL REPORT**

FOUNDATION FOR TRAFFIC SAFETY

# Factors Associated with Seat Belt Use Among U.S. Drivers and Passengers: A Mixed-Methods Study

**SEP 2026**

607 14th Street, NW, Suite 701
Washington, DC 20005
202-638-5944
AAAFoundation.org

## Title

Factors Associated with Seat Belt Use Among U.S. Drivers and Passengers: A Mixed-Methods Study

*(September 2026)*

## Authors

Alycia Bayne, Christopher La Rose, Weiwei Liu, Jackie Sheridan-Johnson, & Maya Ng-Yu

*NORC at the University of Chicago*

S. Adam Smith

*Dunlap and Associates, Inc.*

## Foreword

The AAA Foundation for Traffic Safety advances its mission of *saving lives through research and education*, through work such as that presented in this report. Seat belts are the most effective injury-prevention tool for motor vehicle occupants involved in crashes, and seat belt use has increased substantially over the past several decades. Despite these gains, nearly half of passenger vehicle occupants fatally injured in crashes in the United States each year are not wearing a seat belt, suggesting more work is needed to understand why some drivers and passengers do not consistently wear seatbelts.

This report presents the findings of a mixed-methods study designed to identify factors associated with seat belt use and develop targeted recommendations to increase seat belt use among individuals who do not consistently wear one. Drawing on a literature review, analyses of national fatal crash data, and nationally representative survey data, the study identified nine detailed road user profiles, each paired with tailored recommended strategies to improve seat belt use. These profiles should be of interest to a broad range of traffic safety practitioners and stakeholders.

C. Y. David Yang, Ph.D.

*President and Executive Director*

*AAA Foundation for Traffic Safety*

## About the Sponsor

AAA Foundation for Traffic Safety
607 14th Street, NW, Suite 701
Washington, D.C. 20005
202-638-5944
www.aaafoundation.org

Founded in 1947, the AAA Foundation for Traffic Safety in Washington, D.C., is a nonprofit, publicly supported charitable research and educational organization dedicated to saving lives by preventing traffic crashes and reducing injuries when crashes occur. Funding for this report was provided by voluntary contributions from AAA/CAA and their affiliated motor clubs, individual members, AAA-affiliated insurance companies, and other organizations or sources.

## Table of Contents

## Executive Summary

### Background

Seat belt use significantly reduces the risk of death and serious injury in a motor vehicle crash. Although about 91% of adult front seat occupants in the United States (U.S.) wear seat belts, those who do not account for nearly half of all traffic fatalities. Given the lifesaving benefits of seat belts and persistent gaps in use, traffic safety practitioners must better understand who does not wear their seat belt consistently, and when and why they do not. Research is needed to identify and explore demographic, psychological, and situational factors that are associated with inconsistent seat belt use. This information can help practitioners to implement tailored interventions that reach and resonate with groups who do not consistently wear seat belts.

### Objectives

This study used a mixed-method approach to examine the factors associated with seat belt use among U.S. drivers and passengers. The objectives were to: (a) synthesize literature regarding seat belt use among U.S. drivers and passengers; (b) examine the characteristics of those who always, sometimes, and rarely use seat belts; and (c) identify recommended actions for traffic safety stakeholders to increase seat belt use.

### Methods

The study team conducted a literature review to explore the history of seat belts in the United States and identify the demographic and psychological factors associated with seat belt use or non-use. Next, the study team conducted an analysis of the Fatality Analysis Reporting System (FARS) to identify the characteristics of U.S. drivers and passengers who had worn their seat belts in a crash resulting in a fatality compared to those who had not worn their seat belts. Finally, the study team developed a survey on seat belt use behaviors, attitudes, and decision-making, administered to a nationally representative sample of 2,818 U.S. adults using NORC at the University of Chicago's AmeriSpeak Panel. U.S. adults who never, rarely, or sometimes wear seat belts were oversampled.

### Findings

#### *Literature Review*

The literature review revealed that seat belt use in the United States is high, but uneven across populations and circumstances, with persistent gaps by age, sex, seating position, vehicle type, roadway context, and risk-related behaviors. Specific groups are less likely to wear seat belts consistently: males, younger adults, rear seat passengers,

occupants of pickup trucks, individuals traveling at night or on local and rural roads, and those engaging in alcohol or drug use and other risky behaviors. Psychological and social factors also play a role in shaping seat belt use decisions.

### *Fatal Crash Data Analysis*

The analysis of FARS data from 2017 through 2022 found that more than one quarter of U.S. drivers and passengers (28%) involved in a crash resulting in a fatality in the past 30 days were not wearing their seat belt. Seat belt use was associated with age, police-reported alcohol and drug use, presence of a child in the vehicle, vehicle type, crash timing, road conditions, crash characteristics and violations, and geography.

### *National Survey*

The national survey revealed that most U.S. drivers (70.3%) and passengers (57%) reported always wearing a seat belt, while smaller shares of drivers and passengers reported wearing belts most of the time, but not always (12%, 15.9%), some of the time (15.2%, 20.8%), or rarely/never (2.5%, 6.3%). Drivers and passengers with greater odds of suboptimal seat belt use were male, from racial and ethnic minority groups (particularly non-Hispanic Black drivers), and those with lower educational attainment and lower household income. Higher numbers of impaired driving and riding behaviors were associated with lower seat belt use. Vehicle age was negatively associated with driver seat belt use while vehicle type was not associated with seat belt use. The most prevalent reasons for wearing a seat belt, endorsed by more than 90% of drivers and passengers who wore a seat belt some of the time, most of the time, or all of the time were "wanting to avoid serious injury or death," "It's the law," and "It's a habit." The most prevalent reasons for not wearing a seat belt, stated by 30%–50% of those who wore a seat belt some of the time or rarely/never were "I'm only driving a short distance," "I forget to put it on," "I'm traveling on low-speed roadways."

### *Road User Profiles and Recommendations for Traffic Safety Practitioners*

Study findings were triangulated to empirically derive nine road user profiles representing groups of drivers and passengers with varying levels of seat belt use. Each profile contains recommended actions to increase seat belt use. These actions are informed by survey and market research data, feedback from an expert panel, and the literature. Traffic safety practitioners should find the information and guidance in the profiles helpful for their efforts to improve seat belt use and to tailor strategies to distinct groups of drivers and passengers.

# Introduction

## Background

Seat belt use significantly reduces the risk of death and serious injury in a motor vehicle crash. While nearly 91% of adult front seat occupants wear their seat belt in the United States, the 9% of adults who do not account for nearly 50% of traffic fatalities (National Center for Statistics and Analysis [NCSA], 2025). This already concerning imbalance in fatalities is even more pronounced within certain groups, such as occupants aged 25 to 34 years (61% unrestrained), rear seat occupants (58% unrestrained), and drivers of pickup trucks (60% unrestrained) (NCSA, 2023). Given the clear life-saving benefits of seat belts and room for growth in use rates, it is incumbent upon traffic safety practitioners to understand as much as possible about people who do not use seat belts. Understanding not only demographic trends, but also psychological, social, situational, environmental, and other factors that may influence seat belt use is essential to the identification of high-risk groups of motorists and critical to the development of effective countermeasures to encourage seat belt use among these groups.

## Present Study

The research project explored demographic, geographic, and circumstantial factors associated with seat belt use, examined the characteristics and profiles of those who always, sometimes, or rarely use seat belts when driving or riding in vehicles, and identified strategies to increase use among populations at greatest risk.

The three key project objectives were as follows:

- Identify and synthesize literature regarding seat belt use among U.S. drivers and passengers
- Examine the characteristics of those who never, sometimes, and always use seat belts
- Identify and prioritize recommended actions for traffic safety stakeholders to mitigate safety concerns and increase seat belt use

## Overview of Methods

This study used a mixed-methods approach to examine the factors that influence seat belt use and to identify strategies to increase consistent use among U.S. drivers and passengers. The study team first conducted a comprehensive literature review and an analysis of data from the Fatality Analysis Reporting System (FARS). Findings from these two components informed the design of a national survey focused on seat belt use

behaviors, attitudes, and decision making. The survey was fielded to a nationally representative sample of 2,818 U.S. adults using NORC's AmeriSpeak Panel. AmeriSpeak is a probability-based panel of U.S. households recruited through address-based sampling, rather than opt-in online recruitment, which allows surveys to produce estimates that more accurately reflect the U.S. adult population.

Data from the literature review, FARS analysis, and national survey were triangulated to identify nine distinct road user profiles representing groups of individuals who wear seat belts most of the time, sometimes, or less often, offering opportunities to increase the frequency of seat belt use. An expert panel of traffic safety practitioners and researchers reviewed these empirically derived profiles and the study team further refined the profiles using supplemental market research data to better capture attitudes, behaviors, media consumption, and other characteristics relevant to intervention design. Finally, drawing on the evidence base and expert panel input, the team developed a set of targeted, profile-specific recommended actions to increase seat belt use.

**Organization of the Report**

This report is organized around the study's three primary objectives and the sequence of analytic tasks conducted. Following an introduction and overview of the study methods, there are four sections.

**Section I** presents select findings from a literature review that synthesizes existing research on seat belt use among U.S. drivers and passengers. This section summarizes known demographic, behavioral, psychological, and situational factors associated with seat belt use and non-use and provides the conceptual foundation for the analyses that follow.

**Section II** presents findings from an analysis of data from FARS. This section examines seat belt use among drivers and passengers involved in fatal crashes and identifies characteristics and crash contexts most strongly associated with seat belt non-use.

**Section III** describes results from a nationally representative survey of U.S. adults, which examines seat belt use frequency, attitudes, and behaviors among drivers and passengers. This section explores differences between individuals who always, sometimes, and rarely/never wear seat belts and introduces the use of latent class analysis (LCA) to identify patterns of seat belt use across driving and riding contexts.

**Section IV** presents the development of road user profiles and associated recommendations for traffic safety practitioners. This section describes the process used to create empirically derived profiles, including the integration of survey data, market

research, and expert panel input, and outlines the rationale for the recommended actions tailored to each profile.

The report includes a summary and discussion that synthesizes findings across all three objectives, highlights cross-cutting themes, and discusses recommendations and implications for traffic safety practitioners. The final section is the conclusions.

## Section I—Factors Associated with Seat Belt Use: A Literature Review

To ground the study in existing evidence and inform its design, the study team conducted a literature review on the factors that influence seat belt use. The primary function of the literature review was to explore the history of seat belts in the United States and the demographic and psychological factors associated with seat belt use or non-use. A secondary function of the literature review was to identify domains for inclusion in a national survey about seat belt use, including topics that might be understudied. Section I presents key findings from the literature review.

### Methods

Building on a recent and overlapping effort (Romoser et al., under review), the authors used the compendium as a starting point. The authors selected 193 articles that met the search criteria. An additional 10 articles were identified during ad hoc searches to supplement the body of knowledge in the compendium, such that the total number of sources referenced in the literature review was 203 articles. Articles were incorporated using the Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) guidelines. Data on seat belt usage included in this review is predominantly focused on findings in the United States unless otherwise specified.

### Selected Literature Review Findings

#### *Brief History of Seat Belts*

The early 1900s saw several initial attempts to adopt the use of seat belts in automobiles. These included the introduction and popularization of belts in the world of motorsports, advocacy efforts from pilots, engineers, and medical professionals to install and use seat belts in their personal vehicles, and even calls for factory installation of seat belts as early as 1935 (Johannessen & Vos, 1982; Ronan, 1979). In 1951, the Automotive Crash-Injury Research Project identified vehicle ejection as a major cause of serious injury in crashes—challenging the popular belief at the time that being thrown out of the car during a crash was safer than remaining inside. The report identified seat belts as an effective means of minimizing the chances of ejection from the vehicle (see Ronan, 1979).

Early seat belts typically only included a lap restraint component, with a few noteworthy exceptions (e.g., Griswold & DeHaven, 1955). It was not until 1959 that Nils Bohlin would develop the more recognizable modern design of the three-point seat belt during his time at Volvo (Alexa et al., 2020; Bohlin, 1962). Perhaps most notable about the development and proliferation of this modern seat belt design was the decision by Volvo to offer the designs to other automotive manufacturers at no cost (Alexa et al., 2020).

The 1960s saw the first steps toward legislative efforts to promote the use of seat belts in the United States. In 1961, Wisconsin became the first state to require all new vehicles to have seat belts installed in the front seats, with 23 other states adopting similar legislation by 1964 (Nolan, 1964). Federal laws and regulations for seat belts followed shortly thereafter. The U.S. Department of Transportation (USDOT) began to develop a variety of Federal Motor Vehicle Safety Standards (FMVSS), including FMVSS 208 and 209 regarding requirements for seat belts in vehicles (National Highway Traffic Safety Administration [NHTSA], 1998; Johannessen, 1984; Johannessen & Vos, 1982).

These early laws and regulations were designed to promote seat belt use by mandating their installation in vehicles, but did not require motorists to *wear* these seat belts. This disconnect prompted a push for passive safety devices in automobiles—namely, automatic seat belts and/or airbags. In 1970, the National Highway Traffic Safety Administration (NHTSA) established a standard requiring a passive safety device in all passenger vehicles by July 1973 (Bao et al., 2015). An alternative to this requirement was for an audible warning to play when front seat belts were not buckled (Kahane, 2015). This alternative was later amended to require ignition interlock systems for vehicles without automatic seat belts or airbags (see also Kidd & O'Malley, 2023; Kahane, 2015; National Research Council, 2003). These ignition interlock systems prevented the automobile from starting if the seat belt was unfastened. These devices were met with a substantial amount of public resistance and frustration (National Research Council, 2003), ultimately causing Congress to pass an act (the Motor Vehicle and School Bus Safety Amendments of 1974) that prohibited the requirement of ignition interlocks and limited the required minimum duration of auditory warnings to four to eight seconds (Bao et al., 2015; Kidd & O'Malley, 2023; National Research Council, 2003).

Later, Transportation Secretary Elizabeth Dole developed a strategy that encouraged states to pass legislation mandating the use of seat belts by motorists (Booz, 1986; National Research Council, 2003; Roberts, 1994). The first such law passed in New York in 1984 (National Research Council, 2003). By 1991, 40 states and the District of Columbia had adopted mandatory seat belt use laws as well (Houston & Richardson, 2006), and by 1995, 49 states had enacted such legislation (Houston & Richardson, 2006). Today, New Hampshire remains the only state that has not passed mandatory seat belt use laws for adult motor vehicle occupants (Insurance Institute for Highway Safety, 2022; NCSA, 2024).

### *Factors Associated with Seat Belt Use*

Various factors have been implicated in the literature for their potential association with seat belt use patterns, including demographic characteristics, psychological traits, overt reasons expressed for use (or non-use) of belts, social influences, and situational or environmental factors. This section describes a selection of topics representative of each of these factors.

**Demographic Characteristics.** Seat belt use appears to differ between motorists of varying ages. The general trend is that older motorists and children tend to use seat belts more often than young adult motorists (e.g., Boyle, 2023; Kerwin et al., 2006; Lerner et al., 2001; NCSA, 2023; Spado et al., 2019). Seat belt use also varies by sex, with females typically more likely to use seat belts than males (e.g., Barr et al., 2015; Birru et al., 2016; Boyle, 2023; Briggs et al., 2008; Reagan et al., 2013; Richard et al., 2019; Sheveland, 2020; Shinar et al., 2001; Vaughn et al., 2012). In recent years, there has been evidence of a trend for seat belt use to be lower for Black vehicle occupants than for motorists who are White or members of another race (e.g., Boyle, 2023; Pickrell & Liu, 2015; Pickrell & Ye, 2010); however, some self-report data have challenged this perspective (e.g., Spado et al., 2019), and there is evidence that this disparity in usage rates may not have been present as recently as about 20 years ago (see Glassbrenner, 2003, 2005). Educational status has also been identified as a potential covariate of seat belt use, typically revealing that seat belt use increases among individuals with higher levels of educational attainment, although this relationship is not always perfectly linear (e.g., Block, 2000; Boyle & Lampkin, 2008; Boyle & Vanderwolf, 2003; Braver, 2003; Spado et al., 2019; Strine et al., 2010). Evidence on the relationship between financial status and seat belt use is somewhat mixed. While some studies using surveys or crash report data have shown that seat belt use is greater among those with higher incomes or who live in areas with higher median incomes (e.g., Hezaveh & Cherry, 2019; Spado et al., 2019; Vaughn et al., 2012), the findings of other studies have been equivocal (see Sheveland, 2020). Despite the appearance of some trends in these data, it is worth considering that these socioeconomic factors may be partially conflated with age and that this conflation may explain such trends, at least in part.

**Psychological Traits.** Individuals with a decreased tendency to perceive risky situations as representing a danger to their personal safety or elevated likelihood of punishment (e.g., receiving a traffic citation) are generally less likely to use seat belts (AAA Foundation for Traffic Safety, 2022; Richard et al., 2019; Sheveland, 2020). Similarly, individuals with high levels of risk aversion tend to be more likely to wear seat belts (Anderson & Mellor, 2008; Li et al., 2018; Richard et al., 2019; Sheveland, 2020). However, one's perception of risk for seat belt non-use is not necessarily static; such perceptions may be dynamic and conditional. High levels of impulsivity and sensation-seeking behavior are also associated with reduced seat belt use (Daugherty & Brase, 2010; Jonah et al., 1997; Richard et al., 2019; Ryb et al., 2006; Sheveland, 2020). Life satisfaction has been found to be positively associated with increased seat belt use

(Goudie et al., 2011; Sheveland, 2020). Fatalism—the idea that life events are beyond one's ability to control—has historically been associated with decreased seat belt use (Daugherty & Brase, 2010; Sheveland, 2020; Spado et al., 2019; Watson & Austin, 2021).

**Overt Reasons for Use or Non-Use.** Examining the explicit reasons motorists provide for their seat belt use behaviors is also helpful to consider when seeking to identify possible countermeasure approaches. Some of the most prominent reasons motorists provide for using seat belts include the objective of avoiding injury, the fact that the behavior is habitual, the legal requirement to buckle up, and the presence of seat belt reminder systems in vehicles (Sheveland, 2020; Spado et al., 2019). In contrast, common stated reasons for seat belt non-use include short trip distance, forgetting to buckle up, physical discomfort, being in a rush, low perception of risk for non-use, aversion to compelled behavior, and the belief that seat belts themselves pose a novel risk to the motorist (Jermakian & Weast, 2018; Kidd et al., 2014; Sheveland, 2020; Spado et al., 2019).

**Social Influences.** Social pressures also play a role in motorist seat belt use behaviors. Seat belt use is higher among motorists who expect social disapproval of non-use by people important to them (AAA Foundation for Traffic Safety, 2022). Conversely, a sizeable minority (18%) of motorists reported that wearing a seat belt would make them feel self-conscious if their friends did not also buckle up (Spado et al., 2019), indicating that social influences can serve to either increase or decrease levels of belt use. Beyond peers, parental influence also plays a role in seat belt wearing behaviors among their children (Richardson et al., 2006; Sheveland, 2020; Stanley et al., 2014).

**Situational or Environmental Factors.** Conditional features of the transportation scenario motorists are engaged in have also been associated with differences in seat belt use. For instance, seat belt use tends to be higher on expressways than surface streets and also tends to increase as traffic density increases (NCSA, 2024). With respect to vehicle speed, motorists engaged in faster general traffic conditions tend to buckle up more often (NCSA, 2024), although drivers with a personal tendency to drive well above the posted speed limit have reported lower levels of seat belt use than drivers who drive at or near the speed limit (Spado et al., 2019). Seat belt use also tends to be lower at nighttime than it is during the day (Boakye et al., 2019; Kim et al., 2012; NCSA, 2007, 2023; Thomas et al., 2010). Occupants of pickup trucks also tend to buckle up at lower rates than motorists in other types of vehicles (NCSA, 2024; Spado et al., 2019). Vehicle occupants situated in rear seats have often demonstrated lower seat belt use than occupants in the front seats (Hedlund, 2019; NCSA, 2023; Spado et al., 2019).

### *Improving Seat Belt Use*

In addition to exploring the history of seat belts and characteristics associated with their use and non-use, the literature review also included a brief examination of different methods employed to improve seat belt use rates. This exploration was

intended as a generalized introduction to common techniques designed to enhance seat belt use rates, thus serving as a precursor to the recommendations for traffic safety practitioners developed later in the study.

Differences in legal requirements for different states were briefly examined. Key differences in legislation include the following:

- A trend where laws with primary enforcement provisions (i.e., law enforcement stops permitted solely for seat belt non-use) are more effective than those with secondary enforcement (i.e., seat belt laws only enforced if officer has initiated a stop for some other reason; see Boakye & Nambisan, 2020; Chaudhary et al., 2005; Chaudhary et al., 2010; Fell, 2019)
- A tendency for laws that apply to all vehicle occupants to be more effective than those which only apply to front-seat occupants (Boakye & Nambisan, 2020; Boyle, 2023; Findley et al., 2018)
- Higher rates of law compliance are often observed for states with higher fines for violators (Fell, 2019; Houston & Richardson, 2005; Nichols et al., 2010; Nichols et al., 2014).
- High-visibility law enforcement campaigns targeting seat belt violations (e.g., Click It or Ticket) have frequently demonstrated their efficacy at improving belt use rates (Dinh-Zarr et al., 2001; Kirley et al., 2023; Nichols et al., 2016; Shults et al., 2004; Solomon et al., 2002, 2009; Tison et al., 2008; Williams & Wells, 2004).

Beyond legislation and enforcement techniques, various technological approaches have been designed to decrease non-use of seat belts among motorists. In-vehicle seat belt reminders improve rates of buckling up among motorists (Farmer & Wells, 2010; Ferguson et al., 2007; Williams et al., 2002). Beyond ignition interlocks, a variety of alternative interlock systems have been developed with the intent of improving belt use; for instance, gear shift interlocks that prevent an unbelted driver from shifting out of park, or force feedback systems that increase required pressure on the accelerator pedal for unbuckled drivers (for discussion of various systems, see Bao et al., 2015; Kahane, 2015; Kidd & O'Malley, 2023; Van Houten et al., 2010, 2011). More recently, systems designed to automatically detect unbelted drivers have been developed as an alternative technique for tracking and enforcement efforts. Methods have been developed to process video footage captured from in-vehicle cameras to detect seat belt non-use (Nkuzo et al., 2023) as well as roadside or gantry-mounted cameras designed to capture images through the windshield or side windows of vehicles (e.g., Artan et al., 2016; Balci et al., 2018; Hosseini & Fathi, 2023; see also Price, 2023; Raferty, 2021).

Messaging efforts and public outreach promoting seat belt use is also considered as a technique for improving buckling up among motorists. Beyond pairing messaging with other efforts (e.g., the messaging component of a Click It or Ticket campaign), various channels for messaging more generally can be deployed. Examples include

television or radio advertisements (e.g., Nichols et al., 2016), roadway signage (Thomas et al., 2010), messaging in for-hire vehicles (Jermakian & Weast, 2018; Nemire, 2019), or social media outreach (Thomas et al., 2016). Programs that offer incentives for seat belt use may also prove effective at enhancing belt use rates (Burkett et al., 2010), and employers adopting policies that promote belt use among workers can also be helpful (Melton et al., 2012; St. Louis, 2015).

In summary, the literature review identified a variety of techniques that can be implemented to decrease rates of seat belt violations among motorists. However, in many cases, it appears that these methods are intended as a one-size-fits-all approach to improving belt use among the general population. Although the broad efficacy of many of these approaches has been clearly documented, less is known about how well-suited the tactics might be when applied to specific target populations of seat belt non-users. Thus, by gaining a clearer understanding of who these non-users are, this study provides an opportunity to adapt a variety of intervention tactics in a manner that may increase their efficacy among the identified subgroups of at-risk motorists.

## Section II—Seat Belt Use in Fatal Traffic Crashes

While the literature review examined a variety of factors associated with trends in seat belt use behavior, these analyses focused on seat belt use and non-use among motorists involved in fatal crashes. Understanding trends in fatal crash records is a key component in understanding which motorists are not only prone to seat belt non-use but also particularly susceptible to the most severe outcomes associated with failing to buckle up. This analysis leveraged data from FARS, which contains over 100 data elements on crashes occurring on public roadways in the United States where at least one fatality occurred within 30 days of the crash. The project team analyzed FARS data from 2017 through 2022. The purpose of this task was to identify the characteristics of vehicle occupants who were reported to be wearing a seat belt compared to those who were unbuckled at the time of a crash.

### Methods

#### *Sample*

FARS data for each year were merged at the person level. To best assess factors associated with seat belt use, the study team applied the following inclusion criteria to the sample:

- Survivors and decedents
- People in a moving vehicle in transport
- People in a vehicle with a driver present

- People in a vehicle with a seat belt
- Adults and children ages 15 and above (driving age)

The final analytic sample was 350,379 persons after the inclusion criteria were applied.

### *Factors*

Measures selected for the analysis included the following:

- ***Individual characteristics and behaviors*** (e.g., age, sex, and alcohol and drug use)
- ***Vehicle characteristics*** (e.g., number of occupants, body type)
- ***Crash timing and road conditions*** (e.g., light condition; speed limit, road type)
- ***Crash characteristics*** (e.g., speeding related)
- ***Driver characteristics*** (e.g., Body Mass Index [BMI], drinking)
- ***Violations*** (e.g., reckless hit and run, impairment)
- ***County-level variables*** from Social Vulnerability Index (SVI) and Rural-Urban Continuum Codes (RUCC) data.

See Appendix A–Table A-1 for the final list of variables included in the analysis.

### *Analytic Approach*

The project team conducted univariate and bivariate analyses to examine the prevalence of seat belt use and factors associated with seat belt use. Next, the project team conducted a logistic regression analysis to examine factors associated with seat belt non-use for the full sample (drivers and passengers) and the driver sample only. The dependent variable is seat belt non-use, and the independent variables are the above-mentioned factors. The study team used the conventional significance threshold of $p < 0.05$ to determine statistically significant associations. Only statistically significant results are presented in this report. Based on findings from the bivariate and logistic regression analyses, the project team conducted a Classification and Regression Tree (CART) analysis to identify specific subgroups of drivers not likely to have worn seat belts at the time of a crash (see Appendix A—FARS Data Analysis). CART models can be viewed as decision trees in which a variable's value is used to predict another variable's value. A model with multiple predictor variables was built to predict the event, i.e., seat belt non-use (1 = did not use a seat belt; 0 = used a seat belt). After identifying the variables that best predicted the event, the CART identifies mutually exclusive profiles with predicted probability of the event greater than a pre-set level (the default is 50%, but this cutoff can be adjusted to identify more or fewer profiles). The threshold setting of a 10% chance of not wearing a seat belt—reflecting the probability of

seat belt non-use in observational studies— was used to partition results in the decision tree in order to identify potential combinations of characteristics that will emerge as predictive of non-seat belt use.

## Results

### *Univariate and Bivariate Analysis*

Seat belt use in the FARS analytic sample was 72% for drivers and passengers, lower than general population estimates of 91% seat belt use among adult front-seat occupants (NCSA, 2025) (see Appendix A–Table A-2). Passengers were significantly more likely to not wear a seat belt than drivers (31% vs. 27% unbelted; see Appendix A–Table A-3).

### *Multivariate Logistic Regression*

**Individual Characteristics and Behaviors.** Compared to drivers, front-seat passengers had 1.25 times the odds of not wearing a seat belt, and back-seat passengers were even more likely not to wear a seat belt (adjusted odds ratio [AOR] = 3.55). Compared to adults (ages 25–59), young adults (ages 18–24) were slightly more likely not to wear a seat belt (AOR = 1.03), while older adults (ages 60 and above) were more likely to wear a seat belt (AOR = 0.88). Those who had police-reported alcohol use (AOR = 2.44) or police-reported drug use (AOR = 1.93) were more likely not to wear a seat belt compared to their counterparts for whom alcohol or drug use was not reported (see Appendix A–Table A-4).

Findings were consistent in the driver-only model, except for age. In addition to the finding on young adults (ages 18–24), adolescent drivers (ages 15–17) were also slightly more likely to wear a seat belt compared to adult drivers (ages 25–59) (AOR = 0.91), while the effect of being an older adult on seat belt use was not significant in the driver-only model.

**Vehicle Characteristics.** A child's presence in the vehicle significantly increased the odds of wearing a seat belt. Individuals were more likely (AOR = 0.82) to wear a seat belt when a child was present compared to when a child was not present. Compared to cars, individuals in a pickup truck were slightly more likely not to wear a seat belt (AOR = 1.07), while individuals in all other types of vehicles, including SUVs (AOR = 0.92), vans (AOR = 0.73), and station wagons (AOR = 0.88), were more likely to wear a seat belt.

Findings regarding vehicle characteristics were also reflected in the driver model, with one exception. In the driver-only model, the presence of a child in the car was no longer significant. Rather, the presence of any passengers in the car was significantly

correlated with drivers' seat belt use. Drivers were more likely not to wear a seat belt when driving alone, compared to when driving with passengers (AOR = 1.39).

**Crash Timing and Road Conditions.** Individuals involved in crashes that occurred during daylight were more likely to wear a seat belt compared to those involved in crashes in other light conditions (AOR = 0.87). Compared to those who were involved in crashes on "Interstate" or "Principal Arterial–other freeways and expressways," those who were involved in crashes on "Major Collectors," "Minor Collectors," or "Local" roads were more likely not to wear a seat belt (AOR for "Major Collector" = 1.20; AOR for "Minor Collector" or "Local" = 1.43). Those who were involved in crashes in wet or other surface conditions were slightly more likely to wear a seat belt compared to those involved in crashes in dry conditions (AOR = 0.95).

The effects of crash timing and road conditions were similar in the driver-only model; however, the difference in seat belt use between dry and wet or other surface conditions was no longer significant.

**Crash Characteristics and Violations.** When a crash was speeding related, the odds of not using a seat belt were greater than when a crash was not speeding related (AOR = 2.42). When the driver had prior violation records, the likelihood of not using a seat belt increased (AOR = 1.38). Findings were consistent in the driver-only model.

**County-Level Variables.** When a crash occurred in suburban or rural areas (as determined from Rural-Urban Continuum Codes [RUCC] county-level data), the likelihood of not using a seat belt significantly increased compared to crashes that occurred in urban areas (AOR for suburban = 1.08; AOR for rural = 1.56). Findings were consistent in the driver-only model.

### *Seat Belt Non-Use Risk Profiles Among Drivers*

Nine distinct FARS variables were selected from the CART model that best predicted the likelihood of seat belt non-use among drivers, as follows (from most to least predictive):

- Driver drinking (positive Blood Alcohol Concentration [BAC] or police-reported involvement)
- Speeding related
- Vehicle age
- Police-reported drug use
- Road type
- RUCC
- Total lanes in roadway

- License compliance with vehicle class
- Vehicle body type

Using these variables, the CART analyses identified 10 mutually exclusive profiles of drivers with greater than a 50% chance of not wearing a seat belt, and 14 additional profiles with greater than a 10% chance of not wearing a seat belt (24 risk profiles total). Each risk profile, as defined by one or more of the nine variables (e.g., drinking, driving a vehicle 10 years old or older), is associated with a likelihood that a driver was a seat belt non-user (see Appendix A–Table A-5).

As an example, Profile 1 had a 75.2% chance of not wearing a seat belt. Characteristics in this profile included the driver drinking, the crash occurring on a "Major Collector," "Minor Collector," or "Local" road, the driver's vehicle being at least 10 years old, and the crash occurring in a rural area. Among the 3,925 drivers that meet these criteria, 75% of those ($n$ = 2,950) were seat belt non-users.

In summary, the FARS analysis provided a tangible proof-of-concept of the ability to apply CART analyses to develop profiles indicative of likely seat belt non-use. Furthermore, in addition to the literature review, the isolation of factors especially predictive of seat belt wearing behavior from these data provides a complementary point of reference when determining the sorts of survey data that may be especially informative when developing motorist profiles. The insights obtained from this work were leveraged in the development of the survey discussed below.

## Section III—Understanding Reasons People Always, Sometimes, and Rarely/Never Use Seat Belts: A National Survey

Going beyond publicly available data sources, a multimode survey was designed and administered to assess seat belt use and factors associated with seat belt use, in a nationally representative sample of U.S. adults, using NORC's AmeriSpeak panel. The goal of the survey was to examine the characteristics and profiles of people who always, sometimes, and rarely/never use seat belts when driving or riding in vehicles (see Appendix B for the full survey instrument). There were five primary research questions (RQs) for this task, shown in Table 1 along with hypotheses for each research question.

*Table 1. Research Questions (RQ) and Hypotheses (H)*

| Research Questions | Hypotheses |
|---|---|
| **RQ1: What percentage of U.S. adults always, sometimes, and never wear seat belts when driving and separately when riding in a motor vehicle as a passenger?** | • **H1.1:** The majority of U.S. adults are expected to always wear seat belts when driving or riding in a motor vehicle as a passenger.<br>• **H1.2:** A higher proportion of U.S. adults is expected to wear seat belts when driving than when riding in a motor vehicle as a passenger. |
| **RQ2: What are the groups of drivers and passengers who follow similar seat belt wearing patterns across scenarios of when, where, and with whom they were driving/riding, and what characteristics do these groups have?** | |
| **RQ2a: How many groups can be empirically derived for drivers and, separately, passengers in different scenarios based on when, where, and with whom they are likely to wear seat belts, such as on a highway, during the day, at night, and in rural areas?** | • **H2a.1:** A large proportion of the individuals belong to a group that reports seat belt use under all or most circumstances.<br>• **H2a.2:** A very small proportion of the individuals belong to a group that reports rarely/never wearing a seat belt under all or most circumstances.<br>• **H2a.3:** At least one group of individuals belong to a group that reports always wearing a seat belt under only some circumstances but not others. |
| **RQ2b: What are the subgroups of individuals with the highest predicted probability of belonging to the groups identified in RQ2a?** | *Exploratory question; no a priori hypotheses* |

## Methods

### *Sample*

A general population sample of U.S. adults aged 18 or above was selected from NORC's AmeriSpeak Panel for this study. Survey respondents who indicated they had either driven a vehicle or been a passenger in a motor vehicle[1] in the past year were considered eligible and met the screening criteria. U.S. adults aged 18 or above who never, rarely, or sometimes wear seat belts (suboptimal seat belt users) were oversampled, and survey weights were adjusted accordingly. The survey was first fielded

[1] The four screener items used asked how often in the past year the respondent had: driven alone in a motor vehicle; driven with a passenger in a motor vehicle; ridden in the front seat as a passenger in a motor vehicle; and ridden in the back seat as a passenger in a motor vehicle.

as a soft launch on May 2, 2025, and was formally fielded from May 8, 2025, through June 17, 2025. Panelists received recurring email reminders and SMS or text messages throughout the fielding period. Respondents could complete the survey in English or Spanish, online or via phone, and received a cash equivalent of $4 for completing the survey. In total, 11,008 panelists were sampled, and 2,818 completed the survey (response rate = 25.6%). Sampling weights were developed, and non-response weights were adjusted and incorporated into the final weight to ensure national representativeness.

For all analyses, the sample was stratified into driver and passenger subsamples based on survey responses about driving and riding behaviors. Specifically, 2,124 respondents were in both samples, 456 respondents were only in the driver sample, and 237 respondents were only in the passenger sample. In other words, the driver sample consisted of 2,581 (2,124 + 456) individuals[2], and the passenger sample consisted of 2,362 (2,124 + 237) individuals[2].

Among the driver sample, over half of the respondents were adults aged 25–59; males and females were distributed evenly; most of the respondents were non-Hispanic White (61%), with the majority having an education between high school and a Bachelor's degree. Half were married, with an average household income between $50,000 and $59,000 a year. Over half lived in suburban areas, and two-thirds of the households did not have a child aged 17 or younger. About half of the respondents held a moderate political ideology. About one-third of the sample had a BMI in the range of healthy weight (18.5 to <25), one-third had an overweight BMI (25 to <30), and the remaining one-third had a BMI classified as obese (30+). The majority (77%) of the respondents resided in states with a primary seat belt law. The passenger sample was similar to the driver sample regarding sample characteristics. Appendix C–Table C-1 contains driver and passenger sample characteristics.

### *Measures*

**Key Outcomes.** The survey measured frequency of seat belt use as a driver (driving alone and with a passenger) and as a passenger in the front and back seat. The survey also assessed seat belt use under different conditions, including ***with whom*** the respondent drove/rode, ***where*** the respondent drove/rode, and ***when*** the respondent drove/rode (see Table 2).

[2] There is a difference of $n = 1$ in the sum of the respondents in both samples and the driver-only or passenger-only samples due to weighting.

*Table 2. Seat Belt Use Scenarios*

| **Scenarios—With Whom** |
|---|
| Your child under the age of 12 |
| Your teenage child |
| Your significant other/spouse |
| Your friend |
| Your adult child |
| Your parent/guardian/primary caregiver |
| A family member that is not your parent/guardian/primary caregiver or child |
| Other people you don't know |
| Someone driving a taxi/rideshare you are traveling in |
| **Scenarios—Where** |
| On a rural road |
| On a road in the city |
| On a road in the suburbs |
| On a short trip (≤2 miles or 10 minutes) |
| On a somewhat short trip (2–10 miles or 11–30 minutes) |
| On a somewhat long trip (11–25 miles or 30–60 minutes) |
| On a long trip (≥26 miles or 60 minutes) |
| In a state where you are unsure about the seat belt laws |
| On an interstate highway |
| On a bigger main road |
| On a smaller local road |
| **Scenarios—When** |
| During daylight |
| When it is dark outside |
| When there are a few vehicles, all traveling at the speed limit |
| When there are lots of vehicles traveling below the speed limit and stopping frequently |
| When the vehicle is traveling at or under the speed limit |
| When the vehicle is traveling over the speed limit |
| During wet conditions (when it is raining or snowing) |
| During times of the year that law enforcement is more likely to be issuing tickets for not wearing seat belts |
| During times or in areas where the fine for not wearing your seatbelt is higher |

**Covariates.** Respondents were also asked about risky behaviors such as alcohol and marijuana use, and impaired driving/riding. Additionally, the survey assessed vehicle characteristics (e.g., car ownership, vehicle type and age), driving patterns (how

often the respondent drives or rides as a passenger), endorsement for different seat belt enforcement strategies, perceived consequences of not wearing a seat belt, perceived norms and social influences around seat belt use, reasons for wearing (or not wearing) a seat belt (see Table 3), and general behaviors around media usage. See Appendix C–Table C-2 for a detailed list of measures included in the survey.

*Table 3. Reasons for Wearing (or Not Wearing) a Seat Belt*

| Reasons for Wearing a Seat Belt: | Reasons for Not Wearing a Seat Belt: |
|---|---|
| • It's a habit.<br>• I don't want to get a ticket.<br>• I feel unsafe not wearing it.<br>• Others want me to wear it.<br>• It's the law.<br>• I want to avoid serious injury or death.<br>• The people I'm with are wearing seat belts.<br>• My vehicle has an alarm that reminds me.<br>• I was brought up to wear it.<br>• Road, traffic, or weather conditions.<br>• I'm going to be traveling for a long distance.<br>• I'm going to be traveling on the highway. | • I'm only driving a short distance.<br>• I'm driving in light traffic.<br>• I'm in a rush.<br>• I forget to put it on.<br>• It's a hassle to put on.<br>• I don't want my clothes to get wrinkled.<br>• The seat belt is physically uncomfortable.<br>• The probability of being in a crash is too low.<br>• The people I am with are not wearing seat belts.<br>• I don't like being told what to do.<br>• It may cause injury or trap me if I'm in an accident.<br>• I or someone I know was previously in an accident where the seat belt caused an injury.<br>• I don't need to wear one.<br>• I'm traveling on low-speed roadways. |

### *Analytic Approach*

The project team conducted descriptive analyses to characterize the respondents and compare responses based on their seat belt use. Following bivariate analysis to identify factors related to seat belt use, the study team performed multinomial logistic regression analysis to determine the most important factors associated with seat belt use, controlling for other factors. The study team used the conventional significance threshold of $p < 0.05$ to determine statistically significant effects. Only statistically significant results are presented in this report.

Next, the study team conducted LCA to derive profiles of seat belt use under different circumstances (when, where, and with whom) and related a number of factors to these profiles (see Appendix C). LCA is a person-centered approach[3] that provides an efficient tool to empirically identify groups based on patterns of individual survey

[3] A variable-centered approach is to examine the relationship between variables, and a person-centered approach is to identify groups in the population that follow similar behavioral or attitudinal patterns.

responses, rather than relying on a priori knowledge or ad hoc assumptions. Individuals are assigned to the class to which they have the highest probability of belonging. LCA was particularly justified in this study because seat belt use varies across multiple contexts, and the underlying patterning of these behaviors is not known a priori. By allowing the data to reveal distinct, internally consistent subgroups, LCA provides a more valid basis for defining meaningful use profiles than methods that rely on predefined categories.

Lastly, the project team conducted a CART analysis to determine profiles with the highest predicted probability of belonging to the identified seat belt use classes. Upon the identification of latent classes, the study team first extracted posterior probabilities for each class. These probabilities represent the likelihood that an individual belongs to each latent class identified by the model. These probabilities were then used as outcome variables in CART. A CART model with multiple predictor variables (e.g., sex, race, age) was run for each LCA class to predict the probability of being in each LCA class. The classification tree was then used to identify profiles with the highest predicted probability of belonging to each class.

## Results

Below are the analysis results from the univariate descriptive analysis, multivariate regression, LCA, and CART analysis.

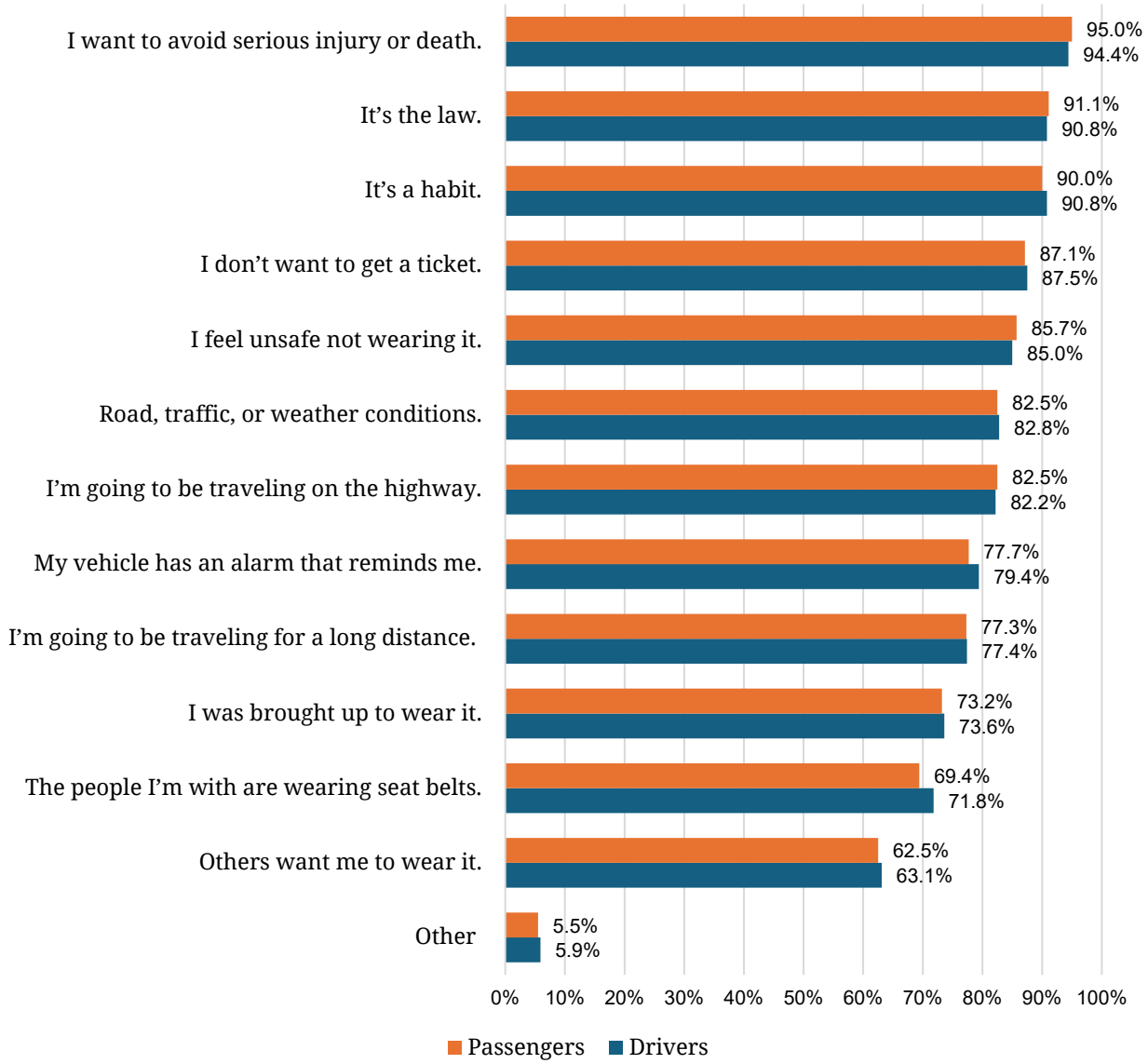
### *Descriptive Analysis*

Overall, about 70% of drivers reported always wearing a seat belt, 2.5% reported rarely/never wearing a seat belt, and the remaining 27% reported using a seat belt some or most of the time. Among passengers, 57% reported wearing a seat belt all of the time, 6.3% reported rarely/never using a seat belt, and 37% reported using a seat belt some or most of the time.

Figure 1 presents the distribution of reasons for wearing a seat belt among those who wore a seat belt some of the time, most of the time, or all of the time. The reason that received most agreement is “I want to avoid serious injury or death,” followed by “It’s a habit” or “It’s the law.” The reasons that received the least amount of agreement are “Others want me to wear it,” “The people I’m with are wearing seat belts,” and “I was brought up to wear it.” This indicates that seat belt use tends to be based on individual decisions and can rarely be impacted by others. Among these three reasons, “I was brought up to wear it” received the most agreement, suggesting that seat belt wearing behavior may be formed early on in life, and parents and/or role models can still play an important role in shaping one’s seat belt use early on. About 80% agreed that reasons for wearing a seat belt may be associated with road type, travel distance, and weather conditions. This indicates that seat belt use may not be uniform, that is, the decision to

wear a seat belt may depend on travel conditions, which are further examined in the LCA analysis.

*Figure 1. Reasons for Wearing a Seat Belt Among Those Who Wore a Seat Belt Some of the Time, Most of the Time, or All of the Time*




Conversely, Figure 2 presents the distribution of agreement on reasons for not wearing a seat belt for those who some of the time, rarely, or never wear a seat belt. The reason with the most agreement is "I'm only driving a short distance." Notably, the reason "I'm traveling on low-speed roadways" also received more agreement than other reasons. This mirrors the pattern shown in Figure 1, that is, perceived importance of wearing a seat belt may differ according to travel and traffic patterns, where wearing a seat belt may be perceived as more important when traveling on a highway, high-speed

roadway, or long distance, and, in contrast, less important when traveling on a local road, low-speed roadway, or short distance.

Two other reasons that received more agreement are “I’m in a rush” and “I forgot to put it on.” Another reason that received more agreement is “The seat belt is physically uncomfortable,” indicating a need to improve seat belt designs to accommodate different weights and heights and other individualized needs. The Road User Profiles document contains the top reasons for wearing or not wearing a seat belt among individuals in each profile.

*Figure 2. Reasons for Not Wearing a Seat Belt Among Some of the Time, Rarely, and Never Seat Belt Users*

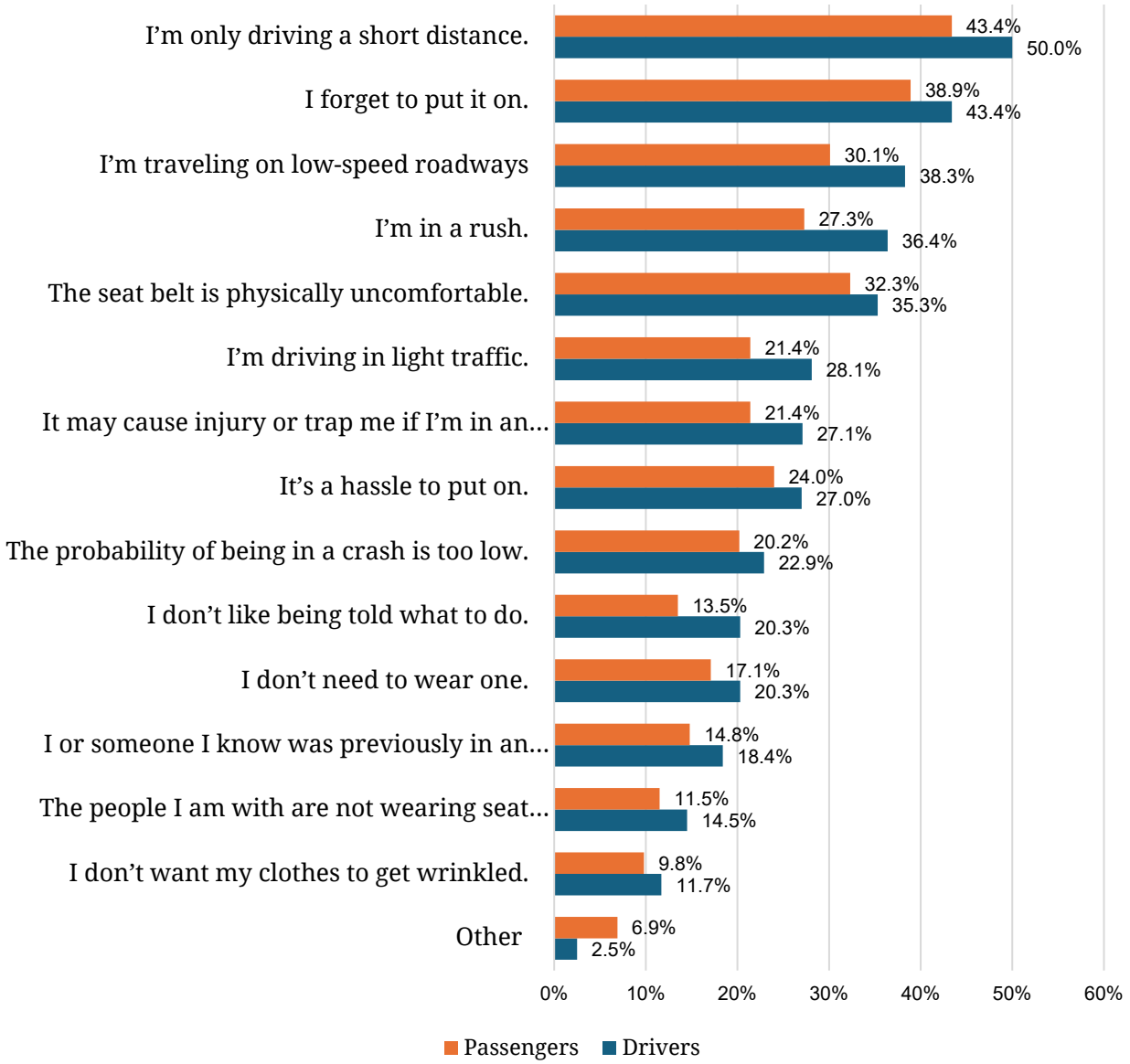


Table 4 presents the bivariate relationship between demographics and seat belt use. Older adults were most likely, and young adults were least likely to wear a seat belt, both as a driver and as a passenger. For example, while 77% older adults wore a seat belt most of the time when driving, only 58% young adults did so. In contrast, only 1.5% of older adults rarely/never wore a seat belt, and 5% of young adults rarely/never wore a seat belt when driving. Females were more likely to wear a seat belt than males when driving or riding in a vehicle. For example, 74% of females wore a seat belt all of the time when driving, compared to only 67% of male drivers. Seat belt use and household income tend to be positively correlated generally. For example, among drivers, the average household income was $40,000–$49,999 for rarely/never seat belt users, $35,000–$49,999 for some of the time users, $50,000–$74,999 for most of the time users, and $60,000–$84,999 for all of the time seat belt users.

*Table 4. Relationship between Demographics and Seat Belt Use*

| | Drivers (*N* = 2,581) | | | | | Passengers (*N* = 2,362) | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | **Rarely/ Never** | **Some of the Time** | **Most of the Time** | **All of the Time** | ***p*-Value** | **Rarely/ Never** | **Some of the Time** | **Most of the Time** | **All of the Time** | ***p*-Value** |
| | **Mean/Frequency** | | | | | **Mean/Frequency** | | | | |
| **Age** | 40.81 | 43.47 | 46.46 | 49.78 | <0.001 | 44.81 | 48.01 | 47.88 | 49.27 | 0.025 |
| Young adult (18–24) | 4.7% | 22.6% | 15.0% | 57.7% | | 8.6% | 23.7% | 19.1% | 48.6% | |
| Adults (25–59) | 2.6% | 15.5% | 12.6% | 69.3% | <0.001 | 6.4% | 20.5% | 15.8% | 57.2% | 0.118 |
| Older adults (60+) | 1.5% | 12.0% | 9.9% | 76.7% | | 5.4% | 20.3% | 14.9% | 59.3% | |
| **Sex** | | | | | | | | | | |
| Male | 2.7% | 16.9% | 13.5% | 67.0% | 0.003 | 8.5% | 20.1% | 15.1% | 56.3% | 0.001 |
| Female | 2.2% | 13.5% | 10.6% | 73.7% | | 4.4% | 21.5% | 16.6% | 57.6% | |
| **Race/Ethnicity** | | | | | | | | | | |
| White, non-Hispanic | 2.2% | 11.1% | 11.4% | 75.3% | | 4.8% | 17.8% | 16.0% | 61.3% | |
| Black, non-Hispanic | 2.4% | 30.0% | 13.3% | 54.3% | | 10.7% | 37.4% | 11.8% | 40.1% | |
| Hispanic | 3.6% | 18.6% | 14.1% | 63.6% | <0.001 | 8.4% | 22.7% | 16.0% | 53.0% | <0.001 |
| Asian Pacific Islander, non-Hispanic | 0.0% | 18.8% | 12.5% | 68.8% | | 6.1% | 17.6% | 14.5% | 61.8% | |
| Other and multi-racial, non-Hispanic | 4.8% | 13.3% | 8.6% | 73.3% | | 7.8% | 16.5% | 25.2% | 50.5% | |
| **Education Level** | | | | | | | | | | |
| Less than high school | 5.2% | 28.6% | 8.6% | 57.6% | | 13.0% | 28.0% | 19.0% | 40.0% | |
| High school graduate or equivalent | 3.1% | 23.6% | 16.6% | 56.6% | | 9.5% | 30.3% | 14.3% | 45.9% | |
| Some college/ associates degree | 3.5% | 12.4% | 12.7% | 71.4% | <0.001 | 6.2% | 21.2% | 13.6% | 58.9% | <0.001 |
| Bachelor's degree | 0.6% | 9.7% | 9.1% | 80.6% | | 3.5% | 13.7% | 16.7% | 66.1% | |
| Postgraduate/ professional degree | 0.8% | 4.8% | 8.5% | 85.8% | | 2.0% | 11.0% | 19.1% | 68.0% | |
| **Marital Status** | | | | | | | | | | |
| Not married | 3.5% | 18.7% | 12.1% | 65.7% | <0.001 | 7.6% | 25.6% | 15.2% | 51.7% | <0.001 |
| Married | 1.5% | 11.7% | 11.9% | 74.9% | | 5.2% | 16.5% | 16.5% | 61.8% | |
| **Household Income*** | 9.01 | 8.93 | 10.42 | 11.42 | <0.001 | 9.82 | 8.99 | 11.16 | 11.52 | <0.001 |

| | Drivers (*N* = 2,581) | | | | | Passengers (*N* = 2,362) | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | Rarely/ Never | Some of the Time | Most of the Time | All of the Time | *p*-Value | Rarely/ Never | Some of the Time | Most of the Time | All of the Time | *p*-Value |
| | Mean/Frequency | | | | | Mean/Frequency | | | | |
| **Current Employment Status** | | | | | | | | | | |
| Working | 2.1% | 16.2% | 12.2% | 69.5% | 0.093 | 6.9% | 19.4% | 15.9% | 57.8% | 0.088 |
| Not working | 3.1% | 13.2% | 11.7% | 72.0% | | 5.3% | 23.2% | 15.8% | 55.6% | |
| **Metropolitan Area Flag** | | | | | | | | | | |
| Urban | 2.7% | 14.2% | 8.9% | 74.2% | 0.002 | 5.2% | 23.1% | 15.6% | 56.1% | 0.002 |
| Suburban | 2.1% | 14.8% | 13.0% | 70.0% | | 6.0% | 18.8% | 16.0% | 59.1% | |
| Rural | 3.5% | 18.8% | 15.2% | 62.5% | | 10.4% | 23.4% | 15.6% | 50.6% | |
| **Any Children in the Household (age 17 or under)** | | | | | | | | | | |
| No | 2.4% | 12.5% | 11.1% | 74.0% | <0.001 | 5.8% | 19.2% | 16.2% | 58.9% | 0.026 |
| Yes | 2.7% | 20.6% | 13.9% | 62.8% | | 7.5% | 23.5% | 15.0% | 54.0% | |
| **Political Ideology** | | | | | | | | | | |
| Liberal | 2.9% | 12.5% | 7.6% | 77.0% | 0.001 | 5.7% | 15.8% | 15.6% | 62.9% | 0.014 |
| Moderate | 2.0% | 16.1% | 13.0% | 68.8% | | 6.1% | 23.0% | 15.3% | 55.6% | |
| Conservative | 2.9% | 16.0% | 13.7% | 67.4% | | 7.2% | 21.1% | 17.3% | 54.4% | |
| **Body Mass Index (BMI)** | | | | | | | | | | |
| Underweight (BMI <18.5) | 1.8% | 30.4% | 14.3% | 53.6% | <0.001 | 12.3% | 35.1% | 19.3% | 33.3% | <0.001 |
| Healthy Weight (BMI 18.5 to <25) | 1.9% | 13.9% | 7.5% | 76.7% | | 5.0% | 17.8% | 16.7% | 60.4% | |
| Overweight (BMI 25 to <30) | 2.1% | 9.9% | 14.2% | 73.8% | | 5.8% | 16.0% | 16.6% | 61.5% | |
| Obesity (BMI ≥30) | 2.8% | 18.1% | 14.2% | 64.9% | | 7.0% | 26.3% | 13.4% | 53.3% | |
| **State Seat Belt Laws** | | | | | | | | | | |
| Primary | 2.3% | 15.2% | 12.1% | 70.5% | 0.649 | 6.0% | 21.5% | 15.4% | 57.1% | 0.299 |
| Secondary or No Law | 3.2% | 15.3% | 11.7% | 69.8% | | 7.4% | 18.7% | 17.4% | 56.6% | |

** Household income is measured by an 18-category variable with the following categories: 1 = less than $5,000; 2 = $5,000–$9,999; 3 = $10,000–$14,999; 4 = $15,000–$19,999; 5 = $20,000–$24,999; 6 = $25,000–$29,999; 7 = $30,000–$34,999; 8 = $35,000–$39,999; 9 = $40,000–$49,999; 10 = $50,000–$59,999; 11 = $60,000–$74,999; 12 = $75,000–$84,999; 13 = $85,000–$99,999; 14 = $100,000–$124,999; 15 = $125,000–$149,999; 16 = $150,000–$174,999; 17 = $175,000–$199,999; and 18 = $200,000 or more.*

Table 5 presents the bivariate relationships between the respondents' perceived consequences of not wearing a seat belt and their seat belt use. For drivers, the perceived consequences of not wearing a seat belt were not significantly correlated with seat belt use. However, for passengers, the perceived consequences of not wearing a seat belt were significantly correlated with seat belt use, although the differences were small. For both drivers and passengers, perceived consequences after receiving a ticket, a fine, or getting involved in a car crash due to not wearing a seat belt differ significantly by seat belt use frequency; however, such differences were small.

*Table 5. Relationship between Perceived Consequences of Not Wearing a Seat Belt and Seat Belt Use (1-Very unlikely to 4-Very likely)*

| | Drivers (*N* = 2,581) | | | | | Passengers (*N* = 2,362) | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | Rarely/ Never | Some of the Time | Most of the Time | All of the Time | *p*-Value | Rarely/ Never | Some of the Time | Most of the Time | All of the Time | *p*-Value |
| | Mean | | | | | Mean | | | | |
| **Driver/passenger consequences** | | | | | | | | | | |
| *Assume that you never wear your seat belt while driving/riding as a passenger over the next six months. How likely do you think…* | | | | | | | | | | |
| You will receive a warning for not wearing a seatbelt? | 2.56 | 2.60 | 2.71 | 2.67 | 0.462 | 2.77 | 2.39 | 2.38 | 2.48 | 0.001 |
| You will receive a ticket for not wearing a seatbelt? | 2.53 | 2.59 | 2.74 | 2.67 | 0.257 | 2.79 | 2.46 | 2.32 | 2.41 | <0.001 |
| You will receive a fine for not wearing a seat belt? | 2.52 | 2.65 | 2.74 | 2.66 | 0.426 | 2.89 | 2.44 | 2.31 | 2.40 | <0.001 |
| You will be involved in a car crash? | 2.33 | 2.43 | 2.35 | 2.31 | 0.176 | 2.61 | 2.35 | 2.20 | 2.32 | <0.001 |
| **Ticketing consequences** | | | | | | | | | | |
| *If you receive a ticket for not wearing your seat belt, how likely do you think…* | | | | | | | | | | |
| The ticket will increase the cost of your car insurance? | 2.93 | 2.80 | 3.13 | 3.16 | <0.001 | 2.87 | 2.82 | 3.05 | 3.18 | <0.001 |
| The ticket will cause you to lose your car insurance? | 2.19 | 2.27 | 2.09 | 1.93 | <0.001 | 2.33 | 2.04 | 1.83 | 1.96 | <0.001 |
| The ticket will cause you to lose your license? | 2.09 | 2.22 | 1.90 | 1.78 | <0.001 | 2.22 | 1.97 | 1.78 | 1.80 | <0.001 |
| *If you receive a fine for not wearing your seat belt, how likely do you think …* | | | | | | | | | | |
| The fine associated with the ticket will be more than you can pay? | 2.64 | 2.51 | 2.32 | 2.05 | <0.001 | 2.64 | 2.36 | 2.02 | 2.04 | <0.001 |

| | Drivers (*N* = 2,581) | | | | | Passengers (*N* = 2,362) | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | Rarely/ Never | Some of the Time | Most of the Time | All of the Time | *p*-Value | Rarely/ Never | Some of the Time | Most of the Time | All of the Time | *p*-Value |
| | Mean | | | | | Mean | | | | |
| **Injury consequences** | | | | | | | | | | |
| *If you are involved in a car crash and you are not wearing your seat belt, how likely do you think…* | | | | | | | | | | |
| That you will be injured in the car crash? | 2.71 | 2.92 | 3.17 | 3.58 | <0.001 | 3.08 | 2.97 | 3.41 | 3.61 | <0.001 |
| That the cost of treating your injury will be more than you can pay? | 2.75 | 2.87 | 2.82 | 3.01 | 0.001 | 2.86 | 2.79 | 2.82 | 3.03 | <0.001 |
| That you might die in the car crash? | 2.44 | 2.88 | 2.90 | 3.20 | <0.001 | 2.95 | 2.76 | 2.95 | 3.25 | <0.001 |
| *If you are involved in a car crash when you are driving and your passenger is not wearing their seat belt, how likely do you think…* | | | | | | | | | | |
| That a passenger in your car will be injured in the crash? | 2.81 | 2.96 | 3.19 | 3.46 | <0.001 | 3.18 | 2.97 | 3.36 | 3.49 | <0.001 |
| That the cost of treatment for your passenger's injury will be more than you can pay? | 2.98 | 2.95 | 2.99 | 3.14 | 0.001 | 3.07 | 2.86 | 3.03 | 3.16 | <0.001 |
| That a passenger in your car will die in the crash? | 2.73 | 2.83 | 2.84 | 3.06 | <0.001 | 2.96 | 2.71 | 2.92 | 3.11 | <0.001 |

Table 6 presents the bivariate relationships between risky behaviors and seat belt use. Those who screened positive for alcohol misuse consistently had a higher likelihood of rarely/never wearing a seat belt and a lower likelihood of wearing a seat belt all of the time, both as a driver and as a passenger. For example, 2% of those who screened negative for alcohol misuse reported rarely/never wearing a seat belt as a driver, compared to 3% among those who screened positive. Over 60% of those who screened negative reported wearing a seat belt all of the time as a passenger, compared to only slightly over 50% of those who screened positive. A similar pattern was observed for marijuana use. Those who used marijuana in the past year had a higher likelihood of rarely/never wearing a seat belt and a lower likelihood of wearing a seat belt all of the time.

The likelihood of seat belt use is also significantly associated with the frequency of impaired driving/riding, with a near-linear relationship. For example, drivers who reported seat belt use all of the time reported driving less frequently when having enough alcohol that they thought might be over the legal limit (at 1.14, i.e., close to never on a scale from 1-Never to 5-All of the time), compared to those who reported rarely/never or sometimes using seat belts (at 1.41 and 1.45 respectively, i.e., between “Never” and “Some of the time”).

A similar pattern was observed for passengers. Passengers who reported seat belt use all of the time reported driving less frequently shortly after marijuana use (at 1.16, i.e., close to never), compared to those who reported rarely/never or sometimes using seat belts (at 1.47 and 1.51 respectively, i.e., between “Never” and “Some of the time”).

*Table 6. Relationship between Risky Behaviors and Seat Belt Use*

| | Drivers (*N* = 2,581) | | | | | Passengers (*N* = 2,362) | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | **Rarely/ Never** | **Some of the Time** | **Most of the Time** | **All of the Time** | ***p*-Value** | **Rarely/ Never** | **Some of the Time** | **Most of the Time** | **All of the Time** | ***p*-Value** |
| | **Mean/Frequency** | | | | | **Mean/Frequency** | | | | |
| **Alcohol Misuse (AUDIT-C)** | | | | | | | | | | |
| Negative screen | 2.1% | 12.9% | 11.8% | 73.2% | 0.001 | 5.1% | 18.3% | 15.6% | 61.0% | <0.001 |
| Positive screen | 3.0% | 18.1% | 11.8% | 67.0% | | 8.3% | 24.2% | 16.4% | 51.1% | |
| **Marijuana Use (SIS-C)** | | | | | | | | | | |
| No past-year use | 1.7% | 11.2% | 12.3% | 74.8% | <0.001 | 5.7% | 17.1% | 16.3% | 60.9% | <0.001 |
| Any past-year use | 3.8% | 23.8% | 11.6% | 60.7% | | 7.6% | 28.7% | 15.4% | 48.3% | |
| **Impaired Driving/Riding** | | | | | | | | | | |
| *In the past year, how often have you…? (1-Never to 5-All of the time)* | | | | | | | | | | |
| Driven when you were so tired that you had a hard time keeping your eyes open | 1.83 | 1.89 | 1.82 | 1.50 | <0.001 | 1.83 | 1.75 | 1.56 | 1.46 | <0.001 |
| Driven when you had enough alcohol that you thought you might be over the legal limit | 1.41 | 1.45 | 1.32 | 1.14 | <0.001 | 1.37 | 1.38 | 1.24 | 1.12 | <0.001 |
| Ridden in a car driven by someone who has had too much alcohol | 1.43 | 1.54 | 1.41 | 1.18 | <0.001 | 1.43 | 1.45 | 1.31 | 1.15 | <0.001 |
| Driven shortly (within an hour) after using marijuana | 1.75 | 1.64 | 1.31 | 1.19 | <0.001 | 1.47 | 1.51 | 1.22 | 1.16 | <0.001 |
| Driven without wearing a seatbelt | 3.20 | 2.16 | 2.09 | 1.10 | <0.001 | 2.27 | 1.92 | 1.49 | 1.09 | <0.001 |

### *Multivariate Regression*

Several respondent characteristics were significantly associated with seat belt use. Female drivers were less likely to be "some of the time" seat belt users compared to male drivers (AOR = 0.62). Compared to non-Hispanic White drivers, drivers of other racial/ethnic identities were more likely to be "some of the time" seat belt users, which was most pronounced for non-Hispanic Black drivers (AOR = 4.39). Drivers with lower educational attainment had higher odds of being suboptimal seat belt users (i.e., not an "all of the time" user) compared to those with a Bachelor's degree or higher (AOR ranges from 1.68 to 3.64).

Drivers who had a BMI classified in the overweight or obese range wore seat belts less consistently than individuals falling within a healthy weight range. Drivers who had a BMI classified in the overweight or obese range had greater odds of being a "most of the time" user compared to individuals falling within a healthy weight BMI range (AOR = 2.18). However, they did not have significantly higher odds of being a "rarely/never" or a "some of the time" seat belt user when compared to individuals with a healthy weight BMI range. Lower household income was associated with greater odds of being a suboptimal seat belt user (AOR ranges from 1.72 to 2.43).

Other than demographic characteristics, vehicle age was negatively associated with seat belt use. Drivers with a vehicle 15 years or older had 1.75 times the odds of being a "some of the time" seat belt user compared to those with a newer vehicle zero to 4 years old. Past-year marijuana use was also associated with increased odds of being a "some of the time" seat belt user compared to those who did not use marijuana in the past year. Lastly, more impaired driving and riding behaviors were associated with less seat belt use. Most notably, drivers who engaged most in impaired driving/riding (i.e., drowsy driving, driving after consuming too much alcohol, riding when the driver has consumed too much alcohol, and driving shortly after using marijuana) had four times the odds of being a "rarely/never " seat belt user compared to those who did not drive or ride impaired.

Similar findings emerged for passengers, with some notable differences. Female passengers were less likely to be "rarely/never" seat belt users compared to male passengers. In addition, only non-Hispanic Black respondents were more likely to be "rarely/never" or "some of the time" seat belt users as passengers compared to non-Hispanic White passengers. Passengers with a high school degree or less were more likely to be "rarely/never" or "some of the time" seat belt users compared to those with a Bachelor's degree or higher. In contrast to drivers, passengers who had a BMI classified in the underweight range had 3.59 times the odds of being a "some of the time" seat belt user compared to individuals falling within a healthy BMI range.

Past-year marijuana use was not significantly associated with seat belt use among passengers. However, passengers who screened positive for alcohol misuse had nearly

twice the odds of being a "rarely/never" seat belt user compared to individuals who screened negative (AOR = 1.92). Appendix C–Tables C-3 and C-4 present the multivariate relationship between these factors and seat belt use.

### *Latent Class Analysis*

The study team used LCA to explore the number of groups (classes) for drivers and, separately, for passengers across different scenarios based on when, where, and with whom they wear seat belts. Appendix C–Tables C-5 and C-6 show the model fit indices for models with different numbers of classes for drivers and passengers, respectively. For both drivers and passengers, a four-class model was selected as the best-fitting model. Figure 3 shows the four classes for drivers, and Figure 4 shows the four classes for passengers. To interpret the area under the curve graphs in the figures, a larger proportion of a given color indicates a higher probability of that response category (i.e., rarely/never, some of the time, most of the time, or all of the time) for the corresponding indicator.

**Drivers.** Among drivers, the largest class identified was "**All of the Time Users**," which comprised 80.7% of drivers. This class had a very high probability (close to 1) of always using a seat belt across all driving scenarios.

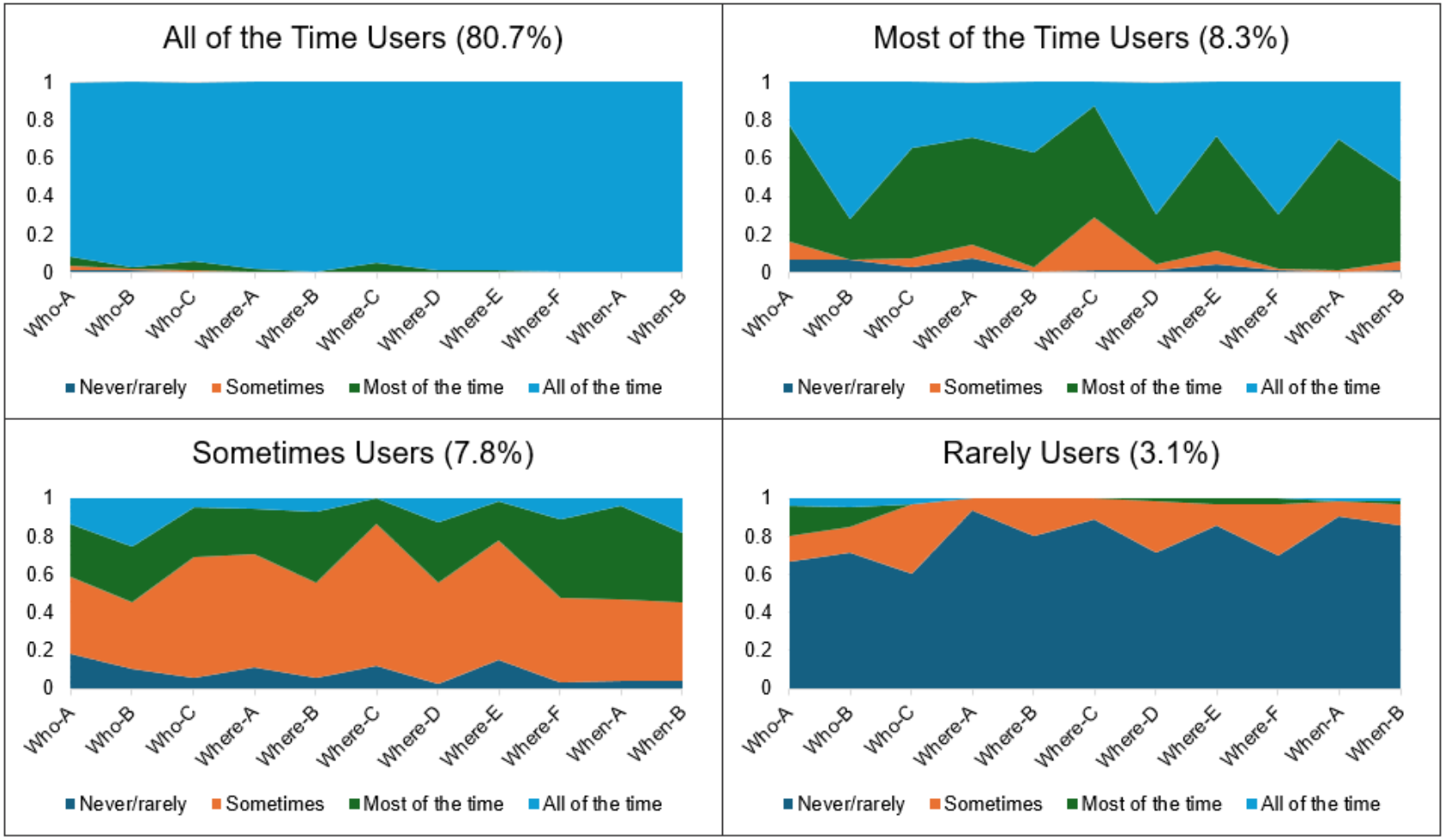
The second class, "**Most of the Time Users**," accounted for 8.3% of the sample. Drivers in this class tended to report wearing their seatbelt "Most of the time" or "All of the time" across scenarios. Individuals in this class showed greater variation in seat belt use across the scenarios compared to the "All of the Time Users" class. For example, individuals in this class increased their seat belt use in scenarios perceived as higher risk, such as driving with a child, driving long distances, or driving on major roads. Conversely, seat belt use was lower when driving short distances.

The third class, "**Sometimes Users**," represented 7.8% of the sample. Drivers in this group indicated "Some of the time" seat belt use more consistently across scenarios. Their seat belt use also varied across scenarios, with similar patterns shown in the "Most of the Time Users," although with slightly less variation.

Finally, the smallest group, comprising 3.1% of the sample, was categorized as "**Rarely Users**." This class showed consistently high probabilities for "Rarely/Never" seat belt use across all indicators.

**Passengers.** Similar patterns and class identities emerged among passengers. The largest class identified was also "All of the Time Users," making up 80.7% of passengers. The second class, "Most of the Time Users," accounted for 9.5% of passengers. The third passenger class, "Sometimes Users," represented 6.8% of the passengers. The final passenger class, "Rarely Users," also represented 3.1% of passengers.

*Figure 3. Driver LCA Classes (N = 2,281)*

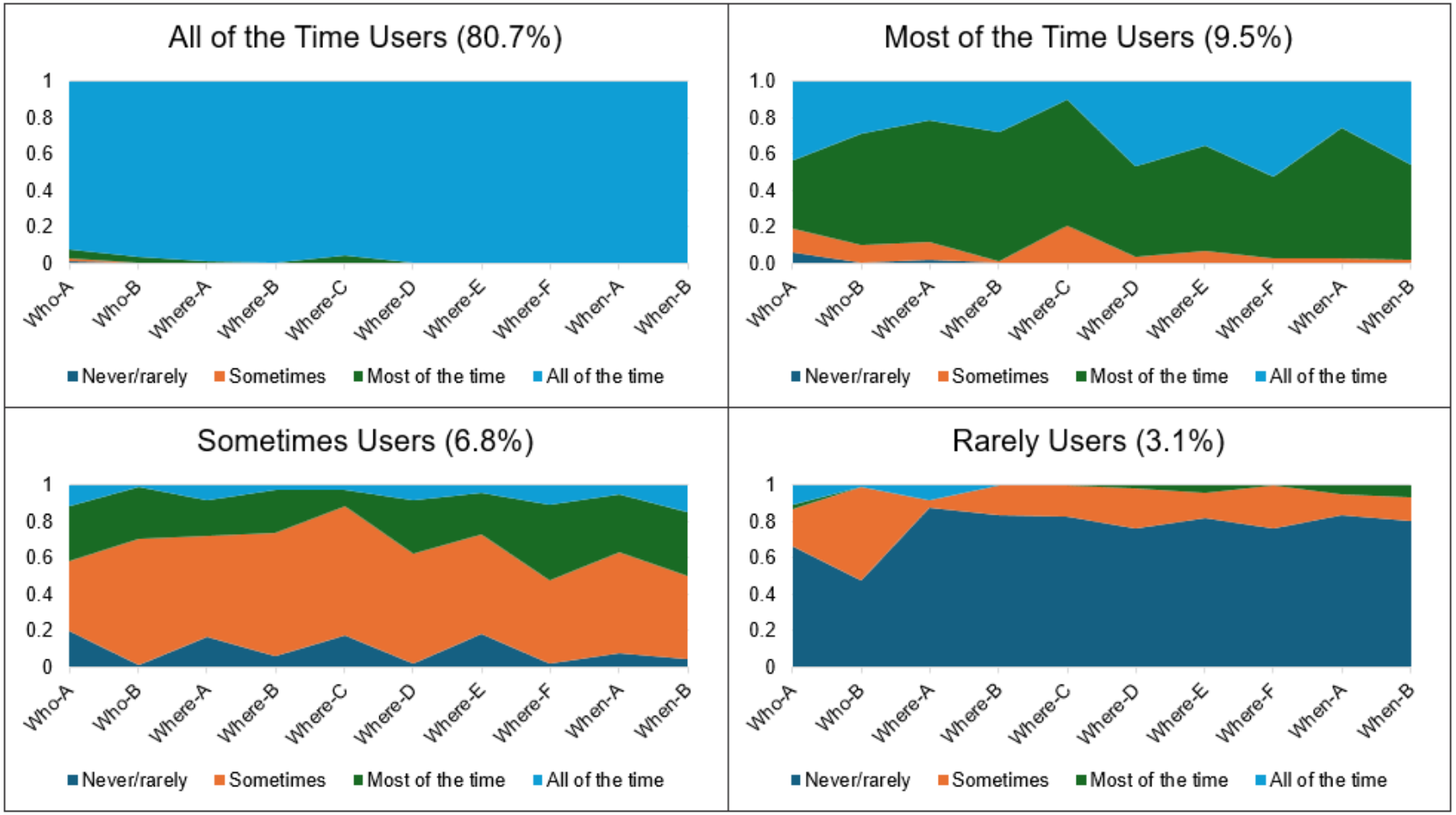



**Who-A**: Driving alone
**Who-B**: Driving with a child
**Who-C**: Driving with a nonchild

**Where-A**: Driving on rural roads
**Where-B**: Driving on urban/suburban roads
**Where-C**: Driving short distance
**Where-D**: Driving long distance
**Where-E**: Driving on smaller roads
**Where-F**: Driving on major roads

**When-A**: Driving in daylight
**When-B**: Driving in dark

*Figure 4. Passenger LCA Classes (N = 2,281)*




**Who-A**: Riding in a rideshare
**Who-B**: Riding with someone known

**Where-A**: Riding on rural roads
**Where-B**: Riding on urban/suburban roads
**Where-C**: Riding short distance
**Where-D**: Riding long distance
**Where-E**: Riding on smaller roads
**Where-F**: Riding on major roads

**When-A**: Riding in daylight
**When-B**: Riding in dark

### *Factors Associated with Seat Belt Use Classes*

Next, the study team examined the relationship between different factors and the seat belt use classes. Appendix C–Tables C-7 and C-8 present the results for drivers and passengers, respectively.

**Scenarios of With Whom, Where, and When.** Table 7 presents the univariate descriptives of class indicators, i.e., seat belt use under scenarios defined by with whom, where, and when for the Driver and Passenger samples. For drivers, seat belt use depends on with whom the driver was traveling. For example, 84% of drivers reported wearing seat belts all of the time when traveling with their child, but this percentage is lower at 77% when it comes to driving alone. Similarly, the likelihood of wearing a seat belt also varies by the location where they were traveling. For example, 88% of drivers and passengers reported using a seat belt all of the time when traveling on a major road, which decreased to 78 and 79%, respectively, when traveling on a short or somewhat short trip. Seat belt use also varied slightly depending on the time of day. Similar patterns were observed for drivers and passengers.

*Table 7. Seat Belt Use in Different Scenarios by Seat Belt Use*

| | **Drivers (*N* = 2,281)** | | | | **Passengers (*N* = 2,141)** | | | |
|---|---|---|---|---|---|---|---|---|
| | Rarely/ Never | Some of the time | Most of the time | All of the time | Rarely/ Never | Some of the time | Most of the time | All of the time |
| **Seat belt use depending on *with whom* they are traveling** | | | | | | | | |
| Your child (teen or under the age of 12) | 5.2% | 4.5% | 6.3% | 84.0% | - | - | - | - |
| Driving with anyone not a teen/under-12 child | 2.9% | 7.1% | 10.8% | 79.1% | - | - | - | - |
| Driving alone | 5.3% | 6.0% | 11.6% | 77.1% | - | - | - | - |
| Someone driving a taxi or rideshare that you are traveling in | - | - | - | - | 4.6% | 5.7% | 9.8% | 79.9% |
| Someone you know driving | - | - | - | - | 1.7% | 7.2% | 10.2% | 80.9% |
| **Seat belt use depending on *where* they are traveling** | | | | | | | | |
| On a rural road | 4.5% | 5.4% | 8.1% | 82.0% | 4.0% | 4.9% | 8.4% | 82.7% |
| On an urban or suburban road | 2.9% | 4.7% | 8.2% | 84.1% | 2.5% | 4.7% | 8.1% | 84.6% |
| On a short or somewhat short trip (<10 miles or 30 minutes) | 3.8% | 8.5% | 9.6% | 78.1% | 3.3% | 9.0% | 9.2% | 78.6% |
| On a somewhat long trip (11–25 miles or 30–60 minutes) | 2.5% | 5.2% | 5.4% | 86.9% | 2.0% | 5.4% | 5.8% | 86.9% |
| On a smaller local road (not an interstate highway and not a main road) | 4.1% | 5.8% | 7.3% | 82.8% | 3.6% | 5.6% | 7.6% | 83.2% |
| On a bigger main road or interstate highway | 2.5% | 4.3% | 5.7% | 87.5% | 2.2% | 4.0% | 5.8% | 88.0% |
| **Seat belt use depending on *when* they are traveling** | | | | | | | | |
| During daylight | 3.4% | 3.5% | 9.5% | 83.6% | 2.9% | 3.3% | 9.8% | 84.0% |
| When it is dark outside | 3.4% | 3.8% | 6.4% | 86.4% | 2.7% | 4.0% | 6.9% | 86.4% |

**Age.** Among drivers, older adults (age 60+) were significantly less likely to be in the "Sometimes Users" class (AOR = 0.48) or "Most of the Time Users" class (AOR = 0.44) compared to adults (ages 25–59). Among passengers, older adults were significantly less likely to be in the "Sometimes Users" class compared to adults (AOR = 0.43).

**Sex.** Female drivers were less likely to be in the "Rarely Users" class (AOR = 0.34) or "Sometimes Users" class (AOR = 0.58) compared to males. Similarly, female passengers were also less likely to be in the "Rarely Users" (AOR = 0.45) or "Sometimes Users" (AOR = 0.48) class compared to males.

**Race.** Non-Hispanic Black respondents had nearly twice the odds of being in the "Most of the Time Users" passenger class compared to non-Hispanic White respondents.

**Education.** For drivers, lower educational attainment was associated with greater odds of being in a suboptimal seat belt user class (AOR ranges from 2.77 to 4.74). Lower educational attainment was a strong predictor of class membership for passengers as well, most notably among individuals with a high school degree or less. Passengers with a high school degree or less had 5.15 times the odds of being in the "Rarely Users" class and 3.09 times the odds of being in the "Sometimes Users" class compared to passengers with a Bachelor's degree or higher.

**Body Mass Index.** BMI was significantly associated with driver class membership. Underweight individuals had four times the odds of being in the "Sometimes Users" class, and obese individuals had three times to the odds of being in the "Rarely Users" class, when compared to individuals with a BMI in the healthy weight range. BMI was significantly associated with passenger class membership as well. Obese individuals had nearly twice the odds of being in the "Sometimes Users" class compared to individuals with a BMI in the healthy weight range. Underweight individuals had over five times the odds of being in the "Most of the Time Users" class compared to those with a BMI in the healthy weight range.

**Household Income.** Lower incomes, particularly the lowest household income category, were associated with suboptimal seat belt use. For example, individuals with a household income of less than $30,000 had increased odds of being in the "Rarely Users," "Sometimes Users," or "Most of the Time Users" classes compared to drivers with a household income of $100,000 or more. For passengers, lower income was also associated with increased odds of being in the "Sometimes Users" class. Individuals with a household income of less than $30,000 and $30,000 to under $60,000 had increased odds of being in the "Sometimes Users" class compared to individuals with a household income of $100,000 or more.

**Vehicle Age.** Drivers with a vehicle 15 years or older had 2.77 times the odds of being in the "Rarely Users" class compared to those with a vehicle 0 to 4 years old.

**Marijuana Use.** Among drivers, individuals who reported any past-year marijuana use had over three times the odds of being in the "Rarely Users" class compared to those who did not use marijuana in the past year.

**Urbanicity.** Among drivers, those residing in rural areas had more than twice the odds of being in the "Most of the Time Users" class as those residing in urban areas. Similar to drivers, passengers residing in rural areas had twice the odds of being in the "Most of the Time Users" class compared to those residing in urban areas.

**Impaired Driving.** Impaired driving and riding behaviors were positively associated with suboptimal seat belt use for both drivers and passengers. As the number of types of impaired driving and riding behaviors increased, the odds of being in the "Sometimes Users" or "Most of the Time Users" class increased.

### *Classification and Regression Tree Analysis*

Next, the study team explored subgroups of individuals with the highest predicted probability of belonging to the classes. CART analysis allowed the study team to identify the specific combinations of characteristics that most strongly differentiate high probability suboptimal seat belt users, making the resulting profiles actionable for targeted interventions and strategies. Appendix C–Tables C-9 and C-10 present the three profiles with the highest predicted probability of belonging to the "Most of the Time Users" class for drivers and passengers, respectively. For example, drivers in Profile 3 ($n$ = 283; 12.4% of drivers) had a predicted probability of belonging to the "Most of the Time Users" driver class at 15.2%. Characteristics in this profile include any impaired driving/riding types (one type or more), being a young adult (age 18–24) or adult (age 25–59), non-Hispanic Black, non-Hispanic White, or Hispanic racial and ethnic identity, a household income of $30,000–$59,999 or $100,000 or more, and no past-year marijuana use. Similarly, passengers in Profile 6 ($n$ = 62; 2.9% of passengers) had the highest probability of belonging to the "Most of the Time Users" passenger class at 31.1%. Characteristics in this profile include having a high school graduate degree or less, an overweight or obese BMI, and a household income of $100,000 or greater.

## Section IV—Road User Profiles

### Overview

Based on LCA and CART analysis findings from the survey and informed by the FARS analysis and input from an expert panel of traffic safety researchers and practitioners (described below), the study team selected nine road user profiles to represent drivers and passengers who suboptimally (most of the time, sometimes, or rarely/never) wear their seat belt. Profile characteristics were developed by combining

data from NORC's AmeriSpeak survey and market research data purchased from MRI Simmons. Each profile is described in a four-page document (see Road User Profiles).

The profiles focus on the defining characteristics of each group of drivers or passengers (drawn from the specific combinations of characteristics that most strongly differentiate high-probability suboptimal seat belt users identified in the CART analysis), describe the circumstances that influence each group's seat belt use, discuss their media use, trusted messengers, relevant attitudes, and behaviors that may motivate behavior change, and make recommendations for practitioners. Ultimately, the profiles and recommendations are practical tools that will help traffic safety practitioners, state highway safety officers, and other organizations to use evidence to design interventions to increase seat belt use, particularly among populations at increased risk. Specifically, the profiles aim to support practitioners to:

- use their own data to identify groups in their states with low seat belt use;
- compare groups with low seat belt use in their states to the profiles;
- select profiles that most closely match the characteristics of groups in their states with low seat belt use;
- identify circumstances of seat belt use, attitudes towards seat belt use, relevant messengers and media for communication with groups, and relevant general attitudes that may be used to influence groups;
- review and select/adapt recommended actions to influence seat belt use; and
- implement actions.

**Profile Development Process**

The study team translated survey findings and analytical results into a refined set of targeted seat belt user profiles to guide strategic messaging and intervention planning (Figure 5). The steps, which are described below in sequence, were as follows:

- Develop and select an initial set of profiles based on the approach described in Section III
- Convene an expert panel to discuss the profiles
- Incorporate market research data to augment the profiles
- Revise profile selection
- Recommend actions to increase seat belt use
- Finalize the profiles

*Figure 5. Profile Development Process*


### *Initial Profile Development and Selection*

Based on the AmeriSpeak survey results, LCA, and CART analysis, the project team initially identified four classes of seat belt users in the driver and passenger samples (see Section III). The study team then identified three profiles from each class based on their predicted probability of belonging to that given class. This yielded 16 potential profiles from the survey data. The study team reviewed these profiles to identify a final set of nine profiles. Profiles that described "All of the Time" seat belt users were excluded to focus on improvement in profiles for individuals who used their seat belt "Most of the Time," "Some of the Time," and "Rarely." The study team prioritized profiles with a large group size (to expand potential reach) and distinct traits (for effective messaging for clear targeting potential). This initial group of profiles, comprising six driver and three passenger profiles, was reviewed with the expert panel.

### *Expert Panel*

The project team convened two virtual expert panel meetings in Fall 2025. The meetings brought together nine experts in seat belt use and traffic safety from state departments of transportation, federal agencies, academia, nonprofit organizations, and consulting. The meetings were recorded to ensure the accuracy of notes, and panelists consented to the recording. Panelists reviewed nine road user profiles across the two meetings and responded to four guiding questions designed to elicit recommendations for improving seat belt use across different road user groups:

- **Behavior Change:** How likely is the road user group represented in this profile to change their seat belt use?
- **Influence:** How can road users be influenced to change their seat belt use? By whom or in what ways can this influence be optimized?
- **Recommended Actions:** What approaches can traffic safety practitioners use to encourage road users to increase seat belt use?
- **Scalability:** Can these strategies be applied broadly?

### *Market Research*

The project team then obtained and appended market research data to further describe the profiles, identify ways to communicate with each population, and reveal possible methods of influencing their behavior. As part of this process, the project team identified and contacted potential vendors, reviewed their data variable lists, and compared the demographic variables from vendors with the AmeriSpeak survey demographics. Based on this review, the study team selected a vendor based on the alignment of profile demographic variables (e.g., age, gender, race/ethnicity, income, education, and health status) and the spread and specificity of attitudinal and behavioral variables provided.

The selected market research vendor, MRI-Simmons (https://www.mrisimmons.com/), collects data from adults 18 years of age and older living in private households in the 48 coterminous states via surveys and interviews. Relevant data collected by MRI-Simmons includes the following:

- Alcohol consumption stratified by alcohol type and location in which it is consumed
- Planned and past marijuana use and formulation (e.g., CBD versus THC)
- Types of media used, timing and frequency of use, activities for which each type of media is used, specific cable and TV broadcasters, types of TV programs watched, video on-demand, and social media platforms
- Sports and leisure activities, including travel and gambling
- Automobile purchase behaviors
- Attitudes about social media, family, friends, risks, employment, social issues, technology, automobiles, and advertising
- Other demographics, including family size, age of children, language preferences, occupation, and generation (e.g., Baby Boomers, Millennials, or Gen Z)

Next, the project team obtained cross-tabulated data for each profile using the profile's defining characteristics and reviewed those data to identify characteristics that were more prevalent than in the general population of U.S. adults, characteristics that were particularly prevalent within a profile, and findings that could inform strategies to reach profile members and encourage more consistent seat belt use. Those descriptive findings were then incorporated into the profile descriptions.

### *Revised Profile Selection*

Based on expert panel feedback, and in collaboration with the AAA Foundation for Traffic Safety, the study team revised the initial selection of profiles to a final selection of five driver profiles and four passenger profiles as shown in Table 8. The final

profiles were selected to represent each category of suboptimal seat belt use, including those who wear seat belts most of the time, sometimes, and rarely/never. Selection considered both the predicted probability of belonging to a given user class and the size of the profile group within the survey sample. One initial CART profile was further split into two final profiles based on income to better distinguish actionable audience segments.

*Table 8. Final Profiles*

| | **Description** |
|---|---|
| **Profile 1** | Male drivers with low incomes who wear seat belts most of the time |
| **Profile 2** | Male drivers with moderate incomes who wear seat belts most of the time |
| **Profile 3** | Drivers aged 18–59 who wear seat belts most of the time |
| **Profile 4** | Risk-tolerant drivers who sometimes wear seat belts |
| **Profile 5** | Drivers with low seat belt use |
| **Profile 6** | Passengers with high incomes who wear seat belts most of the time |
| **Profile 7** | Passengers with low/moderate incomes who wear seat belts most of the time |
| **Profile 8** | Passengers who sometimes wear seat belts |
| **Profile 9** | Passengers with low seat belt use |

Descriptions of the profiles include the defining characteristics of each profile as well as circumstances for seat belt use for each group, consequences of not wearing seat belts that they were most concerned with, media they consumed, and trusted messengers.

### *Profile-Specific Recommended Actions for Traffic Safety Practitioners*

To develop recommended actions to address suboptimal seat belt use for each profile, the study team reviewed the expanded profile descriptions that included not only the defining characteristics for each profile but also additional survey and market research data, looking for opportunities to tie recommended actions to profile characteristics by the following means:

- Focusing on circumstances in which they are less likely to use seat belts consistently, compared to other circumstances and other profiles that demonstrated more frequent seat belt use
- Communicating with them where, when, and how they consume media, via trusted messengers, or associations with specific behaviors, sports, or leisure activities

- Encouraging them to consistently use seat belts by applying attitudes they hold that indicate increased risk tolerance/avoidance and/or different perceptions of self, by referring to consequences that they are more concerned will happen if they do not wear seat belts, or based on additional demographic details

The study team developed three recommended actions per profile and grouped them using a commonly applied framework that practitioners would be familiar with—the "E's of Road Safety" (Groeger, 2011). Over time, different groups have expanded the original three "E's"—Education, Enforcement, and Engineering—by adding new categories, such as Encouragement and Equity, or by refining existing ones. For this study, the team focused on four categories: Education, Encouragement, Enforcement, and Equity, because they represent areas where traffic safety practitioners are best positioned to positively influence seat belt use behaviors.

This framework groups traffic safety countermeasures into areas that focus on the following:

- **Education** and training, in both formal or informal settings, delivered by instructors or via collateral materials (e.g., materials that support marketing strategies)
- **Encouragement**, including communication campaigns and persuasive messaging
- **Enforcement**, such as high-visibility enforcement efforts that include communication and messaging components
- **Equity**, ensuring that efforts to address seat belt use are inclusive of populations most likely to be affected by inconsistent use

The study team focused on these four groups of countermeasures because they were most applicable and feasible for changing seat belt use behavior.

Within each of the four "E" categories, the team identified a subset of overarching recommended actions that applied across the profiles, and ultimately selected three types of actions to include in each profile. These actions were selected because they were supported by the survey and market research data as well as a body of literature, including evidence from the field of traffic safety where the actions have been tested in seat belt interventions. Given the inherent novel nature of this study, the study team also included actions that have not been tested in the context of seat belt use for specific populations and settings, but may reasonably be effective in increasing seat belt use based on similar studies in the fields of injury prevention, public health, and health communications.

The study team also described the recommended actions for each profile in accessible language intended to engage traffic safety practitioners and allow for adaptation to local contexts. To increase utility for practitioners and maximize limited space, information from the expanded profiles was edited to focus on the most pertinent

data points that defined or described the profiles and/or supported the recommended actions. Further details on how each type of recommendation would apply to each profile can be found on the last page of the profiles in the Road User Profiles document.

### *Final Road User Profiles*

After developing recommended actions, the study team then formatted a sample profile. To increase the utility of the profiles for traffic safety practitioners, information from the expanded profiles was edited to focus on the most pertinent data that defined or described the profiles and/or supported the recommended actions. The graphic versions of each profile can be found in the Road User Profiles document, which is intended to function as a standalone product for practitioners to use to inform their work promoting seat belt use, but can be reviewed in parallel with this report.

The Road User Profiles include a guide on how users should interpret the profiles so they can apply insights to improve seat belt use among different groups. This page includes a description of the data presented in the profiles and explains what each section represents.

The subsequent pages then present the nine profiles formatted as four-page PDF documents, each featuring hyperlinks to other sections within the profile. The first page of each profile offers a high-level overview, including profile-defining characteristics, key seat belt use circumstances and reasons, and recommendations for engaging profile members. The second page shows seat belt use circumstances in greater detail, highlights the most common reasons for using or not using seat belts, and displays the top consequences of non-use that concern the profile. The third page integrates survey data on top messengers and media consumption with market research data on media trust, usage patterns, and relevant attitudes, behaviors, and demographics. The final page presents data-driven recommended actions in three “E” categories, including strategies tailored to each profile informed by insights from the preceding pages. The team selected three “E” categories of recommended actions, out of the possible four categories, to maximize available space and ensure readability.

## Summary and Discussion

Although seat belt non-use among U.S. motorists has declined, numerous factors continue to undermine consistent seat belt use among certain road users. These influences are varied and complex, as documented in the literature, and they often make it challenging for traffic safety practitioners to identify clear, actionable strategies for improving seat belt use among at-risk motorists.

The current study offers a novel approach to understanding who seat belt non-users are and demonstrates how a cohesive, holistic view of this population can reveal new opportunities for targeted outreach. Rather than examining individual seat belt use factors in isolation, this study employed advanced analytical techniques—LCA and CART analysis—to synthesize a rich, nationally representative survey dataset into a focused set of road user profiles. By shifting attention away from broad population-level trends and toward distinct suboptimal seat belt user profiles, this approach highlights how multiple factors interact to shape seat belt use behaviors. Examining these nuanced patterns created an opportunity to design tailored interventions that reflect the specific combinations of characteristics influencing each profile. In doing so, this study moves beyond "one-size-fits-all" interventions and instead identifies multiple, more precise pathways for engaging at-risk individuals with strategies that resonate more meaningfully. This section discusses the findings from this study.

### Who Doesn't Buckle Up and Under What Conditions? Insights from the Literature and FARS

The literature consistently demonstrates that seat belt use in the United States is high overall, yet remains uneven across populations and circumstances, with persistent gaps by age, sex, seating position, vehicle type, roadway context, and risk-related behaviors. Prior research shows that males, younger adults, passengers (particularly rear seat occupants), occupants of pickup trucks, individuals traveling at night or on local and rural roads, and those engaging in alcohol or drug use are substantially less likely to wear seat belts consistently (Boakye et al., 2019; Boyle, 2023; Hedlund, 2019; NCSA, 2023, p. 2; NCSA, 2024; Spado et al., 2019). Psychological and social factors—including risk perception, impulsivity, discomfort, fatalistic beliefs, and perceived social norms—also play an important role in shaping seat belt use decisions (Sheveland, 2020; Spado et al., 2019).

In addition to identifying who is least likely to buckle up, the literature highlights that seat belt non-use frequently co-occurs with other risky behaviors and tends to vary by situation rather than reflecting a fixed identity as a "non-user" (Sheveland, 2020). This body of evidence underscores that a simple binary distinction between seat belt users and non-users obscures meaningful differences and limits the effectiveness of one-size-fits-all countermeasures. Instead, the literature points to the importance of

understanding *patterns* of seat belt use across contexts—such as short trips, familiar roads, and other perceived low risk situations—to inform more targeted and effective interventions.

Also, while not a primary focus of the present study, international comparisons further reinforce that improvement in seat belt use is possible, as seat belt use in the United States remains lower than in several peer nations, including Australia, Canada, Germany, Sweden, and the United Kingdom (International Transportation Forum, 2023; World Health Organization, 2020).

The literature review findings provided a strong empirical foundation for the current study's analytic approach, first informing the selection of variables examined in the FARS analysis. The FARS analysis provided insight regarding seat belt use among a higher risk population, namely drivers and passengers involved in a fatal crash.

Overall, 28% of the FARS sample did not wear a seat belt at the time of the crash. Passengers were less likely to wear a seat belt (31% non-use) compared to drivers (27% non-use). Seat belt use in the FARS sample was lower than general population estimates (72% in the sample compared to around 91% in the general population of adult front seat occupants, see Appendix A–Table A-2; NCSA, 2024). However, due to the non-representative sample of FARS, which is limited to drivers and passengers involved in a fatal crash rather than all U.S. drivers and passengers, the proportion of seat belt use may be underestimated, as those who do not use seat belts are more likely to be fatally injured in crashes.

Findings from the FARS analysis were widely consistent with the existing evidence regarding factors associated with less seat belt use, including being a passenger, male, younger, or a rural occupant, among other factors (Boyle, 2023; NCSA, 2024). The FARS analysis provided new insights on factors associated with seat belt non-use among fatal crashes by identifying seat belt non-use risk profiles among drivers.

CART analysis goes beyond regression analyses to identify variables that most strongly predict seat belt non-use. Findings revealed that the most influential factors in determining the likelihood of seat belt non-use were if the driver was drinking, if the crash was speeding related, the total lanes in the roadway, road type, if the driver was out of compliance with their class of vehicle, rurality, vehicle body type, vehicle age, and occupant drug use (police-reported).

These factors can inform prevention efforts to understand the most impactful factors related to seat belt non-use in crashes. For example, drivers who drank alcohol or used drugs were less likely to wear seat belts, consistent with existing literature (Kulanthayan et al., 2004). Actions such as additional enforcement of driving under the influence or campaigns that encourage individuals to identify a designated driver or use ride share services if drinking may be priority focus areas to increase seat belt use.

Findings from the FARS analysis regarding the most influential factors in determining the likelihood of seat belt non-use also provided guidance on the selection of survey questions for the nationally representative survey on seat belt use for the present study.

**Who Buckles Up Most, Sometimes, or Rarely, and Why? Insights from the National Survey**

Univariate analysis of seat belt use indicated that the majority (70%) of U.S. adult drivers always wear a seat belt when driving. This number is lower, however, for passengers, with only slightly more than half (57%) of U.S. adult passengers reporting always wearing a seat belt when riding in a motor vehicle.

These percentages are lower than those reported in the literature. For example, an analysis of 2024 data from the National Occupant Protection Use Survey (NOPUS) suggested that 91.2% of adult front-seat occupants in the United States wore seat belts. Similarly, 86.6% of respondents to the AAA Foundation for Traffic Safety's 2024 Traffic Safety Culture Index (TSCI) reported always using a seat belt while driving during the past 30 days (Zhang & Steinbach, 2025). The survey in the present study asked about seat belt use frequency; thus, the percentages reported here refer to the proportion of drivers or passengers consistently wearing a seat belt (for passengers, regardless of seating position).

The survey results from the present study found that 2.5% of U.S. drivers reported rarely/never wearing a seat belt while driving, and 6.3% of U.S. passengers reported the same. This roughly aligns with NOPUS data, which showed that non-users accounted for only 8.8% of the general motoring public in 2024 (NCSA, 2025). These seemingly small proportions contribute to substantial deaths and injuries each year that can be prevented by the simple action of putting on a seat belt. This finding further underscores the importance of developing countermeasures to increase awareness among this small yet meaningful group. The remaining 27% of drivers and 37% of passengers reported wearing seat belts some of the time or most of the time, a nuanced finding that cannot be captured by studies relying on a binary distinction between "users" and "non-users" as characterized during a single observation.

The survey explored respondents' reasons for wearing or not wearing a seat belt in a variety of scenarios. Overall, the most common reasons for wearing a seat belt among those who wore a seat belt at least some of the time were wanting to avoid serious injury or death, being required by law, doing so by habit, avoiding a ticket, and feeling unsafe being unbelted. The most common reasons for not wearing a seat belt among those who wore a seat belt some of the time, rarely, or never were driving a short distance or traveling on low-speed roadways, forgetting to buckle up, being in a rush, or finding the seat belt physically uncomfortable. Findings are also provided for each of the

four seat belt use groups in Table 7 above and for each of the profiles included in the Road User Profiles.

Multivariate regression analyses revealed factors significantly associated with seat belt use for both drivers and passengers. Several overarching trends were observed, though there were a few differences between drivers and passengers. First, consistent with past studies, females (Boyle, 2023; NCSA, 2023; Sheveland, 2020), older individuals (NCSA, 2023; Sheveland, 2020; Spado et al., 2019), non-Hispanics (Boyle, 2023), and individuals with higher education (Spado et al., 2019; Strine et al., 2010) and income (Block, 2000; Spado et al., 2019) were more likely to wear seat belts consistently.

Second, individuals who drove an older vehicle were less likely to consistently wear seat belts. Prior research has examined vehicle characteristics, including model year, as correlates of seat belt use, with observational evidence indicating higher belt use in newer vehicles equipped with enhanced seat belt reminder systems (NHTSA, 2021). However, the presence and magnitude of the benefits associated with specific enhanced seat belt reminder systems depend in part on whether a state has a primary seat belt use law, suggesting that vehicle technology and policy context influence belt use. Fewer studies have focused on isolating the independent effect of vehicle age from driver and contextual factors (e.g., Polson et al., 2021).

Third, higher BMI (overweight and obese) was associated with a lower likelihood of consistently wearing seat belts among drivers. This finding is consistent with prior research demonstrating significantly lower seat belt use among obese motorists compared with their healthy-weight counterparts (Jehle et al., 2014). A prominent reason for seat belt non-use among motorists is discomfort associated with their use (Dissanayake & Parikh, 2012; Hezaveh et al., 2019; Jermakian & Weast, 2018; Kidd et al., 2014; Sheveland, 2020; Spado et al., 2019). As such, it is possible that individuals with higher BMI experience greater physical discomfort when using standard seat belt configurations—such as pressure across the abdomen, restricted movement, or difficulty achieving a proper belt fit—which may reduce the likelihood of consistent use.

Lastly, individuals who engage in alcohol misuse and marijuana use, and those who engage in impaired driving, were less likely to wear seat belts consistently. This is consistent with the literature that supports the correlation between seat belt non-use and frequent engagement in other risky behaviors (Williams et al., 2002).

Recognizing that individuals may make different decisions about seat belt use under various conditions, in different locations, and depending on with whom they drive or ride, the present study examined seat belt use across a variety of scenarios using LCA. Consistent with findings from naturalistic driving data, occasional seat belt users are more likely to wear seat belts during longer trips and on higher-speed roadways, such as major roads and highways (Richard et al., 2019). Conversely, they may be less likely to wear seat belts when driving on local roads or when traveling short distances.

Observational research has typically found higher compliance in higher-risk or higher-speed environments, such as the NOPUS data, which demonstrated that 92.9% of occupants wear their seat belt in fast- or heavy-traffic scenarios, and 95% wear their seat belt when traveling on expressways; slightly higher than the overall seat belt use rate of 91.2% (NCSA, 2025).

This study went beyond examining seat belt use across different scenarios regarding when, where, and with whom people buckle up. This was achieved by using LCA to investigate groups of individuals who follow similar patterns of seat belt wearing across these conditional factors. LCA, as a person-centered approach, empirically identifies groups based on patterns of individual survey responses, rather than relying on a priori knowledge or ad hoc assumptions. LCA has been used extensively in the prevention of risky and problematic behaviors (Liu et al., 2020; Liu et al., 2023) but is relatively novel in the field of traffic safety. This is one of the first studies to use this approach to investigate whether there are groups of individuals who tend to make seat belt-wearing decisions differently across scenarios. Findings can yield tailored strategies to increase seat belt use and reduce crash fatalities.

Using LCA, this study found that U.S. adults tend to fall into four distinct classes, demonstrating the conditional nature of seat belt wearing for some users. For both drivers and passengers, the largest class was “All of the Time Users” (80.7% of drivers; 80.7% of passengers). Individuals in this class had a very high probability of always wearing seat belts across all scenarios. On the other end of the spectrum, a small group of about 3% of U.S. adults were in the “Rarely Users” class (3.1% of drivers; 3.1% of passengers), who rarely wear seat belts under any scenario. The two remaining classes, “Most of the Time Users” (8.3% of drivers; 9.5% of passengers) and “Sometime Users” (7.8% of drivers; 6.8% of passengers), reported seat belt use falling between the “Rarely Users” and “All the Time Users.”

While seat belt use tends to be consistent across scenarios for most U.S. adults (i.e., “All of the Time Users”), a notable proportion of U.S. adults (about 16% of the drivers/passengers) reported variation in seat belt wearing across scenarios. This suggests that for suboptimal seat belt users, messages highlighting the importance of wearing seat belts should focus on key scenarios where seat belt use is less frequent, such as on smaller local roads, for shorter trips, and when driving alone.

Next, the study team examined how various factors are associated with seat belt user groups and found results similar to those from the multivariate regression. For example, female and older drivers and passengers are more likely to be “All of the Time Users.” Drivers and passengers with higher educational attainment, as well as those with higher incomes, tend to wear seat belts more consistently. Those who engage in impaired driving tend to wear seat belts less consistently. Consistent with the health promotion literature—which shows that tailored health messages are more effective because they align with the specific characteristics, needs, and behavioral tendencies of different

audience groups (Lustria, 2017; Stellefson et al., 2008)—messages should be tailored to encourage populations with a higher tendency to exhibit suboptimal seat belt use. For example, many motorists identify legal requirements and the desire to avoid traffic citations as common reasons for seat belt use (Sheveland, 2020; Spado et al., 2019). Thus, stricter and more visible enforcement may be recommended to increase seat belt use (see Section IV).

Lastly, the study team explored subgroups of individuals with the highest tendency to belong to the identified classes to identify distinct road user profiles.

## From Evidence to Action: Recommended Actions for Traffic Safety Practitioners

The third and final objective of this study was to identify and prioritize recommended actions for traffic safety practitioners to increase seat belt use. As noted earlier, recommendations were informed by and grouped into four selected categories, the "E's of Road Safety." The section below discusses how each "E" category has been applied across profiles and summarizes the types of recommended actions that appear in the nine empirically derived profiles for drivers and passengers.

To review the specific recommended actions for each profile, see the Road User Profiles document.

### *Education*

These recommendations cluster around three educational strategies: (a) digital education and reminders, (b) education delivered in formal settings, and (c) social norm–based education. Together, these strategies address different reasons people do not wear seat belts, including forgetting, situational decision making, and beliefs about risk, comfort, or social expectations.

**Digital Education and Reminders.** Digital education includes short prompts or reminders delivered through digital channels, such as text messages, app notifications, or in-vehicle alerts (Suffoletto et al., 2022). These messages are often described as "cues," signals that prompt a behavior at the right moment (Craig et al., 2021; Kidd et al., 2014). Digital education and reminders are recommended across profiles. These approaches are most effective when they act as a timely prompt, addressing forgetting to buckle up or situational lapses, for example, during short trips and in driving contexts where risk is perceived to be low (Kidd et al., 2014; Sheveland, 2020). In several profiles, digital strategies also include short, engaging content that reinforces why consistent seat belt use matters.

For driver profiles with higher seat belt use (Profiles 1, 2, and 3), digital reminders support habit maintenance. Individuals in these groups wear seat belts most of the time, and reminders help prevent occasional lapses. For driver profiles with moderate seat

belt use (Profile 4) and passenger profiles with higher seat belt use (Profiles 6 and 7), digital education plays a role in shaping behavior. Brief, well-timed messages can encourage more consistent use (Suffoletto et al., 2022). For profiles with lower use (Profile 5), digital reminders alone are unlikely to result in behavior change. In this profile, non-use is more often linked to discomfort and the perception that wearing a seat belt is a hassle. In such cases, reminders should reinforce messages delivered through other strategies, particularly enforcement (Kirley et al., 2023).

**Education in Formal Settings.** Education delivered in formal settings, such as workplaces, schools, or health care organizations, plays an important role in increasing seat belt use (Fernandez et al., 2006; Goldzweig et al., 2013; Segui-Gomez, 2000). Educational interventions to increase seat belt use aim to influence beliefs and perceived barriers.

For profiles with high to moderate seat belt use (Profiles 1, 2, 3, and 4 for drivers and 6 and 7 for passengers), education reinforces existing norms and supports consistency across different situations. Structured settings provide opportunities to address common reasons for non-use, such as short trips, rushing, or feeling safe on local roads, and reinforces the importance of wearing a seat belt on every trip.

For driver profiles with lower seat belt use (Profile 5), education delivered through trusted organizational messengers, including healthcare providers, employers, or community organizations, can be impactful. This education can address misperceptions about crash risk, discomfort, fatalistic beliefs, or concerns that seat belts may cause harm. Addressing these issues increases receptivity to additional strategies, even when education alone does not immediately change behavior (Kirley et al., 2023; Sheveland, 2020).

**Social Norm–Based Education.** Social norm–based education focuses on what people believe others typically do and what behaviors they believe are socially expected or acceptable (Bicchieri, 2005). These perceptions are strongly linked to seat belt use, particularly among individuals who are not opposed to seat belts but do not use them consistently (Sheveland, 2020; Spado et al., 2019).

For driver profiles with high to moderate seat belt use (Profiles 1, 2, 3, and 4), social norm messaging reinforces the expectation that buckling up is standard and routine. For profiles with lower use, norm-based strategies help shift behavior by emphasizing that wearing a seat belt on every trip is both common and expected, especially when passengers are present in the vehicle. For passenger profiles with higher seat belt use (Profiles 6 and 7), social norm education is most effective when norms are communicated by trusted messengers such as family members, employers, student leaders, or healthcare providers, depending on the profile. In these cases, social norm strategies are further enhanced when combined with approaches that also address

discomfort, resistance to authority, or cultural attitudes toward seat belt use (Kirley et al., 2023; Sheveland, 2020).

**Implications for Traffic Safety Practitioners.** Education is most effective when tailored to behavioral patterns and reasons for seat belt non-use, rather than delivered as a one-size-fits-all approach (Kirley et al., 2023; Sheveland, 2020). For people who already wear seat belts most of the time, education should focus on reinforcing habits and preventing lapses. For people who wear seat belts inconsistently, education should focus on specific situations where non-use is common and encourage consistent behavior. For people who have lower seat belt use, education should focus on basic beliefs and barriers, delivered through trusted sources and combined with other strategies such as enforcement. These recommendations align with evidence showing that education tailored to specific roles, e.g. drivers versus passengers, is more effective than generic messaging for sustaining protective behaviors over time (Bol et al., 2020; Kirley et al., 2023).

### *Encouragement*

The focus was three-fold: (a) leading with social, digital, and broadcast media, (b) integrating messaging into environments, social settings, and activities favored by each profile, and (c) tailoring message content to profile characteristics, including risk perceptions, attitudes, language preferences, trusted messengers, and educational attainment. These strategies focus on the channels that can most effectively reach drivers and passengers and share authentic, relatable messages that can encourage consistent seat belt use.

**Broad-Reach Social, Digital and Broadcast Media.** Broad-reach media, including social media and digital video platforms, plays a central role in encouragement strategies across profiles. Channels that can reach profiles include Facebook, Instagram, X/Twitter, YouTube, and TikTok. These channels can provide repeated exposure to simple, consistent messages that seat belt use is routine and expected. Media based encouragement can increase safety behaviors, including seat belt use, particularly when coordinated with other strategies (Akbari et al., 2021).

For profiles with higher seat belt use (Profiles 1, 2, and 3 for drivers; Profiles 6 and 7 for passengers), broad-reach media can support habit reinforcement. Individuals in these groups wear seat belts most of the time but report less consistent use on short trips, local or rural roads, and in conditions that are perceived to be of lower risk, such as daylight. Regular exposure to brief reminders via social media, streaming video, radio, or television helps maintain the norm that buckling up applies to *every* trip (NHTSA, 2025).

For profiles with moderate seat belt use (Profile 4 for drivers and Profile 8 for passengers), media-based encouragement can shape situational decisions. These profiles report less consistent seat belt use when rushing, traveling short distances, or riding on

local roads. Short, repeated messages delivered through frequently used platforms, such as social media feeds, streaming television (e.g., Netflix and Hulu), or national/local broadcast television, can also help to keep seat belt use at the forefront of people's minds.

Strategic placement of messaging varies by profile, for example, Spanish language networks, high viewership sports programming, and weekday daytime television. For profiles with lower seat belt use (Profile 5 for drivers and Profile 9 for passengers), encouragement through media is important for normalization and reaching a broad audience. However, encouragement is unlikely to be sufficient on its own. In these profiles, non-use is more strongly tied to discomfort, hassle, or persistent habits. Media encouragement is therefore best used to reinforce norms and support other strategies, such as relying on trusted messengers to prompt, promote, and reinforce seat belt use, as well as using incentives to support wearing seat belts.

**Integrating Messaging into Environments, Settings, and Activities.** Relatable scenarios and alignment with audience interests help to reinforce seat belt use as a normal, valued, and self-protective behavior. As such, messaging that supports seat belt use should be embedded into the environments, activities, and content with which profile members are already engaged (Akor & Awanu, 2025). For instance, there may be opportunities to reach road users in Profiles 1, 2, 3, 4, 6, and 9 by placing ads within sports and leisure programming and integrating seat belt prompts inside gaming platforms through gaming influencers, in-game rewards, and branded giveaways. For thrill-seeking audiences, risk-based framing that emphasizes favorable tradeoffs—such as the low cost of buckling up relative to the high potential payoff of survival—may be a promising strategy rather than focusing on the consequences of injury or death.

Messages should also depict relatable everyday settings (McLaughlin et al., 2025), such as dining out or spending time with friends and family, and could be delivered in restaurants, coffee shops, healthcare practices, car dealerships, and employment settings. Likewise, showing drivers and passengers engaging in everyday hobbies (e.g., baking, cooking, gardening, and caring for pets) can frame seat belt use as a routine safety behavior and normalize wearing seat belts (e.g., Profile 7 for passengers). Status-driven incentives—such as social media badges, unlockable achievements in games, VIP access, discounts, and early event entry—may be effective for some groups, particularly younger or career-focused audiences (e.g., Profile 9 for passengers).

Finally, partnerships with employers, job-seeking platforms, and rideshare services can extend the reach and credibility of these messages (Kalbfleisch, 2003). For example, partnering with rideshare companies could involve using push notifications in passengers' apps to promote seat belt use at the start of the ride and tap-to-confirm options in driver-facing apps to verify seat belt use. When paired with incentives or feedback, app-based reminders have been shown to increase seat belt use and support the formation of lasting safety habits (Ebert et al., 2025).

**Tailoring Messages.** Messaging strategies to encourage consistent seat belt use should vary by audience and channel. Implementers should consider differing levels of audience knowledge, beliefs, and/or behavior (Delhomme et al., 2009), as well as the best way of reaching them. On social media, messages should be short, authentic, and engaging, making risks more personal by highlighting potential impacts on family members, or by stressing that short trips and familiar roads still carry real danger. Effective communication also depends on tailoring messages to the motivations and contexts of each profile. For example, younger audiences may respond well to humorous (Barta et al., 2023) or relatable scenarios that normalize seat belt use and emphasize wearing them when traveling to and from social gatherings. Older audiences could benefit from messages that correct misperceptions of low risk, frame seat belt use as self-protection, are supported by real crash outcome stories, and provide cues to address forgetting or rushing. This can address concerns, for instance, for older adults who may have higher BMI scores, about a lack of comfort, fear of death, and being injured while wearing seat belts.

Equally important is selecting the right messengers. Messengers considered "close to home," such as significant others, parents, adult children, family members, and friends, are well-positioned to model and reinforce seat belt use. More distant or public facing messengers, including law enforcement officers, rideshare/taxi drivers, social media influencers, gaming personalities, student leaders, and peer advocates, can add credibility and reach (Bartels & Nelissen, 2002; Verhue & Verbeek, 2002). Finally, language and cultural relevance also matter. Messages for Profiles 2 and 8 should be delivered in Spanish when appropriate and supported by messengers who reflect diverse backgrounds. Inclusion of culturally resonant influencers is also important for Profile 9 (74% in this profile identify as Black/African American) as this increases appeal and credibility.

**Implications for Traffic Safety Practitioners.** Encouragement strategies are most effective when they are repeated (Jones, 1997; McDonald, 1995), strategically timed (Delhomme et al., 2009), delivered through trusted channels and messengers (Verhue & Verbeek, 2002), and if possible, at moments where people fail to buckle up such as on short trips, local or rural roads, nighttime travel, and when rushing. Encouragement strategies, particularly with respect to communications, are especially well-suited to reach drivers and passengers who already wear their seat belts most of the time but need brief, consistent reminders rather than motivation to buckle up. For profiles with lower seat belt use (Profiles 5 and 9), encouragement can shape decisions but is unlikely to be a sufficient strategy on its own and should be coordinated with other enforcement measures. Traffic safety practitioners may consider embedding encouragement into apps/platforms that people already use, along with messages that align with the population's language, culture, and interests.

### *Enforcement*

The recommended enforcement actions can be grouped broadly into three strategies: (a) high-visibility enforcement, (b) positioning law enforcement as credible messengers, and (c) integrating seat belt enforcement with efforts to enforce other traffic safety laws. These enforcement strategies also overlap with education and encouragement efforts by increasing repeated exposure to safety messages.

**High-Visibility Enforcement.** High-visibility enforcement is central to increasing seat belt use. These efforts pair enhanced patrols and traffic stops with media campaigns, roadside signage, and law enforcement officer messaging, both included in campaign materials and delivered in settings such as routine traffic stops. A substantial body of evidence demonstrates that high visibility enforcement campaigns (such as *Click It or Ticket*) are associated with short-term increases in seat belt use and reductions in crash fatalities, particularly among groups with lower compliance, including men, younger drivers, and rural motorists (Dinh-Zarr et al., 2001; NHTSA, 2021)

Several profiles report buckling up more consistently during high-visibility enforcement or higher fine periods (Profiles 1 and 3), because “it’s the law” (Profiles 4 and 9), or because of concerns about fines, tickets, insurance impacts, or medical costs from crashes (Profiles 4, 8 and 9). For these groups, messaging should highlight legal penalties, financial burdens, and real stories from trusted messengers, reinforcing legal and financial consequences as part of enforcement messaging.

**Law Enforcement as Messengers.** Law enforcement officers are highly credible messengers for traffic safety, particularly for individuals who respond to authority, social expectations, or norms. Studies of seat belt campaigns indicate that when officers are visible in campaign materials and actively reinforce seat belt expectations during routine interactions, compliance increases, especially among drivers who are not strongly opposed to seat belts but wear them inconsistently (Fell, 2019; Kirley et al., 2023).

For Profiles 1, 3, 4, 8, and 9, law enforcement officers are trusted messengers for reinforcing norms around consistent seat belt use. Law enforcement officers should reinforce seat belt use during stops to both seat belt wearers and non-wearers, using scripts that emphasize consistent seat belt use, counter excuses, highlight risks, and provide positive reinforcement. Brief, respectful interactions, such as verbal reminders, warnings, or positive reinforcement during stops, can support compliance (Miller et al., 2024).

In some cases, small tokens of recognition at stops or checkpoints can encourage compliant behavior (Geller et al., 1982) for profiles influenced by praise and recognition (Profile 3). Additionally, multilingual enforcement messaging can improve reach (e.g., Profile 8), for example, by placing messages on platforms such as Spanish-language TV,

websites, and gaming sites to align with media consumption patterns. For profiles with inconsistent or lower seat belt use, specifically, law enforcement officers can be influential as trusted safety voices who reinforce expectations and norms, in combination with reinforcement from family, community, and workplace messengers.

**Targeted Enforcement and Outreach.** Enforcement should be tailored to situational and behavioral patterns. For profiles more likely to consume alcohol outside the home (Profiles 3 and 8), seat belt enforcement can be paired with impaired-, distracted-, or drowsy-driving campaigns. Materials can be distributed at bars, clubs, restaurants, and entertainment venues, especially when co-branded with enforcement checkpoints.

**Implications for Traffic Safety Practitioners.** Enforcement needs to be visible, have a face, and show clear consequences. Therefore, pairing enforcement efforts with media campaigns (Akbari et al., 2021) and synergizing seat belt enforcement with other efforts (e.g. drinking and driving initiatives) can capture attention and motivate positive change for multiple traffic safety outcomes. In addition, law enforcement officers are among the most influential messengers for certain populations and thus could be positioned as key safety messengers in media campaigns and primed to deliver messages that focus on legal and financial consequences (Miller et al., 2024). Seat belt campaigns should clearly publicize fine amounts, insurance implications, and real crash-cost stories.

### *Equity*

As traffic safety practitioners apply and adapt any of the other recommended actions described in this section, it is important to consider how traffic safety outcomes may be disproportionately experienced across different population groups, including those defined by primary language, age, family size, income, education, or health status (Boyle, 2023; Sheveland, 2020; Spado et al., 2019). Therefore, efforts to increase seat belt use should be designed to reach all populations. Six of the profiles (Profiles 2, 5, 6, 7, 8 and 9) have recommend actions related to equity, including the use of accessible communication, targeted outreach strategies, and partnerships with trusted messengers and community organizations.

**Culturally Appropriate Communications.** It is important to develop and deliver messages in the primary languages spoken by the population (for example, Spanish for Profiles 2 and 8) and ensure materials are culturally relevant (Stellefson et al., 2008). Using plain language, appropriate reading levels, and strong visuals can help all populations to benefit from the communications (Stellefson et al., 2008). A clear call-to-action to wear seat belts is also critical (Lustria, 2017).

**Meeting People Where They Are Through Targeted Outreach and Media Placement.** Messages focused on changing the behaviors of profiles with less consistent seat belt use are likely to be more effective if they are shared in the settings, channels,

and times most likely to reach the audience, for example, daytime TV and print media for older adults in Profile 5, bilingual TV for Profile 8, and in-person outreach at community or leisure events to reach harder-to-access audiences (NCSA, 2024; Sheveland, 2020).

**Trusted Messengers and Community Partners.** Engaging influencers who resonate with each profile is also critical. For profiles with lower or less consistent seat belt use, these messengers include children; spouses; law enforcement officers; bilingual, multi-racial, or culturally aligned celebrities; community-based organizations; advocacy groups; healthcare providers; rideshare drivers; and seat belt advocates (Sheveland, 2020; Spado et al., 2019). Having these key influencers share short messages with a clear call-to-action, supported by personal stories, could encourage these profiles to buckle up. Distributing supportive materials through trusted partners, such as seat belt accessories for those with higher BMI scores in Profiles 5, 6, and 7, could reinforce this message.

**Implications for Traffic Safety Practitioners.** To ensure all groups can understand and act on seat belt messaging, communication cannot be generic. Equitable engagement requires deliberate adaptation to language, culture, and literacy; outreach to meet people where they are; and partnerships with trusted messengers to coordinate messaging rather than relying on broad public outreach campaigns (Lustria, 2017; Stellefson et al., 2008).

## Study Limitations

This study has several limitations. First, FARS data are not representative of the population of U.S. drivers and passengers, as FARS includes only crashes that resulted in a fatality within 30 days of the crash. Consequently, the FARS dataset disproportionately reflects severe events and excludes nonfatal crashes, meaning patterns of seat belt use and other behaviors observed in FARS differ from those in the general driving population. Second, the survey data may be subject to measurement error if respondents interpreted the seat belt frequency survey items (e.g., “some of the time” or “rarely”) inconsistently. Third, as with most survey research, responses may be subject to recall bias and social desirability bias. However, these effects were likely mitigated by informing respondents about confidentiality protections and administering the survey online rather than in person. Fourth, the survey did not collect detailed information on the specific circumstances in which respondents chose not to wear seat belts, limiting our ability to examine combinations of different factors and scenarios (e.g., driving at night on an interstate with a child in the vehicle). Finally, the survey did not include measures of other potentially relevant risky behaviors or traits—such as illicit drug use, gambling, impulsiveness, or sensation seeking—to minimize respondent burden and maintain survey length, although market research data were used to partially address these gaps.

Future research can build on this work by incorporating qualitative perspectives from drivers and passengers themselves, capturing how lived experiences, beliefs, and contextual factors shape real-world decisions about seat belt use.

## Conclusions

Seat belt use remains one of the most effective and well-established strategies for reducing fatalities and serious injuries in motor vehicle crashes. Although overall seat belt use in the United States is high, a relatively small proportion of drivers and passengers who do not wear seat belts, or who wear them inconsistently, account for a disproportionate share of traffic fatalities. Understanding who these individuals are, when and why they do not wear their seat belts, and how best to reach them is critical for improving traffic safety outcomes.

This study contributes to the evidence base by moving beyond a binary distinction between seat belt "users" and "non-users" and instead examining seat belt use as a patterned behavior that varies across drivers, passengers, situations, and contexts. By integrating findings from a literature review, an analysis of fatal crash data, and a nationally representative survey, the study provides a multidimensional view of seat belt use among U.S. drivers and passengers. Advanced analytic techniques—LCA and CART analysis—were used to identify distinct groups, or profiles, of road users who share similar seat belt use behaviors and risks, highlighting how demographic, behavioral, situational, and environmental factors interact to influence seat belt use.

Findings from the FARS analysis reinforced evidence that seat belt non-use is strongly associated with increased crash severity and fatal outcomes, particularly among passengers, individuals involved in alcohol- or speeding-related crashes, and those traveling on local or rural roads. The CART analysis demonstrated the utility of identifying combinations of characteristics associated with a high likelihood of seat belt non-use in fatal crashes, offering a complementary perspective to traditional regression analyses.

National survey findings then underscored the importance of addressing inconsistent seat belt use. While most U.S. adults reported wearing seat belts all of the time (70% of drivers; 57% of passengers), a sizable minority reported wearing seat belts suboptimally, meaning most of the time, some of the time, or rarely/never (30% of drivers; 43% of passengers), often depending on trip length, road type, perceived risk, or context. These patterns would be obscured by approaches that rely solely on observational studies or binary measures of seat belt use. The identification of four distinct seat belt use classes among both drivers and passengers highlights that, for many individuals, seat belt decisions are situational rather than fixed, creating opportunities for focused interventions.

Building on these findings, the study developed nine empirically derived road user profiles representing drivers and passengers with suboptimal seat belt use. These profiles synthesize survey data, market research insights, and expert panel feedback into practical products designed for traffic safety practitioners. The recommended actions

associated with each profile are organized as a subset of the “E’s of Road Safety” framework (Education, Encouragement, Enforcement, and Equity) to support the selection and adaptation of strategies that reflect the specific motivations, barriers, and communication preferences of each group of drivers or passengers.

Collectively, these findings reinforce that one-size-fits-all approaches are unlikely to achieve meaningful gains among populations at highest risk. Instead, strategies to increase seat belt use are most effective when they are tailored to behavioral patterns, delivered through trusted messengers, timed to high-risk situations, and coordinated across education, encouragement, and enforcement efforts. Incorporating equity considerations is also essential to ensure that interventions are accessible, culturally relevant, and effective in reaching different populations.

By pairing rigorous, data-driven analysis with creative translation, this study provides traffic safety practitioners with a framework for understanding seat belt use behaviors. The road user profiles are an innovative, visually engaging tool that brings complex behavioral data to life and offers a nuanced picture of distinct types of drivers and passengers. Designed to be intuitive and user-friendly, these profiles enable traffic safety practitioners to move beyond generalized approaches and apply insights in ways that resonate locally and drive community-level impacts.

Sustained progress in increasing seat belt use, particularly among those who wear seat belts inconsistently or rarely, will depend on investing in tailored strategies, cross-sector partnerships, and ongoing evaluation to ensure efforts are reaching the right people, in the right ways, at the right times.

## Acknowledgements

The research team thanks Jim Fell, Meghan Melnick, and Matthew Romoser for their technical contributions during the early phases of the study.

## References


AAA Foundation for Traffic Safety. (2022). *2021 Traffic Safety Culture Index* [Technical Report]. AAA Foundation for Traffic Safety. https://aaafoundation.org/wp-content/uploads/2026/01/2021-TSCI-Full-Report.pdf

Akbari, M., Lankarani, K. B., Tabrizi, R., Heydari, S. T., Vali, M., Motevalian, S. A., & Sullman, M. J. (2021). The effectiveness of mass media campaigns in increasing the use of seat belts: A systematic review. *Traffic Injury Prevention*, *22*(7), 495–500. https://doi.org/10.1080/15389588.2021.1921168

Akor, J., & Awanu, S. (2025). Evaluating the effectiveness of social media health promotion campaigns for sustainable behavior change in the United States. *International Journal of Frontier Research in Science*, *3*(2), 010–018. https://doi.org/10.56355/ijfrls.2025.3.2.0023

Alexa, V., Cioată, V., Raţiu, S., & Dascăl, A. (2020). Testing the functionality of the safety belts of road vehicles in the production process phase. *Journal of Physics: Conference Series 1426*(1), 012039. https://doi.org/10.1088/1742-6596/1426/1/012039

Anderson, L. R., & Mellor, J. M. (2008). Predicting health behaviors with an experimental measure of risk preference. *Journal of Health Economics*, *27*(5), 1260–1274. https://doi.org/10.1016/j.jhealeco.2008.05.011

Artan, Y., Bulan, O., Loce, R. P., & Paul, P. (2016). Passenger Compartment Violation Detection in HOV/HOT Lanes. *IEEE Transactions on Intelligent Transportation Systems*, *17*(2), 395–405. https://doi.org/10.1109/TITS.2015.2475721

Balci, B., Alkan, B., Elihos, A., & Artan, Y. (2018). NIR Camera Based Mobile Seat Belt Enforcement System Using Deep Learning Techniques. *2018 14th International Conference on Signal-Image Technology & Internet-Based Systems (SITIS)*, 247–252. https://doi.org/10.1109/SITIS.2018.00045

Bao, S., Xiong, H., Buonarosa, M. L., & Sayer, J. R. (2015). Using naturalistic driving data to examine drivers' seatbelt use behavior: Comparison between teens and adults. *Journal of Safety Research*, *54*, 69.e29–73. https://doi.org/10.1016/j.jsr.2015.06.006

Barr, G. C., Jr., Kane, K. E., Barraco, R. D., Rayburg, T., Demers, L., Kraus, C. K., Greenberg, M. R., Rupp, V. A., Hamilton, K. M., & Kane, B. G. (2015). Gender differences in perceptions and self-reported driving behaviors among teenagers. *The Journal of Emergency Medicine*, *48*(3), 366–70.e3. https://doi.org/10.1016/j.jemermed.2014.09.055

Barta, S., Belanche, D., Fernández, A., & Flavián, M. (2023). Influencer marketing on TikTok: The effectiveness of humor and followers' hedonic experience. *Journal of Retailing and Consumer Services*, *70*, 103149. https://doi.org/10.1016/j.jretconser.2022.103149

Bartels, G. C. & Nelissen, W. J. A. (Eds.). (2002). *Marketing for sustainability: Towards Transactional Policy-Making*. SAGE Publications Ltd.

Bicchieri, C. (2005). *The grammar of society: The nature and dynamics of social norms*. Cambridge University Press.

Birru, H., Rudisill, T. M., Fabio, A., & Zhu, M. (2016). A comparison of self-reported seat belt usage among the Appalachian and non-Appalachian United States. *Annals of Epidemiology*, *26*(3), 227–230. https://doi.org/10.1016/j.annepidem.2016.02.001

Block, A. W. (2000). *1998 Motor Vehicle Occupant Safety Survey: Volume 2: Seat Belt Report* (DOT HS 809 051). https://doi.org/10.21949/1525432

Boakye, K. F., Khattak, A., Everett, J., & Nambisan, S. (2019). Correlates of front-seat passengers' non-use of seatbelts at night. *Accident Analysis & Prevention, Road Safety Data Considerations*, *130*, 30–37. https://doi.org/10.1016/j.aap.2018.04.006

Boakye, K. F., & Nambisan, S. S. (2020). Seatbelt laws and seatbelt use among front-and rear-seat vehicle occupants in fatal crashes in the United States. *Case Studies on Transport Policy*, *8*(3), 1030–1037. https://doi.org/10.1016/j.cstp.2020.04.003

Bohlin, N. I. (1962). *Safety belt* (Patent No. 3,043,625). https://patents.google.com/patent/US3043625A/en

Bol, N., Smit, E. S., & Lustria, M. L. A. (2020). Tailored health communication: Opportunities and challenges in the digital era. *Digital health*, *6*. https://doi.org/10.1177/2055207620958913

Booz, M. L. (1986). *The constitutionality of mandatory seat belt laws* (VHTRC 86-R41). Virginia Transportation Research Council. https://rosap.ntl.bts.gov/view/dot/19122

Boyle, L. L. (2023). *Occupant Restraint Use in 2022: Results From the NOPUS Controlled Intersection Study* (DOT HS 813 523; p. 33). National Highway Traffic Safety Administration. https://crashstats.nhtsa.dot.gov/Api/Public/ViewPublication/813523

Boyle, L. L., & Lampkin, C. (2008). *2007 Motor Vehicle Occupant Safety Survey: Volume 2: Seat Belt Report* (DOT HS 810 975). National Highway Traffic Safety Administration. https://doi.org/10.21949/1525633

Boyle, L. L., & Vanderwolf, P. (2003). *2003 Motor Vehicle Occupant Safety Survey: Volume 2: Safety Belt Report* (DOT HS 809 789). National Highway Traffic Safety Administration. https://doi.org/10.21949/1525501

Braver, E. R. (2003). Race, Hispanic origin, and socioeconomic status in relation to motor vehicle occupant death rates and risk factors among adults. *Accident Analysis & Prevention*, *35*(3), 295–309. https://doi.org/10.1016/s0001-4575(01)00106-3

Briggs, N. C., Lambert, E. W., Goldzweig, I. A., Levine, R. S., & Warren, R. C. (2008). Driver and passenger seatbelt use among U.S. high school students. *American Journal of Preventive Medicine*, *35*(3), 224–229. https://doi.org/10.1016/j.amepre.2008.03.038

Burkett, K. M., Davidson, S., Cotton, C., Barlament, J., Loftin, L., Stephens, J., Dunbar, M., & Butterfield, R. (2010). Drive alive: Teen seat belt survey program. *The Western Journal of Emergency Medicine*, *11*(3), 279–282. https://pmc.ncbi.nlm.nih.gov/articles/PMC2941367/

Chaudhary, N. K., Alonge, M., & Preusser, D. F. (2005). Evaluation of the Reading, PA nighttime safety belt enforcement campaign: September 2004. *Journal of Safety Research*, *36*(4), 321–326. https://doi.org/10.1016/j.jsr.2005.06.009

Chaudhary, N. K., Leaf, W., Preusser, D., & Cassanova, T. (2010). *Guidelines to observe and estimate statewide seat belt use at night* (DOT HS 811 288). National Highway Traffic Safety Administration. https://rosap.ntl.bts.gov/view/dot/17651

Craig, K. J., Morgan, L. C., Chen, C.-H., Michie, S., Fusco, N., Snowdon, J. L., Scheufele, E., Gagliardi, T., & Sill, S. (2021). Systematic review of context-aware digital behavior change interventions to improve health. *Translational Behavioral Medicine*, *11*(5), 1037–1048. https://doi.org/10.1093/tbm/ibaa099

Daugherty, J. R., & Brase, G. L. (2010). Taking time to be healthy: Predicting health behaviors with delay discounting and time perspective. *Personality and Individual Differences*, *48*(2), 202–207. https://doi.org/10.1016/j.paid.2009.10.007

Delhomme, P., De Dobbeleer, W., Forward, S., Simões, A., Adamos, G., Areal, A., Chappé, J., Eyssartier, C., Loukopoulos, P., Nathanail, T., Nordbakke, S., Peters, H., Phillips, R., Pinto, M., Ranucci, M.-F., Sardi, G. M., Trigoso, J., Vaa, T., Veisten, K., & Walter, E. (2009). *Manual for designing, implementing, and evaluating road safety communication campaigns: Part I*. Brussels: Institut Belge pour la Sécurité Routière. https://www.vias.be/storage/main/cast-wp3-deliverable-3.2a.pdf

Dinh-Zarr, T. B., Sleet, D. A., Shults, R. A., Zaza, S., Elder, R. W., Nichols, J. L., Thompson, R. S., Sosin, D. M., & Task Force on Community Preventive Services. (2001). Reviews of evidence regarding interventions to increase the use of safety belts. *American Journal of Preventive Medicine*, *21*(4 Suppl), 48–65. https://doi.org/10.1016/s0749-3797(01)00378-6

Dissanayake, S., & Parikh, A. (2012). Self-Reported Behavior, Perceptions, and Attitudes of Drivers Regarding Seat Belt Use: A Descriptive Study. *Advances in Transportation Studies*, *26*. https://trid.trb.org/View/1143820

Ebert, J. P., Yan, R., Friday, S., Small, D., McDonald, C. C., Bartolozzi, K., & Delgado, M. K. (2025). Behavioral interventions for increasing seat belt use and decreasing distracted driving using telematics: A national randomized trial. *American Journal of Public Health*, *115*(5), 758–768. https://doi.org/10.2105/AJPH.2024.307980

Farmer, C. M., & Wells, J. K. (2010). Effect of enhanced seat belt reminders on driver fatality risk. *Journal of Safety Research*, *41*(1), 53–57. https://doi.org/10.1016/j.jsr.2009.11.001

Fell, J. (2019). Underutilized strategies in traffic safety: Results of a nationally representative survey. *Traffic Injury Prevention, 20*(sup2), S57–S62. https://doi.org/10.1080/15389588.2019.1654605

Ferguson, S. A., Wells, J. K., & Kirley, B. B. (2007). Effectiveness and driver acceptance of the Honda belt reminder system. *Traffic injury prevention*, *8*(2), 123–129. https://doi.org/10.1080/15389580601049968

Fernandez, W. G., Mehta, S. D., Coles, T., Feldman, J. A., Mitchell, P., & Olshaker, J. (2006). Self-reported safety belt use among emergency department patients in Boston, Massachusetts. *BMC Public Health, 6*(1), 111. https://doi.org/10.1186/1471-2458-6-111

Findley, D. J., Sanchez, M., & Nye, T. (2018). Estimating the effect of standard enforcement of a rear seat belt law for rear seat fatality prevention. *Transportation Research Record, 2672*(33), 67–77. https://doi.org/10.1177/0361198118790131

Geller, E. S., Johnson, R. P., & Pelton, S. L. (1982). Community-based interventions for encouraging safety belt use. *American Journal of Community Psychology*, *10*(2), 183–195. https://doi.org/10.1007/BF00896423

Glassbrenner, D. (2003). *Research Note: Safety belt use in 2002—Demographic characteristics* (DOT HS 809 557). National Highway Traffic Safety Administration. https://crashstats.nhtsa.dot.gov/Api/Public/ViewPublication/809557

Glassbrenner, D. (2005). *Traffic Safety Facts: Safety belt use in 2004—Demographic results* (DOT HS 809 848). National Highway Traffic Safety Administration. https://crashstats.nhtsa.dot.gov/Api/Public/ViewPublication/809848

Goldzweig, I. A., Levine, R. S., Schlundt, D., Bradley, R., Jones, G. D., Zoorob, R. J., & Ekundayo, O. J. (2013). Improving seat belt use among teen drivers: Findings from a service-learning approach. *Accident Analysis & Prevention*, *59*, 71–75. https://doi.org/10.1016/j.aap.2013.04.032

Goudie, R. J. B., Mukherjee, S. N., De Neve, J.-E., Oswald, A. J., & Wu, S. (2011). Happiness as a Driver of Risk-Avoiding Behavior. *CESifo Working Paper Series No. 3451*. https://doi.org/10.2139/ssrn.1846390

Griswold, R., II., & DeHaven, H. (1955). *Combination shoulder and lap safety belts* (Patent No. 2,710,649). https://patents.google.com/patent/US2710649A/en

Groeger, J. A. (2011). Chapter 1: How many E's in road safety? In B. E. Porter (Ed.), *Handbook of traffic psychology* (pp. 3–12). Elsevier. https://doi.org/10.1016/B978-0-12-381984-0.10001-3

Hedlund, J. (2019). *Rear seat belt use: Little change in four years, much more to do.* Governors Highway Safety Association. https://www.ghsa.org/sites/default/files/2025-04/Spotlight_Seatbelts_2019_J2.pdf

Hezaveh, A. M., & Cherry, C. R. (2019). Neighborhood-level factors affecting seat belt use. *Accident Analysis & Prevention*, *122*, 153–161. https://doi.org/10.1016/j.aap.2018.10.005

Hezaveh, A. M., Nordfjærn, T., Everett, J., & Cherry, C. R. (2019). The correlation between education, engineering, enforcement, and self-reported seat belt use in Tennessee: Incorporating heterogeneity and time of day effects. *Transportation Research Part F: Traffic Psychology and Behaviour*, *66*, 379–392. https://doi.org/10.1016/j.trf.2019.09.003

Hosseini, S., & Fathi, A. (2023). (PDF) Automatic detection of vehicle occupancy and driver's seat belt status using deep learning. *Signal, Image and Video Processing*, *17*(2), 491–499. https://doi.org/10.1007/s11760-022-02244-w

Houston, D. J., & Richardson, L. E., Jr. (2005). Getting Americans to buckle up: The efficacy of state seat belt laws. *Accident Analysis & Prevention*, *37*(6), 1114–1120. https://doi.org/10.1016/j.aap.2005.06.009

Houston, D. J., & Richardson, L. E., Jr. (2006). Safety belt use and the switch to primary enforcement, 1991–2003. *American Journal of Public Health*, *96*(11), 1949–1954. https://doi.org/10.2105/AJPH.2005.074385

Insurance Institute for Highway Safety. (2022). *Seat Belts*. Highway Loss Data Institute. https://www.iihs.org/topics/seat-belts

International Transportation Forum. (2023). *Road Safety Annual Report 2023*. OECD Publishing. https://doi.org/10.1787/8654c572-en

Jehle, D., Doshi, C., Karagianis, J., Consiglio, J., & Jehle, G. (2014). Obesity and seatbelt use: A fatal relationship. *The American Journal of Emergency Medicine*, *32*(7), 756–760. https://doi.org/10.1016/j.ajem.2014.01.010

Jermakian, J. S., & Weast, R. A. (2018). Passenger use of and attitudes toward rear seat belts. *Journal of Safety Research*, *64*, 113–119. https://doi.org/10.1016/j.jsr.2017.12.006

Johannessen, H. G. (1984). *Historical perspective on seat belt restraint systems*. SAE International Congress and Exposition, Detroit, Michigan. https://doi.org/10.4271/840392

Johannessen, H. G., & Vos, T. H. (1982). *The changing shape of seat belt systems*. Passenger Car Meeting & Exposition, Troy, Michigan. https://doi.org/10.4271/820796

Jonah, B., Thiessen, R., Au-Yeung, E., & Vincent, A. (1997). Sensation seeking and risky driving. In Federal Highway Administration, *Risk-Taking Behavior and Traffic Safety Symposium Proceedings*. https://rosap.ntl.bts.gov/view/dot/1683

Jones, J. P. (1997). What does effective frequency mean in 1997? *Journal of Advertising Research, 37*(4), 14–20. https://doi.org/10.1080/00218499.1997.12466680

Kahane, C. J. (2015). *Lives saved by vehicle safety technologies and associated Federal Motor Vehicle Safety Standards, 1960 to 2012* (DOT HS 812 069). National Highway Traffic Safety Administration. http://www-nrd.nhtsa.dot.gov/Pubs/812069.pdf

Kalbfleisch, P. J. (2003). Credibility for the 21st century: Integrating perspectives on source, message, and media credibility in the contemporary media environment. *Annals of the International Communication Association 27*(1):293–335. https://doi.org/10.1080/23808985.2003.11679029

Kerwin, A. J., Griffen, M. M., Tepas III, J. J., Schinco, M. A., Pieper, P., Devin, T., & Frykberg, E. R. (2006). The burden of noncompliance with seat belt use on a trauma center. *Journal of Trauma and Acute Care Surgery*, *60*(3), 489–493. https://doi.org/10.1097/01.ta.0000204030.85070.ff

Kidd, D. G., McCartt, A. T., & Oesch, N. J. (2014). Attitudes Toward Seat Belt Use and In-Vehicle Technologies for Encouraging Belt Use. *Traffic Injury Prevention*, *15*(1), 10–17. https://doi.org/10.1080/15389588.2013.792111

Kidd, D. G., & O'Malley, S. (2023). Increasing seat belt use in the United States by promoting and requiring more effective seat belt reminder systems. *Traffic Injury Prevention*, *24*(sup1), S80–S87. https://doi.org/10.1080/15389588.2022.2134730

Kim, K., Moulton, H., Kim, S., & Yamashita, E. (2012). *Differences Between Daytime and Nighttime Seat Belt Use in Hawaii*. Transportation Research Board 91st Annual Meeting. https://trid.trb.org/View/1130760

Kirley, B. B., Robison, K. L., Goodwin, A. H., Harmon, K. J., O'Brien, N. P., West, A., Harrell, S. S., Thomas, L., & Brookshire, K. (2023). *Countermeasures that work: A highway safety countermeasure guide for State Highway Safety Offices, 11th edition, 2023* (DOT HS 813 490). National Highway Traffic Safety Administration. https://www.nhtsa.gov/sites/nhtsa.gov/files/2023-12/countermeasures-that-work-11th-2023-tag.pdf

Kulanthayan, S., Law, T. H., Raha, A. R., & Radin, U. R. S. (2004). Seat belt use among car users in Malaysia. *IATSS Research*, *28*(1), 19–25. https://doi.org/10.1016/S0386-1112(14)60088-1

Lerner, E. B., Jehle, D. V., Billittier IV, A. J., Moscati, R. M., Connery, C. M., & Stiller, G. (2001). The influence of demographic factors on seatbelt use by adults injured in motor vehicle crashes. *Accident Analysis & Prevention*, *33*(5), 659–662. https://doi.org/10.1016/s0001-4575(00)00080-4

Li, L., Shults, R. A., Andridge, R. R., Yellman, M. A., Xiang, H., & Zhu, M. (2018). Texting/Emailing While Driving Among High School Students in 35 States, United States, 2015. *Journal of Adolescent Health*, *63*(6), 701–708. https://doi.org/10.1016/j.jadohealth.2018.06.010

Liu, W., Mumford, E. A., & Taylor, B. G. (2023). Profiles of Attitudes Toward Dating Abuse and Association with Subsequent Adolescent Relationship Abuse. *Prevention Science 24*(4), 650–662. https://doi.org/10.1007/s11121-022-01452-7

Liu, W., Taylor, B. G., & Mumford, E. A. (2020). Profiles of Adolescent Relationship Abuse and Sexual Harassment: A Latent Class Analysis. *Prevention Science 21*(3), 377–387. https://doi.org/10.1007/s11121-019-01075-5

Lustria, M. L. A. (2017). Message Tailoring in Health and Risk Messaging. In M. Powers (Ed.) *Oxford Research Encyclopedia of Communication*. https://doi.org/10.1093/acrefore/9780190228613.013.323

McDonald, C. (1995). *Advertising reach and frequency: Maximizing advertising results through effective frequency* (2nd ed.). NTC Business Books.

McLaughlin, G., Egizi, A. M., Sinha, I., Luis, N. S., & Clyburn, A. M. (2025, July 24). *Making health messages matter: Reaching Americans amid information overload*. Deloitte Center for Government Insights . https://www.deloitte.com/us/en/insights/industry/government-public-sector-services/public-health-messaging.html

Melton, T. J., Couillard, D. J., Ferguson, P. L., Power, S., Norcross, E. D., & Fakhry, S. M. (2012). Level I Trauma Center Internal Campaign to Increase Safe Driving by Staff. *Journal of Trauma Nursing 19*(4), 221. https://doi.org/10.1097/JTN.0b013e31827758aa

Miller, R. J., Miller, S., Redden, C., Retting, R., & Sprattler, K. (2024). *Nighttime Seat Belt Enforcement: A How-To Guide and Case Study Summary*. (Report No. DOT HS 813 537). National Highway Traffic Safety Administration. https://rosap.ntl.bts.gov/view/dot/73789/dot_73789_DS1.pdf

National Center for Statistics and Analysis. (2007). *Traffic Safety Facts: Seat belt use in 2006—Use rates in the States and Territories* (DOT HS 810 690). National Highway Traffic Safety Administration. https://crashstats.nhtsa.dot.gov/Api/Public/ViewPublication/810690

National Center for Statistics and Analysis. (2023). *Traffic Safety Facts: Occupant Protection in Passenger Vehicles—2021 Data* (Report DOT HS 813 449). National Highway Traffic Safety Administration. https://crashstats.nhtsa.dot.gov/Api/Public/ViewPublication/813449

National Center for Statistics and Analysis. (2024). *Traffic Safety Facts: Seat belt use in 2023—Overall results* (DOT HS 813 543). National Highway Traffic Safety Administration. https://crashstats.nhtsa.dot.gov/Api/Public/Publication/813543

National Center for Statistics and Analysis. (2025). *Traffic Safety Facts: Seat belt use in 2024—Overall results* (DOT HS 813 682). National Highway Traffic Safety Administration. https://crashstats.nhtsa.dot.gov/Api/Public/ViewPublication/813682

National Highway Traffic Safety Administration. (1998). *Federal Motor Vehicle Safety Standards and Regulations.* https://web.archive.org/web/20230825011819/https://one.nhtsa.gov/cars/rules/import/fmvss/index.html

National Highway Traffic Safety Administration. (2021). *Traffic Tech: High-visibility enforcement and seat belt use* (DOT HS 813 098). National Highway Traffic Safety Administration. https://doi.org/10.21949/1525996

National Highway Traffic Safety Administration. (2025). *Buckle Up. Every Trip. Every Time.* Traffic Safety Marketing. https://www.trafficsafetymarketing.gov/safety-topics/seat-belt-safety/buckle-every-trip-every-time

Nemire, K. (2019). Warning signs to fasten seat belts result in higher rates of rear seat belt use in rideshare vehicles. *Proceedings of the Human Factors and Ergonomics Society Annual Meeting 63*(1). https://doi.org/10.1177/1071181319631515

Nichols, J. L., Chaffe, R., Solomon, M., & Tison, J. (2016). *Traffic Safety Facts: The* Click It or Ticket *evaluation, 2013* (DOT HS 812 238). National Highway Traffic Safety Administration. https://doi.org/10.21949/1525923

Nichols, J. L., Solomon, M. G., Chaffe, R., & Preusser, D. F. (2010). *Evaluation of a county enforcement program with a primary seat belt ordinance: St. Louis, Missouri* (DOT HS 811 292). National Highway Traffic Safety Administration. https://doi.org/10.21949/1525692

Nichols, J. L., Tippetts, A. S., Fell, J. C., Eichelberger, A. H., & Haseltine, P. W. (2014). The effects of primary enforcement laws and fine levels on seat belt usage in the United States. *Traffic Injury Prevention*, *15*(6), 640–644. https://doi.org/10.1080/15389588.2013.857017

Nkuzo, L., Sibiya, M., & Markus, E. D. (2023). A Comprehensive Analysis of Real-Time Car Safety Belt Detection Using the YOLOv7 Algorithm. *Algorithms*, *16*(9). https://doi.org/10.3390/a16090400

Nolan, J. (1964). Motor Vehicles-A Comparative Analysis of Seat Belt Legislation. *DePaul Law Review 14*(1), 152.

Pickrell, T. M., & Liu, C. (2015). *Occupant restraint use in 2013: Results from the National Occupant Protection Use Survey controlled intersection study* (DOT HS 812 080). National Highway Traffic Safety Administration. https://crashstats.nhtsa.dot.gov/Api/Public/ViewPublication/812080

Pickrell, T. M., & Ye, T. J. (2010). *Occupant restraint use in 2009—Results from the National Occupant Protection Use Survey controlled intersection study* (DOT HS 811 414). National Highway Traffic Safety Administration. https://crashstats.nhtsa.dot.gov/Api/Public/ViewPublication/811414

Polson, A., Lerner, N., Burkhardt, E., Piesse, A., Zador, P., & Janniello, E. (2021, November 1). *Enhanced Seat Belt Reminder Systems: An Observational Study Examining the Relationship with Seat Belt Use* (Report No. DOT HS 812 808). National Highway Traffic Safety Administration. https://doi.org/10.21949/1530239

Price, T. (2023). *AI hits the road, high tech highways emerge in NC*. Elon News Network. https://www.elonnewsnetwork.com/article/2023/09/ai-hits-road-high-tech-highways-emerge-north-carolina

Raferty, S. J. (2021). *Benefits of mobile point-to-point safety cameras in rural South Australia* (Case Report Series CASR 185). The University of Adelaide Centre for Automotive Safety Research. https://casr.adelaide.edu.au/casrpubfile/2692/CASR185.pdf

Reagan, I. J., McClafferty, J. A., Berlin, S. P., & Hankey, J. M. (2013). Using naturalistic driving data to identify variables associated with infrequent, occasional, and consistent seat belt use. *Accident Analysis & Prevention*, *50*, 600–607. https://doi.org/10.1016/j.aap.2012.06.008

Richard, C. M., Thomas, F. D., Blomberg, R. D., Brown, J. L., Wright, T. J., Graham, L. A., Lee, J., & Landgraf, A. (2019). *Characteristics and predictors of occasional seat belt use using Strategic Highway Research Program 2 Data* (DOT HS 812 840). National Highway Traffic Safety Administration. https://doi.org/10.21949/1525973

Richardson, L. E., Jr, Albers, N., & Stokes, S. D. (2006). *Deciding to click it: Seatbelt use by Missouri teens*. https://rosap.ntl.bts.gov/view/dot/5636

Roberts, M. C. (1994). Lee Salk Distinguished Service Award Address: Prevention/Promotion in America: Still Spitting on the Sidewalk. *Journal of Pediatric Psychology*, *19*(3), 267–281. https://doi.org/10.1093/jpepsy/19.3.267

Romoser, M. R., Smith, S. A., Kyle, M. X., Thomas, D., Brunsen, E., & DeCina, L. (Unpublished). *State of knowledge on seat belt use.* (Report No. DOT HS xxx xxx). National Highway Traffic Safety Administration.

Ronan, L. (1979). *Seat belts: 1949–1956* (DOT HS 803 911). National Highway Traffic Safety Administration. https://rosap.ntl.bts.gov/view/dot/11828

Ryb, G. E., Dischinger, P. C., Kufera, J. A., & Read, K. M. (2006). Risk perception and impulsivity: Association with risky behaviors and substance abuse disorders. *Accident Analysis & Prevention*, *38*(3), 567–573. https://doi.org/10.1016/j.aap.2005.12.001

Segui-Gomez, M. (2000). Evaluating worksite-based interventions that promote safety belt use. *American Journal of Preventive Medicine*, *18*(4, Suppl. 1), 11–22. https://doi.org/10.1016/s0749-3797(00)00136-7

Sheveland, A. C., Luchman, J. N. ,. Xie, J. ,. Bleiberg, M. A. ,. Eby, D. W. ,. Molnar, L. J. ,. &. Walton, B. R. (2020). *Psychological constructs related to seat belt use, volume 2: Results report* (DOT HS 813 029). National Highway Traffic Safety Administration. https://doi.org/10.21949/1525991

Shinar, D., Schechtman, E., & Compton, R. (2001). Self-reports of safe driving behaviors in relationship to sex, age, education and income in the US adult driving population. *Accident Analysis & Prevention*, *33*(1), 111–116. https://doi.org/10.1016/s0001-4575(00)00021-x

Shults, R. A., Elder, R. W., Sleet, D. A., Thompson, R. S., & Nichols, J. L. (2004). Primary enforcement seat belt laws are effective even in the face of rising belt use rates. *Accident Analysis & Prevention*, *36*(3), 491–493. https://doi.org/10.1016/s0001-4575(03)00038-1

Solomon, M., Preusser, D. F., & Chaudhary, N. K. (2009). *Evaluation of the May 2007* Click It or Ticket *mobilization* (DOT HS 811 239). National Highway Traffic Safety Administration. https://doi.org/10.21949/1525680

Solomon, M., Ulmer, R. G., & Preusser, D. F. (2002). *Evaluation of Click It or Ticket model programs* (DOT HS 809 498). National Highway Traffic Safety Administration. https://doi.org/10.21949/1525534

Spado, D., Schaad, A., & Block, A. (2019). *2016 Motor Vehicle Occupant Safety Survey; Volume 2: Seat belt report* (DOT HS 812 727). National Highway Traffic Safety Administration. https://rosap.ntl.bts.gov/view/dot/43609/dot_43609_DS1.pdf

St. Louis, R. (2015). *Evaluation of Bis-Man Clicks: An employer-led seat belt use promotion program*. 2015 Traffic Safety Conference, Corpus Christi, TX. https://www.slideshare.net/slideshow/evaluation-of-bisman-clicks-an-employerled-seatbelt-promotion-program/55799898

Stanley, L., Plumb, C., Pimley, E., & Borden, K. (2014). *A Peer-to-Peer Traffic Safety Campaign Program* (FHWA/MT-14-003/8218). Montana Department of Transportation. https://doi.org/10.21949/1518128

Stellefson, M. L., Hanik, B. W., Chaney, B. H., & Chaney, D. J. (2008). Challenges for Tailored Messaging in Health Education. *American Journal of Health Education*, *39*(5), 303–313. https://doi.org/10.1080/19325037.2008.10599054

Strine, T. W., Beck, L. F., Bolen, J., Okoro, C., Dhingra, S., & Balluz, L. (2010). Geographic and sociodemographic variation in self-reported seat belt use in the United States. *Accident Analysis & Prevention*, *42*(4), 1066–1071. https://doi.org/10.1016/j.aap.2009.12.014

Suffoletto, B., Pacella-LaBarbara, M. L., Huber, J., Delgado, M. K., & McDonald, C. (2022). Effectiveness of a text message intervention promoting seat belt use among young adults: A randomized clinical trial. *JAMA Network Open*, *5*(9), e2231616. https://doi.org/10.1001/jamanetworkopen.2022.31616

Thomas, F. D., Blomberg, R. D., Korbelak, K. T., & Fauchier, C. M. (2016). *Expanding the Seat Belt Program Strategies Toolbox: A Starter Kit for Trying New Program Ideas*. (Report No. DOT HS 812 341). National Highway Traffic Safety Administration. https://doi.org/10.21949/1525902

Thomas, F. D., Blomberg, R. D., & Van Dyk, J. (2010). *Evaluation of the First Year of the Washington Nighttime Seat Belt Enforcement Program* (DOT HS 811 295). National Highway Traffic Safety Administration. https://doi.org/10.21949/1525702

Tison, J., Solomon, M., Nichols, J. L., Gilbert, S. H., Siegler, J. N., & Cosgrove, L. A. (2008). *May 2006* Click It or Ticket *seat belt mobilization evaluation: Final Report* (DOT HS 810 979). National Highway Traffic Safety Administration. https://doi.org/10.21949/1525630

Transportation Research Board. (2003). *Buckling Up: Technologies to Increase Seat Belt Use.* TRB Special Report 278. https://trb.org/publications/sr/sr278sum.pdf

Van Houten, R., Hilton, B., Schulman, R., & Reagan, I. (2011). *Using Haptic Feedback to Increase Seat Belt Use of Service Vehicle Drivers* (DOT HS 811 434). National Highway Traffic Safety Administration. https://rosap.ntl.bts.gov/view/dot/1912/dot_1912_DS1.pdf

Van Houten, R., Malenfant, J. L., Reagan, I., Sifrit, K., Compton, R., & Tenenbaum, J. (2010). Increasing seat belt use in service vehicle drivers with a gearshift delay. *Journal of Applied Behavior Analysis*, *43*(3), 369–380. https://doi.org/10.1901/jaba.2010.43-369

Vaughn, M. G., Salas-Wright, C. P., & Piquero, A. R. (2012). Buckle up: Non-seat belt use and antisocial behavior in the United States. *Annals of Epidemiology*, *22*(12), 825–831. https://doi.org/10.1016/j.annepidem.2012.09.010

Verhue, D., & Verbeek, J. (2002). Celebrities in advertising and publicity campaigns. In G. Bartels and W. Nelissen (Eds.), *Marketing for sustainability: Towards Transactional Policy-Making* (pp. 115-127). SAGE Publications Ltd.

Watson, C. E., & Austin, R. A. (2021). Differences in rural and urban drivers' attitudes and beliefs about seat belts. *Accident Analysis & Prevention*, *151*, 105976. https://doi.org/10.1016/j.aap.2021.105976

Williams, A. F., & Wells, J. K. (2004). The role of enforcement programs in increasing seat belt use. *Journal of Safety Research*, *35*(2), 175–180. https://doi.org/10.1016/j.jsr.2004.03.001

Williams, A. F., Wells, K., & Farmer, C. M. (2002). Effectiveness of Ford's belt reminder system in increasing seat belt use | Injury Prevention. *Injury Prevention*, *8*(4), 293–296. https://doi.org/10.1136/ip.8.4.293

World Health Organization. (2020). *Road safety: Seat-belts and child restraints* [Dataset]. https://www.who.int/data/gho/data/themes/topics/indicator-groups/indicator-group-details/GHO/seat-belt

Zhang, X., & Steinbach, R. (2025). *2024 Traffic Safety Culture Index* [Technical Report]. AAA Foundation for Traffic Safety. https://aaafoundation.org/wp-content/uploads/2026/05/202606-AAAFTS-2025-TSCI.pdf

## Appendices

## Appendix A—FARS Analysis

*Table A-1. FARS and County-Level Data Measures and Coding*

| Variable (Original FARS Variable Name) | Response categories | Used in regression/CART | Notes |
|---|---|---|---|
| **Seat belt use (REST_USE)** | • Yes<br>• No | Yes | |
| **Individual Characteristics and Behavior** | | | |
| **Driver/passenger status (PER_TYP)** | • Driver<br>• Passenger | Yes (full sample) | Due to its high correlation with seating position, this variable was combined with seating position for regression analysis with three categories: driver; passenger front seat; passenger back seat to be included in the regression analysis for the full sample. This variable was excluded for the driver sample logistic regression and CART analysis due to lack of variation (all drivers). |
| **Age (AGE)** | • Adolescents (15–17)<br>• Young Adult (18–24)<br>• Adults (25–59)<br>• Older Adults (60+) | Yes | |
| **Sex (SEX)** | • Male<br>• Female | Yes | |
| **Seating position (SEAT_POS)** | • Front<br>• Back | Yes (full sample) | Due to its high correlation with driver/passenger status, this variable was combined with seating position for the logistic regression analyses with three categories: driver; passenger front seat; passenger back seat to be included in the regression analysis for the full sample. This variable was excluded for the driver sample logistic regression and CART analysis due to lack of variation (all front seat). |

| Variable (Original FARS Variable Name) | Response categories | Used in regression/CART | Notes |
|---|---|---|---|
| **Police reported alcohol involvement (both passengers and drivers) (DRINKING)** | • Yes<br>• No | Yes (full sample) | • Data was augmented for drivers with missing data on this variable using the "Driver drinking" variable.<br>• This variable is included for the full sample logistic regression. However, driver drinking was included for the driver only sample logistic regression and CART analysis. |
| **Police reported drug involvement (both passengers and drivers) (DRUGS)** | • Yes<br>• No | Yes | |
| **Race and Hispanic Origin (A_HRACE)** | • Hispanic<br>• White Non-Hispanic<br>• Black Non-Hispanic<br>• American Indian Non-Hispanic/Unknown<br>• Asian Non-Hispanic/Unknown<br>• Pacific Islander Non-Hispanic/Unknown<br>• Multiple Races Non-Hispanic/Unknown<br>• All other Non-Hispanic or Race | No | This variable is for decedents only and was excluded from regression and CART. |
| **Vehicle Characteristics** | | | |
| **Number of occupants (NUMOCCS)** | • 1<br>• 2<br>• 3<br>• 4<br>• 5<br>• 6<br>• 7<br>• 8+ | Yes | Due to high correlation with driver/passenger and seating position, this variable was excluded from the full sample and recoded into No Passengers and 1 or more Passengers for the driver sample logistic regression and CART analyses. |
| **Child present in the vehicle** | • Yes<br>• No | Yes | This variable was derived using age to indicate the presence of any passenger under 18 years old in the vehicle. |

| Variable (Original FARS Variable Name) | Response categories | Used in regression/CART | Notes |
|---|---|---|---|
| **Body type (BODY_TYP)** | • Car<br>• SUV<br>• Van<br>• Pickup<br>• Station Wagon | Yes | |
| **Vehicle age** | • 0–4 years old<br>• 5–9 years old<br>• 10–14 years old<br>• 15+ years old | Yes | This variable was derived by subtracting the vehicle model year from the crash year. |
| **Crash Timing and Road Conditions** | | | |
| **Pre/post-pandemic** | • Pre-Pandemic (2017–2019)<br>• Post-Pandemic (2020–2022) | Yes | This variable was derived from the crash year. |
| **Light condition (LGT_COND)** | • Daylight<br>• Other condition (Dark, Dawn, Dusk, Other) | Yes | |
| **Total lanes (VNUM_LAN)** | • 1 Lane<br>• 2 Lanes<br>• 3 Lanes<br>• 4 Lanes<br>• 5 Lanes<br>• 6 Lanes<br>• 7+ Lanes | Yes | For ease of interpretation and based on bivariate results, this variable was recoded into One to Two Lane; Three to Four lanes; Five to Six lanes; and Seven or More Lanes for the logistic regression and CART analyses. |
| **Speed limit (VSPD_LIM)** | • Low Speed (<35 MPH)<br>• Medium Speed (35–50 MPH)<br>• High Speed (>50 MPH) | No | Due to high correlation with road type and given road type was more highly correlated with seat belt use, this variable was excluded from the logistic regression (full sample and driver) and CART analyses. |

| Variable (Original FARS Variable Name) | Response categories | Used in regression/CART | Notes |
|---|---|---|---|
| **Road type (FUNC_SYS)** | • Interstate<br>• Principal Arterial—Other Freeways and Expressways<br>• Principal Arterial—Other<br>• Minor Arterial<br>• Major Collector<br>• Minor Collector<br>• Local | Yes | For ease of interpretation and based on bivariate results, this variable was recoded into Interstate or Principal Arterial—Other Freeways and Expressways; Principal Arterial—Other; Minor Arterial; Major Collector; Minor Collector or Local for the logistic regression and CART analyses. |
| **Roadway surface condition (VSURCOND)** | • Dry<br>• Wet or other | Yes | |
| **Fatal injury at work (WORK_INJ)** | • Yes<br>• No | No | This variable is for decedents only and was excluded from the logistic regression and CART analyses. |
| **Crash Characteristics, Driver Characteristics, and Violations** | | | |
| **Airbag deployed (AIR_BAG)** | • Yes<br>• No | No | This variable was excluded from the logistic regression and CART analyses because airbag deployment is a consequence rather than a predictor of seat belt use. |
| **Ejected (EJECTION)** | • Yes<br>• No | No | This variable was excluded from the logistic regression and CART analyses because being ejected is a consequence rather than a predictor of seat belt use. |
| **Land use (RUR_URB)** | • Rural<br>• Urban | No | Due to the high correlation with RUCC, this variable was excluded from the logistic regression and CART analyses. |
| **Speeding related (SPEEDREL)** | • Yes<br>• No | Yes | |

| Variable (Original FARS Variable Name) | Response categories | Used in regression/CART | Notes |
|---|---|---|---|
| **Violations charged (MVIOLATN, VIOLATION)** | | | |
| **Reckless/careless/ hit-and-run** | • Yes<br>• No | No | Due to the low prevalence of the violations charged (0.8%-6%) and high correlation with one another and low correlation with seat belt use, these variables were excluded from the logistic regression and CART analyses. |
| **Impairment** | • Yes<br>• No | No | |
| **Speed-related** | • Yes<br>• No | No | |
| **Rules of the road—traffic sign and signals** | • Yes<br>• No | No | |
| **Rules of the road—turning, yielding, signaling** | • Yes<br>• No | No | |
| **Rules of the road—wrong side, passing and following** | • Yes<br>• No | No | |
| **Rules of the road—lane usage** | • Yes<br>• No | No | |
| **Non-moving—license and registration violations** | • Yes<br>• No | No | |
| **Equipment** | • Yes<br>• No | No | |
| **License, registration, and other violations** | • Yes<br>• No | No | |
| **Driver drinking (positive BAC or police reported involvement) (DR_DRINK)** | • Yes<br>• No | Yes (driver sample and CART) | This variable was included for the driver sample logistic regression and CART analysis. However, police-reported alcohol involvement was included for the full sample logistic regression. |
| **Driver height (inches) (DR_HGT)** | N/A | No | This variable was used to create BMI, and was excluded from the logistic regression and CART analyses to avoid overlap with the BMI variable. |

| Variable (Original FARS Variable Name) | Response categories | Used in regression/CART | Notes |
|---|---|---|---|
| **Driver weight (pounds) (DR_WGT)** | N/A | No | This variable was used to create BMI, and was excluded from the logistic regression and CART analyses to avoid overlap with the BMI variable. |
| **Driver BMI** | • Underweight (BMI <18.5)<br>• Healthy Weight (BMI 18.5 to <25)<br>• Overweight (BMI 25 to < 30)<br>• Obesity (BMI ≥30 or greater) | No | This variable was derived from the driver height and weight. This variable was excluded from the logistic regression and CART analyses due to 36% missing. |
| **License compliance with class of vehicle (L_COMPL)** | • In compliance<br>• Not in compliance | Yes | |
| **Driver prior DWIs (PREV_DWI)** | • Yes<br>• No | Yes | Due to high level of missingness of prior suspensions (18%) and prior crashes (9%), this variable was collapsed into any prior violations for the logistic regression and CART analyses. |
| **Driver prior crashes (PREV_ACC)** | • Yes<br>• No | Yes | |
| **Driver prior speeding (PREV_SPD)** | • Yes<br>• No | Yes | |
| **Driver prior suspensions (PREV_SUS3)** | • Yes<br>• No | Yes | |

| Variable (Original FARS Variable Name) | Response categories | Used in regression/CART | Notes |
|---|---|---|---|
| **County-Level Variables** | | | |
| **Social Vulnerability Index (SVI):** | | | |
| **Socioeconomic status** | • No High Vulnerability<br>• High Vulnerability | Yes | For ease of interpretation, for the univariate and bivariate analyses an indicator variable was created for each theme to indicate if any component of that theme was in the 90th percentile for ranking on vulnerability. For the logistic regression and CART analyses, due to high correlation between different SVI themes, one indicator variable was created if any component of any theme was in the 90th percentile for ranking on vulnerability. |
| **Household characteristics** | • No High Vulnerability<br>• High Vulnerability | Yes | |
| **Racial & ethnic minority status** | • No High Vulnerability<br>• High Vulnerability | Yes | |
| **Housing type/transportation** | • No High Vulnerability<br>• High Vulnerability | Yes | |
| **Rural-Urban Continuum Codes (RUCC)** | • Metro–Counties in metro areas of 1 million population or more<br>• Metro–Counties in metro areas of 250,000–1 million population<br>• Metro–Counties in metro areas of fewer than 250,000 population<br>• Nonmetro–Urban population of 20,000 or more, adjacent to a metro area<br>• Nonmetro–Urban population of 20,000 or more, not adjacent to a metro area<br>• Nonmetro–Urban population of 5,000 to 20,000, adjacent to a metro area<br>• Nonmetro–Urban population of 5,000 to 20,000, not adjacent to a metro area<br>• Nonmetro–Urban population of fewer than 5,000, adjacent to a metro area<br>• Nonmetro–Urban population of fewer than 5,000, not adjacent to a metro area | Yes | For ease of interpretation and based on bivariate results, this variable was recoded into Urban (Metro–Counties in metro areas of 1 million population or more), Suburban (Metro–Counties in metro areas of fewer than 1 million population), and Rural (all Nonmetro areas) for the logistic regression and CART analyses. |

## Analytic Plan

The purpose of this analysis is to identify the characteristics of occupants in vehicles that distinguish those who did not wear a seat belt compared to those who wore a seat belt at the time of a fatal crash using the FARS data from 2017 to 2022. First, univariate and bivariate descriptive analyses were conducted to examine who is more or less likely to wear a seat belt. Second, logistic regression analyses were conducted to examine the effect of various individual characteristics and behaviors, vehicle characteristics, and crash characteristics on likelihood of not wearing a seat belt, controlling for other factors. Third, CART analyses were conducted to develop profiles of drivers who were least likely to wear seat belts.

The analytic plan is described below. Data cleaning, descriptive analyses, and the CART analysis were performed in SPSS. The logistic regression analyses were performed in Stata.

## Data Tables

Table A-2 describes the characteristics of the full sample of drivers and passengers, as well as segmented by seat belt users, non-seat belt users, and unbelted fatalities. Among the full sample of drivers and passengers for which seat belt use was reported, 71.9% were using a seat belt and 28.1% were not. (Seat belt use status was missing for 31,534 or 9.0% of individuals in the sample.)

*Table A-2. Univariate Descriptives of Study Variables among the Full Sample, Seat Belt Users, Non-Seat Belt Users, and Non-Seat Belt User Fatalities*

| | Full Sample (*N*=350,397) | | Seat Belt Users (*N*=229,348) | | Non-Seat Belt Users (*N*=89,497) | | Non-Seat Belt User Fatalities (*N*=61,866) | |
|---|---|---|---|---|---|---|---|---|
| | **Mean (Std. Dev)/*N* (%)** | ***N* missing (%)** | **Mean (Std. Dev)/N (%)** | ***N* missing (%)** | **Mean (Std. Dev)/*N* (%)** | ***N* missing (%)** | **Mean (Std. Dev)/N (%)** | ***N* missing (%)** |
| **Individual Characteristics and Behavior** | | | | | | | | |
| **Driver/passenger status** | | 394 (0.1%) | | 25 (0%) | | 222 (0.2%) | | 153 (0.2%) |
| Driver | 252,169 (72.1%) | | 168,682 (73.6%) | | 61,566 (69.0%) | | 47,956 (77.7%) | |
| Passenger | 97,816 (27.9%) | | 60,641 (26.4%) | | 27,709 (31.0%) | | 13,757 (22.3%) | |
| **Age** | 41.1 (19.33) | 0 (0%) | 42.9 (19.8) | 0 (0%) | 37.9 (18.0) | 0 (0%) | 40.6 (18.6) | 0 (0%) |
| Adolescents (15–17) | 18,135 (5.2%) | | 11,023 (4.8%) | | 5,291 (5.9%) | | 2,429 (3.9%) | |
| Young adults (18–24) | 68,529 (19.6%) | | 40,770 (17.8%) | | 20,384 (22.8%) | | 12,056 (19.5%) | |
| Adults (25–59) | 193,391 (55.2%) | | 124,603 (54.3%) | | 50,808 (56.8%) | | 36,182 (58.5%) | |
| Older adults (60+) | 70,324 (20.1%) | | 52,952 (23.1%) | | 13,014 (14.5%) | | 11,199 (18.1%) | |
| **Sex** | | 387 (0.1%) | | 0 (0%) | | 74 (0.1%) | | 39 (0.1%) |
| Male | 219,877 (62.8%) | | 135,552 (59.2%) | | 62,739 (70.2%) | | 44,185 (71.5%) | |
| Female | 130,115 (37.2%) | | 93,572 (40.8%) | | 26,684 (29.8%) | | 17,642 (28.5%) | |
| **Seating position** | | 3,947 (1.1%) | | 463 (0.2%) | | 2,319 (2.6%) | | 1,152 (1.9%) |
| Front | 319,294 (92.2%) | | 215,506 (94.2%) | | 76,507 (87.8%) | | 56,229 (92.6%) | |
| Back | 27,138 (7.8%) | | 13,379 (5.8%) | | 10,671 (12.2%) | | 4,485 (7.4%) | |
| **Police reported alcohol involvement** | | 1,429 (0.4%) | | 499 (0.2%) | | 603 (0.7%) | | 378 (0.6%) |
| Yes | 42,825 (12.3%) | | 17,150 (7.5%) | | 20,647 (23.2%) | | 16,680 (27.1%) | |
| No | 306,125 (87.7%) | | 211,699 (92.5%) | | 68,247 (76.8%) | | 44,808 (72.9%) | |

| | Full Sample (*N*=350,397) | | Seat Belt Users (*N*=229,348) | | Non-Seat Belt Users (*N*=89,497) | | Non-Seat Belt User Fatalities (*N*=61,866) | |
|---|---|---|---|---|---|---|---|---|
| | **Mean (Std. Dev)/*N* (%)** | ***N* missing (%)** | **Mean (Std. Dev)/N (%)** | ***N* missing (%)** | **Mean (Std. Dev)/*N* (%)** | ***N* missing (%)** | **Mean (Std. Dev)/N (%)** | ***N* missing (%)** |
| **Police reported drug involvement** | | 29,820 (8.5%) | | 13,210 (5.8%) | | 12,040 (13.5%) | | 10,390 (16.8%) |
| Yes | 23,542 (7.3%) | | 10,525 (4.9%) | | 10,619 (13.7%) | | 8,158 (15.8%) | |
| No | 297,017 (92.7%) | | 205,613 (95.1%) | | 66,838 (86.3%) | | 43,318 (84.2%) | |
| **Race and Hispanic origin** | (N=139,912 decedents) | 7,128 (5.1%) | (N=64,368 decedents) | 3,426 (5.3%) | (N=61,866 decedents) | 2,788 (4.5%) | | 2,788 (4.5%) |
| Hispanic | 21,690 (16.3%) | | 10,086 (16.6%) | | 9,355 (15.8%) | | 9,355 (15.8%) | |
| White non-Hispanic | 77,160 (58.1%) | | 37,346 (61.3%) | | 33,586 (56.9%) | | 33,586 (56.9%) | |
| Black non-Hispanic | 21,695 (16.3%) | | 7,724 (12.7%) | | 11,019 (18.7%) | | 11,019 (18.7%) | |
| American Indian non-Hispanic/unknown | 2,389 (1.8%) | | 734 (1.2%) | | 1,317 (2.2%) | | 1,317 (2.2%) | |
| Asian non-Hispanic/unknown | 1,472 (1.1%) | | 971 (1.6%) | | 353 (0.6%) | | 353 (0.6%) | |
| Pacific Islander non-Hispanic/unknown | 130 (0.1%) | | 54 (0.1%) | | 59 (0.1%) | | 59 (0.1%) | |
| Multiple races non-Hispanic/unknown | 503 (0.4%) | | 213 (0.3%) | | 237 (0.4%) | | 237 (0.4%) | |
| All other non-Hispanic or race | 7,745 (5.8%) | | 3,814 (6.3%) | | 3,152 (5.3%) | | 3,152 (5.3%) | |
| **Driver height (inch)** | 68.1 (4.0) | 54,519 (15.6%) | 68.0 (4.0) | 34,639 (15.1%) | 68.6 (3.9) | 14,233 (15.9%) | 68.6 (3.9) | 9,208 (14.9%) |
| **Driver weight (pound)** | 181.5 (45.8) | 126,656 (36.1%) | 180.7 (45.3) | 85,042 (37.1%) | 183.9 (47.2) | 31,003 (34.6%) | 185.2 (47.7) | 20,277 (32.8%) |

| | Full Sample (*N*=350,397) | | Seat Belt Users (*N*=229,348) | | Non-Seat Belt Users (*N*=89,497) | | Non-Seat Belt User Fatalities (*N*=61,866) | |
|---|---|---|---|---|---|---|---|---|
| | **Mean (Std. Dev)/*N* (%)** | ***N* missing (%)** | **Mean (Std. Dev)/N (%)** | ***N* missing (%)** | **Mean (Std. Dev)/*N* (%)** | ***N* missing (%)** | **Mean (Std. Dev)/N (%)** | ***N* missing (%)** |
| **Driver BMI** | 27.4 (6.1) | 126,770 (36.2%) | 27.4 (6.0) | 85,093 (37.1%) | 27.4 (6.4) | 31,056 (34.7%) | 27.6 (6.4) | 20,321 (32.8%) |
| Underweight (BMI <18.5) | 5,116 (2.3%) | | 3,136 (2.2%) | | 1,473 (2.5%) | | 979 (2.4%) | |
| Healthy weight (BMI 18.5–<25) | 81,932 (36.6%) | | 52,154 (36.2%) | | 21,711 (37.2%) | | 15,088 (36.3%) | |
| Overweight (BMI 25–<30) | 75,964 (34.0%) | | 49,612 (34.4%) | | 19,235 (32.9%) | | 13,723 (33.0%) | |
| Obesity (BMI >30) | 60,597 (27.1%) | | 39,353 (27.3%) | | 16,022 (27.4%) | | 11,755 (28.3%) | |
| **Vehicle Characteristics** | | | | | | | | |
| **Number of occupants** | 2.0 (1.4) | 2,630 (0.8%) | 1.9 (1.3) | 1,078 (0.5%) | 2.1 (1.8) | 443 (0.5%) | 1.7 (1.3) | 121 (0.2%) |
| 1 | 169,025 (48.6%) | | 109,831 (48.1%) | | 44,561 (50.0%) | | 38,614 (62.5%) | |
| 2 | 98,215 (28.2%) | | 68,770 (30.1%) | | 21,560 (24.2%) | | 13,208 (21.4%) | |
| 3 | 39,267 (11.3%) | | 25,020 (11.0%) | | 10,571 (11.9%) | | 5,238 (8.5%) | |
| 4 | 22,208 (6.4%) | | 14,082 (6.2%) | | 5,983 (6.7%) | | 2,587 (4.2%) | |
| 5 | 10,790 (3.1%) | | 6,565 (2.9%) | | 3,119 (3.5%) | | 1,176 (1.9%) | |
| 6 | 3,896 (1.1%) | | 2,148 (0.9%) | | 1,329 (1.5%) | | 435 (0.7%) | |
| 7 | 1,856 (0.5%) | | 942 (0.4%) | | 702 (0.8%) | | 194 (0.3%) | |
| 8+ | 2,492 (0.7%) | | 912 (0.4%) | | 1,229 (1.4%) | | 293 (0.5%) | |
| **Child present in vehicle** | | 69 (0%) | | 4 (0%) | | 33 (0%) | | 25 (0%) |
| Yes | 56,669 (16.2%) | | 38,204 (16.7%) | | 13,770 (15.4%) | | 6,557 (10.6%) | |
| No | 293,641 (83.8%) | | 191,140 (83.3%) | | 75,694 (84.6%) | | 55,284 (89.4%) | |
| **Body type** | | 1,023 (0.3%) | | 219 (0.1%) | | 315 (0.4%) | | 241 (0.4%) |
| Car | 155,684 (44.6%) | | 100,386 (43.8%) | | 40,229 (45.1%) | | 28,965 (47.0%) | |
| SUV | 83,465 (23.9%) | | 56,953 (24.9%) | | 19,570 (21.9%) | | 13,113 (21.3%) | |
| Van | 19,272 (5.5%) | | 13,579 (5.9%) | | 3,902 (4.4%) | | 2,268 (3.7%) | |
| Pickup | 71,072 (20.3%) | | 44,160 (19.3%) | | 21,250 (23.8%) | | 14,347 (23.3%) | |
| Station wagon | 19,863 (5.7%) | | 14,051 (6.1%) | | 4,231 (4.7%) | | 2,932 (4.8%) | |

| | Full Sample (*N*=350,397) | | Seat Belt Users (*N*=229,348) | | Non-Seat Belt Users (*N*=89,497) | | Non-Seat Belt User Fatalities (*N*=61,866) | |
|---|---|---|---|---|---|---|---|---|
| | **Mean (Std. Dev)/*N* (%)** | ***N* missing (%)** | **Mean (Std. Dev)/N (%)** | ***N* missing (%)** | **Mean (Std. Dev)/*N* (%)** | ***N* missing (%)** | **Mean (Std. Dev)/N (%)** | ***N* missing (%)** |
| **Vehicle age** | 11.0 (7.3) | 1,164 (0.3%) | 10.0 (6.9) | 263 (0.1%) | 13.2 (7.5) | 341 (0.4%) | 13.6 (7.6) | 258 (0.4%) |
| 0–4 years old | 79,048 (22.6%) | | 60,627 (26.5%) | | 12,659 (14.2%) | | 7,955 (12.9%) | |
| 5–9 years old | 77,375 (22.2%) | | 55,756 (24.3%) | | 15,295 (17.2%) | | 10,110 (16.4%) | |
| 10–14 years old | 81,413 (23.3%) | | 51,891 (22.7%) | | 21,980 (24.7%) | | 15,144 (24.6%) | |
| 15+ years old | 111,379 (31.9%) | | 60,811 (26.5%) | | 39,222 (44.0%) | | 28,399 (46.1%) | |
| **Crash Timing and Road Conditions** | | | | | | | | |
| **Pre/post-pandemic** | | 0 (0%) | | 0 (0%) | | 0 (0%) | | 0 (0%) |
| Pre-pandemic | 167,277 (47.7%) | | 112,464 (49.0%) | | 41,111 (45.9%) | | 28,575 (46.2%) | |
| Post-pandemic | 183,102 (52.3%) | | 116,884 (51.0%) | | 48,386 (54.1%) | | 33,291 (53.8%) | |
| **Light condition** | | 1,151 (0.3%) | | 296 (0.1%) | | 403 (0.5%) | | 369 (0.6%) |
| Daylight | 171,766 (49.2%) | | 120,488 (52.6%) | | 39,179 (44.0%) | | 27,059 (44.0%) | |
| Other condition | 177,462 (50.8%) | | 108,564 (47.4%) | | 49,915 (56.0%) | | 34,438 (56.0%) | |
| **Total lanes** | 2.7 (1.2) | 6,677 (1.9%) | 2.8 (1.2) | 4,299 (1.9%) | 2.5 (1.0) | 1,282 (1.4%) | 2.4 (0.95) | 807 (1.3%) |
| 1 lane | 4,913 (1.4%) | | 2,786 (1.2%) | | 1,515 (1.7%) | | 1,072 (1.8%) | |
| 2 lanes | 215,766 (62.8%) | | 132,867 (59.0%) | | 64,631 (73.3%) | | 46,085 (75.5%) | |
| 3 lanes | 45,616 (13.3%) | | 33,016 (14.7%) | | 8,724 (9.9%) | | 5,682 (9.3%) | |
| 4 lanes | 38,104 (11.1%) | | 27,002 (12.0%) | | 7,171 (8.1%) | | 4,541 (7.4%) | |
| 5 lanes | 29,014 (8.4%) | | 21,518 (9.6%) | | 4,697 (5.3%) | | 2,813 (4.6%) | |
| 6 lanes | 6,464 (1.9%) | | 4,913 (2.2%) | | 983 (1.1%) | | 583 (1.0%) | |
| 7+ lanes | 3,825 (1.1%) | | 2,947 (1.3%) | | 494 (0.6%) | | 283 (0.5%) | |
| **Speed limit** | | 15,070 (4.3%) | | 9,354 (4.1%) | | 2,873 (3.2%) | | 1,970 (3.2%) |
| Low speed (<35 MPH) | 32,492 (9.7%) | | 18,425 (8.4%) | | 8,220 (9.5%) | | 5,252 (8.8%) | |
| Medium speed (35–50 MPH) | 135,245 (40.3%) | | 90,070 (40.9%) | | 32,435 (37.4%) | | 21,621 (36.1%) | |
| High speed (>50 MPH) | 167,572 (50.0%) | | 111,499 (50.7%) | | 45,969 (53.1%) | | 33,023 (55.1%) | |

| | Full Sample (*N*=350,397) | | Seat Belt Users (*N*=229,348) | | Non-Seat Belt Users (*N*=89,497) | | Non-Seat Belt User Fatalities (*N*=61,866) | |
|---|---|---|---|---|---|---|---|---|
| | **Mean (Std. Dev)/*N* (%)** | ***N* missing (%)** | **Mean (Std. Dev)/N (%)** | ***N* missing (%)** | **Mean (Std. Dev)/*N* (%)** | ***N* missing (%)** | **Mean (Std. Dev)/N (%)** | ***N* missing (%)** |
| **Road type** | | 1,140 (0.3%) | | 486 (0.2%) | | 392 (0.4%) | | 253 (0.4%) |
| Interstate | 47,806 (13.7%) | | 32,561 (14.2%) | | 11,666 (13.1%) | | 8,136 (13.2%) | |
| Principal Arterial—other freeways and expressways | 16,747 (4.8%) | | 11,826 (5.2%) | | 3,748 (4.2%) | | 2,693 (4.4%) | |
| Principal Arterial—other | 113,423 (32.5%) | | 81,085 (35.4%) | | 22,403 (25.1%) | | 14,797 (24.0%) | |
| Minor Arterial | 78,892 (22.6%) | | 52,478 (22.9%) | | 18,942 (21.3%) | | 12,987 (21.1%) | |
| Major Collector | 49,430 (14.2%) | | 29,068 (12.7%) | | 16,128 (18.1%) | | 11,604 (18.8%) | |
| Minor Collector | 10,256 (2.9%) | | 5,398 (2.4%) | | 4,023 (4.5%) | | 2,896 (4.7%) | |
| Local | 32,685 (9.4%) | | 16,446 (7.2%) | | 12,195 (13.7%) | | 8,500 (13.8%) | |
| **Roadway surface condition** | | 7,936 (2.3%) | | 4,898 (2.1%) | | 1,608 (1.8%) | | 1,133 (1.8%) |
| Dry | 290,508 (84.8%) | | 191,326 (85.2%) | | 73,761 (83.9%) | | 50,828 (83.7%) | |
| Wet or other | 51,935 (15.2%) | | 33,124 (14.8%) | | 14,128 (16.1%) | | 9,905 (16.3%) | |
| **Fatal injury at work** | (N=139,912 decedents) | 13,198 (9.4%) | (N=64,368 decedents) | 6,272 (9.7%) | (N=61,866 decedents) | 5,435 (8.8%) | | 5,435 (8.8%) |
| Yes | 1,187 (0.9%) | | 584 (1.0%) | | 475 (0.8%) | | 475 (0.8%) | |
| No | 125,527 (99.1%) | | 57,512 (99.0%) | | 55,956 (99.2%) | | 55,956 (99.2%) | |
| **Crash Characteristics, Driver Characteristics, and Violations** | | | | | | | | |
| **Airbag deployed** | | 17,389 (5%) | | 6,178 (2.7%) | | 3,283 (3.7%) | | 2,305 (3.7%) |
| Yes | 184,297 (55.3%) | | 120,897 (54.2%) | | 51,920 (60.2%) | | 37,256 (62.6%) | |
| No | 148,693 (44.7%) | | 102,273 (45.8%) | | 34,294 (39.8%) | | 22,305 (37.4%) | |
| **Ejected** | | 2,303 (0.7%) | | 335 (0.1%) | | 901 (1.0%) | | 511 (0.8%) |
| Yes | 35,098 (10.1%) | | 2,957 (1.3%) | | 29,189 (32.9%) | | 24,951 (40.7%) | |
| No | 312,978 (89.9%) | | 226,056 (98.7%) | | 59,407 (67.1%) | | 36,404 (59.3%) | |
| **Land use** | | 801 (0.2%) | | 365 (0.2%) | | 233 (0.3%) | | 148 (0.2%) |
| Rural | 144,007 (41.2%) | | 88,870 (38.8%) | | 46,225 (51.8%) | | 33,385 (54.1%) | |
| Urban | 205,571 (58.8%) | | 140,113 (61.2%) | | 43,039 (48.2%) | | 28,333 (45.9%) | |

| | Full Sample (*N*=350,397) | | Seat Belt Users (*N*=229,348) | | Non-Seat Belt Users (*N*=89,497) | | Non-Seat Belt User Fatalities (*N*=61,866) | |
|---|---|---|---|---|---|---|---|---|
| | **Mean (Std. Dev)/*N* (%)** | ***N* missing (%)** | **Mean (Std. Dev)/N (%)** | ***N* missing (%)** | **Mean (Std. Dev)/*N* (%)** | ***N* missing (%)** | **Mean (Std. Dev)/N (%)** | ***N* missing (%)** |
| **Speeding related** | | 13,508 (3.9%) | | 5,952 (2.6%) | | 4,278 (4.8%) | | 3,340 (5.4%) |
| Yes | 65,003 (19.3%) | | 28,101 (12.6%) | | 28,993 (34.0%) | | 20,394 (34.8%) | |
| No | 271,868 (80.7%) | | 195,295 (87.4%) | | 56,226 (66.0%) | | 38,132 (65.2%) | |
| **Violations charged** | | 0 (0%) | | 0 (0%) | | 0 (0%) | | 0 (0%) |
| Reckless/careless/ hit-and-run | 21,124 (6.0%) | | 11,288 (4.9%) | | 6,419 (7.2%) | | 2,343 (3.8%) | |
| Impairment | 12,641 (3.6%) | | 6,667 (2.9%) | | 4,262 (4.8%) | | 1,744 (2.8%) | |
| Speed-related | 3,752 (1.1%) | | 2,131 (0.9%) | | 1,163 (1.3%) | | 501 (0.8%) | |
| Rules of the road—traffic sign and signals | 2,960 (0.8%) | | 2,114 (0.9%) | | 572 (0.6%) | | 189 (0.3%) | |
| Rules of the road—turning, yielding, signaling | 5,319 (1.5%) | | 4,400 (1.9%) | | 534 (0.6%) | | 218 (0.4%) | |
| Rules of the road—wrong side, passing and following | 1,982 (0.6%) | | 1,275 (0.6%) | | 539 (0.6%) | | 187 (0.3%) | |
| Rules of the road—lane usage | 3,456 (1.0%) | | 1,994 (0.9%) | | 1,106 (1.2%) | | 541 (0.9%) | |
| Non-moving—license and registration violations | 9,510 (2.7%) | | 5,840 (2.5%) | | 2,560 (2.9%) | | 899 (1.5%) | |
| Equipment | 2,687 (0.8%) | | 689 (0.3%) | | 1,885 (2.1%) | | 634 (1.0%) | |
| License, registration, and other violations | 5,263 (1.5%) | | 2,660 (1.2%) | | 1,608 (1.8%) | | 748 (1.2%) | |
| **Driver drinking reported by police** | | 0 (0%) | | 0 (0%) | | 0 (0%) | | 0 (0%) |
| Yes | 64,388 (18.4%) | | 25,713 (11.2%) | | 30,711 (34.3%) | | 23,107 (37.4%) | |
| No | 285,991 (81.6%) | | 203,635 (88.8%) | | 58,786 (65.7%) | | 38,759 (62.6%) | |

| | Full Sample (*N*=350,397) | | Seat Belt Users (*N*=229,348) | | Non-Seat Belt Users (*N*=89,497) | | Non-Seat Belt User Fatalities (*N*=61,866) | |
|---|---|---|---|---|---|---|---|---|
| | **Mean (Std. Dev)/*N* (%)** | ***N* missing (%)** | **Mean (Std. Dev)/N (%)** | ***N* missing (%)** | **Mean (Std. Dev)/*N* (%)** | ***N* missing (%)** | **Mean (Std. Dev)/N (%)** | ***N* missing (%)** |
| **License compliance with class of vehicle** | | 4,641 (1.3%) | | 2,274 (1.0%) | | 1,423 (1.6%) | | 855 (1.4%) |
| In compliance | 287,556 (83.2%) | | 200,207 (88.2%) | | 65,284 (74.1%) | | 46,005 (75.4%) | |
| Not in compliance | 58,182 (16.8%) | | 26,867 (11.8%) | | 22,790 (25.9%) | | 15,006 (24.6%) | |
| **Driver prior DWIs** | | 7,152 (2.0%) | | 3,549 (1.5%) | | 2,279 (2.5%) | | 1,346 (2.2%) |
| Prior DWIs | 10,404 (3.0%) | | 4,512 (2.0%) | | 4,514 (5.2%) | | 3,388 (5.6%) | |
| No prior DWIs | 332,823 (97.0%) | | 221,287 (98.0%) | | 82,704 (94.8%) | | 57,132 (94.4%) | |
| **Driver prior crashes** | | 30,135 (8.6%) | | 17,828 (7.8%) | | 8,702 (9.7%) | | 5,865 (9.5%) |
| Prior crashes | 55,264 (17.3%) | | 33,712 (15.9%) | | 16,259 (20.1%) | | 11,516 (20.6%) | |
| No prior crashes | 264,980 (82.7%) | | 177,808 (84.1%) | | 64,536 (79.9%) | | 44,485 (79.4%) | |
| **Driver prior speeding** | | 7,152 (2.0%) | | 3,549 (1.5%) | | 2,279 (2.5%) | | 1,346 (2.2%) |
| Prior speeding | 60,098 (17.5%) | | 35,685 (15.8%) | | 18,578 (21.3%) | | 12,875 (21.3%) | |
| No prior speeding | 283,129 (82.5%) | | 190,114 (84.2%) | | 68,640 (78.7%) | | 47,645 (78.7%) | |
| **Driver prior suspensions** | | 63,430 (18.1%) | | 41,663 (18.2%) | | 16,020 (17.9%) | | 10,968 (17.7%) |
| Prior suspensions | 34,917 (12.2%) | | 17,225 (9.2%) | | 13,368 (18.2%) | | 9,231 (18.1%) | |
| No prior suspensions | 252,032 (87.8%) | | 170,460 (90.8%) | | 60,109 (81.8%) | | 41,667 (81.9%) | |

| | Full Sample (*N*=350,397) | | Seat Belt Users (*N*=229,348) | | Non-Seat Belt Users (*N*=89,497) | | Non-Seat Belt User Fatalities (*N*=61,866) | |
|---|---|---|---|---|---|---|---|---|
| | **Mean (Std. Dev)/*N* (%)** | ***N* missing (%)** | **Mean (Std. Dev)/N (%)** | ***N* missing (%)** | **Mean (Std. Dev)/*N* (%)** | ***N* missing (%)** | **Mean (Std. Dev)/N (%)** | ***N* missing (%)** |
| **County-Level Variables** | | | | | | | | |
| **Social Vulnerability Index (SVI)** | | 2,713 (0.8%) | | 1,544 (0.7%) | | 611 (0.7%) | | 429 (0.7%) |
| **Socioeconomic status** | 0.59 (0.27) | | 0.59 (0.27) | | 0.59 (0.27) | | 0.59 (0.27) | |
| No high vulnerability | 199,667 (57.4%) | | 129,917 (57.0%) | | 52,895 (59.5%) | | 37,305 (60.7%) | |
| High vulnerability | 147,999 (42.6%) | | 97,887 (43.0%) | | 35,991 (40.5%) | | 24,132 (39.3%) | |
| **Household characteristics** | 0.53 (0.26) | | 0.53 (0.26) | | 0.55 (0.27) | | 0.54 (0.27) | |
| No high vulnerability | 179,802 (51.7%) | | 115,666 (50.8%) | | 49,031 (55.2%) | | 34,485 (56.1%) | |
| High vulnerability | 167,864 (48.3%) | | 112,138 (49.2%) | | 39,855 (44.8%) | | 26,952 (43.9%) | |
| **Racial & ethnic minority status** | 0.70 (0.25) | | 0.71 (0.24) | | 0.66 (0.26) | | 0.65 (0.27) | |
| No high vulnerability | 254,831 (73.3%) | | 164,162 (72.1%) | | 69,244 (77.9%) | | 48,466 (78.9%) | |
| High vulnerability | 92,835 (26.7%) | | 63,642 (27.9%) | | 19,642 (22.1%) | | 12,971 (21.1%) | |
| **Housing type/transportation** | 0.62 (0.25) | | 0.62 (0.25) | | 0.60 (0.25) | | 0.60 (0.26) | |
| No high vulnerability | 145,964 (42.0%) | | 93,625 (41.1%) | | 41,607 (46.8%) | | 29,710 (48.4%) | |
| High vulnerability | 201,702 (58.0%) | | 134,179 (58.9%) | | 47,279 (53.2%) | | 31,727 (51.6%) | |

| | Full Sample (*N*=350,397) | | Seat Belt Users (*N*=229,348) | | Non-Seat Belt Users (*N*=89,497) | | Non-Seat Belt User Fatalities (*N*=61,866) | |
|---|---|---|---|---|---|---|---|---|
| | **Mean (Std. Dev)/*N* (%)** | ***N* missing (%)** | **Mean (Std. Dev)/N (%)** | ***N* missing (%)** | **Mean (Std. Dev)/*N* (%)** | ***N* missing (%)** | **Mean (Std. Dev)/N (%)** | ***N* missing (%)** |
| **Rural-Urban Continuum Code (RUCC)** | | 2,713 (0.8%) | | 1,544 (0.7%) | | 611 (0.7%) | | 429 (0.7%) |
| Metro–counties in metro areas of 1 million population or more | 154,627 (44.5%) | | 104,929 (46.1%) | | 32,873 (37.0%) | | 21,878 (35.6%) | |
| Metro–counties in metro areas of 250,000 to 1 million population | 75,267 (21.6%) | | 51,013 (22.4%) | | 18,583 (20.9%) | | 12,886 (21.0%) | |
| Metro–counties in metro areas of fewer than 250,000 population | 36,590 (10.5%) | | 23,897 (10.5%) | | 9,737 (11.0%) | | 6,794 (11.1%) | |
| Nonmetro–urban population of 20,000 or more, adjacent to a metro area | 19,892 (5.7%) | | 12,761 (5.6%) | | 5,831 (6.6%) | | 4,151 (6.8%) | |
| Nonmetro–urban population of 20,000 or more, not adjacent to a metro area | 6,046 (1.7%) | | 3,717 (1.6%) | | 1,796 (2.0%) | | 1,254 (2.0%) | |
| Nonmetro–urban population of 5,000 to 20,000, adjacent to a metro area | 21,904 (6.3%) | | 13,267 (5.8%) | | 7,198 (8.1%) | | 5,240 (8.5%) | |
| Nonmetro–urban population of 5,000 to 20,000, not adjacent to a metro area | 9,867 (2.8%) | | 5,621 (2.5%) | | 3,605 (4.1%) | | 2,570 (4.2%) | |
| Nonmetro–urban population of fewer than 5,000, adjacent to a metro area | 13,580 (3.9%) | | 7,442 (3.3%) | | 5,195 (5.8%) | | 3,747 (6.1%) | |
| Nonmetro–urban population of fewer than 5,000, not adjacent to a metro area | 9,893 (2.8%) | | 5,157 (2.3%) | | 4,068 (4.6%) | | 2,917 (4.7%) | |

Table A-3 describes the bivariate results that assess the relationship between crash characteristics and seat belt use. The table includes the proportion of *non*-seat belt use by crash characteristics.

*Table A-3. Bivariate Relationship Between Personal Factors and Seat Belt Use*

| | % Did Not Use Seat Belt | *P*-value |
|---|---|---|
| **Individual Characteristics and Behavior** | | |
| **Driver/passenger status** | | |
| Driver | 26.7% | <0.001 |
| Passenger | 31.4% | |
| **Age** | | |
| Adolescents | 32.4% | <0.001 |
| Young adults | 33.3% | |
| Adults | 29.0% | |
| Older adults | 19.7% | |
| **Sex** | | |
| Male | 31.6% | <0.001 |
| Female | 22.2% | |
| **Seating position** | | |
| Front | 26.2% | <0.001 |
| Back | 44.4% | |
| **Police reported alcohol involvement** | | |
| Yes | 54.6% | <0.001 |
| No | 24.4% | |
| **Police reported drug involvement** | | |
| Yes | 50.2% | <0.001 |
| No | 24.5% | |
| **Race and Hispanic origin (N=139,912 decedents)** | | |
| Hispanic | 48.1% | <0.001 |
| White non-Hispanic | 47.3% | |
| Black non-Hispanic | 58.8% | |
| American Indian non-Hispanic/unknown | 64.2% | |
| Asian non-Hispanic/unknown | 26.7% | |
| Pacific Islander non-Hispanic/unknown | 52.2% | |
| Multiple races non-Hispanic/unknown | 52.7% | |
| All other non-Hispanic or race | 45.2% | |

| | % Did Not Use Seat Belt | *P*-value |
|---|---|---|
| **Driver BMI categories** | | |
| Underweight (BMI <18.5) | 32.0% | <0.001 |
| Healthy weight (BMI 18.5 to < 25) | 29.4% | |
| Overweight (BMI 25 to < 30) | 27.9% | |
| Obesity (BMI ≥30) | 28.9% | |
| **Vehicle Characteristics** | | |
| **Number of occupants** | | |
| 1 | 28.9% | <0.001 |
| 2 | 23.9% | |
| 3 | 29.7% | |
| 4 | 29.8% | |
| 5 | 32.2% | |
| 6 | 38.2% | |
| 7 | 42.7% | |
| 8+ | 57.4% | |
| **Child present in vehicle** | | |
| Yes | 26.5% | <0.001 |
| No | 28.4% | |
| **Body type** | | |
| Car | 28.6% | <0.001 |
| SUV | 25.6% | |
| Van | 22.3% | |
| Pickup | 32.5% | |
| Station wagon | 23.1% | |
| **Vehicle age** | | |
| 0–4 years old | 17.3% | <0.001 |
| 5–9 years old | 21.5% | |
| 10–14 years old | 29.8% | |
| 15+ years old | 39.2% | |
| **Crash Timing and Road Conditions** | | |
| **Pre/post-pandemic** | | |
| Pre-pandemic | 26.8% | <0.001 |
| Post-pandemic | 29.3% | |
| **Light condition** | | |
| Daylight | 24.5% | <0.001 |
| Other condition | 31.5% | |

| | % Did Not Use Seat Belt | *P*-value |
|---|---|---|
| **Total lanes** | | |
| 1 lane | 35.2% | <0.001 |
| 2 lanes | 32.7% | |
| 3 lanes | 20.9% | |
| 4 lanes | 21.0% | |
| 5 lanes | 17.9% | |
| 6 lanes | 16.7% | |
| 7+ lanes | 14.4% | |
| **Speed limit** | | |
| Low speed (<35 MPH) | 30.9% | <0.001 |
| Medium speed (35–50 MPH) | 26.5% | |
| High speed (>50 MPH) | 29.2% | |
| **Road type** | | |
| Interstate | 26.4% | <0.001 |
| Principal Arterial—other freeways and expressways | 24.1% | |
| Principal Arterial—other | 21.6% | |
| Minor Arterial | 26.5% | |
| Major Collector | 35.7% | |
| Minor Collector | 42.7% | |
| Local | 42.6% | |
| **Roadway surface condition** | | |
| Dry | 27.8% | <0.001 |
| Wet or other | 29.9% | |
| **Fatal injury at work (N=139,912 decedents)** | | |
| Yes | 44.9% | .004 |
| No | 49.3% | |
| **Crash Characteristics, Driver Characteristics, and Violations** | | |
| **Airbag deployed** | | |
| Yes | 30.0% | <0.001 |
| No | 25.1% | |
| **Ejected** | | |
| Yes | 90.8% | <0.001 |
| No | 20.8% | |
| **Land use** | | |
| Rural | 34.2% | <0.001 |
| Urban | 23.5% | |

| | | % Did Not Use Seat Belt | *P*-value |
|---|---|---|---|
| **Speeding-related** | | | |
| | Yes | 50.8% | <0.001 |
| | No | 22.4% | |
| **Violations Charged** | | | |
| **Reckless/careless/hit-and-run** | | | |
| | Yes | 36.3% | <0.001 |
| | No | 27.6% | |
| **Impairment** | | | |
| | Yes | 39.0% | <0.001 |
| | No | 27.7% | |
| **Speed-related** | | | |
| | Yes | 35.3% | <0.001 |
| | No | 28.0% | |
| **Rules of the road—traffic sign and signals** | | | |
| | Yes | 21.3% | <0.001 |
| | No | 28.1% | |
| **Rules of the road—turning, yielding, signaling** | | | |
| | Yes | 10.8% | <0.001 |
| | No | 28.3% | |
| **Rules of the road—wrong side, passing and following** | | | |
| | Yes | 29.7% | 0.121 |
| | No | 28.1% | |
| **Rules of the road—lane usage** | | | |
| | Yes | 35.7% | <0.001 |
| | No | 28.0% | |
| **Non-moving—license and registration violations** | | | |
| | Yes | 30.5% | <0.001 |
| | No | 28.0% | |
| **Equipment** | | | |
| | Yes | 73.2% | <0.001 |
| | No | 27.7% | |

| | | % Did Not Use Seat Belt | *P*-value |
|---|---|---|---|
| **License, registration, and other violations** | | | |
| | Yes | 37.7% | <0.001 |
| | No | 27.9% | |
| **Driver drinking reported by police** | | | |
| | Yes | 54.4% | <0.001 |
| | No | 22.4% | |
| **License compliance with class of vehicle** | | | |
| | In compliance | 24.6% | <0.001 |
| | Not in compliance | 45.9% | |
| **Driver prior DWIs** | | | |
| | Prior DWIs | 50.0% | <0.001 |
| | No prior DWIs | 27.2% | |
| **Driver prior crashes** | | | |
| | Prior crashes | 32.5% | <0.001 |
| | No prior crashes | 26.6% | |
| **Driver prior speeding** | | | |
| | Prior speeding | 34.2% | <0.001 |
| | No prior speeding | 26.5% | |
| **Driver prior suspensions** | | | |
| | Prior suspensions | 43.7% | <0.001 |
| | No prior suspensions | 26.1% | |
| **County-Level Variables** | | | |
| **Social Vulnerability Index (SVI)** | | | |
| | Socioeconomic status | | |
| | No high vulnerability | 28.9% | <0.001 |
| | High vulnerability | 26.9% | |
| **Household characteristics** | | | |
| | No high vulnerability | 29.8% | <0.001 |
| | High vulnerability | 26.2% | |

| | % Did Not Use Seat Belt | *P*-value |
|---|---|---|
| **Racial & ethnic minority status** | | |
| No high vulnerability | 29.7% | <0.001 |
| High vulnerability | 23.6% | |
| **Housing Type/Transportation** | | |
| No high vulnerability | 30.8% | <0.001 |
| High vulnerability | 26.1% | |
| **Rural-Urban Continuum Code (RUCC)** | | |
| Metro–counties in metro areas of 1 million population or more | 23.9% | <0.001 |
| Metro–counties in metro areas of 250,000 to 1 million population | 26.7% | |
| Metro–counties in metro areas of fewer than 250,000 population | 28.9% | |
| Nonmetro–urban population of 20,000 or more, adjacent to a metro area | 31.4% | |
| Nonmetro–urban population of 20,000 or more, not adjacent to a metro area | 32.6% | |
| Nonmetro–urban population of 5,000 to 20,000, adjacent to a metro area | 35.2% | |
| Nonmetro–urban population of 5,000 to 20,000, not adjacent to a metro area | 39.1% | |
| Nonmetro–urban population of fewer than 5,000, adjacent to a metro area | 41.1% | |
| Nonmetro–urban population of fewer than 5,000, not adjacent to a metro area | 44.1% | |

Table A-4 presents the regression results to examine the relationship between person, vehicle, crash and county level factors and seat belt use.

*Table A-4. Multivariate Relationship Between Independent Variables and Seat Belt Non-Use*

| | Full Sample *N*=266,447 | | Driver Sample *N*=188,567 | |
|---|---|---|---|---|
| | **AOR** | ***P*-value** | **AOR** | ***P*-value** |
| **Individual Characteristics and Behavior** | | | | |
| **Seating position [ref=Driver]** | | | | |
| Passenger front seat | 1.25 | <0.001 | -- | -- |
| Passenger back seat | 3.55 | <0.001 | -- | -- |
| **Age [ref=Adult]** | | | | |
| Adolescents | 0.96 | .166 | 0.91 | .030 |
| Young adults | 1.03 | .018 | 1.05 | .002 |
| Older Adults | 0.88 | <0.001 | 0.98 | .272 |
| **Sex [ref=Male]** | | | | |
| Female | 0.78 | <0.001 | 0.78 | <0.001 |
| Alcohol involved | 2.44 | <0.001 | 2.93 | <0.001 |
| Drugs involved | 1.93 | <0.001 | 1.94 | <0.001 |
| **Vehicle Characteristics** | | | | |
| No passenger in the car | -- | -- | 1.39 | <0.001 |
| Child present | 0.82 | <0.001 | 1.00 | .851 |
| **Body type [ref=Car]** | | | | |
| SUV | 0.92 | <0.001 | 0.96 | .010 |
| Van | 0.73 | <0.001 | 0.73 | <0.001 |
| Pickup | 1.07 | <0.001 | 1.10 | <0.001 |
| Station wagon | 0.88 | <0.001 | 0.91 | .001 |
| **Vehicle Age [ref=0–4 years old]** | | | | |
| 5–9 years old | 1.25 | <0.001 | 1.25 | <0.001 |
| 10–14 years old | 1.71 | <0.001 | 1.69 | <0.001 |
| 15+ years old | 2.42 | <0.001 | 2.37 | <0.001 |
| **Crash Timing and Road Conditions** | | | | |
| **Pre/post-pandemic [ref=Pre-pandemic]** | | | | |
| Post-pandemic | 1.11 | <0.001 | 1.14 | <0.001 |
| **Light condition [ref=Other condition]** | | | | |
| Daylight | 0.87 | <0.001 | 0.94 | <0.001 |

| | Full Sample *N*=266,447 | | Driver Sample *N*=188,567 | |
|---|---|---|---|---|
| | **AOR** | ***P*-value** | **AOR** | ***P*-value** |
| **Total lanes [ref=1 to 2 lanes]** | | | | |
| Three to four lanes | 0.74 | <0.001 | 0.73 | <0.001 |
| Five to six lanes | 0.62 | <0.001 | 0.60 | <0.001 |
| Seven+ lanes | 0.52 | <0.001 | 0.55 | <0.001 |
| **Road type [ref=Interstate or Principal Arterial- other freeways or expressways]** | | | | |
| Principal Arterial—other | 0.86 | <0.001 | 0.85 | <0.001 |
| Minor Arterial | 0.99 | .659 | 0.98 | .381 |
| Major Collector | 1.20 | <0.001 | 1.20 | <0.001 |
| Minor Collector or Local | 1.43 | <0.001 | 1.42 | <0.001 |
| **Roadway surface condition [ref=Dry]** | | | | |
| Wet or other surface | 0.95 | <0.001 | 0.98 | .253 |
| **Crash Characteristics, Driver Characteristics, and Violations** | | | | |
| Speeding related | 2.42 | <0.001 | 2.39 | <0.001 |
| License not in compliance with class of vehicle [ref=In compliance) | 1.71 | <0.001 | 1.62 | <0.001 |
| Driver prior violations | 1.38 | <0.001 | 1.39 | <0.001 |
| **County-Level Variables** | | | | |
| **RUCC [ref=Urban]** | | | | |
| Suburban | 1.08 | <0.001 | 1.08 | <0.001 |
| Rural | 1.56 | <0.001 | 1.65 | <0.001 |
| **SVI** | | | | |
| High vulnerability | 0.89 | <0.001 | 0.88 | <0.001 |

Three selected profiles with the highest chance of not wearing a seat belt are presented in Table A-5.

*Table A-5. Selected Profiles for High-Risk Non-Seat Belt Users*

| Profile 1 (*N*=3,925) | Profile 2 (*N*=3,374) | Profile 3 (*N*=3,473) |
|---|---|---|
| • **75.2% chance no seat belt**<br>• **Drinking:** Yes<br>• **Road type:** Major Collector, Minor Collector, or Local<br>• **Vehicle age:** 10–14 years old or 15+ years<br>• **RUCC:** Rural | • **69.3% chance no seat belt**<br>• **Drinking:** Yes<br>• **Road type:** Major Collector, Minor Collector, or Local<br>• **Vehicle age:** 10–14 years old or 15+ years<br>• **RUCC:** Urban or suburban<br>• **Body type:** SUV, pickup, or station wagon | • **65.7% chance no seat belt**<br>• **Drinking:** Yes<br>• **Road type:** Interstate or Principal Arterial—other freeways and expressways, Principal Arterial—other, or Minor Arterial<br>• **Vehicle age:** 10–14 years old or 15+ years<br>• **Speeding related:** Yes<br>• **Total lanes in roadway:** 1–2 lanes or 7+ lanes |

Table A-6 describes the proportion that each risk profile represents among unbelted fatalities. Profile 1 represents 5% and Profile 2 and Profile 3 each represents 4% of driver unbelted fatalities.

*Table A-6. Proportion of Unbelted Driver Fatalities by Risk Profile*

| Risk Profile | Unbelted Driver Fatalities (*N*=47,956)<br>*N* (%) |
|---|---|
| **Profile 1** | 2,558 (5.3%) |
| **Profile 2** | 2,006 (4.2%) |
| **Profile 3** | 2,004 (4.2%) |

## Appendix B: Seat Belt Use Survey Questionnaire

Q1. How often did you have a drink containing alcohol in the past year?

RESPONSE OPTIONS:

01 Never
02 Monthly or less
03 2-4 times a month
04 2-3 times a week
05 4 or more times a week

Q2. On days in the past year when you drank alcohol, how many drinks containing alcohol did you typically drink?

RESPONSE OPTIONS:

01 0, 1, or 2
02 3 to 4
03 5 to 6
04 7 to 9
05 10 or more

Q3. How often did you have [6 or more \ 4 or more drinks] on an occasion in the past year?

RESPONSE OPTIONS:

01 Never
02 Less than monthly
03 Monthly
04 Weekly
05 Daily or almost daily

Q4. How often did you use marijuana in the past year?

RESPONSE OPTIONS:

01 Never
02 Less than monthly
03 Monthly
04 Weekly
05 Daily or almost daily

Q5. In the past year, how often have you?

GRID ITEMS:

A. Driven when you were so tired that you had a hard time keeping your eyes open
B. Driven when you had enough alcohol that you thought you might be over the legal limit
C. Ridden in a car driven by someone who has had too much alcohol
D. Driven shortly (within an hour) after using marijuana
E. Driven without wearing a seatbelt

RESPONSE OPTIONS:

01 Never
02 Rarely
03 Some of the time
04 Most of the time
05 All of the time

Q6. Do you own a car or have a car that you regularly drive?

RESPONSE OPTIONS:

01 Yes
02 No, but I drive cars from time to time
03 No – I am mostly or always a passenger

Q7. What <u>type of vehicle</u> do you most often drive?

RESPONSE OPTIONS:

01 Car
02 SUV
03 Van
04 Pickup
05 Station Wagon
06 Other: Please specify

Q8. What is the model year of the vehicle you most often drive?

Q9. In the past year, how often do you…

GRID ITEMS:

A. Drive alone in a motor vehicle?
B. Drive with a passenger in a motor vehicle?
C. Ride in the Front Seat as a passenger in a motor vehicle?
D. Ride in the Back Seat as a passenger in a motor vehicle?

RESPONSE OPTIONS:

01 Never
02 Rarely
03 Some of the time
04 Most of the time
05 All of the time

Q10. In the past year, how often do you wear your seat belt in a car, SUV, van, pickup truck, or station wagon?

GRID ITEMS:

A. Driving alone
B. Driving with a passenger
C. Riding in the Front Seat as a passenger
D. Riding in the Back Seat as a passenger

RESPONSE OPTIONS:

01 Never
02 Rarely
03 Some of the time
04 Most of the time
05 All of the time

Q11. What is the main reason that you wear your seat belt all of the time?

Q12. Below is a list of reasons why you might wear your seat belt. Please indicate whether each reason applies to you.

GRID RANDOMIZE ITEMS:

A. It's a habit.
B. I don't want to get a ticket.
C. I feel unsafe not wearing it.
D. Others want me to wear it.
E. It's the law.
F. I want to avoid serious injury or death.
G. The people I'm with are wearing seat belts.
H. My vehicle has an alarm that reminds me.
I. I was brought up to wear it.
J. Road, traffic, or weather conditions.
K. I'm going to be traveling for a long distance.
L. I'm going to be traveling on the highway.
M. Other (please specify)

RESPONSE OPTIONS:

01 Yes
02 No

Q13. What is the main reason that you <u>never</u> wear your seat belt?

Q14. Below is a list of reasons why you might never wear your seat belt. Please indicate whether each reason applies to you.

GRID RANDOMIZE ITEMS:

A. I'm only driving a short distance.
B. I'm driving in light traffic.
C. I'm in a rush.
D. I forget to put it on.
E. It's a hassle to put on.
F. I don't want my clothes to get wrinkled.
G. The seat belt is physically uncomfortable.
H. The probability of being in a crash is too low.
I. The people I am with are not wearing seat belts.
J. I don't like being told what to do.
K. It may cause injury or trap me if I'm in an accident.
L. I or someone I know was previously in an accident where the seat belt caused an injury.
M. I don't need to wear one.
N. I'm traveling on low speed roadways.
O. Other (please specify):

RESPONSE OPTIONS:

01 Yes
02 No

Q15. What is the main reason that you wear your seat belt some of the time?

Q16. Below is a list of reasons why you might wear your seat belt some of the time. Please indicate whether each reason applies to you.

GRID RANDOMIZE ITEMS:

A. It's a habit.
B. I don't want to get a ticket.
C. I feel unsafe not wearing it.
D. Others want me to wear it.
E. It's the law.
F. I want to avoid serious injury or death.
G. The people I'm with are wearing seat belts.
H. My vehicle has an alarm that reminds me.
I. I was brought up to wear it.
J. Road, traffic, or weather conditions.
K. I'm going to be traveling for a long distance.
L. I'm going to be traveling on the highway.
M. Other (please specify):

RESPONSE OPTIONS:

01 Yes
02 No

Q17. What is the main reason that you do not wear your seat belt all of the time?

Q18. Below is a list of reasons why you might not wear your seat belt all of the time. Please indicate whether each reason applies to you.

GRID RANDOMIZE ITEMS:

A. I'm only driving a short distance.
B. I'm driving in light traffic.
C. I'm in a rush.
D. I forget to put it on.
E. It's a hassle to put on.
F. I don't want my clothes to get wrinkled.
G. The seat belt is physically uncomfortable.
H. The probability of being in a crash is too low.
I. The people I am with are not wearing seat belts.
J. I don't like being told what to do.
K. It may cause injury or trap me if I'm in an accident.
L. I or someone I know was previously in an accident where the seat belt caused an injury.
M. I don't need to wear one.
N. I'm traveling on low speed roadways.
O. Other (please specify):

RESPONSE OPTIONS:

01 Yes
02 No

Q19. Some people's use of a seat belt differs depending on the situation, including who is traveling with them. How often do you wear your seat belt when you are the driver and driving with …

GRID ITEMS:

A. Your significant other/spouse (i.e., wife/husband, boyfriend/girlfriend, partner)?
B. Your friend?
C. Your child under the age of 12?
D. Your teenage child?
E. Your adult child?
F. Your parent/guardian/primary caregiver?
G. A family member that is not your parent/guardian/primary caregiver or child?
H. Other people you don't know?

RESPONSE OPTIONS:

01 Never
02 Rarely
03 Some of the time
04 Most of the time
05 All of the time
06 Not applicable

Q20. Some people's use of a seat belt differs depending on the situation, including where they are traveling. How often do you wear your seat belt when you are driving …

GRID ITEMS:

A. On a rural road?
B. On a road in the city?
C. On a road in the suburbs?
D. On a short trip (less than or equal to 2 miles or 10 minutes)?
E. On a somewhat short trip (2-10 miles or 11-30 minutes)?
F. On somewhat long trip (11-25 miles or 30-60 minutes)?
G. On a long trip (at least 26 miles or 60 minutes)?
H. In a different state where you are unsure about the seat belt laws?
I. On an interstate highway?
J. On a bigger main road (not an interstate highway)?
K. On a smaller local road (not an interstate highway and not a main road)?

RESPONSE OPTIONS:

01 Never
02 Rarely
03 Some of the time
04 Most of the time
05 All of the time
06 Not applicable

Q21. Some people's use of a seat belt differs depending on the situation, including when they are traveling. How often do you wear your seat belt when you are driving …

GRID ITEMS:

A. During daylight?
B. When it is dark outside?
C. When there are a few vehicles and they are all traveling at the speed limit?
D. When there are lots of vehicles and they are all traveling below the speed limit and stopping frequently?
E. When the vehicle is traveling at or under the speed limit?
F. When the vehicle is traveling over the speed limit?
G. During wet conditions (when it is raining or snowing)?
H. During times of the year that law enforcement is ikely to be issuing tickets for not wearing seat belts (i.e, Click it or Ticket weeks/months)?
I. During times or in areas where the fine for not wearing your seatbelt is higher?

RESPONSE OPTIONS:

01 Never
02 Rarely
03 Some of the time
04 Most of the time
05 All of the time
06 Not applicable

Q22. Some people's use of a seat belt differs depending on the situation, including who is traveling with them. How often do you wear your seat belt when you are riding as a passenger and the following person is driving …

GRID ITEMS:

A. Your significant other/spouse (i.e., wife/husband, boyfriend/girlfriend, partner)?
B. Your friend?
C. Your teenage child who is of driving age?
D. Your adult child?
E. Your parent/guardian/primary caregiver?
F. A family member that is not your parent/guardian/primary caregiver or child?
G. Someone driving a taxi or rideshare that you are traveling in?
H. Other people you don't know?

RESPONSE OPTIONS:

01 Never
02 Rarely
03 Some of the time
04 Most of the time
05 All of the time
06 Not applicable

Q23. *S*ome people's use of a seat belt differs depending on the situation, including where they are traveling. How often do you wear your seat belt when you are riding as a passenger …

GRID ITEMS:

A. On a rural road?
B. On a road in the city?
C. On a road in the suburbs?
D. On a short trip (less than or equal to 2 miles or 10 minutes)?
E. On a somewhat short trip (2-10 miles or 11-30 minutes)?
F. On a somewhat long trip (11-25 miles or 30-60 minutes)?
G. On a long trip (at least 26 miles or 60 minutes)?
H. In a different state where you are unsure about the seat belt laws?
I. On an interstate highway?
J. On a bigger main road (not an interstate highway)?
K. On a smaller local road (not an interstate highway and not a main road)?

RESPONSE OPTIONS:

01 Never
02 Rarely
03 Some of the time
04 Most of the time
05 All of the time
06 Not applicable

Q24. Some people's use of a seat belt differs depending on the situation, including when they are traveling. How often do you wear your seat belt when you are riding as a passenger …

GRID ITEMS:

A. During daylight?
B. When it is dark outside?
C. When there are a few vehicles and they are all traveling at the speed limit?
D. When there are lots of vehicles and they are all traveling below the speed limit and stopping frequently?
E. When the vehicle is traveling at or under the speed limit?
F. When the vehicle is traveling over the speed limit?
G. During wet conditions (when it is raining or snowing)?
H. During times of the year that law enforcement is more likely to be issuing tickets for not wearing seat belts (i.e, Click it or Ticket weeks/months)?
I. During times or in areas where the fine for not wearing your seatbelt is higher?

RESPONSE OPTIONS:

01 Never
02 Rarely
03 Some of the time
04 Most of the time
05 All of the time
06 Not applicable

Q25. To what extent do you agree or disagree with the following statements about technology?

GRID ITEMS:

A. All cars should have an alarm to remind drivers/passengers to put on their seat belts.
B. All cars should have a system that prevents the car from moving until everyone has seat belts on.
C. Law enforcement should use cameras to automatically detect people not using seat belts to help them enforce seatbelt laws.

RESPONSE OPTIONS:

01 Strongly Agree
02 Agree
03 Neither Agree Nor Disagree
04 Disagree
05 Strongly Disagree

Q26. Assume that you never wear your seat belt while driving over the next six months. How likely do you think …

GRID ITEMS:

A. You will receive a warning for not wearing a seatbelt?
B. You will receive a ticket for not wearing a seatbelt?
C. You will receive a fine for not wearing a seatbelt?
D. You will be involved in a car crash?

RESPONSE OPTIONS:

01 Very likely
02 Somewhat likely
03 Somewhat unlikely
04 Very unlikely

Q27. Assume that you never wear your seat belt while riding as a passenger over the next six months. How likely do you think …

GRID ITEMS:

A. You will receive a warning for not wearing a seatbelt?
B. You will receive a ticket for not wearing a seatbelt?
C. You will receive a fine for not wearing a seatbelt?
D. You will be involved in a car crash?

RESPONSE OPTIONS:

01 Very likely
02 Somewhat likely
03 Somewhat unlikely
04 Very unlikely

Q28. If you receive a ticket for not wearing your seat belt, how likely do you think …

GRID ITEMS:

A. The ticket will increase the cost of your car insurance?
B. The ticket will cause you to lose your car insurance?
C. The ticket will cause you to lose your license?

RESPONSE OPTIONS:

01 Very likely
02 Somewhat likely
03 Somewhat unlikely
04 Very unlikely

Q29. If you receive a fine for not wearing your seat belt, how likely do you think …

GRID ITEM:

A. The fine associated with the ticket will be more than you can pay?

RESPONSE OPTIONS:

01 Very likely
02 Somewhat likely
03 Somewhat unlikely
04 Very unlikely

Q30. If you are involved in a car crash and you are not wearing your seat belt, how likely do you think …

GRID ITEMS:

A. That you will be injured in the car crash?
B. That the cost of treating your injury will be more than you can pay?
C. That you might die in the car crash?

RESPONSE OPTIONS:

01 Very likely
02 Somewhat likely
03 Somewhat unlikely
04 Very unlikely

Q31. If you are involved in a car crash when you are driving and your passenger is not wearing their seat belt, how likely do you think …

GRID ITEMS:

A. That a passenger in your car will be injured in the crash?
B. That the cost of treatment for your passenger's injury will be more than you can pay?
C. That a passenger in your car will die in the crash?

RESPONSE OPTIONS:

01 Very likely
02 Somewhat likely
03 Somewhat unlikely
04 Very unlikely

Q32. If one of the following people/types of people asked you to wear your seat belt, would you be more or less likely to use your seat belt?

GRID ITEMS:

A. Your significant other/spouse (i.e., wife/husband, boyfriend/girlfriend, partner)
B. Your friends
C. Your child under the age of 12
D. Your teenage child
E. Your adult child
F. Your parent/guardian/primary caregiver
G. A family member that is not your parent/guardian/primary caregiver or child
H. Someone driving a taxi or rideshare that you are traveling in
I. People you don't know
J. Someone you don't know whose life has been negatively affected by not wearing a seat belt

RESPONSE OPTIONS:

01 Much more likely than usual
02 Somewhat more likely than usual
03 Somewhat less likely than usual
04 Much less likely than usual
05 Does not affect the likelihood that I will wear my seatbelt
06 Not applicable

Q33. If one of the following groups asked you to wear your seat belt, would you be more or less likely to use your seat belt?

GRID ITEMS:

A. Law enforcement officers
B. Researchers
C. Elected officials
D. Government officials (not elected)
E. The people you report to at work
F. Business leaders
G. Celebrities
H. People you follow on social media
I. Faith leaders

RESPONSE OPTIONS:

01 Much more likely than usual
02 Somewhat more likely than usual
03 Somewhat less likely than usual
04 Much less likely than usual
05 Does not affect the likelihood that I will wear my seatbelt
06 Not applicable

Q34. If one of the following organizations asked you to wear your seat belt, would you be more or less likely to use your seat belt?

GRID ITEMS:

A. American Automobile Association (AAA)
B. Other safety groups like the Insurance Institute for Highway Safety
C. Other consumer groups such as the American Association of Retired Persons
D. Government agencies involved in transportation, like the National Highway Traffic Safety Administration
E. Government agencies involved in health, like the Centers for Disease Control and Prevention
F. Community groups or neighborhood associations

RESPONSE OPTIONS:

01 Much more likely than usual
02 Somewhat more likely than usual
03 Somewhat less likely than usual
04 Much less likely than usual
05 Does not affect the likelihood that I will wear my seatbelt

Q35. How often do you use each of the following sources to obtain news about current events and issues?

Print

A. Local magazines either hard copy or online
B. Local newspapers either hard copy or online
C. National magazines either hard copy or online
D. National newspapers either hard copy or online
E. Neighborhood newsletter or listserv either hard copy or online

Broadcast

A. Local AM/FM
B. National AM/FM
C. Local television stations
D. National television networks (CBS, ABC, or NBC)
E. National cable networks (CNN, MSNBC, Fox News)

Social Media (Text and/or Images)

A. Facebook or Instagram
B. LinkedIn
C. BlueSky
D. Truth Social
E. X/Twitter
F. Other

Digital Audio

K. Podcasts
L. Satellite Radio

Digital Video

G. Connected/Streaming TV, like Netflix, Hulu, Max
H. Facebook/Instagram Videos
I. SnapChat
J. TikTok
K. Youtube

Online Discussion Forums

S. Reddit
T. Quora
U. Other

RESPONSE OPTIONS:

01 Daily
02 Weekly
03 Monthly
04 Never

## Appendix C: Survey Analysis

Table C-1 presents the weighted sample description for the Driver and Passenger samples separately.

*Table C-1. Weighted Sample Description for Driver and Passenger Samples*

| | Drivers (*N*=2,581) | | Passengers (*N*=2,362) | |
|---|---|---|---|---|
| | **Mean (Std. Dev) /*N* (%)** | ***N* missing** | **Mean (Std. Dev) /*N* (%)** | ***N* missing** |
| **Age** | 48.2 (18.1%) | 0 | 48.5 (18.2%) | 0 |
| Young adult (18–24) | 274 (10.6%) | | 257 (10.9%) | |
| Adults (25–59) | 1,506 (58.4%) | | 1,368 (57.9%) | |
| Older adults (60+) | 800 (31.0%) | | 737 (31.2%) | |
| **Sex** | | 0 | | 0 |
| Male | 1,272 (49.3%) | | 1,124 (47.6%) | |
| Female | 1,309 (50.7%) | | 1,238 (52.4%) | |
| **Race/Ethnicity** | | 0 | | 0 |
| White, non-Hispanic | 1,571 (60.9%) | | 1,449 (61.3%) | |
| Black, non-Hispanic | 293 (11.3%) | | 261 (11.0%) | |
| Hispanic | 468 (18.1%) | | 420 (17.8%) | |
| Asian Pacific Islander, non-Hispanic | 144 (5.6%) | | 131 (5.5%) | |
| Other and multi-racial, non-Hispanic | 105 (4.1%) | | 102 (4.3%) | |
| **Education Level** | | 0 | | 0 |
| Less than high school | 210 (8.2%) | | 200 (8.5%) | |
| High school graduate or equivalent | 716 (27.7%) | | 621 (26.3%) | |
| Some college/Associates degree | 684 (26.5%) | | 608 (25.8%) | |
| Bachelor's degree | 617 (23.9%) | | 576 (24.4%) | |
| Postgraduate/ professional degree | 354 (13.7%) | | 355 (15.0%) | |
| **Marital Status** | | 0 | | 0 |
| Not married | 1,290 (50.0%) | | 1,122 (47.5%) | |
| Married | 1,291 (50.0%) | | 1,240 (52.5%) | |
| **Household Income*** | 10.9 (4.5%) | 0 | 10.8 (4.5%) | |
| **Urbanicity** | | 0 | | 0 |
| Urban | 816 (31.6%) | | 763 (32.3%) | |
| Suburban | 1,423 (55.1%) | | 1,291 (54.7%) | |
| Rural | 341 (13.2%) | | 308 (13.0%) | |

| | Drivers (*N*=2,581) | | Passengers (*N*=2,362) | |
|---|---|---|---|---|
| | **Mean (Std. Dev) /*N* (%)** | ***N* missing** | **Mean (Std. Dev) /*N* (%)** | ***N* missing** |
| **Current Employment Status** | | 0 | | 0 |
| Working | 1,676 (65.0%) | | 1,510 (63.9%) | |
| Not working | 904 (35.0%) | | 852 (36.1%) | |
| **Any Children in the Household (Age <17)** | | 104 | | 101 |
| No | 1,691 (68.3%) | | 1,528 (67.6%) | |
| Yes | 786 (31.7%) | | 733 (32.4%) | |
| **Political Ideology** | | 40 (1.6%) | | 33 |
| Liberal | 553 (21.8%) | | 526 (22.6%) | |
| Moderate | 1,242 (48.9%) | | 1,119 (48.1%) | |
| Conservative | 746 (29.4%) | | 683 (29.3%) | |
| **Body Mass Index (BMI)** | | 101 | | 105 |
| Underweight (BMI <18.5) | 55 (2.2%) | | 57 (2.5%) | |
| Healthy Weight (BMI 18.5 to <25) | 734 (29.6%) | | 676 (29.9%) | |
| Overweight (BMI 25 to <30) | 802 (32.3%) | | 755 (33.4%) | |
| Obesity (BMI ≥30) | 889 (35.8%) | | 769 (34.1%) | |
| **State Seat Belt Laws** | | 0 | | 0 |
| Primary | 1,985 (76.9%) | | 1,832 (77.6%) | |
| Secondary | 588 (22.8%) | | 521 (22.0%) | |
| No Law | 7 (0.3%) | | 9 (0.4%) | |

** Household income is measured by an 18-category variable with the following categories: 1 = less than $5,000; 2 = $5,000–$9,999; 3 = $10,000–$14,999; 4 = $15,000–$19,999; 5 = $20,000–$24,999; 6 = $25,000–$29,999; 7 = $30,000–$34,999; 8 = $35,000–$39,999; 9 = $40,000–$49,999; 10 = $50,000–$59,999; 11 = $60,000–$74,999; 12 = $75,000–$84,999; 13 = $85,000–$99,999; 14 = $100,000–$124,999; 15 = $125,000–$149,999; 16 = $150,000–$174,999; 17 = $175,000–$199,999; and 18 = $200,000 or more.*

Table C-2 presents the measures, coding decisions, and notes for survey measures. All measures were included in the univariate analysis, but only measures of respondent demographics, driving behaviors, risky behaviors, use of technology in seat belt enforcement, and perceived consequences of not wearing a seat belt were included in the bivariate analysis. Measures used in multinomial logistic regression and LCA are noted in the table.

*Table C-2. Survey Measures and Coding*

| Variable | Response categories | Used in regression/LCA | Notes |
|---|---|---|---|
| **Seat Belt Use** | | | |
| Seat belt use—driving alone | Never/Rarely; Some of the time; Most of the time; All of the time | Regression DV and LCA-indicator | For Driver Regression, combined. Used individually for LCA as an indicator. |
| Seat belt use—driving with a passenger | | Regression DV | |
| Seat belt use—riding in the front seat as a passenger | | Regression DV | For Passenger Regression, combined. |
| Seat belt use—riding in the back seat as a passenger | | Regression DV | |
| ***Scenarios: With Whom (How often do you wear your seat belt when you are the driver and driving with/riding as a passenger and the following person is driving…)*** | | | |
| Your child under the age of 12 | Never, Rarely; Some of the time; Most of the time; All of the time | Driver LCA-indicator | For Driver LCA, combined into "driving with a child." For the Passenger LCA, included in the indicator "riding as a passenger when someone you know is driving." |
| Your teenage child | | LCA-indicator | |
| Your significant other/spouse | | LCA-indicator | For Driver LCA, combined into "driving with a non-child." For the Passenger LCA, included in the indicator "riding as a passenger when someone you know is driving." "Other people you don't know was excluded from the Passenger LCA. |
| Your friend | | LCA-indicator | |
| Your adult child | | LCA-indicator | |
| Your parent/guardian/primary caregiver | | LCA-indicator | |
| A family member that is not your parent/guardian/ primary caregiver or child | | LCA-indicator | |
| Other people you don't know | | LCA-indicator | |
| Someone driving a taxi/rideshare you are traveling in | | Passenger LCA-indicator | |

| Variable | Response categories | Used in regression/LCA | Notes |
|---|---|---|---|
| ***Scenarios: Where (How often do you wear your seat belt when you are driving/riding as a passenger… )*** | | | |
| On a rural road | Never, Rarely; Some of the time; Most of the time; All of the time | LCA-indicator | |
| On a road in the city | | LCA-indicator | Combined for the Driver and Passenger LCA into suburban or urban road. |
| On a road in the suburbs | | LCA-indicator | |
| On a short trip (≤2 miles or 10 minutes) | | LCA-indicator | Combined for the Driver and Passenger LCA into short or somewhat short trip. |
| On a somewhat short trip (2–10 miles or 11–30 minutes) | | LCA-indicator | |
| On a somewhat long trip (11–25 miles or 30–60 minutes) | | LCA-indicator | Combined for the Driver and Passenger LCA into somewhat long or longer trip. |
| On a long trip (≥26 miles or 60 minutes) | | LCA-indicator | |
| In a state where you are unsure about the seat belt laws | | No | |
| On an interstate highway | | LCA-indicator | Combined for the Driver and Passenger LCA into major road type. |
| On a bigger main road | | LCA-indicator | |
| On a smaller local road | | LCA-indicator | |
| ***Scenarios: When (How often do you wear your seat belt when you are driving/riding as a passenger…)*** | | | |
| During daylight | Never, Rarely; Some of the time; Most of the time; All of the time | LCA-indicator | |
| When it is dark outside | | LCA-indicator | |
| When there are a few vehicles all traveling at the speed limit | | No | |
| When there are lots of vehicles traveling below the speed limit and stopping frequently | | No | |
| When the vehicle is traveling at or under the speed limit | | No | |
| When the vehicle is traveling over the speed limit | | No | |
| During wet conditions (when it is raining or snowing) | | No | |
| During times of the year that law enforcement is more likely to be issuing tickets for not wearing seat belts | | No | |
| During times or in areas where the fine for not wearing your seatbelt is higher | | No | |

| Variable | Response categories | Used in regression/LCA | Notes |
|---|---|---|---|
| **Risky Behaviors** | | | |
| Alcohol misuse (AUDIT-C)* | Negative screen; Positive screen | Covariate | |
| Marijuana use (SIS-C) | No past-year use; Any past-year use | Covariate | |
| ***Impaired Driving/Riding Behaviors (In the past year, how often have you…?)*** | | | |
| Driven when you were so tired that you had a hard time keeping your eyes open | Never, Rarely; Some of the time; Most of the time; All of the time | No | These variables were combined into one 4-category impaired driving/riding variable of the count of types (0; 1; 2; or 3-4 types) of different impaired behaviors. Each variable was collapsed into never/ever, and then a count variable for the number of types of behaviors "ever" endorsed was used in the analyses.<br><br>To note, all respondents had the opportunity to answer questions about impaired driving. Among the 237 passengers who did not report driving and are therefore included exclusively in the Passenger Sample, 87.8% reported "never" or "rarely" to all four impaired driving questions. |
| Driven when you had enough alcohol that you thought you might be over the legal limit | | No | |
| Ridden in a car driven by someone who had too much alcohol | | No | |
| Driven shortly (within an hour) after using marijuana | | No | |
| Driven without wearing a seatbelt | | No | |
| **Driving Behaviors** | | | |
| Car ownership | Yes; No, but I drive cars from time to time; No – I am mostly or always a passenger | No | This variable asked if the respondent owned a car or had a car that they regularly drive. |
| Vehicle type | Car; SUV; Van; Pickup; Station Wagon; Other | Covariate | |
| Vehicle age | 0–4 years old; 5–9 years old; 10–14 years old; 15+ years old | Covariate | |

| Variable | Response categories | Used in regression/LCA | Notes |
|---|---|---|---|
| ***Driving Patterns*** | | | |
| Drive alone in a motor vehicle | Never, Rarely; Some of the time; Most of the time; All of the time | No | These variables were used to define the driver and passenger samples for subgroup analyses. A respondent was included as a driver if they selected some of the time, most of the time, or all of the time for "Drive alone in a motor vehicle" or "Drive with a passenger in a motor vehicle." A respondent was included as a passenger if they selected some of the time, most of the time, or all of the time for "Ride in the Front Seat as a passenger in a motor vehicle" or "Ride in the Back Seat as a passenger in a motor vehicle." Respondents that selected "Never" for all items were excluded from the remainder of the survey. |
| Drive with a passenger in a motor vehicle | | No | |
| Ride in the Front Seat as a passenger in a motor vehicle | | No | |
| Ride in the Back Seat as a passenger in a motor vehicle | | No | |
| **Use of Technology in Seat Belt Enforcement *(To what extent do you agree or disagree with the following statements about technology?)*** | | | |
| All cars should have an alarm to remind drivers/passengers to put on their seat belts | Strongly disagree; Disagree; Neither agree nor disagree; Agree; Strongly agree | No | |
| All cars should have a system that prevents the car from moving until everyone has seat belts on | | No | |
| Law enforcement should use cameras to automatically detect people not using seat belts to enforce seat belt laws | | No | |
| **Perceived Consequences of Not Wearing a Seat Belt** | | | |
| ***Driver/Passenger Consequences (Assume that you never wear your seat belt over the next six months. How likely do you think…)*** | | | |
| You will receive a warning for not wearing a seatbelt | Very unlikely; Somewhat unlikely; Somewhat likely; Very likely | No | |
| You will receive a ticket for not wearing a seatbelt | | No | |
| You will receive a fine for not wearing a seat belt | | No | |
| You will be involved in a car crash | | No | |

| Variable | Response categories | Used in regression/LCA | Notes |
|---|---|---|---|
| ***Ticketing/Fine Consequences (If you receive a ticket/fine for not wearing your seat belt, how likely do you think…)*** | | | |
| The ticket will increase the cost of your car insurance | Very unlikely; Somewhat unlikely; Somewhat likely; Very likely | No | |
| The ticket will cause you to lose your car insurance | | No | |
| The ticket will cause you to lose your license | | No | |
| The fine associated with the ticket will be more than you can pay | | No | |
| ***Injury Consequences*** | | | |
| *If you are involved in a car crash and you are not wearing your seat belt, how likely do you think…* | | | |
| That you will be injured in the car crash | Very unlikely; Somewhat unlikely; Somewhat likely; Very likely | No | |
| That the cost of treating your injury will be more than you can pay | | No | |
| That you might die in the car crash | | No | |
| ***If you are involved in a car crash when you are driving and your passenger is not wearing their seat belt, how likely do you think…*** | | | |
| That a passenger in your car will be injured in the crash | Very unlikely; Somewhat unlikely; Somewhat likely; Very likely | No | |
| That the cost of treatment for your passenger's injury will be more than you can pay | | No | |
| That a passenger in your car will die in the crash | | No | |

| Variable | Response categories | Used in regression/LCA | Notes |
|---|---|---|---|
| **Social Norms/Influences Around Seat Belt Use** | | | |
| ***Individuals (If one of the following people/types of people asked you to wear your seat belt, would you be more or less likely to use your seat belt?)*** | | | |
| Your significant other/spouse | Does not affect or less likely to use seat belt; Somewhat more likely than usual; Much more likely than usual | No | |
| Your friends | | No | |
| Your child under the age of 12 | | No | |
| Your teenage child | | No | |
| Your adult child | | No | |
| Your parent/guardian/primary caregiver | | No | |
| A family member that is not your parent/guardian or child | | No | |
| Someone driving a taxi or rideshare that you are traveling in | | No | |
| People you don't know | | No | |
| Someone you don't know who has been affected by not wearing a seat belt | | No | |
| ***Groups (If one of the following groups asked you to wear your seat belt, would you be more or less likely to use your seat belt?)*** | | | |
| Law enforcement officers | Does not affect or less likely to use seat belt; Somewhat more likely than usual; Much more likely than usual | No | |
| Researchers | | No | |
| Elected officials | | No | |
| Government officials (not elected) | | No | |
| The people you report to at work | | No | |
| Business leaders | | No | |
| Celebrities | | No | |
| People you follow on social media | | No | |
| Faith leaders | | No | |

| Variable | Response categories | Used in regression/LCA | Notes |
|---|---|---|---|
| ***Organizations (If one of the following organizations asked you to wear your seat belt, would you be more or less likely to use your seat belt?)*** | | | |
| American Automobile Association (AAA) | Does not affect or less likely to use seat belt; Somewhat more likely than usual; Much more likely than usual | No | |
| Other safety groups (e.g., IIHS) | | No | |
| Other consumer groups (e.g., AARP) | | No | |
| Government agencies involved in transportation (e.g., NHTSA) | | No | |
| Government agencies involved in health (e.g., CDC) | | No | |
| Community groups or neighborhood associations | | No | |
| **Reasons for Wearing a Seat Belt** | | | |
| It's a habit. | Yes; No | No | Among some of the time, most of the time, and all of the time users only. |
| I don't want to get a ticket. | | No | |
| I feel unsafe not wearing it. | | No | |
| Others want me to wear it. | | No | |
| It's the law. | | No | |
| I want to avoid serious injury or death. | | No | |
| The people I'm with are wearing seat belts. | | No | |
| My vehicle has an alarm that reminds me. | | No | |
| I was brought up to wear it. | | No | |
| Road, traffic, or weather conditions. | | No | |
| I'm going to be traveling for a long distance. | | No | |
| I'm going to be traveling on the highway. | | No | |
| Other | | No | |

| Variable | Response categories | Used in regression/LCA | Notes |
|---|---|---|---|
| **Reasons for Not Wearing a Seat Belt** | | | |
| I'm only driving a short distance. | Yes; No | No | Among never, rarely, and some of the time users only. |
| I'm driving in light traffic. | | No | |
| I'm in a rush. | | No | |
| I forget to put it on. | | No | |
| It's a hassle to put on. | | No | |
| I don't want my clothes to get wrinkled. | | No | |
| The seat belt is physically uncomfortable. | | No | |
| The probability of being in a crash is too low. | | No | |
| The people I am with are not wearing seat belts. | | No | |
| I don't like being told what to do. | | No | |
| It may cause injury or trap me if I'm in an accident. | | No | |
| I or someone I know was previously in an accident where the seat belt caused an injury. | | No | |
| I don't need to wear one. | | No | |
| I'm traveling on low-speed roadways. | | No | |
| Other | | No | |
| **Media Usage (*How often do you use each of the following sources to obtain news about current events and issues?)*** | | | |
| ***Print*** | | | |
| Local magazines either hard copy or online | Never; Monthly; Weekly; Daily | No | |
| Local newspapers either hard copy or online | | No | |
| National magazines either hard copy or online | | No | |
| National newspapers either hard copy or online | | No | |
| Neighborhood newsletter or listserv either hard copy or online | | No | |

| Variable | Response categories | Used in regression/LCA | Notes |
|---|---|---|---|
| ***Broadcast*** | | | |
| Local AM/FM | Never; Monthly; Weekly; Daily | No | |
| National AM/FM | | No | |
| Local television stations | | No | |
| National television networks (CBS, ABC, or NBC) | | No | |
| National cable networks (CNN, MSNBC, Fox News) | | No | |
| ***Social Media (Text and/or Images)*** | | | |
| Facebook or Instagram | Never; Monthly; Weekly; Daily | No | |
| LinkedIn | | No | |
| BlueSky | | No | |
| Truth Social | | No | |
| X/Twitter | | No | |
| Other | | No | |
| ***Digital Audio and Video*** | | | |
| Podcasts | Never; Monthly; Weekly; Daily | No | |
| Satellite Radio | | No | |
| Connected/Streaming TV, like Netflix, Hulu, Max | | No | |
| Facebook/Instagram Videos | | No | |
| SnapChat | | No | |
| TikTok | | No | |
| YouTube | | No | |
| ***Online Discussion Forums*** | | | |
| Reddit | Never; Monthly; Weekly; Daily | No | |
| Quora | | No | |
| Other | | No | |

** The AUDIT-C screening tool is comprised of three items: how often did the individual have a drink containing alcohol in the past year, how many drinks containing alcohol does the individual typically drink on days in the past year when they drank alcohol, and how often did they have (6 for males, 4 for females or adults older than 65) drinks on an occasion in the past year. A positive screen is a score of three or more for females and four or more for males.*

Table C-3 and Table C-4 present the multivariate relationship between these factors and seat belt use.

*Table C-3. Multivariate Relationship between Seat Belt Use Among Drivers and Related Factors*[4]

| | Drivers (*N*=2,307) | | | | | |
|---|---|---|---|---|---|---|
| | Rarely/Never | | Some of the time | | Most of the time | |
| | AOR | *p*-value | AOR | *p*-value | AOR | *p*-value |
| **Age (ref=Adults 25–59)** | | | | | | |
| Young adult (18–24) | 1.00 | 0.994 | 1.18 | 0.600 | 1.59 | 0.176 |
| Older adults (60+) | 0.81 | 0.668 | 0.80 | 0.345 | 0.69 | 0.072 |
| **Sex (ref=Male)** | 0.71 | 0.254 | **0.62** | 0.015 | 0.83 | 0.314 |
| **Race/Ethnicity (ref=White non-Hispanic)** | | | | | | |
| Black, non-Hispanic | 1.18 | 0.751 | **4.39** | 0.000 | **1.92** | 0.016 |
| Hispanic | 1.23 | 0.660 | **1.77** | 0.041 | 1.24 | 0.374 |
| Other race, Asian-Pacific Islander, and 2+ races, non-Hispanic | 1.02 | 0.985 | **2.20** | 0.014 | 1.17 | 0.664 |
| **Education Level (ref=Bachelor's Degree or Higher)** | | | | | | |
| High school graduate or less | **3.64** | 0.034 | **2.17** | 0.007 | **1.68** | 0.045 |
| Some college/Associates Degree | **3.37** | 0.036 | 0.92 | 0.751 | 1.08 | 0.707 |
| **Metropolitan Area of Residence (ref=Urban)** | | | | | | |
| Suburban | 1.26 | 0.549 | 1.50 | 0.063 | 1.43 | 0.082 |
| Rural | 1.33 | 0.538 | 1.66 | 0.070 | 1.64 | 0.074 |
| **Political Ideology (ref=Moderate)** | | | | | | |
| Liberal | 2.02 | 0.092 | **0.54** | 0.025 | **0.40** | 0.000 |
| Conservative | 2.04 | 0.083 | 1.09 | 0.678 | 0.93 | 0.728 |
| **BMI (ref=Healthy Weight)** | | | | | | |
| Underweight | 0.80 | 0.851 | 2.91 | 0.052 | 1.97 | 0.433 |
| Overweight | 1.28 | 0.612 | 0.86 | 0.587 | **2.18** | 0.001 |
| Obesity | 1.38 | 0.470 | 1.49 | 0.119 | **2.18** | 0.001 |
| **Household Income (ref=$100,000+)** | | | | | | |
| < $30,000 | 2.22 | 0.168 | **2.43** | 0.005 | **2.24** | 0.010 |
| $30,000 to <$60,000 | 1.13 | 0.840 | **1.72** | 0.045 | 1.25 | 0.421 |
| $60,000 to <$100,000 | 0.94 | 0.913 | 0.79 | 0.417 | **1.88** | 0.007 |
| **Marital Status (ref=Married)** | 1.50 | 0.290 | 0.90 | 0.643 | 0.86 | 0.456 |

[4] A design-based Wald test indicated that the model was statistically significant ($F(87, 2220) = 3.39$, $p < .001$).

| | Drivers (*N*=2,307) | | | | | |
|---|---|---|---|---|---|---|
| | Rarely/Never | | Some of the time | | Most of the time | |
| | AOR | *p*-value | AOR | *p*-value | AOR | *p*-value |
| **Vehicle Type (ref=Car, SUV, or Station Wagon)** | | | | | | |
| Pickup | 0.88 | 0.780 | 0.81 | 0.499 | 1.61 | 0.075 |
| Van or Other | 1.76 | 0.413 | 0.97 | 0.951 | 0.86 | 0.696 |
| **Vehicle Age (ref=0-4 years old)** | | | | | | |
| 5–9 Years Old | 1.22 | 0.702 | 1.25 | 0.373 | 1.10 | 0.673 |
| 10–14 Years Old | 1.28 | 0.633 | 1.25 | 0.466 | 0.72 | 0.203 |
| 15 Years Old or Older | 1.64 | 0.280 | **1.75** | 0.040 | 0.66 | 0.134 |
| **Alcohol Misuse (AUDIT-C) (ref=Negative)** | 1.31 | 0.503 | 1.13 | 0.571 | 1.00 | 0.985 |
| **Past-Year Marijuana Use (ref=No past-year use)** | 1.38 | 0.467 | **1.63** | 0.028 | 0.83 | 0.390 |
| **Impaired Driving/Riding Types of "Ever" Behaviors (ref=0 types)** | | | | | | |
| 1 type | 2.09 | 0.100 | 1.19 | 0.479 | **2.11** | 0.000 |
| 2 types | 2.51 | 0.079 | 1.13 | 0.729 | **2.07** | 0.015 |
| 3 or 4 types | **4.02** | 0.022 | **2.80** | 0.001 | **3.40** | 0.000 |

Note: Bolded values differ significantly at the 95% confidence level.

*Table C-4. Multivariate Relationship between Seat Belt Use Among Passengers and Related Factors*[5]

| | Passengers (*N*=2,184) | | | | | |
|---|---|---|---|---|---|---|
| | Rarely/Never | | Some of the time | | Most of the time | |
| | AOR | *p*-value | AOR | *p*-value | AOR | *p*-value |
| **Age (ref=Adults 25–59)** | | | | | | |
| **Young adult (18–24)** | 0.73 | 0.527 | 0.88 | 0.635 | 1.29 | 0.456 |
| **Older adults (60+)** | 0.99 | 0.981 | 0.96 | 0.838 | 0.96 | 0.826 |
| **Sex (ref=Male)** | **0.44** | 0.006 | 0.96 | 0.787 | 1.21 | 0.250 |
| **Race/Ethnicity (ref=White Non-Hispanic)** | | | | | | |
| **Black, non-Hispanic** | **2.49** | 0.020 | **2.36** | 0.000 | 1.09 | 0.763 |
| **Hispanic** | 1.55 | 0.322 | 1.22 | 0.381 | 1.09 | 0.694 |
| **Other race, Asian-Pacific Islander, and 2+ races, non-Hispanic** | 2.20 | 0.098 | 1.07 | 0.835 | 1.21 | 0.560 |
| **Education Level (ref=Bachelor's Degree or Higher)** | | | | | | |
| High school graduate or less | **4.94** | 0.000 | **1.66** | 0.023 | 1.13 | 0.621 |
| Some college/Associates degree | 2.08 | 0.089 | 1.14 | 0.493 | 0.85 | 0.424 |
| **Metropolitan Area of Residence (ref=Urban)** | | | | | | |
| **Suburban** | 1.20 | 0.548 | 0.97 | 0.859 | 0.93 | 0.672 |
| **Rural** | 1.91 | 0.074 | 1.14 | 0.562 | 1.12 | 0.672 |
| **Political Ideology (ref=Moderate)** | | | | | | |
| **Liberal** | 0.80 | 0.542 | **0.60** | 0.014 | 0.82 | 0.314 |
| **Conservative** | 1.04 | 0.878 | 0.94 | 0.746 | 1.14 | 0.494 |
| **BMI (ref=Healthy Weight)** | | | | | | |
| **Underweight** | 2.80 | 0.235 | **3.59** | 0.017 | 1.92 | 0.217 |
| **Overweight** | 1.05 | 0.904 | 0.88 | 0.541 | 1.07 | 0.751 |
| **Obesity** | 1.20 | 0.656 | 1.48 | 0.052 | 0.98 | 0.927 |
| **Household Income (ref=$100,000 or more)** | | | | | | |
| **Less than $30,000** | 1.30 | 0.519 | **2.91** | 0.000 | 1.03 | 0.911 |
| **$30,000 to under $60,000** | 1.36 | 0.425 | **1.74** | 0.020 | 0.75 | 0.240 |
| **$60,000 to under $100,000** | 0.79 | 0.547 | 1.15 | 0.532 | 0.92 | 0.676 |
| **Marital Status (ref=Married)** | 1.04 | 0.892 | 0.99 | 0.960 | 0.88 | 0.467 |
| **Alcohol Misuse (AUDIT-C) (ref=Negative)** | **1.92** | 0.015 | 1.24 | 0.217 | 1.14 | 0.453 |

[5] A design-based Wald test indicated that the model was statistically significant ($F(72, 2112) = 3.32$, $p < 0.001$).

| | Passengers (*N*=2,184) | | | | | |
|---|---|---|---|---|---|---|
| | Rarely/Never | | Some of the time | | Most of the time | |
| | AOR | *p*-value | AOR | *p*-value | AOR | *p*-value |
| **Past-Year Marijuana Use (ref=No past-year use)** | 1.00 | 0.995 | 1.20 | 0.319 | 1.03 | 0.891 |
| **Impaired Driving/Riding Types of "Ever" Behaviors (ref=0 types)** | | | | | | |
| **1 type** | **2.03** | 0.041 | 1.27 | 0.175 | 1.38 | 0.085 |
| **2 types** | 1.46 | 0.392 | 1.54 | 0.105 | 1.57 | 0.108 |
| **3 or 4 types** | **3.11** | 0.020 | **3.36** | 0.000 | **2.25** | 0.010 |

*Note: Bolded values differ significantly at the 95% confidence level.*

Table C-5 shows the model fit indices for models with different numbers of classes for drivers, and Table C-6 shows the fit indices for passengers. The log-likelihood (LL) describes how well the model explains the observed data (high values indicate a better fit). Bayesian Information Criterion (BIC) indicates model fit and accounts for overfitting of the model (lower BIC values indicate a better fit). Vuong-Lo-Mendell-Rubin Likelihood Ratio Test (VLMR-LRT) compares the model against the previous model (i.e., M2-M1), with a significant *p*-value of less than 0.05 indicating a better fit. Lastly, entropy measures the classification certainty, ranging from zero to one (high values indicate well-defined classes).

For both drivers and passengers, a four-class model was selected as the best-fitting model. For drivers, while BIC is the lowest for a five-class model, the BIC reduction from a three to a four-class model is more than three times the reduction from a four to a five-class model, indicating a diminishing return of BIC reduction. Thus, a more parsimonious four-class model was selected. For passengers, a four-class model was selected for similar reasons.

*Table C-5. LCA Model Fit Indices for Drivers (N=2,281)*

| Class Enumeration | | | | | | |
|---|---|---|---|---|---|---|
| **Model** | **Description** | **LL** | **npar** | **BIC** | **VLMR-LRT** | **Entropy** |
| **M1** | 1 class model | −15371.8 | 33 | 30999.14 | NA | 1 |
| **M2** | 2 class model | −9453 | 67 | 19424.84 | 0 | 0.992 |
| **M3** | 3 class model | −8549.69 | 101 | 17881.48 | 0.7955 | 0.988 |
| **M4** | 4 class model | −8118.99 | 135 | 17283.39 | 0.8909 | 0.984 |
| **M5** | 5 class model | −7900.21 | 169 | 17109.12 | 0.782 | 0.958 |
| **M6** | 6 class model | −7779.7 | 203 | 17131.38 | 0.7627 | 0.958 |

*Note: npar = number of parameters.*

*Table C-6. LCA Model fit Indices for Passengers (N=2,141)*

| Class Enumeration | | | | | | |
|---|---|---|---|---|---|---|
| **Model** | **Description** | **LL** | **npar** | **BIC** | **VLMR-LRT** | **Entropy** |
| **M1** | 1 class model | −13110.6 | 30 | 26451.75 | NA | 1 |
| **M2** | 2 class model | −7750.01 | 61 | 15968.9 | 0 | 0.989 |
| **M3** | 3 class model | −6882.35 | 92 | 14471.87 | 0.1758 | 0.983 |
| **M4** | 4 class model | −6482.7 | 123 | 13910.86 | 0.7673 | 0.986 |
| **M5** | 5 class model | −6246.49 | 154 | 13676.73 | 0.7603 | 0.977 |
| **M6** | 6 class model | −6156.68 | 185 | 13735.39 | 0.8143 | 0.976 |

*Note: npar = number of parameters.*

Table C-7 and Table C-8 present the multivariate relationship between demographics, risky behaviors, and other individual characteristics and seat belt use class membership.

*Table C-7. Multivariate Relationship between Seat Belt Use Class Assignment Among Drivers and Related Factors*

| Drivers (*N*=2,281) | | | | | | |
|---|---|---|---|---|---|---|
| | **Rarely Users (3.1%)** | | **Sometimes Users (7.8%)** | | **Most of the Time Users (8.3%)** | |
| | **AOR** | ***p*-value** | **AOR** | ***p*-value** | **AOR** | ***p*-value** |
| **Age (ref=Adults 25–59)** | | | | | | |
| **Young adult (18–24)** | 2.34 | 0.071 | 1.07 | 0.863 | 0.99 | 0.973 |
| **Older adults (60+)** | 2.02 | 0.085 | **0.48** | **0.030** | **0.44** | **0.005** |
| **Sex (ref=Male)** | **0.34** | **0.001** | **0.58** | **0.027** | 0.71 | 0.125 |
| **Race/Ethnicity (ref=White Non-Hispanic)** | | | | | | |
| **Black, non-Hispanic** | 1.03 | 0.958 | 2.50 | 0.009 | 1.56 | 0.213 |
| **Hispanic** | 1.07 | 0.879 | 1.15 | 0.669 | 0.99 | 0.978 |
| **Other race, Asian-Pacific Islander, and 2+ races, non-Hispanic** | 2.59 | 0.071 | 2.12 | 0.055 | 0.59 | 0.320 |
| **Education Level (ref=Bachelor's Degree or Higher)** | | | | | | |
| **High school graduate or less** | 1.94 | 0.171 | **4.74** | **<0.001** | 0.99 | 0.967 |
| **Some college/Associates degree** | 1.48 | 0.422 | **2.77** | **0.007** | 0.68 | 0.144 |
| **Metropolitan Area of Residence (ref=Urban)** | | | | | | |
| **Suburban** | 1.09 | 0.800 | 1.40 | 0.235 | 1.28 | 0.350 |
| **Rural** | 1.12 | 0.802 | 1.43 | 0.302 | **2.21** | **0.012** |

| | Drivers (*N*=2,281) | | | | | |
|---|---|---|---|---|---|---|
| | Rarely Users (3.1%) | | Sometimes Users (7.8%) | | Most of the Time Users (8.3%) | |
| | AOR | *p*-value | AOR | *p*-value | AOR | *p*-value |
| **Political Ideology (ref=Moderate)** | | | | | | |
| **Liberal** | 0.86 | 0.731 | 0.86 | 0.687 | 0.70 | 0.201 |
| **Conservative** | 1.10 | 0.787 | 1.03 | 0.904 | 1.17 | 0.511 |
| **BMI (ref=Healthy Weight)** | | | | | | |
| **Underweight** | 1.45 | 0.774 | **4.06** | **0.046** | 1.72 | 0.664 |
| **Overweight** | 1.22 | 0.690 | 1.31 | 0.417 | 1.65 | 0.068 |
| **Obesity** | **3.39** | **0.005** | 1.57 | 0.183 | 1.54 | 0.093 |
| **Household Income (ref=$100,000 or more)** | | | | | | |
| **<$30,000** | **3.16** | **0.027** | **2.59** | **0.015** | **2.92** | **0.005** |
| **$30,000 to <$60,000** | 1.86 | 0.222 | 1.48 | 0.258 | 1.32 | 0.400 |
| **$60,000 to <$100,000** | 1.72 | 0.320 | 1.26 | 0.535 | **1.99** | **0.015** |
| **Marital Status (ref=Married)** | 1.45 | 0.282 | 1.13 | 0.682 | 1.33 | 0.234 |
| **Vehicle Type (ref=Car, SUV, or Station Wagon)** | | | | | | |
| **Pickup** | 0.64 | 0.355 | 1.13 | 0.728 | 1.84 | 0.056 |
| **Van or Other** | 0.20 | 0.083 | 1.27 | 0.587 | 0.49 | 0.146 |
| **Vehicle Age (ref=0–4 years old)** | | | | | | |
| **5–9 Years Old** | 0.79 | 0.658 | 1.75 | 0.086 | 1.14 | 0.642 |
| **10–14 Years Old** | 1.64 | 0.341 | 0.87 | 0.704 | 1.08 | 0.793 |
| **15+ Years Old** | **2.77** | **0.033** | 1.67 | 0.135 | 1.15 | 0.661 |
| **Alcohol Misuse (AUDIT-C) (ref=Negative)** | 0.90 | 0.777 | 1.39 | 0.203 | 1.09 | 0.732 |
| **Past-Year Marijuana Use (ref=No past-year use)** | **3.38** | **0.003** | 1.01 | 0.969 | 0.70 | 0.140 |
| **Impaired Driving/Riding Types of "Ever" Behaviors (ref=0 types)** | | | | | | |
| **1 type** | 1.48 | 0.311 | **2.20** | **0.03** | **2.13** | **0.003** |
| **2 types** | 1.68 | 0.288 | **2.60** | **0.03** | 1.86 | 0.097 |
| **3 or 4 types** | 3.32 | 0.017 | **9.34** | **<0.001** | **3.42** | **0.003** |

*Note: Bolded values differ significantly at the 95% confidence level.*

*Table C-8. Multivariate Relationship between Seat Belt Use Class Assignment Among Passengers and Related Factors*

| | Passengers (*N*=2,141) | | | | | |
|---|---|---|---|---|---|---|
| | Rarely Users (3.1%) | | Sometimes Users (6.8%) | | Most of the Time Users (9.5%) | |
| | AOR | *p*-value | AOR | *p*-value | AOR | *p*-value |
| **Age (ref=Adults 25–59)** | | | | | | |
| Young adult (18–24) | 1.52 | 0.439 | 1.21 | 0.623 | 1.13 | 0.748 |
| Older adults (60+) | 0.63 | 0.372 | 0.43 | 0.011 | 0.69 | 0.153 |
| Sex (ref=Male) | 0.45 | 0.038 | 0.48 | 0.004 | 0.68 | 0.078 |
| **Race/Ethnicity (ref=White Non-Hispanic)** | | | | | | |
| Black, non-Hispanic | 1.89 | 0.188 | 1.84 | 0.068 | 1.93 | 0.049 |
| Hispanic | 0.81 | 0.722 | 0.82 | 0.569 | 1.17 | 0.581 |
| Other race, Asian-Pacific Islander, and 2+ races, non-Hispanic | 1.44 | 0.568 | 1.56 | 0.338 | 0.70 | 0.473 |
| **Education Level (ref=Bachelor's Degree or Higher)** | | | | | | |
| High school graduate or less | 5.15 | 0.017 | 3.09 | 0.007 | 1.75 | 0.063 |
| Some college/Associates degree | 2.38 | 0.170 | 1.37 | 0.459 | 0.93 | 0.772 |
| **Metropolitan Area of Residence (ref=Urban)** | | | | | | |
| Suburban | 0.67 | 0.338 | 1.37 | 0.250 | 1.40 | 0.182 |
| Rural | 1.59 | 0.281 | 1.55 | 0.224 | 2.00 | 0.031 |
| **Political Ideology (ref=Moderate)** | | | | | | |
| Liberal | 2.10 | 0.141 | 0.87 | 0.638 | 0.86 | 0.609 |
| Conservative | 1.08 | 0.863 | 0.74 | 0.295 | 1.17 | 0.506 |
| **BMI (ref=Healthy Weight)** | | | | | | |
| Underweight | 3.06 | 0.248 | 2.35 | 0.210 | 5.50 | 0.009 |
| Overweight | 0.97 | 0.958 | 1.89 | 0.070 | 1.08 | 0.770 |
| Obesity | 1.10 | 0.847 | 1.99 | 0.038 | 1.33 | 0.298 |

| | Passengers (*N*=2,141) | | | | | |
|---|---|---|---|---|---|---|
| | Rarely Users (3.1%) | | Sometimes Users (6.8%) | | Most of the Time Users (9.5%) | |
| | AOR | *p*-value | AOR | *p*-value | AOR | *p*-value |
| **Household Income (ref=$100,000 or more)** | | | | | | |
| <$30,000 | 3.86 | 0.064 | 4.10 | 0.001 | 1.79 | 0.094 |
| $30,000 to <$60,000 | 2.22 | 0.238 | 2.80 | 0.013 | 0.94 | 0.868 |
| $60,000 to <$100,000 | 2.52 | 0.171 | 1.50 | 0.341 | 1.40 | 0.222 |
| **Marital Status (ref=Married)** | 1.23 | 0.719 | 1.88 | 0.038 | 1.28 | 0.305 |
| **Alcohol Misuse (AUDIT-C) (ref=Negative)** | 1.12 | 0.814 | 1.41 | 0.204 | 1.04 | 0.867 |
| **Past-Year Marijuana Use (ref=No past-year use)** | 1.57 | 0.376 | 1.46 | 0.165 | 0.79 | 0.292 |
| **Impaired Driving/Riding Types of "Ever" Behaviors (ref=0 types)** | | | | | | |
| 1 type | 1.39 | 0.523 | 1.47 | 0.270 | 1.43 | 0.150 |
| 2 types | 2.49 | 0.099 | 2.71 | 0.023 | 2.13 | 0.027 |
| 3 or 4 types | 2.42 | 0.151 | 7.43 | <0.001 | 2.91 | 0.003 |

Table C-9 and Table C-10 present the three profiles with the highest predicted probability of belonging to the “Most of the Time Users” class for drivers and passengers, respectively.

*Table C-9. CART Profiles with the Highest Probability of Being in the Driver LCA "Most of the Time Users" Class (D2)*

| | Profile D2-A (*N*=133; 5.8%)* | Profile D2-B (*N*=83; 3.7%) | Profile D2-C (*N*=283; 12.4%) |
|---|---|---|---|
| **Probability of being a Most of the Time user** | **25.2%** | **17.0%** | **15.2%** |
| **Impaired driving/ riding types** | 1 type, 2 types or 3–4 types (any impaired driving/riding) | 2 types or 3–4 types | 1 type, 2 types or 3–4 types (any impaired driving/riding) |
| **Race/ethnicity** | Black NH, White NH, or Hispanic | Black NH, White NH, or Hispanic | Black NH, White NH, or Hispanic |
| **Household income** | Less than $30,000 or $60,000–$99,999 | Less than $30,000 or $60,000–$99,999 | $30,000–$59,999 or $100,000 or more |
| **Sex** | Male | Female | |
| **Past-year marijuana use** | Never | | Never |
| **Age** | | | Young adult (18–24) or Adult (25–59) |

**Weighted frequencies and counts are presented. Weighted frequencies represent the proportion among the driver LCA analytic sample (N=2,281).*

*Table C-10. CART Profiles with the Highest Probability of Being in the Passenger LCA "Most of the Time Users" Class (P2)*

| | Profile P2-A (*N*=62; 2.9%)* | Profile P2-B (*N*=219; 10.2%) | Profile P2-C (*N*=208; 9.7%) |
|---|---|---|---|
| **Probability of being a Most of the Time user** | **31.1%** | **20.3%** | **8.8%** |
| **Education** | HS graduate or less | HS graduate or less | HS graduate or less |
| **BMI** | Overweight (BMI 25 to <30) or Obesity (BMI ≥30) | Overweight (BMI 25 to <30) or Obesity (BMI ≥30) | Healthy weight (BMI 18.5 to <25) |
| **Household income** | $100,000+ | Less than $30,000, $30,000–$59,999, or $60,000–$99,999 | |
| **Race/ethnicity** | | Black NH or White NH | |
| **Alcohol misuse (AUDIT-C)** | | Negative screen | |

**Weighted frequencies and counts are presented. Weighted frequencies represent the proportion among the driver LCA analytic sample (N=2,281).*