A Roadside Observation Study for Measuring Seat Belt & Child Restraint Use in Namibia

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A Roadside Observation Study for Measuring Seat Belt & Child Restraint Use in Namibia

An Interactive Qualifying Project
submitted to the Faculty of
WORCESTER POLYTECHNIC INSTITUTE
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degree of Bachelor of Science

by
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Abstract

Namibia's annual road fatality rate ranks among the highest in the world at 31 deaths per 100,000 inhabitants. Failure to use a seat belt or child restraint greatly increases a motor vehicle occupant's chance of injury or death in the event of an accident. The Motor Vehicle Accident Fund and Automobile Association of Namibia wish to investigate seat belt and child restraint compliance in the country, but previous studies reveal a gap in data collection. This research addressed the data gap through the design and implementation of a roadside observation study and attitudinal survey in Namibia's Khomas Region. The research team performed statistical analysis to investigate correlations between observed compliance and factors such as driver demographics, site location, and vehicle type. Analysis revealed a pervasive lack of child passenger safety throughout the Khomas Region, with only 7% of observed children correctly buckled in a seat belt or child restraint. Researchers also found significantly lower adult passenger compliance in taxis (17%) than in private cars (42%). Attitudinal survey responses shed light on potential reasons for low seat belt use in taxis. When asked the reasons for their non-compliance, respondents cited factors typically associated with taxi use: low speed of travel, short length of trip, and perceived safety of sitting in the back seat. To address these findings, the team recommended a child restraint donation and redistribution system targeted toward parents unable to afford child restraints, as well as radio advertisements in various languages and educational stickers to target taxi occupants.

Executive Summary

Motor vehicle accidents are among the leading causes of death worldwide (The Top 10 Causes of Death, 2017). Namibia's annual road fatality rate ranks among the highest in the world at 31 deaths per 100,000 inhabitants (LAC, 2016). Figure 1.A highlights the central region of the country, the Khomas Region, which contains the capital city, Windhoek. Due to the large population of the capital, Khomas possesses the highest vehicle density in the country. Consequently, Khomas also experiences the highest number of motor vehicle crashes throughout Namibia (NRSC, 2016). Figure 2.B shows the crash statistics for the entirety of Namibia from June 2015. Crashes that occurred in the Khomas Region are triple that of any other region in the country.

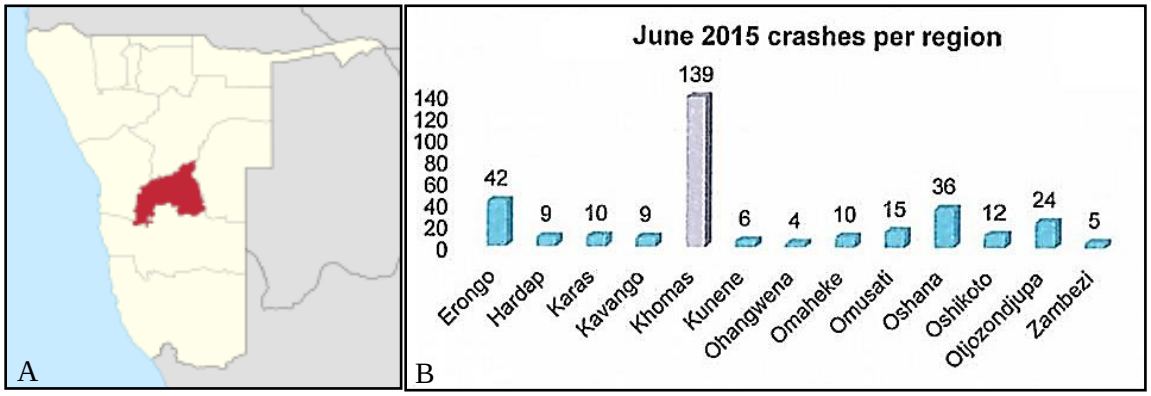

Figure 1: *(left) A. Map of Namibia with Khomas Region highlighted (Wikipedia, 2017) (right) B. Crash statistics for Namibia by region for June 2015*

Dangerous driving conditions create a need for increased seat belt and child restraint use to help improve vehicle occupant safety in the Khomas Region. The invention of the seat belt in the 1930s and improvements to the child restraint throughout the 1950s led to decreased road casualties worldwide. In the United States, proper seat belt use saves almost 14,000 lives annually (NHTSA, 2015). Like the United States, Namibia enforces laws requiring seat belt use; however, cultural differences, economic constraints, and negative attitudes toward seat belts lower compliance levels throughout the country. To limit costs, employers often transport large numbers of employees to and from work unrestrained in the beds of trucks (Chief A. Eiseb, personal communication, March 27, 2017). The government considered this need and adapted Namibian law to allow as many as six passengers to travel in the bed of a truck unrestrained. This adaptation further decreases seat belt compliance.

The Motor Vehicle Accident (MVA) Fund and Automobile Association of Namibia (AA) offer benefits and services to motor vehicle occupants traveling in the country. The MVA Fund compensates victims and their families in the event of a motor vehicle accident. The AA provides driver education opportunities, emergency roadside services, and routine vehicle maintenance to its customers. Headquartered in Windhoek, these two organizations work closely together while coordinating with other road safety associations, including the Namibian Police

Force (NAMPOL), Windhoek City Police, and the National Road Safety Council (NRSC) to collect and organize data annually on motor vehicle registrations and crashes in Namibia. Each of these organization aims to use this data to decrease motor vehicle accidents, injuries, and fatalities and to improve general road safety throughout the country.

The MVA Fund and AA proposed a roadside observation study to investigate seat belt and child restraint compliance rates in the Khomas Region. In coordination with the MVA Fund and AA, this project focused on the design and implementation of an observational study to collect data on these safety behaviors utilizing the following four objectives:

1. Collect data on current levels of proper vehicle occupant seat belt and child restraint use in the Khomas Region of Namibia
2. Analyze the collected data to quantify seat belt and child restraint usage levels
3. Identify common reasons car, taxi, and truck occupants in the Khomas Region of Namibia do not use seat belts and child restraints
4. Recommend methods to encourage the public to use seat belts and child restraints properly.

The initial plan involved observation in four regions of Namibia to gather data on seat belt and child restraint use across the country; however, due to financial considerations and time constraints, the sponsors and researchers agreed to eliminate travel to rural regions. The data collection focused instead on the Khomas Region; therefore, results and correlations evaluating overall seat belt and child restraint compliance in this region may not represent compliance throughout the rest of the country. The results of this project apply primarily to the Windhoek area; obtaining results for the rest of Namibia requires widespread data collection.

To collect complete, relevant data on seat belt and child restraint compliance rates in the Khomas Region, research focused on background information, data collection, and data analysis. After in-depth research on road conditions, traffic laws, and driver education, the researchers compiled background information necessary to understand current driving culture in Namibia. The student researchers met with NAMPOL and Windhoek City Police to gather more information regarding locational demographics and traffic patterns throughout the region. With this knowledge and through discussions with the MVA Fund and AA, the researchers constructed an observational study schedule consisting of intersections and primary schools suitable for collecting diverse vehicle, driver, adult passenger, and child passenger data. Intersections suitable for collection included a stoplight or stop sign to ensure adequate time for each researcher to make the necessary observations. The observational study schedule also incorporated intersections and schools in various socioeconomic areas to collect a diverse sample population representative of the Khomas Region. Data collection occurred at these predetermined sites at various times of day, including morning rush hour around 07:30, mid-day at 12:00, after school pick up times at 12:30, and evening rush hour at 17:00 to incorporate various regional traffic patterns.

To collect and organize the observational data quickly and efficiently, the team designed a checklist-style form with offline capabilities accessible through Qualtrics survey software and

implemented an observational protocol with well-defined responsibilities for each project member. See Figure 2 for a visual representation of the Qualtrics data collection form.

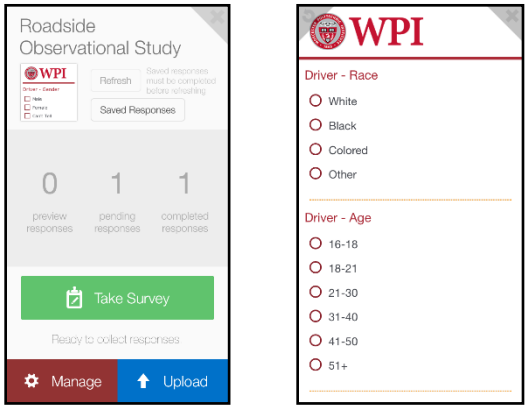

Figure 2: *Visual representation of example questions in the roadside observation study Qualtrics collection form*

At an observational location, three members of the project group noted specific details about the vehicles and occupants surveyed while the fourth member entered the data into the software. The first member relayed vehicle type and driver demographics, the second noted adult passengers, and the third member noted child passengers. This study prioritized visual observation, discrete collection, and speed to minimize potential bias introduced by observation on the safety behavior of the observed motor vehicle occupants. To ensure that the data collection methods met these goals, the observers pre-tested the software at a high-traffic intersection and a busy primary school prior to the start of data collection.

During the observational study period, researchers noticed a high number of taxis in the Khomas Region. At the last three observation sites, the team altered the vehicle type subgroups to include “taxi” in addition to “car” and “truck”. After completing data collection at five primary schools, six intersections, and one police roadblock, the researchers organized and analyzed the 1,504 collected motor vehicle entries using Qualtrics and Excel.

The project team recognized low child restraint compliance at all five primary school observation sites, ranging from 0% to 20% shown in Figure 3. The research group found the lowest compliance levels at schools in the informal settlements of the city. This area represents a lower socioeconomic class than the other three school locations; it may be difficult for families in this location to buy proper child restraints, contributing to the lower compliance in the area.

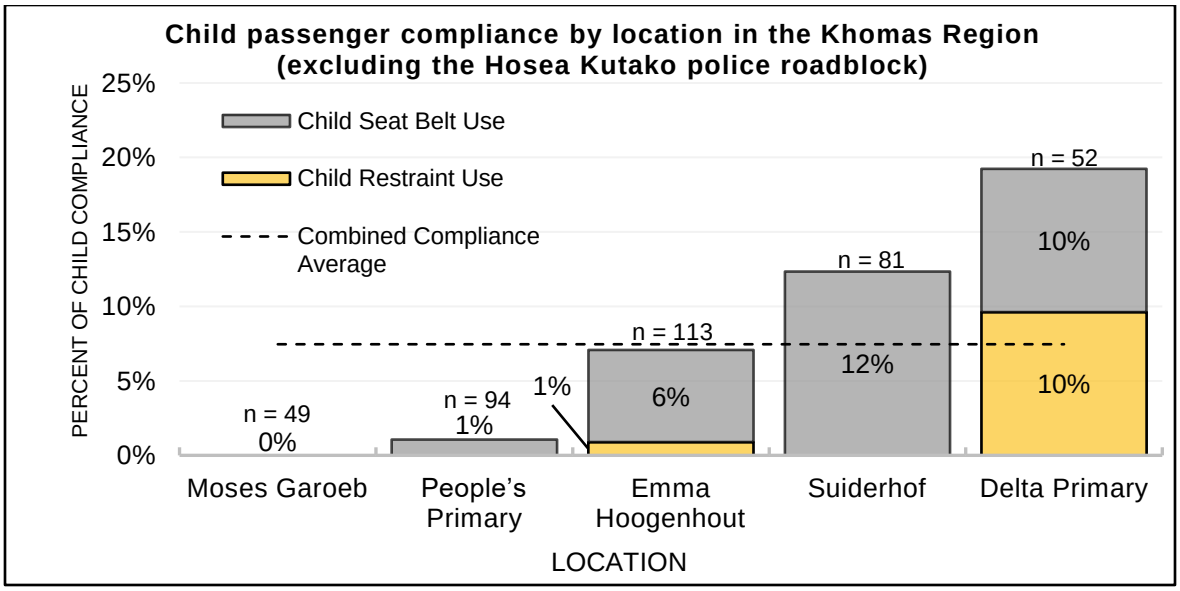

Figure 3: *Roadside observation study results for child passenger compliance by location in the Khomas Region (excluding the Hosea Kutako police roadblock)*

The team explored seat belt use as it related to demographics and other factors by parsing the data to find significant trends. Then, utilizing hypothesis testing with a 95% confidence level, the researchers statistically analyzed all investigated correlations. Tests yielding a P-value less than 0.05 represent a statistically significant finding. Through these methods, the analysis identified four statistically significant correlations within the observed driver population as shown in Figure 4 below. The project team found evidence that higher compliance rates significantly correlated with white and colored drivers as compared to black drivers. Additionally, older drivers aged 41 and over, wear seat belts more often than younger drivers, under 40 years old. High seat belt compliance also strongly correlated with drivers of personal cars as compared to taxi drivers, and female drivers as compared to male drivers.

Driver Seat Belt Compliance by Race

Vehicle Type	Driver Count*	Compliance Percentage
White	132	82.6%
Black	1076	74.5%
Colored	104	85.6%
Other	8	75.0%
P-value = 0.0432 (black to white)		
P-value = 0.0126 (black to colored)		

Driver Seat Belt Compliance by Age

Vehicle Type	Driver Count*	Compliance Percentage
16-18	0	N/A
18-21	3	100.0%
21-30	244	72.1%
31-40	617	73.7%
41-50	325	83.3%
51+	131	77.1%
P-value = 0.0009 (41+ to 40 and under)		

Driver Seat Belt Compliance by Vehicle Type

Vehicle Type	Vehicle Count*	Compliance Percentage
Car	170	82.9%
Truck	109	73.4%
Taxi	156	68.6%
P-value = 0.0027 (car to taxi)		

Driver Seat Belt Compliance by Gender

Gender	Driver Count*	Compliance Percentage
Male	1109	73.7%
Female	211	89.6%
P-value = 0.0000		

* These counts do not include vehicles in which observers could not see the occupants.
** P-values that did not indicate statistical significance are not included in the tables.

Figure 4: *Roadside observation study statistically significant correlations for drivers in the Khomas Region*

The group observed 156 taxis out of 453 total vehicles at the last three sites. Parsing the data through similar filtering and statistical analysis methods, the team identified a significant correlation between low adult passenger seat belt compliance and taxi transportation with only 17% of taxi passengers properly wearing a seat belt as compared to 42% of passengers in private cars. Figure 5 summarizes these usage rates and shows the corresponding correlation.

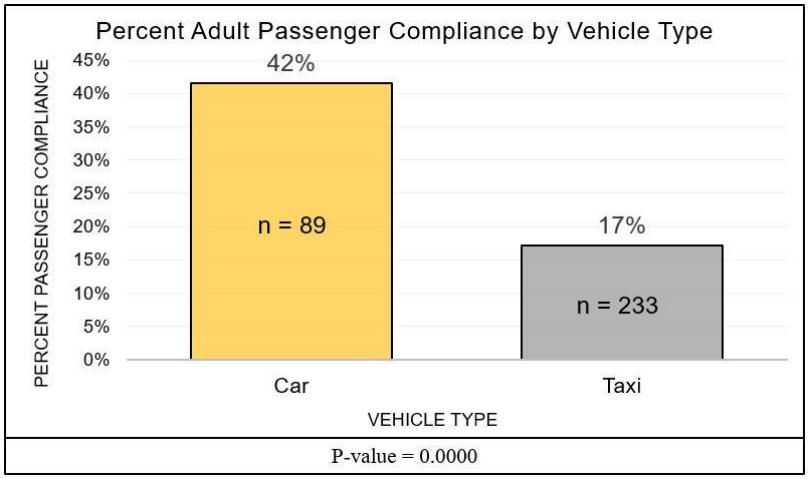

Figure 5: *Roadside observation study results with statistically significant comparison of compliance percentages of adult passengers in personal cars and taxis in the Khomas Region*

To investigate the seat belt habits of young adult drivers and to identify the most common reasons for non-compliance, the project included the design and distribution of an attitudinal survey to college-age students in the United States at Worcester Polytechnic Institute (WPI) and in Namibia at the Namibia University of Science and Technology (NUST). The survey distributed to WPI students collected the age and driver education level of respondents and evaluated the impact of driver education and seat belt advertising on the self-reported compliance levels of respondents. It also investigated common motivations behind compliance and non-compliance. After arriving in Namibia, the student researchers discovered that NUST students frequently rely on taxis for transportation. In addition, when compared to WPI, NUST's generally older student population is more likely to have children. In response to these findings, the research team modified the attitudinal survey for distribution at NUST to investigate these culturally relevant factors. The updated survey included the same questions regarding age, seat belt use, and common motivations for compliance and non-compliance, but substituted questions on taxi use and child restraints for the original survey questions on driver education.

From the attitudinal survey distributed at WPI, the research team collected 252 responses, of which 79% of respondents reported always wearing their seat belt when traveling in a motor vehicle. Only 42% of the 99 respondents at NUST reported always wearing a seat belt.

Figure 6 below graphically compares the attitudinal survey responses from the two sample populations at WPI and NUST. The figure quantifies self-reported compliance on a scale of 0 to 4, with higher values indicating greater compliance. The results provided statistically significant evidence that WPI students reported significantly greater seat belt use and are more

likely to have a driver's license than NUST students.

Self-Reported Compliance Comparison: WPI and NUST						
University	Always	Usually	Sometimes	Rarely	Never	Weighted Compliance
WPI	200	41	9	2	0	3.74
NUST	42	18	35	3	1	2.98
P-value = 0.0000						

Driver's License Prevalence Comparison: WPI and NUST			
University	Yes	No	%
WPI	250	2	99.21%
NUST	32	67	32.32%
P-value = 0.0000			

Figure 6: *Statistically significant correlations comparing attitudinal survey results reported by WPI and NUST students*

Based on all results from both the observational study and two attitudinal surveys, the team identified three main areas to address to improve low compliance levels in the Khomas Region:

1. Child passengers in all vehicle types (cars, taxis, and trucks)
2. Adult passengers in taxis
3. Public transportation

The project team recommended radio advertisements, promotional stickers, and seat belt wipes to target low compliance of taxi occupants. These measures address concerns regarding taxi cleanliness and educating taxi occupants on the importance of seat belt use, even on short trips and when sitting in the back seat. The team also recommended a child restraint donation and redistribution system targeted toward parents unable to afford child restraints. Additionally, the students proposed a future project to improve and expand the public transportation system in Windhoek to limit the unsafe transportation of workers in the city. An increased awareness of the importance of seat belt and child restraint use may contribute to safer roads and fewer motor vehicle accident casualties in the future.

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Chapter 1: Introduction

Many motor vehicle occupants wear seat belts and child restraints to reduce the risk associated with motor vehicle travel. Failure to use a seat belt or child restraint greatly increases a vehicle occupant's chance of injury in the event of an accident. Safety experts advise all occupants to utilize these safety devices, even if not mandated by local law (Robertson, 1996). To keep people safe, organizations like police forces and auto insurance companies must rely on the general population to practice safe road behavior. Consequently, road safety organizations design and implement public education campaigns to improve safety behaviors, including seat belt and child restraint use.

In Namibia, several factors contribute to dangerous driving conditions. For example, speeding is a significant cause of vehicle accidents in Namibia, especially on the country's many unpaved gravel roads (Eggleston et. al, 2016). The national police force in Namibia, NAMPOL, enforces traffic and driving laws that discourage unsafe behaviors, like speeding. However, the NAMPOL division responsible for enforcing traffic laws is severely understaffed, with less than one officer per 1,000 vehicles in Namibia (Miyanicwe, 2013). Unsafe driving habits and understaffed enforcement contribute to the need for drivers and occupants to take measures to ensure their own safety, such as using seat belts and child restraints.

The Motor Vehicle Accident (MVA) Fund insures all people injured in motor vehicle accidents in Namibia. The MVA Fund works closely with the Automobile Association of Namibia (AA), which provides other motoring services to the public, such as driving school, emergency assistance, vehicle inspections, and towing services. With the shared goal of increasing the overall safety of Namibia's roads, these companies want to investigate driver and passenger safety behaviors. Consequently, both organizations aim to collect data on the usage rates of seat belts and child restraints in Namibia. With updated and relevant data regarding these safety practices, the MVA Fund and AA can determine correlations between population demographics and low usage rates. Then, these correlations can help develop a targeted education campaign on the benefits of wearing seat belts and child restraints to decrease the severity of injuries from motor vehicle accidents.

Across the globe, other organizations have collected seat belt and child restraint data. In 2001, researchers from Monash University Accident Research Centre in Victoria, Australia conducted a roadside observation study to collect data on seat belts and child restraints in Melbourne, Australia (Whelan, 2013). The Monash research team developed an effective strategy for efficient and accurate data collection through visual observation. Similarly, the Economic and Social Research Council of the United Kingdom conducted a research study to assess the driving behaviors of citizens of fourteen different countries, including European countries and the United States, over a period of ten years (Steptoe et al., 2002). In the studied countries, there was a noticeable increase in seat belt use from 1990 to 2000; the study attributed this increase to recently implemented public awareness campaigns (Steptoe et al., 2002).

In 2009, Mike Winnett of the Global Road Safety Partnership (GRSP) assessed motorists' attitudes and self-reported use of seat belts in Namibia with an **attitudinal survey**, which assesses the feelings of a population toward a subject. The National Road Safety Council of Namibia targeted seat belt use data in 2012 with an **observational study**. This systematic analysis of human behavior found lower wearing rates than the self-reported rates of the GRSP survey (NRSC, 2016). In addition to seat belts, the GRSP also collected data on child restraints and found even self-reported usage, which typically reflects higher-than-actual results, to be very low. Each of these studies provides pertinent benchmark information for collecting useful data on seat belt use, assessing public opinion, and educating the public on the importance of seat belts and child restraints.

Despite previous studies about seat belt use in Namibia, much of the data collected is outdated and may be unrepresentative of the current driving habits in Namibia. The data also does not evaluate specific driving habits and attitudes that may contribute to non-compliance. The MVA Fund's current data on seat belt and child restraint use comes from hospitals and police reports after an accident. The police file these reports after investigating the cause of injuries in an accident, in which cases many victims report not wearing their seat belts. As this one subset is the only source of data, it may not accurately represent the driving habits of all drivers in Namibia.

This project addresses these research gaps by assisting the MVA Fund and AA in collecting data through the design and implementation of an **observational study** and **attitudinal survey**. The project team first assessed the current levels of vehicle occupant seat belt and child restraint use in the Khomas Region of Namibia, and analyzed the data collected to quantify current trends. The team found that child passengers and adult passengers in taxis had the lowest compliance rates of all populations analyzed. Next, using attitudinal survey responses, the project team identified low speed of travel, short length of trip, discomfort from wearing a seat belt, and perceived safety of sitting in the back seat as the most common reasons that people do not wear seat belts. The researchers also found self-reported compliance to be much lower in Namibia than in the United States. To address trends identified through survey and observation, the team recommended radio advertisements in various languages and informational stickers to target taxi drivers and passengers, as well as a child restraint donation and redistribution system for parents unable to afford child restraints. Additionally, the team proposed a future project to improve and expand the public transportation system in Windhoek in order to limit the unsafe transportation of workers in the city. An increased awareness of the importance of seat belt and child restraint use may contribute to safer roads and fewer motor vehicle accident casualties in Namibia in the future.

Chapter 2: Background

This background material supports the methods used to achieve our project goal of collecting data on seat belt and child restraint use. The chapter first discusses the statistics and history of seat belt use in the United States to provide a baseline for comparison to later information about Namibia. The United States has experienced a transition from minimal seat belt use to widespread use largely through educational campaigns and law enforcement efforts. As these strategies for increasing seat belt usage proved successful in the United States, they can provide valuable information on the best methods to tailor solutions to a particular location, like Namibia. The background then gives information about driving in Namibia, ranging from road conditions to behavioral statistics to investigate previous studies and findings on road safety in the country. A discussion of previous studies with important considerations and various methodologies for investigating public safety behaviors composes the last portion of this chapter. Through this discussion, the project team gathered relevant information on the creation of a successful observational study, attitudinal survey, and educational campaign to apply to this research project.

2.1 Driving & Road Safety in the United States

Over the last 60 years, the United States government worked to create safer driving practices across the country. During this time, the National Highway Traffic Safety Administration (NHTSA) enacted new laws that required all drivers and passengers to wear a seat belt to reduce the number of fatalities associated with driving. As a result, seat belts and child restraints, when used properly, have saved countless lives in the United States. The use of seat belts not only reduces injury and fatality rates but may also decrease the cost of compensation for insurance companies.

2.1.1 History

The invention of user-operated motor vehicles in the late 1800s forever changed transportation methods. Long distance travel became faster and more convenient than ever before. With convenience, however, came an increased risk of injury or death due to motor vehicle accidents. In the 1930s, physicians created a device to combat the rapidly rising rate of injuries in car crashes (see Figure 8 for this timeline). They designed a safety belt that differed from the modern seat belts we use today (see Figure 7A); it consisted of a single strap of woven fabric that crossed one's lap as opposed to the three-point, cross-body seat belts used in most modern-day vehicles. By the 1950s, car companies offered seat belts as an optional accessory for an additional cost. As shown in Figure 7B, the Swedish car company Volvo became the first car

manufacturer to utilize a three-point seat belt, a restraint that ran across the lap and chest, in 1959 (“Seat Belts”, 2015).

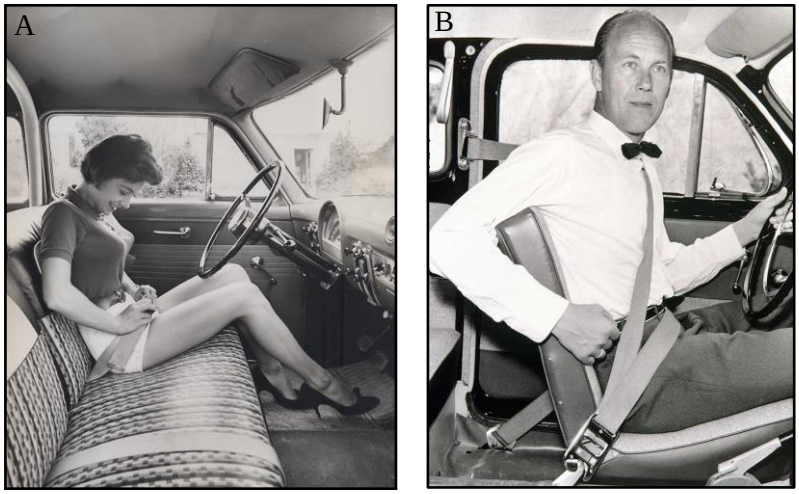


Figure 7: *(left) A. Young woman fastening a two-point safety belt, circa 1950 (pinterest.com) (right) B. Nils Bohlin, inventor of the three-point safety belt, demonstrating its use in 1959 (wired.com)*

Following the invention of seat belts, engineers focused on improving the safety of children in a vehicle with the development of the first child restraint by Ford Motor Company and General Motors in 1968. Automotive researchers originally developed child restraints to keep small children from moving around in a moving vehicle. By the 1970s, child restraints focused more on the protection of the child in the event of an accident. In 1971, the National Highway Traffic Safety Administration (NHTSA) issued the first standard for child restraints. This standard required vehicle manufacturers to provide a means to secure a child restraint through a lap seat belt. In 1973, General Motors went on to develop the first rear-facing child restraint for infants. Ten years after its publication, the regulation published by NHTSA expanded to include crash testing for all child restraints and buckle requirements. It required seats to withstand a crash at 30 mph and buckles needed to be childproof. By 1985, all fifty states, as well as the District of Columbia and Puerto Rico had adopted a child passenger safety law (Stewart, 2009).

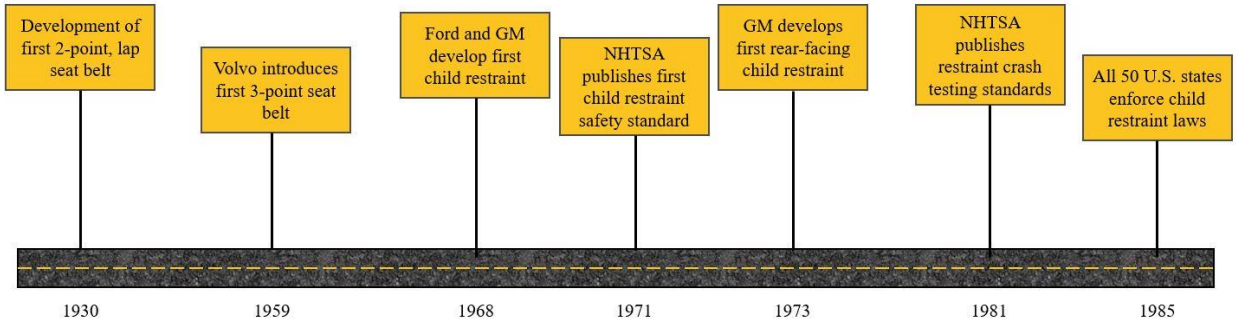


Figure 8: *Timeline of seat belt and child restraint improvements in the United States from 1930-1985*

2.1.2 Usage Statistics

Using a seat belt while in the car can be the difference between life and death in the event of an accident. After the enactment of the 1992 Motor Vehicle Safety Act whereby the federal government set and enforced standards for road safety in the United States, the rate of deaths per hundred million vehicle miles decreased by 3.7% in the first year (Robertson, 1996).

A study conducted by Youth Risk Behavior Surveys in 2006 analyzed seat belt use in American high school students who were at least 16 years old. The survey found that 59% of students always used their seat belt as a driver, while only 42% always used a seat belt as a passenger in a vehicle. Further analysis of almost 13,000 subjects found that among young black men, those with poor grades in school used their seat belts least. Among young women, seat belt use as a driver and as a passenger were 14.6% and 7.8% higher than their male counterparts, respectively. One speculation for the discrepancies between seat belt uses in this age group concluded that socioeconomic status was a contributing factor (Lambert, Goldzweig, Levine, & Warren, 2016).

Crash data from the NHTSA found a correlation between proper child restraint use and crash survival. The data found a 28% reduction in passenger death for children ages 2 - 6 properly seated in a restraint. Additionally, the results suggested that even improperly using a child restraint, such as failing to secure the restraint to the car seat or improperly buckling the restraint, resulted in a 21% reduction in passenger death. Researchers concluded that child restraints are necessary to protect children while in a vehicle. They urged that promotion of child safety continue so that proper child restraint use will increase in the future (Elliott et al., 2006).

2.1.3 “Click it or Ticket” Campaign

In 1993, the United States NHTSA started the Click or Ticket road safety campaign. The campaign began at the state level, but spread nation-wide. Click it or Ticket aims to increase the proper use of seat belts across the country through “short-term, high-visibility” law enforcement (MMWR, 2016). Periodically, police will issue a high volume of seat belt non-compliance citations over a short period. In some states, the laws tied to the campaign allow police officers to pull over and fine any vehicle occupant who is not properly wearing a seat belt. In other states, officers can only administer a fine after pulling over the driver for a separate offense.

Experts have largely deemed the campaign a success based on a resulting increase in public awareness and seat belt wearing rates. Nationally, the seat belt use rate increased from 75% to 82% from 2002 to 2005 following substantial Click it or Ticket advertising on television, radio, and billboards (see Figure 9) (NHTSA, 2009).

Figure 9: *Click it or Ticket campaign advertisement for the state of Delaware (Delaware.gov, 2014)*

2.1.4 Accident Insurance and Taxes

This section describes the compensation methods used by auto insurance companies in the United States. These compensation methods differ from those used by the MVA Fund in Namibia. See Section 2.3.3 for details of MVA Fund compensation methods.

To gather pertinent information on insurance company operations in the United States, one student researcher from the project team interviewed an insurance company employee. Per personal communication with Nicole Chretien, a vice president at MetLife Auto and Home Insurance, the law in the United States requires auto insurance for all drivers. In the event of an accident, the at-fault driver's auto insurance provides the primary source for medical coverage for any victims involved in the accident. Some drivers do not have auto insurance, generally due to financial instability. In the event of an accident in which the at-fault driver does not have auto insurance, the victim can sue the at-fault driver. The victim's auto insurance can pay for some medical costs if the at-fault driver cannot cover the costs of injuries to the victim. If the victim does not have adequate auto insurance, the victim's medical coverage would be the secondary form of payment and can cover the cost of the injuries (see Figure 10).

Auto insurance companies receive their premiums from the customers who buy the insurance policies. These policies fund insurance companies to pay for auto losses. All auto insurance policies have limits on coverage. In the event of an accident that goes beyond the limits of an auto insurance policy, some states have funds to pay for the excess medical costs. Funds can be obtained from taxes or fees charged to insurance companies.

Insurance companies generally support public education campaigns that attempt to educate people on matters that benefit the company, such as safety behaviors or public health. Insurance companies often fund public education campaigns or offer specific campaigns themselves (N. Chretien, personal communication, February 5, 2017). For example, Nationwide Insurance has a "learning center" on their website to educate people on preventing specific disasters or accidents. They dedicate a page to informing drivers on the best safety tips to follow

while driving (Nationwide, 2016). Similarly, Geico has a page titled “Why Should You Wear a Seat Belt,” which gives multiple reasons why drivers should practice safe driving and wear a seat belt (Cutruzzula, 2016). MetLife Auto and Home has a page dedicated to driving safety with children discussing child restraints (MetLife, 2017).

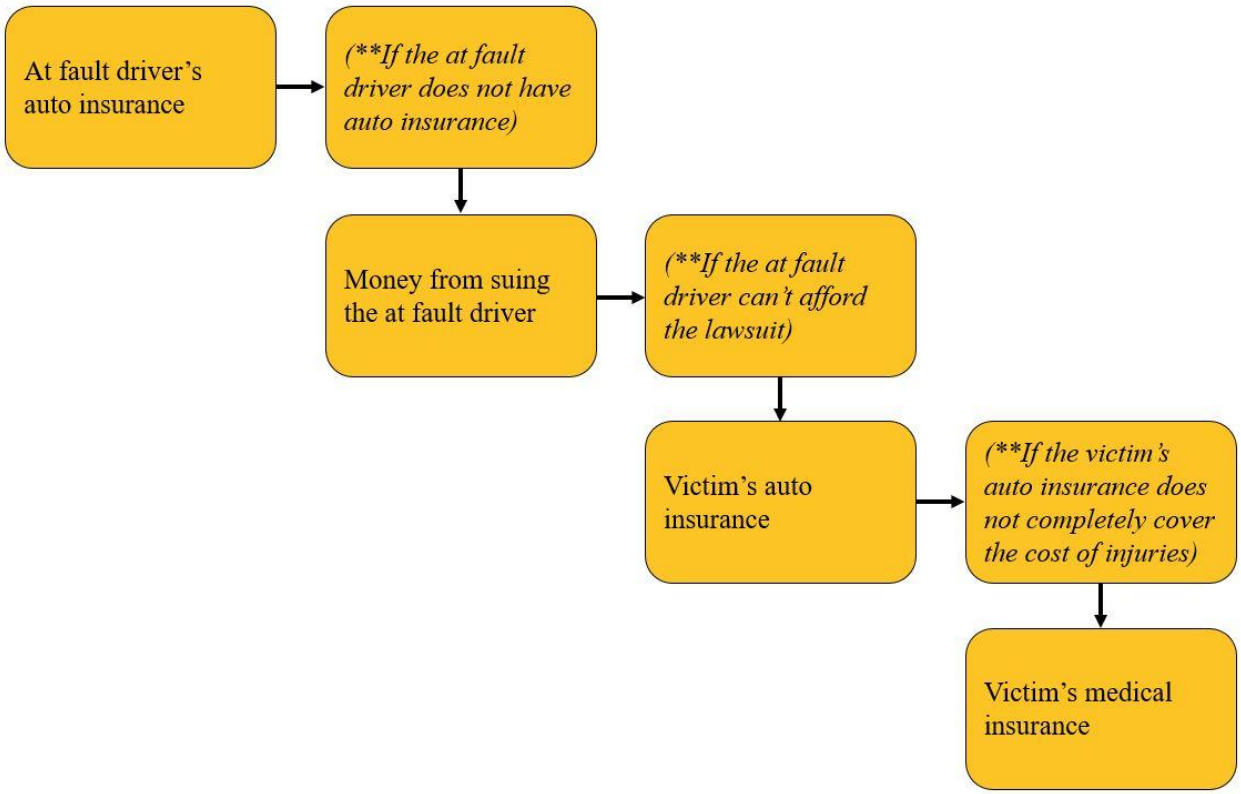


Figure 10: *Flowchart depicting the progress of the insurance coverage in the event of an automobile accident in the United States*

2.2 Driving in Namibia

To better understand and analyze driver and passenger motivations behind seat belt and child restraint use, the research team investigated driving in Namibia. Driving schools, manuals, and tests are the first formal driving educational opportunities for new operators. Through various means of driver education, these new drivers learn the laws and regulations enforced in Namibia, including seat belt and child restraint laws. To improve vehicle occupant safety by increasing compliance with such laws, Namibia must first educate its drivers on the necessity of using seat belts and child restraints.

According to figures published by the Roads Authority in Namibia in 2014, the capital Windhoek in the Khomas Region is home to approximately 150,000 registered motor vehicles, equivalent to 46% of Namibia’s vehicle population. High traffic congestion and high population density from the 325,000 residents in the city’s 645 square kilometers, contribute to the capital’s common head-on, sideswipe, and rear-end collisions. Figure 11 shows in June 2015, the accident

call center of the MVA Fund fielded 139 calls from the Khomas Region out of 321 countrywide road accident (Informante, 2015). The region also saw the highest number of injuries in that same month with 248 of the country's reported 603 occurring in Khomas (Graig, 2015).

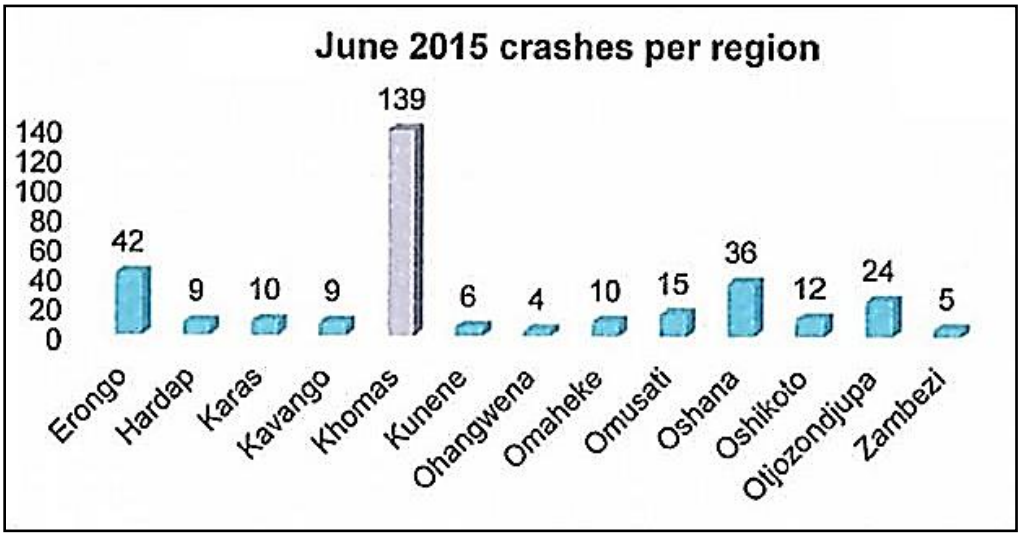


Figure 11: *Crash statistics for Namibia by region for June 2015 (Informante, 2015)*

2.2.1 Driver Education

Namibia categorizes learners' and driving licenses by codes to educate and permit drivers to operate specific vehicle types (Hamata, 2011). Table 1 and Table 2 summarize the license codes and corresponding age restrictions for motor vehicle driver authorization beginning at age 16.

Table 1: *Namibian learner's license codes with vehicle types and age restrictions*

Code	Vehicle Type	Age Restriction
1	motorcycles	over 16
2	small motor vehicles under 3500 kg	over 17
3	large motor vehicles exceeding 3500 kg	over 18

Table 2: *Namibian driving licenses with vehicle types and age restrictions*

Code	Vehicle Type	Age Restriction
A1	motorcycles with engine cylinder capacities not exceeding 125 cubic cm	over 16
A	motorcycles with engine cylinder capacities exceeding 125 cubic cm	over 18
B	motor vehicles weighing less than 3500 kg	over 18
C	motor vehicles weighing more than 3500 kg	over 18

To promote vehicle operator safety on the wide range of road conditions in Namibia, various driver education companies, such as the AA, offer classroom-style driver education to improve driver safety and preparedness for motor vehicle operation. Defensive driving is a key topic in driver education. Other important skills highlighted in driving schools are spatial awareness, steering control, decision-making, managing distractions, recognizing hazards, and quick reactions (Tjozongoro, 2016). Additionally, the same companies offer instructed driving hours and scheduled road observation to increase the extent of a driver's road experience in preparation for the driving test.

To take the learner's license test in Namibia, an applicant must show valid identification, complete an application, pass an eye exam, and pay any applicable fees at a local driving test center. The test covers rules of the road, traffic signs, traffic signals, road markings, and vehicle controls (Tjozongoro, 2016). Once the applicant passes the exam, the learner's license is valid for 18 months while preparing for the driving test (Hamata, 2011). There are several published learners and drivers test manuals to help applicants prepare for both license tests. These manuals cover road traffic signs, road safety tips, and road rules for cars, sedans, bakkies, trucks, and motorcycles (Tjozongoro, 2016).

2.2.2 Laws, Regulations & Enforcement

Law enforcement plays an essential role in maintaining safety in all communities. In Namibia, NAMPOL is the national police force. It dedicates a complete division to traffic law enforcement. Approximately 15 kilometers outside the country's largest cities and towns, NAMPOL stations roadblocks on major highways and roadways. At these roadblocks, officers can monitor driver identification, vehicle registration, rental documentation, and driver licenses; however, inadequate staffing and limited funding undermine the division's efficiency (Namibia 2016 Crime & Safety Report, 2016). With only 232 officers to serve 269,000 vehicles in the country, the division has one trained officer per 9,500 people and 1,200 vehicles. The traffic law enforcement division has insufficient equipment including breathalyzers, roadblock trailers, and

speed traps (Miyanicwe, 2013). They also lack long-range communication devices, which makes communication impossible in remote areas.

Namibian traffic laws cover a variety of situations to encourage and enforce driver and passenger safety. As of 2001, Namibian government legally requires seat belts in all new motor vehicles. Vehicle owners can only remove these belts if they install a replacement. The seat belt must comply with the South African Bureau of Standards 1080:1983 and display a certification marker (The Road Traffic and Transport Regulations, 2002). However, drivers can legally operate motor vehicles made before 1984 that do not have seat belts and do not need to install seat belts (Legal Assistance Centre, 2012).

Additionally, all children between the ages of 3 and 14 must use a seat belt or child restraint (Sherwood et al., 2006). Child restraints must comply with South African Bureau of Standards 1340:1985 and display a certification marker (The Road Traffic and Transport Regulations, 2002). Drivers can legally operate a vehicle without a child restraint if they secure the child in the car with a seat belt. If there are no child restraints or seat belts in the vehicle, the child must sit in the back seat of the car (Legal Assistance Centre, 2012). Failure to comply with any of these laws can result in a fine of up to N$2,000 (Self Drive Touring in Namibia: All You Need to Know, 2013).

2.2.3 Cultural Implications

While Namibia is an independent country that does not actively practice segregation, the lingering effects of apartheid are still apparent. When South Africa controlled Namibia, apartheid laws restricted black Namibians from many social and economic rights and political power (Dugdale-Pointon, 2002). Namibia no longer allows blatant discrimination, but black Namibians often do not have the same opportunities as whites. The land distribution in Namibia exemplifies this discrimination. Six percent of Namibians are white, but they own 90% of the commercial land. The blacks in the surrounding areas often work for the white farm owners (Talbot, 2005). White owners will often transport their black and colored workers unrestrained in the back of overcrowded trucks. Sometimes, the owners do not let their employees sit in the front seat even if a seat is available. Discrimination and inequality still exists in rural Namibia and contributes to unsafe driving practices (A. Eiseb, personal communication, March 27, 2017).

Because of the unequal distribution of land and other cultural factors, many black Namibians come to the capital, Windhoek, for work. Employers transfer workers in large numbers in the back of trucks and, though this is common in rural areas, it becomes more dangerous on the city's busy, paved roads. One law states that up to six adults may be transported unrestrained in the back of a truck. Originally intended for large farming families to travel and work together, employers manipulate the law to transport workers, often exceeding legal passenger capacity as shown in Figure 12. Employers will transport workers that live outside of Windhoek in the backs of trucks or vans because it is the cheapest option for both parties.

Figure 12: *Overcrowded truck in Windhoek*

2.2.4 Public Transportation

Namibia ranks among the least densely populated countries in the world, with 2.9 inhabitants per square kilometer (Porter, 2016). Population dwindles in the more rural areas of the country, which makes public transportation impractical. The only significant public transportation system in Namibia is the Windhoek bus system; however, this system has limited routes and capacity. At N$6 per ride, the buses struggle to compete with low-priced taxis that take passengers to any location in the city faster for a comparable rate of N$10 (Move Windhoek, n.d.) These factors inhibit the system's ability to support Windhoek's growing working-class population, who cannot rely on the frequently late buses to get to work on time (A. Eiseb, R. Lucy, personal communication, March 27, 2017). Since many workers do not own personal vehicles, they must get to work by paying for a taxi or using free, but often unsafe transportation provided by their employer (A. Eiseb, R. Lucy, personal communication, March 27, 2017).

The Move Windhoek campaign aims to address these issues to improve Windhoek's bus system. Their goal is to modify the current system into a viable travel option for the people of Windhoek by adding more buses, more routes, and more stops (Move Windhoek, n.d.). Move Windhoek interviewed one woman who pledged to use the buses for one month and shared her experiences on social media. When asked what improvements she wished to see, she replied, "As I took the bus, I have observed, passengers would often beg the operators/drivers to hop off at traffic lights, or yields, as the next bus stop would be too far from their destination" (Muleke, 2016). A more accommodating public transportation system in Windhoek would appeal to more riders and minimize the number of workers forced to use unsafe transportation provided by their employers.

2.3 Road Safety in Namibia

Understanding the safety of drivers and passengers in Namibia requires knowledge on road conditions and maintenance. Namibia's road conditions vary throughout the country and the government maintains the roads regularly to ensure safety. Agencies such as the MVA Fund and the AA take some of the responsibility to ensure that travelers are properly equipped on the road as well as appropriately compensated in the event of an accident.

2.3.1 Road Conditions

The easiest way to travel in Namibia is by car (Murphy, 2013). The road conditions in Namibia vary widely, from paved to dirt roads. Paved roads are typical in the more populated, developed areas while dirt roads connect rural areas (Country Reports, 2017). A system of paved roads runs through the country from the South African border to Angola. This system of roads often runs for many kilometers between gas stations, requiring travelers to arrange for sufficient fuel. Most areas in Namibia contain well-kept gravel roads (Murphy, 2013). Although road safety organizations, such as the Roads Authority, provide substantial maintenance for gravel roads (Roads Authority, 2011), they can often deteriorate during the rainy season, making them more dangerous than during the dry season. Additionally, tires often puncture on gravel roads due to the road texture (ASIRT, 2014). Many accidents occur when drivers exceed speed limits on poorly maintained dirt roads; therefore, the government set lower speed limits on gravel roads, approximately 80 km/h (45mph) (Country Reports, 2017). In cities and urban areas, the speed limit is 60 km/h (36 mph) while on open paved roads, the speed limit ranges between 100-120 km/h (60-75 mph). In school zones, the speed limit is 40 km/h (24 mph) (ASIRT, 2014).

Figure 13: *A typical B road in Namibia*

Figure 14: *A typical D road in Namibia (Virtual Tourist, 2011)*

Namibia uses the letters B, C, and D to label roads based on the conditions. B roads are national, paved roads (see Figure 13), C roads are wide, well-kept, gravel roads, and D roads have much rougher terrain (see Figure 14) (ASIRT, 2014). As described in section 2.3.2, road safety organizations provide general road maintenance to the roads in Namibia, including gravel roads. D-labeled roads are rough but can generally accommodate most vehicles; however, in Kaokoveld (see the region circled in green in Figure 16), only four-wheel drive vehicles can safely maneuver the D roads (Murphy, 2013). The paved roads generally consist of one lane in each direction, divided in the middle. Dirt roads make up many roads in Namibia as seen in Figure 15 and Figure 16, but the letter classification system distinguishes this large surface type into smaller subsets based on condition (Country Reports, 2017). 6,387 kilometers of the 45,387 kilometer road network are paved and very few roads have shoulders (ASIRT, 2014). Salt often covers the roads along the coast of Namibia, which makes them slippery during the morning and night mists.

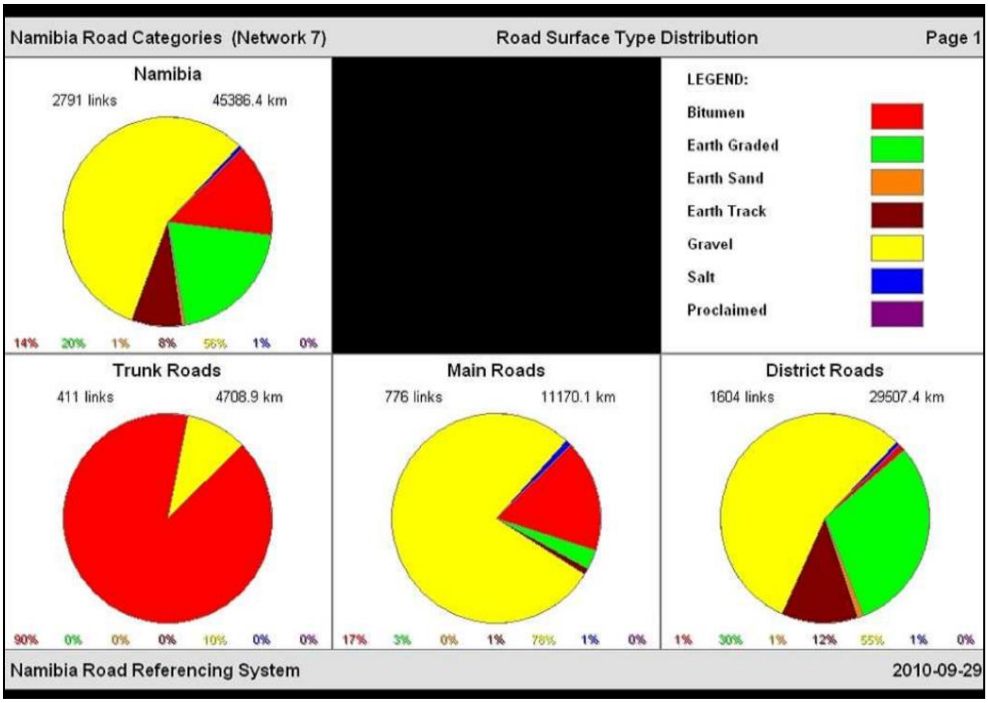


Figure 15: *Road surface type distribution of various road surfaces in Namibia by road location (Roads Authority, 2011)*

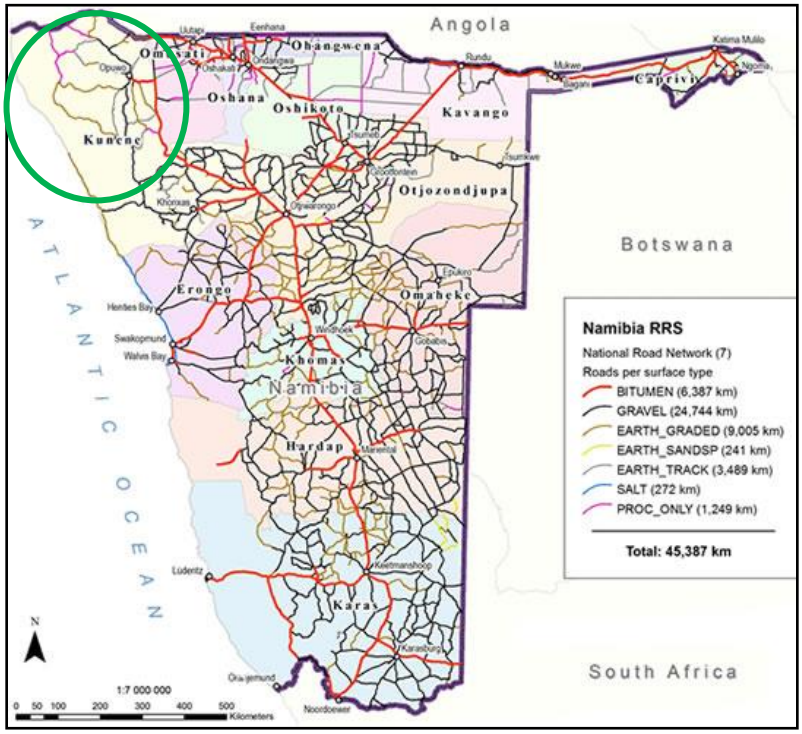


Figure 16: *Road surface type map with Kaokoveld, an area with rough D roads, circled in green (Roads Authority, 2011)*

2.3.2 Road Maintenance

General road maintenance and well-kept roads improve the safety of travelers. After Namibia's independence in 1990, the government set four goals: reduce inequalities in income distribution, eradicate poverty, create employment, and revive and sustain economic growth. To do so, the government considered the physical infrastructure of Namibia, including roads. Chapter 3 of the protocol on transport, communications and meteorology published by the Southern African Development Community in 1996 discusses road infrastructure in Namibia and states that maintenance and improvement to all roads is necessary to support economic growth in and around Namibia (Southern African Development Community, 1996). While the main goal of road maintenance is to provide economic stimulation, a beneficial byproduct is safer driving conditions in Namibia.

Currently, the government pays road maintenance contractors based on how much work they complete, but the new president of the Association of Southern National Road Agencies, Conrad Lutombi, would like this agreement to change. He states, "Because we want to bring efficiency and effectiveness into the management of the road network it is time now to move into long-term performance-based road management and maintenance contracts, which define minimum conditions of road assets that must be maintained by a contractor." Lutombi believes that this change will maintain the roads at a higher standard leading to road transport efficiency and lower transport costs to better stimulate the economy (New Era Newspaper, 2015).

Road maintenance and transportation efficiency are main responsibilities of the Roads Authority, a non-profit, mission-driven organization. They aim for Namibia's road network to surpass the country's economic needs by 2030. This organization provides much of the road safety in Namibia (Roads Authority, 2011). The Roads Authority also works with the MVA Fund and AA to improve roads and to keep the roads accessible and safe (J. Lutombi, personal communication, February 3, 2017).

2.3.3 The MVA Fund

The Namibian government founded the MVA Fund in 1991, one year after gaining independence from South Africa. The mission of the MVA Fund is to provide assistance and compensation to all people injured in road crashes, as well as the dependents of those killed. The organization relies on its core values of passion, excellence, teamwork, and integrity to implement crash and injury prevention measures (MVA Fund, n.d). The Ministry of Mines and Energy enforces a tax on gasoline, which provides funding to both the MVA Fund and the National Road Safety Council (NRSC). As of September 2013, the MVA Fund receives funds for each liter of gas and diesel sold at a rate of N$0.477 per liter (Windhoek Observer, 2016).

The MVA Fund consists of the following business units: Operations, Corporate Affairs, Legal Services, Finance, Human Relations, and Business Strategy (see Figure 17). Of these units, this project concerns the Operations unit. This unit processes claims filed with the MVA and

compensates victims involved in motor vehicle accidents. Additionally, this unit is responsible for accident and injury prevention as well as rehabilitation for injured persons (MVA Fund, n.d).

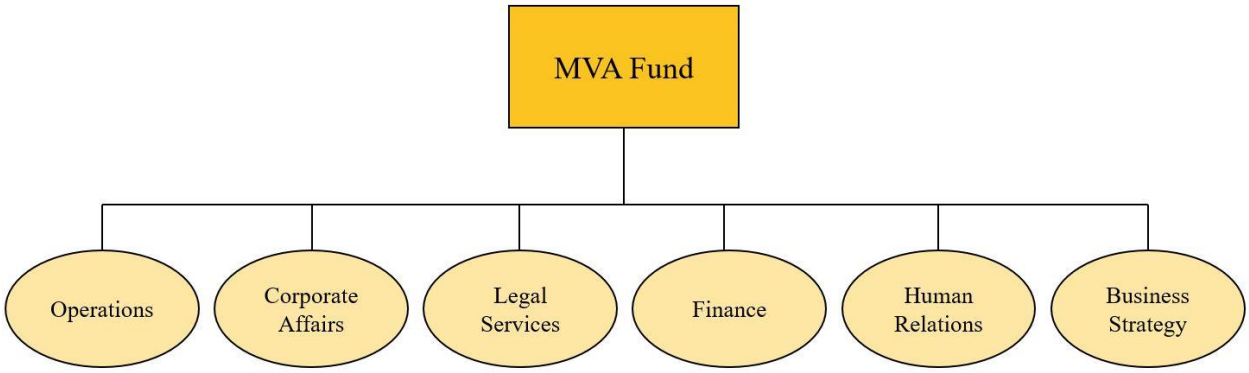


Figure 17: *MVA Fund business units*

2.3.4 The Automobile Association of Namibia

The AA began business operations in 1989. The main objective of the company is to provide motoring services and facilities to its members (AA Namibia, n.d.). Namibians must purchase AA membership to receive the associated benefits, which include driving school, vehicle inspection, towing, and emergency services. The AA is located down the street from the MVA Fund office in Windhoek, and the two organizations work closely together on many road safety issues (J. Lutombi, personal communication, February 3, 2017).

2.4 Driver Safety Issues in Namibia

This project collected data on vehicle occupant behavior in Namibia. A baseline assessment of road safety practices will help stakeholders, including the MVA Fund, AA, NAMPOL, NRSC, and Roads Authority, implement innovative methods for improving the habits of drivers. By understanding the environment and attitudes that led to such habits, these stakeholders can improve their impact on driver behavior and road safety. This section will discuss driving in the country and previous and ongoing efforts to educate drivers in Namibia, concluding with information on strategies for designing successful public education campaigns.

2.4.1 Attitudes & Awareness

The government of Namibia recently began efforts to address the nation's reputation as a dangerous driving destination. These efforts are concurrent with United Nations General Assembly resolution 64/255 (2010), which declared the 2010s as the "Decade of Action for Road Safety" (see Figure 18). The Legal Assistance Center in Namibia, LAC, reported the annual road injury fatality rate in Namibia as 31 deaths per 100,000 inhabitants, more than three times that of Europe (LAC, 2016). In May 2016, the LAC released a report proposing strategies for enhancing

road safety. The report responded to a February 2016 head-on collision between a truck and minibus in northern Namibia that resulted in 14 deaths.

Figure 18: *Official tag for the Decade of Action for Road Safety (FIA Foundation, 2011)*

The LAC's proposal references the 2014 Namibian Road Safety Management Bill; the intent of this bill is to provide for the establishment of a Road Safety Agency and Road Safety Fund. These institutions serve as the executing agency in relation to road safety education and promotion (Ministry of Works and Transport, 2014). Though the bill sets goals for teaching safe driving practices to drivers in Namibia, it does not outline a methodology for implementing this goal. Without a concrete education plan in place or reliable data to assess over time, it is difficult to gauge improvement in this area.

One course of action in progress now incorporates road safety training as part of grade school education. This practice aims to change the long-standing inclination for reckless behavior among Namibian drivers. According to the Minister of Works and Transport, Mr. Erkki Nghimtina: "The purpose of education is to change mindsets, attitudes and behaviors and to create a deep-rooted culture of road safety among all road users" (World Health Organization, 2010). By addressing the importance of this issue at an early age, officials hope to encourage the next generation of Namibians to prioritize road safety.

2.4.2 Drinking and Driving

Authorities in Namibia recognize the dangers associated with drunk driving, both to the driver as well as to passengers and occupants of other vehicles on the road. Violators of drunk driving laws face arrests and mandatory court appearances (Menges, 2010). Despite progressive laws prohibiting intoxication behind the wheel, drunken driving remains a prevalent problem among Namibian vehicle operators. When the MVA Fund collaborated with Namibian police in October 2016 for a road safety campaign, vehicle inspections at the town of Rehoboth showed that for every 20 vehicles stopped, just four drivers were sober (Shapwanale, 2016).

In a study by the NRSC of Namibia, for more than two-thirds of drivers involved in road collisions, police failed to indicate whether they had tested for alcohol intoxication on accident forms. Forms that did address this issue reported that the police only tested 30% of drivers (see Figure 19) (NRSC, 2016). The scattered nature of such testing renders an accurate statistical analysis of intoxication as a contributor to road collisions in Namibia impossible.

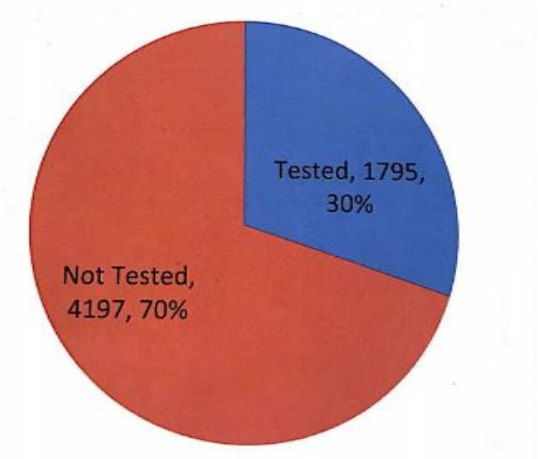


Figure 19: *Collision percentage of drivers tested for alcohol use in 2012 in Namibia (NRSC, 2016)*

2.4.3 Seat Belt and Child Restraint Use

Wearing seat belts is mandatory for all drivers in Namibia. Seat belts are also mandatory for passengers in the front and back seats of passenger vehicles. Despite these laws, non-compliance is common. Available data from crash survivors indicates a compliance rate of 60.4% among drivers, but only 17% among passengers (see Figure 20) (NRSC, 2016). By comparison, a 2001 study in Melbourne, Australia found that about 92% of all observed vehicle occupants in that city wore seat belts (see Section 2.5.1) (Whelan, 2001).

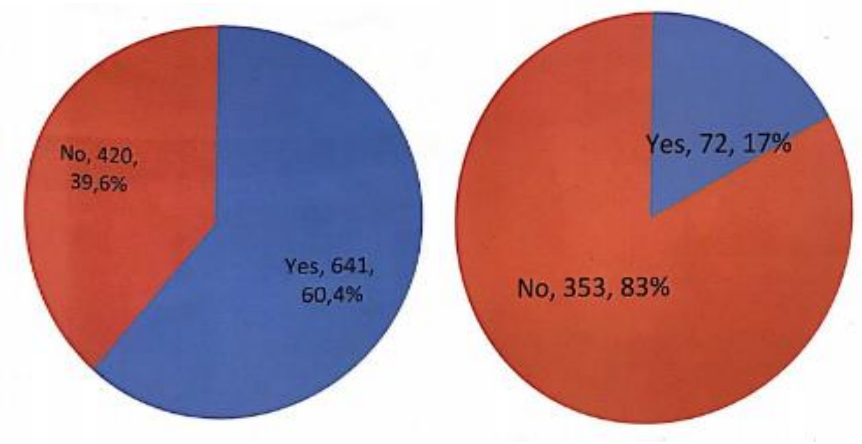


Figure 20: *Comparison of seat belt use among drivers (left) and passengers (right) in Namibia in 2012 (NRSC, 2016)*

Table 3, compiled using NRSC data, summarizes the likelihood of drivers and passengers suffering serious or fatal injuries in the event of a road accident (NRSC, 2016).

Table 3: *Comparison of injury severity among drivers and passengers in 2012 in Namibia (NRSC, 2016)*

	Drivers		Passengers	
Injury Type	Number	%	Number	%
Fatal	121	**34.8**	74	**50.0**
Serious	442		406	
Minor	1054	65.2	480	50.0
All	1617	100.0	960	100.0

As shown, 50.0% of injuries sustained by passengers classify as serious or fatal, compared to just 34.8% among injuries sustained by drivers. This statistic, coupled with the significantly higher rate of seat belt use among drivers compared to passengers, supports the claim that, “seat belt use is the most effective way to save lives and reduce injuries in crashes” (National Highway Traffic Safety Administration, 2015). An international study on seat belt use and attitudes provides evidence that informing the public on the importance of seat belt use can contribute to increased wearing rates (see Section 2.2.3) (Steptoe et al., 2002).

2.5 Relevant Previous Research

Various institutions and organizations previously conducted studies relevant to the goals and methodology of this project. The Accident Research Center of Monash University in Australia performed a roadside observation study in 2001 to establish a benchmark for road safety. This project used the Monash study as a model to design a successful roadside study in Namibia. In 2002, the Economic and Social Research Council of the United Kingdom investigated the effectiveness of governmental efforts to inform the public of the importance of seat belts. The organization used results from a questionnaire to measure trends in seat belt use from 1990 to 2000. It sampled university students in fourteen European countries. These results guided this project to suggest and implement public education measures aimed at improving road safety in Namibia. While these efforts may not be directly applicable to Namibia, the study also analyzed the assessment and tailoring of public education measures to fit the various needs of a country. The Global Road Safety Partnership, GRSP, conducted a questionnaire in 2009; this survey assessed public attitudes towards seat belt use and collected reported wearing rates from people in Namibia. The GRSP used a written survey to collect data through roadside observation.

The methods and goals of the GRSP survey showed similarities to our research study. The following sections describe these three important studies in detail.

2.5.1 Monash University Accident Research Center Roadside Observation Study (2001)

In 2001, researchers at Monash University Accident Research Centre in Melbourne, Australia conducted a roadside observation study to establish a benchmark of safety on Melbourne roads. The study addressed the lack of data on driver and passenger behavior in Australia. It reported on several safety indicators, including seat belt and child restraint usage, by drivers, motorcyclists, and bicyclists. The benchmark study collected 4,665 observations at multiple intersections over a two-month span. The researchers selected five sites based on optimal visibility for recording observations. Each intersection needed a traffic light, a high traffic volume, and a speed limit of 60 kilometers per hour to allow for the most accurate data collection.

Before beginning the study, all involved researchers completed education and training on vehicle classification and age estimation to improve data quality. Then, the researchers designed a checklist-style survey to evaluate each vehicle and its occupants for the needed data systematically. They included all vehicles stopped in the left-hand lane of the intersection and completed a checklist for each one. They worked in pairs to assure safety and to increase data validity. They also carried explanatory statements for anyone that initiated contact with questions or concerns about the study. The statement emphasized the importance of the data collection and assured anonymity for all subjects surveyed. It also included contact information for the University Standing Committee on Ethics in Research Involving Humans and a project worker for ethical concerns or survey results (Whelan, 2013).

As presented in the findings of the study, 7% of the 6,570 occupants surveyed failed to wear their seat belt or used it incorrectly. The report also quantified the most common errors of seat belt usage and correlated various subject demographics with seat belt use rates. Additionally, the study found that adult occupants incorrectly restrained or failed to restrain 21.6% of 637 child passengers (Whelan, 2013). As a result, the research team proposed that the traffic safety community should address seat belt and child restraint use with enforcement, education, and advertising campaigns.

2.5.2 Seat Belt Use, Attitudes, and Changes in Legislation: An International Study (2002)

In 2002, an international study conducted by the Economic and Social Research Council of the United Kingdom suggested steadily increasing seat belt use over a period of ten years. The analysis aimed to prove that change in legislation and attitudes toward motor vehicle safety translated to higher seat belt use. University students from fourteen countries participated in an anonymous questionnaire to assess their driving behavior. The study surveyed 10,576 people in

1990 and an additional 10,294 people in 2000. Figure 21 shows survey, results from fourteen countries that indicate an increase in seat belt over a course of ten years.

	Men			Women		
Country (*n*)	1990 % (95% CI)	2000 % (95% CI)	Change %	1990 % (95% CI)	2000 % (95% CI)	Change %
Belgium (1750)	77 (73–80)	69 (64–74)	−8	81 (78–84)	83 (78–88)	+2
England (1560)	88 (83–93)	83 (79–87)	−5	92 (88–96)	89 (85–93)	−3
France (1414)	88 (83–93)	88 (84–92)	0	88 (84–92)	95 (91–99)	+7
Germany (1518)	81 (77–85)	70 (66–75)	−11[b]	89 (85–93)	83 (79–87)	−6
Greece (1462)	27 (22–32)	55 (51–59)	+28[b]	28 (23–32)	60 (56–64)	+32[b]
Hungary (1341)	64 (59–68)	74 (68–79)	+10[b]	62 (58–67)	72 (68–77)	+10[b]
Iceland (1476)	73 (69–77)	76 (72–81)	+3	85 (81–89)	92 (88–96)	+7
Ireland (1254)	75 (71–80)	85 (77–93)	+10	75 (72–79)	86 (81–90)	+11[b]
Italy (2833)	46 (42–50)	53 (51–56)	+7[b]	45 (41–49)	55 (52–57)	+10[b]
Netherlands (1433)	83 (78–88)	83 (79–88)	0	92 (88–95)	89 (85–93)	−3
Poland (1554)	25 (20–29)	72 (68–77)	+47[b]	24 (19–28)	81 (77–85)	+57[b]
Portugal (1790)	31 (26–35)	92 (89–96)	+61[b]	30 (26–34)	96 (92–99)	+66[b]
Spain (1283)	55 (51–59)	81 (75–86)	+26[b]	57 (53–61)	79 (74–84)	+22[b]
USA (1672)		72 (68–75)			87 (84–89)	

Figure 21: *University student self-reported seat belt use in 1990 and 2000 (Steptoe et al., 2002)*

Many men and women in the countries involved in the survey increased their seat belt use over the ten-year period (Steptoe et al., 2002). Between the two genders, females reported a 3% higher rate of seat belt use than males. The study also investigated whether respondents believed seat belts were useful. Over the duration of ten years, an increasing majority of people reported that wearing their seat belt was an important aspect of driving and it would protect them against injury or even death. Participants assigned their level of belief with a number on a scale from 1-10, 10 corresponding to a respondent's strong belief that seat belts are of high importance, as shown in Figure 22.

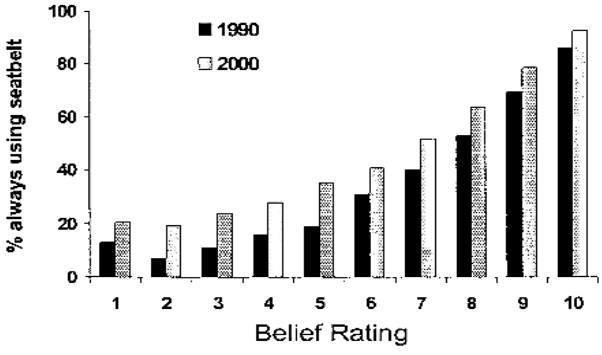


Figure 1. Proportion of respondents with belief scores at each level of the ten-point rating who report always using a seat belt.

Figure 22: *Belief scores between 1 and 10 vs. how often seat belts are worn (Steptoe et al., 2002)*

This study concluded that government attempts to educate the public about seat belt use were responsible for the increase of use within the ten-year period. Three of the countries that experienced the highest growth in seat belt usage also adopted new laws regarding seat belt use.

Not only did the governments of these countries succeed in educating their citizens regarding the new jurisdiction, but they also succeeding in shifting public attitude toward seat belt use overall (Steptoe et al., 2002).

2.5.3 Global Road Safety Partnership: Seat Belt Wearing Baseline Situation Assessment (2009)

In 2009, Mike Winnett of the Global Road Safety Partnership (GRSP) authored a study on seat belt attitudes and compliance in Namibia. He collected data via a questionnaire handed out at various locations in ten towns throughout the country. The results of the study suggest that in Namibia, awareness of the importance of using seat belts is extremely high; 98.4% of those surveyed answered "yes" when asked, "Do you believe that it is beneficial to always wear a seat belt when travelling in a vehicle?" (Winnett, 2009). Despite this, only 64.7% indicated that they always wear a seat belt when traveling in a vehicle, with 30.5% answering "sometimes". Common reasons given by respondents for not wearing a seat belt included "a vehicle is not equipped with seat belts", "It is safe to sit in the back seat - I do not need to wear my seat belt", and "Wearing a seat belt is uncomfortable" (Winnett, 2009). The study also noted that self-reported wearing rates significantly exceeded the wearing rates observed by the NRSC (see Section 2.4.3 and Figure 23).

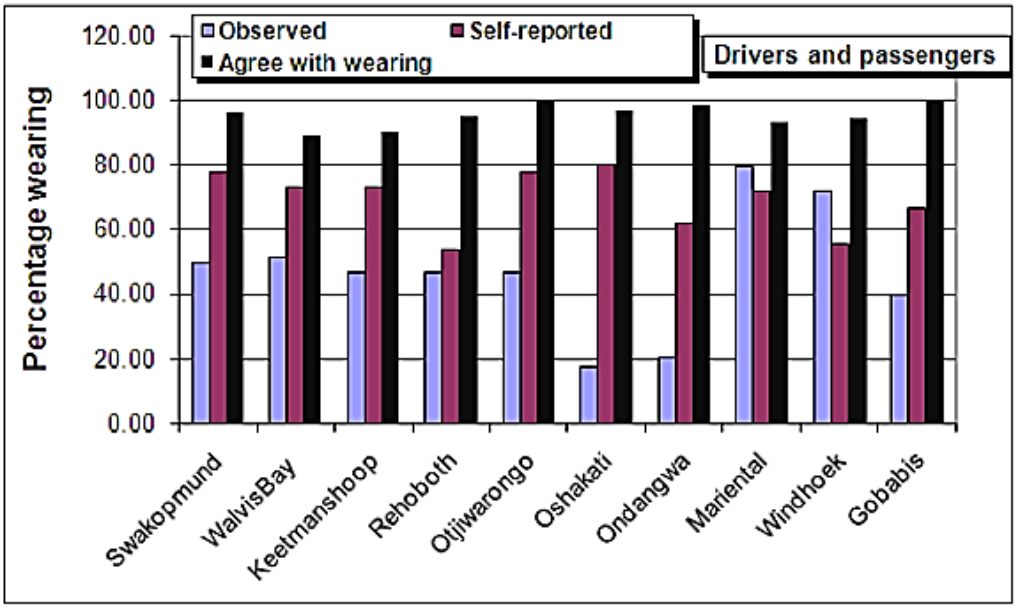


Figure 23: *Comparison of observed and self-reported seat belt wearing rates by city/town (Winnett, 2009)*

Furthermore, the survey asked if drivers had a child under the age of 12. Of the 1067 respondents, 50% had a child younger than 12 years old. The following question asked respondents if they restrained child passengers when traveling in a vehicle. Only 21.4% responded to the survey with child passengers were "always buckled up". Additionally, 21.1% of

responses indicated children were “placed on an adult’s lap”. Only 5.5% of responses reported children were “always placed in a baby car seat, suitable for the child’s weight and age”.

This GRSP study is relevant to this project as it shares many of the same objectives. Both projects aim to assess public attitude toward seat belt and child restraint use in Namibia, collect baseline data on wearing rates, and determine potentially effective methods of public education to increase usage. The projects differ, however, in methodology; the GRSP collected data through a written survey while this project will collect data via visual observation and written survey.

2.5.4 Successful Public Education Campaign Techniques

Successfully developing public education campaigns requires obtaining knowledge regarding the aspects of the campaigns that lead to success. Understanding this information will benefit development and implementation of a successful public education campaign in Namibia.

According to a study done on the effectiveness of mass media campaigns for reducing drinking and driving and alcohol-involved crashes, message content and message delivery are important factors in the design and implementation of a public education campaign (Elder, 2004). Common message content includes specific themes emphasized to motivate the public to change their behavior. In the study by Elder et. al., the campaign used themes such as fear of arrest and fear of harm to self to inspire the public to consider the implications of their actions when drunk driving. Similarly, the study also suggests creating a certain amount of anxiety in the viewers of the public education campaign. Too much anxiety is undesirable and can cause the subjects to ignore the encouraged behaviors, but some anxiety is beneficial when trying to change public behavior (Elder, 2004). Utilizing this theory, many driver education programs across the United States show the well-known driving video “Red Asphalt”. This short film gives a vivid portrayal of the consequences of ignoring traffic laws, including wearing a seat belt. This video uses fear as the main motivator to reach the audience and frighten them into following traffic laws. At the beginning of the film, the host gives a disclaimer that the movie crew did not enjoy making the film and does not expect the viewers to enjoy it either (Smith, 2006). A multitude of commercials and awareness ads about seat belts and other laws surrounding operating a motor vehicle use fear or sadness as the primary motive to ensure the desired behavioral change in the public.

Although fear was the most effective motivator for that study, other motivators can capture public attention. Any emotion-evoking message, targeting fear, sadness, or hope, can prove effective. The message must simply inspire the public into action. Even simple motivators, such as an insurance company informing the public that safe drivers receive discounts can suffice (N. Chretien, personal communication, February 5, 2017). A campaign executed in Costa Rica promoting the use of seat belts took a different approach. It attempted to educate the public via media through positive police enforcement. Instead of pulling vehicles over and ticketing drivers, police educated drivers by offering campaign materials and safety advice (Por Amor, 2003). This

campaign took a gentle approach and yielded promising results, increasing the percentage of seat belt compliance from 24% to 82% (Road Safety Toolkit, 2010).

The content of a public education campaign is important, but useless without an effective delivery strategy. The successful public education study by Elder et al. also stresses that message content must be comprehensible by the target audience. The appearance frequency of the campaign is another important aspect to consider. Increasing the population's exposure to the campaign helps the register the message more thoroughly. Production quality and distribution location are crucial to the effectiveness of the public education campaign in eliciting the desired outcome and response from the target audience.

According to the Elder et al. study, pretesting the content and delivery is an important technique to consider when creating a public education campaign (see Figure 24). Pretesting ensures that the audience perceives the campaign in the desired manner. The study uses an example of a campaign to prevent alcohol-related problems by promoting drinking in moderation. The campaign author, Lawrence Wallack, did not pretest the visual, and the viewers thought that the campaign ads promoted alcohol consumption. Pretesting helps gauge audience reactions and identify needed improvements (Elder, 2004).

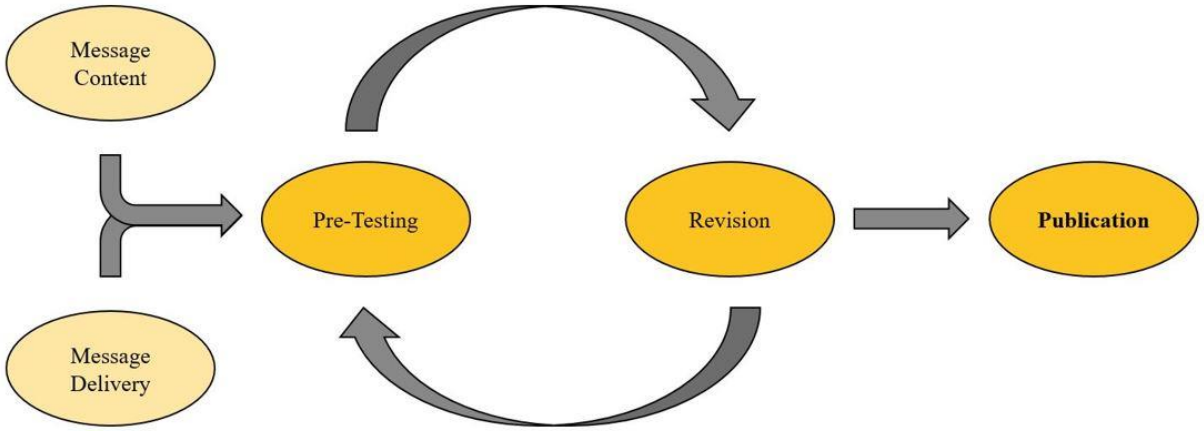


***Figure 24**: Flowchart of public education campaigns*

2.5.4.1 Addressing Common Reasons for Non-Compliance

A successful education campaign must first consider potential resistance from the public. The proposed campaign should anticipate this resistance and address it in a constructive manner to maximize the impact on the target audience (Elder, 2004).

Even though 98.4% of drivers in Namibia agree that it is beneficial to wear a seat belt while traveling in a vehicle, far fewer drivers do so in practice (Winnett, 2009). The respondents of a 2009 survey distributed by the Global Road Safety Partnership, discussed in more detail in section 2.5.3, gave many reasons for not wearing a seat belt. Table 4 shows the most common responses.

Table 4: *Common reasons for not wearing a seat belt (Winnett, 2009)*

Reason for Not Wearing Seat Belt	% of Respondents
Many vehicles are not equipped with seat belts	31.0
It is safe to sit in the back seat without a seat belt	22.0
Seat belts are uncomfortable	19.0
It is safe to travel short distances without a seat belt	13.7

Other respondents said they do not wear seat belts: when no one else is doing so; while traveling at low speeds; while traveling in town; or due to the belief that wearing a seat belt increases the likelihood or severity of injury in the event of a crash (Winnett, 2009).

Despite overwhelming evidence that seat belts minimize the risks associated with vehicle operation, many drivers oppose laws mandating their use. Opponents of seat belt legislation cite such laws as a violation of civil liberties. Among these opponents is Walter E. Williams, a libertarian economist from George Mason University. He believes that, "People have the right to take chances with their own lives. People do not have a right to take chances with the lives of others." (Williams, 2016). He argues that since failure to wear a seat belt puts only that occupant in danger, individuals should have the freedom to choose. Williams also questions the government's decision to obstruct certain liberties while allowing others: "The point is whether government has a right to coerce us into taking care of ourselves. If eating what we wish is our business and not that of government, then why should we accept government's coercing us to wear seat belts?" (Williams, 2016).

Critics of seat belt laws have also cited that seat belts are medical devices designed to ensure health and safety. The government, then, has no more right to force seat belts on its citizens, as doctors have to force treatment on their patients (Holdorf, 2002). Another school of thought claims that, in a prohibited deal with the United States Department of Transportation, automakers pushed mandatory seat belt use into law in hopes of saving money on more expensive passive restraints, such as airbags (Holdorf, 2002).

Advocates for seat belt legislation often counter these arguments by citing the government's responsibility, "to pass laws that promote public health, safety, and welfare" (Fazzalaro, 1998). Supporters of the laws may also reject the assumption that failure to buckle up only affects the individual, suggesting that unrestrained vehicle occupants are more likely to lose control of the vehicle and inflict injury upon other occupants. Some feel that government is justified in its concern over the societal costs of those injured by preventable road accidents (Fazzalaro, 1998).

2.6 Summary

All over the world, people rely on motor vehicles as one of the fastest and most convenient modes of transportation; however, road accidents are among the top ten causes of death globally (The Top 10 Causes of Death, 2017). The correct use of seat belts and child restraints worldwide can significantly decrease the number of injuries and fatalities in traffic accidents. To improve the safety of drivers and passengers of motor vehicles, transportation and road safety organizations in Namibia, like the MVA Fund, and AA, collect data on compliance rates to encourage the public to use seat belts and child restraints.

In Namibia, law requires all motor vehicle occupants to wear seat belts; however, adaptations to the law allow for unrestrained passengers in specific cases. With these regulatory discrepancies, motor vehicle occupants fail to use seat belts and child restraints consistently. In addition, public transportation in Namibia's capital city, Windhoek does not meet the current needs of its citizens; public buses offer limited routes and often run behind schedule. To commute to work quickly and cheaply, employees often travel through the city unrestrained in the beds of trucks. These factors combined with high vehicle density and traffic in the city contribute to higher risk travel for motor vehicle occupants.

To address low seat belt compliance, the United States encouraged correct seat belt and child restraint usage through public education campaigns tailored specifically toward the American public. These campaigns, like "Click It or Ticket", contributed to increased seat belt compliance throughout the country. Methods employed by successful public education campaigns and the gathered information on driving and road safety in Namibia offer important considerations to evaluate and improve the national seat belt and child restraint compliance rate.

Chapter 3: Methodology

This project determined the level of seat belt and child restraint usage in the Khomas Region of Namibia through the design and implementation of a roadside observation study, in coordination with the MVA Fund and AA. The project team broke the project down into the following objectives:

1. Collect data on current levels of proper vehicle occupant seat belt and child restraint use in the Khomas Region of Namibia
2. Analyze the collected data to quantify seat belt and child restraint usage levels
3. Identify common reasons car, taxi, and truck occupants in the Khomas Region of Namibia do not use seat belts and child restraints
4. Recommend methods to encourage the public to use seat belts and child restraints properly.

3.1 Collect Data on Current Seat Belt & Child Restraint Use

To understand current seat belt and child restraint use in the Khomas Region of Namibia, the research team conducted an observational study. Initially, the proposed project spanned four regions in Namibia; however, financial considerations and time constraints restricted the project scope to survey seat belt and child restraint use in greater Windhoek and the Khomas Region. An observational study collects data from a sample population to find a correlation in behavior when the observer has no control of the subjects. While there are many independent variables that researchers cannot control when performing an observational study, such as sampling diversity, this method eliminates the potential bias of self-reported seat belt and child restraint use. A drawback to the study is a degree of human error while observing vehicles. For example, age estimation may vary from one team member to the next. Another drawback in the design of this study is that data collected solely in the Khomas Region may not yield results applicable to the entire country of Namibia.

Team members conducted this study using web-based surveying software with offline capabilities. The team then used this software to create an easy-to-understand database of information for use by the MVA Fund and AA, as well as recommendations for potential public education materials. Although there have been previous attempts at collecting data on seat belt use, the collection of child restraint use data is the first of its kind in Namibia. Therefore, this project aimed to improve on previous methods of seat belt data collection and provide a new benchmark for child restraint data collection.

3.1.1 Design an Observational Study

The design of this project's observational study emphasized speed and efficiency to limit the time vehicles stopped for observation. These observations provided data on driver demographics, as well as the vehicle occupants' seat belt and child restraint use.

The research team explored the possibility of implementing observational technology to assist in data collection. The Republic of Namibia enforces several privacy laws that protect citizens from unconsented surveillance (Privacy International, 2015). Based on sponsor feedback, the team deemed visual observation, without video technology, legally and ethically acceptable. The project team did not take any surveillance and did not collect personal information due to the incriminating behavior studied. This method of data collection did not cost the sponsor additional funds for surveillance equipment such as cameras.

3.1.2 Collect Observational Study Data

The team collected data by roadside observation using software produced by Qualtrics. The software provides the user with an easy-to-use and customizable template for survey creation. It allows offline use, so a location that lacks Wi-Fi access can still serve as a suitable site for the study. The offline services provided by Qualtrics enable the user to record data and subsequently upload the data online when an Internet connection is available. Each team member downloaded the Qualtrics Surveys application on his or her respective mobile device (see Figure 25). Although only one team member utilized the application at a time during the observational study data collection, the application was available on multiple devices in the event of a technical issue. The observation team members pre-downloaded the data collection form onto their devices using a single Qualtrics account before traveling to an observational study site. From that single Qualtrics account, all responses automatically uploaded to the same database.

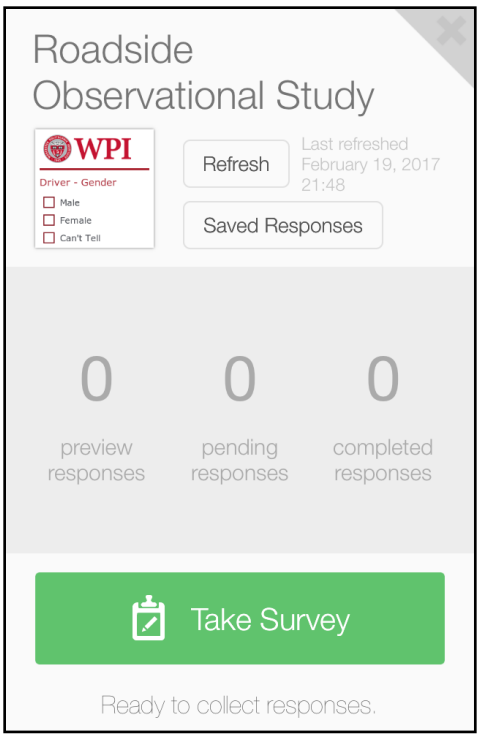


Figure 25: *Image of downloaded roadside observation study on the Qualtrics mobile application in offline mode*

The initial observations for the study collected vehicle type and driver demographic data. The team categorized vehicles as a car, any four-wheeled vehicle designed either to seat less than eight passengers, or a truck, any four-wheeled vehicle with an open bed. Later, the team added taxi as a third vehicle type option. Observers can easily identify Windhoek taxis by large alphanumeric labels on the side and back of the vehicle. The investigators excluded vans from the observational study because gathering visual information on the many passengers travelling in vans proved difficult. The observers noted information such as age and gender of the driver as these details could prove pertinent to the design of educational materials following the observational study.

The next portion of the observational study related to seat belt use of the vehicle occupants. If there were no passengers other than the driver in the car, the collection form ended. If there were passengers other than the driver in the car, the form continued regarding the occupants in the car and recorded if they were properly using a seat belt or a child restraint. ‘Properly using a seat belt’ implies that an adult or child occupant of the car has buckled a seat belt correctly across the lap and the shoulder. ‘Properly using a child restraint’ means that an adult or other occupant correctly buckled the restraint so that the child has limited mobility. The team determined a child to be any passenger approximately under 25 kg and under one meter tall. The project team conducted a test run of the Qualtrics data collection software and made any necessary changes to increase speed and efficiency. Appendix A shows the complete data collection form.

With proper coordination, the four team members gathered and recorded all information quickly at the corner of an intersection with a stoplight or stop sign. NAMPOL agreed to provide a police officer at all locations so the team could observe in a safe environment. The four team members stood together at the corner to allow for easy vehicle observation and communication between team members. At all sites except the final location, the observers wore yellow vests provided by the AA to ensure safety. To investigate any possible influence of these vests on motor vehicle occupant compliance, they did not wear vests at the last observation site and compared the results. The project team assigned specific vehicle and occupant observations to three team members. They communicated these observations to the fourth team member, who input the information into the application as shown in Figure 26.

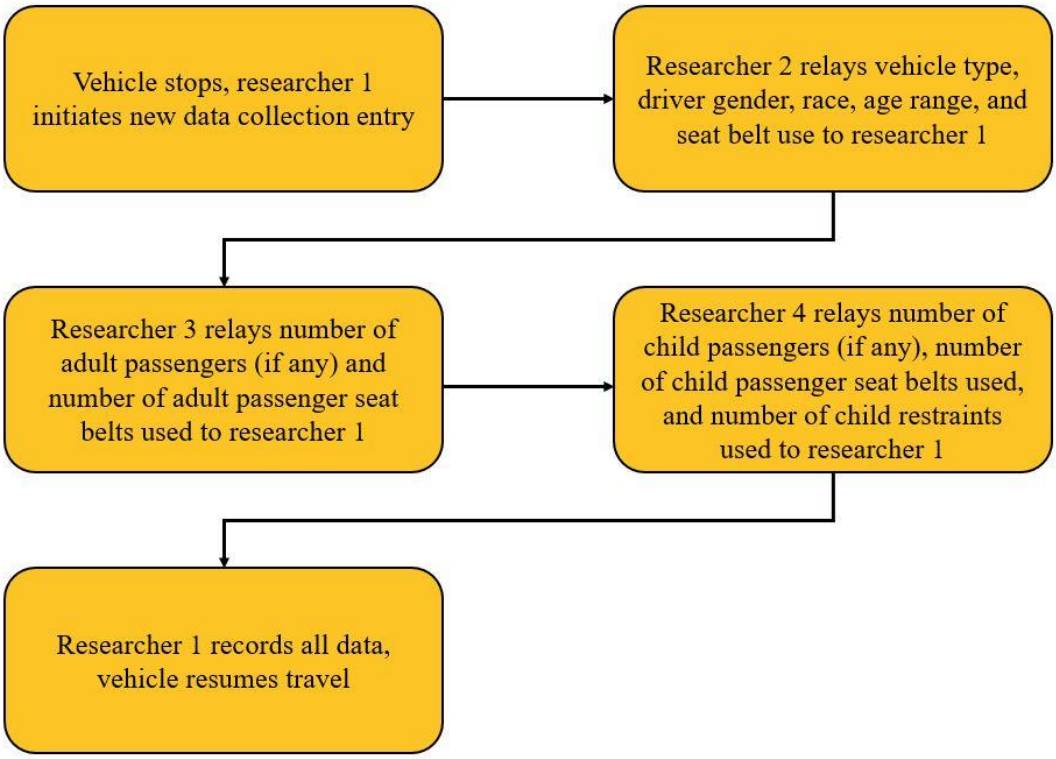


Figure 26: *Roadside observational study process*

After the researchers gathered all pertinent study information, the Qualtrics application stored all data for the vehicle in the mobile device. Once the team arrived at a location with Wi-Fi and Internet access, they uploaded the results to a computer.

3.1.3 Select Observation Sites

Namibia consists of multiple regions with varying populations and road environments, such as rural and urban areas. The team researched and surveyed locations to ensure that the data collected included a range of these environments. The project team discussed the selection of the survey sites and the frequency of observation early in the seven-week project period. At the request of the MVA Fund and AA, the team worked with NAMPOL at the selected observation

locations to provide a safe observation environment. Factors considered when selecting locations included:

- Is it safe to collect data at the selected location?
- Will a statistically significant number of vehicles pass the selected location?
- Does the study represent various communities?
- Does the chosen site skew the sample population based on demographic or cultural trends?

Initially, the sponsors suggested traveling to four regions throughout the country to survey including the Kavango, Ohangwena, Erongo, and Khomas Regions. After financial considerations for travel and overnight accommodations, the sponsors and research team agreed to conduct the observational study in only the **Khomas Region**, located in the center of the country. The region possesses the highest vehicle density in the country as well as the most number of crashes in the country. This region includes both offices of the MVA Fund and AA in the nation's capital city, Windhoek. Due to the high motor vehicle population in this region, data collected in the Khomas Region represented urban driving environments; however, this regional data collection may not accurately represent all of Namibia. To draw conclusions for compliance levels throughout the entire country, data collection should include additional regions as well. Figure 27 highlights the location of the Khomas Region in the country.

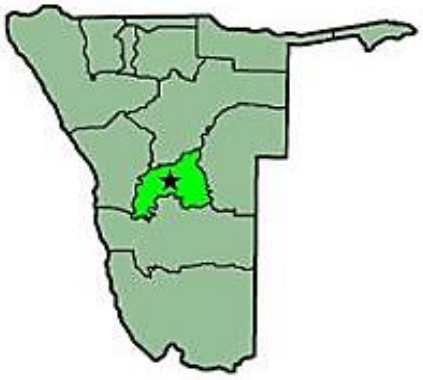


Figure 27: *Khomas Region of Namibia, highlighted in light green, and the country's capital Windhoek, marked by the star (Wikipedia, 2002)*

The team selected six intersections to survey based on recommendations from the AA. These intersections spread across Windhoek enabling the observation team to easily access the locations as well as limit costs for travel. Table 5 lists these intersections and Figure 28 shows their location within the region.

Table 5: *Selected roadside observational study intersections*

Number	Intersection of…	and…
Intersection #1	Otjomuise Rd.	Sam Nujoma Dr.
Intersection #2	John Meinert St.	Hosea Kutako Dr.
Intersection #3	Wilibald Kapuenene	Hans-Dietrich Genscher St.
Intersection #4	Mandume Ndemufayo Ave.	Fidel Castro St.
Intersection #5	Monte Christo Rd.	Hereford St.
Intersection #6	Sam Nujoma Dr.	Independence Ave.

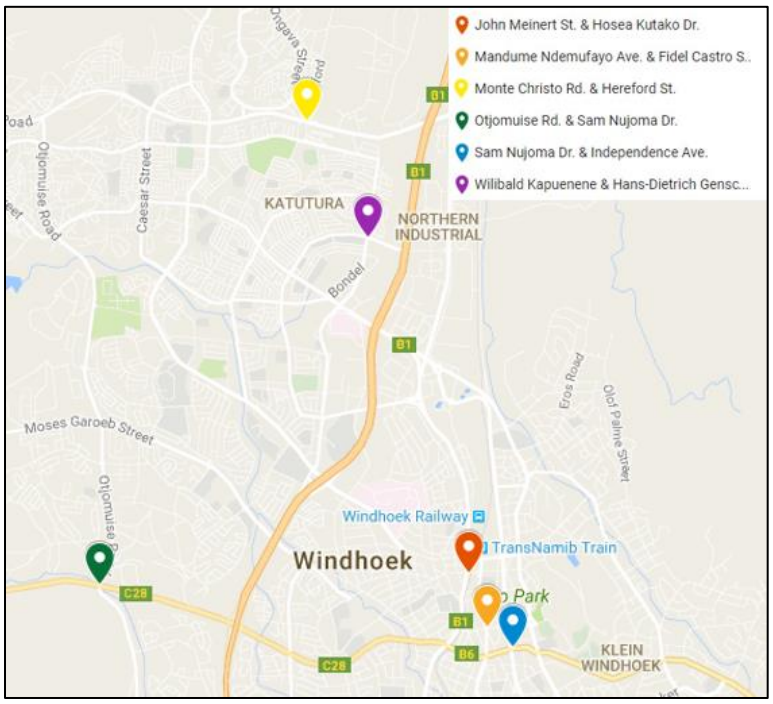


Figure 28: *Map of six selected roadside observational study intersections*

The intersections of John Meinert Street and Hosea Kutako Drive, Mandume Ndemufayo Avenue and Fidel Castro Street, and Sam Nujoma Drive and Independence Avenue are in business districts, which limited the number of children and child restraint entries collected. To combat this, the team selected five primary schools in the Khomas Region to increase the sample size when collecting child restraint data. The five schools represent different constituencies of Khomas, including Katutura East, Moses Garoeb, Windhoek East and Windhoek West. Table 6 refers to each school and its address while Figure 29 shows each location. The observers collected data at the schools in the same manner as the intersections.

Table 6: *Selected primary schools and addresses in Windhoek, Namibia*

School Name	Location
M.Garoeb Primary School	Etetewe, Windhoek
People's Primary School and Creche	Hans Uirab St, Katutura, Windhoek
Emma Hoogenhout Primary School	Egret, Windhoek
Delta School Windhoek	Rev Michael Scott St, Windhoek
Suiderhof Primary School	Krupp Street, Windhoek

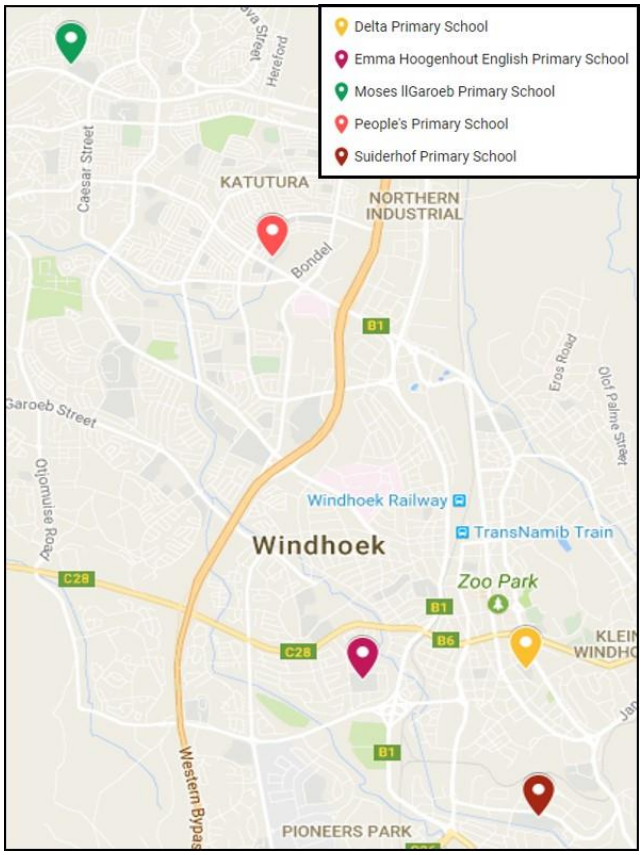


Figure 29: *Map of five selected primary schools for roadside observational study*

Figure 30 and Figure 31 show the schedule for surveying intersections and schools. The MVA Fund, AA, and the project team collectively and strategically selected times for high traffic volume and diverse surrounding population demographics. Many traffic authorities in Windhoek, such as NAMPOL and the Windhoek City Police, identify rush hour as 07h00m and at 17h30m. Primary schools in Windhoek dismiss at approximately 13h00m. Therefore, the ideal period to

collect school data and the maximum number of child restraint data entries is from 12h30m to 14h00m.

Originally, the team intended for the observational study to take place at permanent police roadblocks. However, NAMPOL suggested that compliance is generally higher at the permanent roadblock because drivers know law enforcement observes motor vehicles and occupants at these locations. For a more accurate representation of safety habits in the Khomas Region, intersections and schools were the primary focus. The project team included one police roadblock location in the schedule for a comparison of compliance.

March 2017

Monday	Tuesday	Wednesday	Thursday	Friday
27	28	29	30	31
Meeting with NAMPOL and Windhoek Police Dept.	10:00 Formal Pretesting at Independence and Sam Nujoma Intersection & 12:45 Formal Pretesting at Delta School		07:00 Intersection Data Collection at Otjomuise and Sam Nujoma	

Figure 30: *March 2017 observation schedule*

April 2017

Monday	Tuesday	Wednesday	Thursday	Friday
3	4	5	6	7
07:45 Intersection Data Collection at John Meinert and Hosea Kutako & 12:30 School Data Collection at Delta Primary School	12:30 School Data Collection at Emma Hoogenhout English Primary School	12:30 School Data Collection at Suiderhof Primary School	12:30 School Data Collection at People's Primary School	
10	11	12	13	14
12:30 School Data Collection at M. Garoeb Primary School & 17:00 Intersection Data Collection at Wilibald Kapuenene and Hans-Dietrich Genscher	13:30 Data Collection at the Airport Checkpoint	07:30 Intersection Data Collection at Mandume Ndemufayo and Fidel Castro & 09:00 Intersection Data Collection at Monte Cristo and Hereford & 12:00 NUST attitudinal survey	07:30 Intersection Data Collection at Wilibald Kapuenene and Hans-Dietrich Genscher	

Figure 31: *April 2017 observation schedule*

3.1.4 Pre-Test Observational Study

Before collecting data, the team conducted a pretest of the observational protocol. This helped the research team become familiar with the Qualtrics application and to address any unanticipated issues before formal data collection. The pretest took place at two locations: the intersection of Sam Nujoma Road and Independence Avenue, and outside of the Delta Primary School located on Rev. Michael Scott Street.

The intersection of Sam Nujoma Road and Independence Avenue proved an effective survey location. The intersection possesses a stoplight that queues motor vehicles automatically. The researchers collected all data on the southbound side of Independence Avenue on Tuesday, March 28, 2017, between 10h00m and 10h30m. When the traffic light indicated a red light, the research team observed cars in the leftmost lane since those cars are closest to the side of the road. On average, the team successfully observed three vehicles clearly visible to all team members during one red light cycle. In the 30-minute observation period, the project team observed 73 vehicles.

The Delta Primary School observation took place later that day, Tuesday, March 28, 2017, at 13h00m. The research team arrived at the school at 12h30m to determine the best location to conduct the observation. The school sits on the corner of a very busy street, Dr. A.B. May Street, which does not have a traffic light or a stop sign. Rev. Michael Scott Street is a smaller street with a yield sign that allowed the observers to collect data more easily.

From this pretest period, the observation team determined the best methods to collect data at the school observation locations. The end of the school day, 13h00m, is often chaotic due to many pedestrians and vehicles attempting to leave the same location at once. Rather than stand at the entrance of the school, the project team discovered it is best to find an intersection near the school with a traffic light or stop sign to limit traffic density and simplify data collection.

3.2 Analyze Collected Data

At the completion of the observational study, the research team processed the data collected. With the results, the team filtered the collected data with several parameters to find statistically significant trends in seat belt and child restraint use in the Khomas Region. The Qualtrics software stored all data for easy input and comparison. The project team automatically tabulated the responses to the study with just a few simple settings within the software for later analysis. Figure 32 below is a sample table generated using three test responses. The researchers isolated the question regarding driver gender and compared it to a subsequent observation on the driver’s use of a seat belt.

		Driver – Seat belt			
		Yes	Maybe	No	Total
Driver – Gender	Male	2	0	0	2
	Female	1	0	0	1
	Can't Tell	0	0	0	0
	Total	3	0	0	3

Figure 32: *Sample study results filtered by driver gender vs. seat belt use*

The team created a database from the responses of the observational study and used the database to filter collected data to identify correlations. The Qualtrics software enabled the research team to generate and export data and tables into common Office formats such as Microsoft Excel files and Adobe PDF files to report and share easily with the sponsors and other interested road safety organizations.

In addition to tabulating results, the researchers summarized data graphically to visually represent the entered observations (see Figure 33).

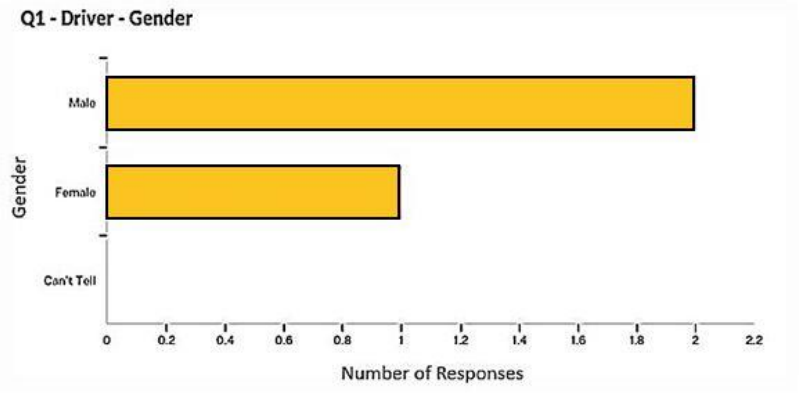


Figure 33: *Bar graph exported from Qualtrics to show gender responses in the sample study*

To determine the strength of the identified correlations, the project team utilized a **two-tail, two-sample hypothesis t-test** between percentages using a significance level of $\alpha = 0.05$. This type of hypothesis test determines the probability of obtaining a result at least as extreme as that of the sample data, assuming there is no true correlation (Frost, 2015). The test compares sample results to the null hypothesis, which states that compliance is the same across all demographics. The two-tailed test looks for any variation from the null hypothesis and is not limited to results either greater or less than the null hypothesis. The test statistic, *t*, represents the number of standard deviations between the null hypothesis and the observed results, and is determined with the following equation (Frost, 2015):

$$t = \frac{(\bar{p}_1 - \bar{p}_2)}{\sqrt{\bar{p}(1-\bar{p})(\frac{1}{n_1} + \frac{1}{n_2})}}$$

$$\bar{p}_1 = compliance\ rate\ of\ sample\ 1$$

$$n_1 = sample\ 1\ count$$

$$\bar{p}_2 = compliance\ rate\ of\ sample\ 2$$

$$n_2 = sample\ 2\ count$$

$$\bar{p} = overall\ compliance\ rate$$

Using a normal distribution, the test statistic is converted to a P-value to indicate the probability of the sample results while assuming the null hypothesis. The P-value is also a function of the degrees of freedom in the calculation; the number of degrees of freedom is the total size of all samples minus the number of samples, as shown by the equation:

$$degrees\ of\ freedom = (n_1 + n_2 + \cdots + n_z) - z$$

In hypothesis tests that yield a P-value less than the defined significance level of $\alpha = 0.05$, the analysts rejects the null hypothesis in favor of statistically significant evidence of a correlation.

3.3 Identify Common Reasons for Not Using a Seat Belt

The roadside observation study analysis described in Sections 3.1 and 3.2 does not explore the factors that influence an individual's decision to wear a seat belt. To understand the factors that most significantly affect seat belt use, the team designed and implemented an attitudinal survey. The researchers designed the attitudinal survey to assess the feelings of new drivers toward seat belt and child restraint use. The project team distributed the survey to college-age students in both the United States to gauge the impact of recent driver education on seat belt use and Namibia to identify the most common reasons for non-compliance. Appendix C and E contain the complete survey forms for both universities.

3.3.1 Design an Attitudinal Survey

Before designing the survey, our project researched successful survey techniques. The most effective surveys are simple while collecting all the required information. Long surveys often lose participation and/or record inaccurate responses (Smith, 2012). Effective surveys also use scales with a range of response options, such as "Strongly Agree" to "Strongly Disagree". Including more than three options further qualifies intermediate responses such as "Sometimes".

Options for responses to similar questions should remain consistent to allow for easier analysis. Surveys should also include an explanatory statement at the beginning to inform the participants of the goals of the survey and the applications of the data collected. This explanatory statement can involve a disclaimer to address possible concerns the participants may have regarding liability and anonymity (Smith, 2012).

Survey designers must first decide which research questions they hope to answer with the survey and then they create survey questions that accurately address these questions. The survey distributed to WPI students in the United States addressed the following research questions:

- What is the impact of driver education on seat belt use?
- What is the impact of current seat belt advertising on seat belt use?
- What percentage of students report consistent seat belt use?
- What are the common factors that deter someone from wearing a seat belt?

Through the observational study, the researchers identified high frequency taxi use. To probe this new development further, the team substituted questions on driver education and seat belt advertising in the WPI survey for questions on taxi use. The survey distributed to NUST students in Namibia addressed the following research questions:

- What percentage of NUST students have a driver's license?
- How frequently do students utilize taxis as a mode of transportation?
- What percentage of students report consistent seat belt use?
- What are the common factors that deter someone from wearing a seat belt?

To address these questions, the research team developed a series of questions based on the 2009 study authored by Mike Winnett of the GRSP detailed in Section 2.5.3. The GRSP distributed a questionnaire to passersby in twelve Namibian cities and towns as a baseline attitudinal assessment of seat belt use for drivers in the country. This questionnaire aimed to answer some of the same research questions listed above, such as addressing common factors and motivations that affect a person's decision to use a seat belt (Winnett, 2009). Because of these similarities, some questions from our survey come directly from the GRSP questionnaire with only slight modifications. Figure 34 summarizes general Do's and Do Not's for creating effective surveys:

Do:	Do Not:
☑ Give clear instructions ☑ Keep question structure simple ☑ Ask one question at a time ☑ Maintain a parallel structure for all questions ☑ Define terms before asking the question ☑ Be explicit about the period of time being referenced by the question ☑ Provide a list of acceptable responses to closed questions ☑ Ensure that response categories are both exhaustive and mutually exclusive ☑ Label response categories with words rather than numbers ☑ Ask for number of occurrences, rather than providing response categories such as often, seldom, never ☑ Save personal and demographic questions for the end of the survey	⦸ Use jargon or complex phrases ⦸ Frame questions in the negative ⦸ Use abbreviations, contractions or symbols ⦸ Mix different words for the same concept ⦸ Use "loaded" words or phrases ⦸ Combine multiple response dimensions in the same question ⦸ Give the impression that you are expecting a certain response ⦸ Bounce around between topics or time periods ⦸ Insert unnecessary graphics or mix many font styles and sizes ⦸ Forget to provide instructions for returning the completed survey!

Figure 34: *Do's and Do Not's for creating effective surveys (University of Wisconsin, 2010)*

3.3.2 Implement the Attitudinal Survey

After designing the attitudinal survey, the project team implemented the survey to capture a random sampling of the two target populations: college students in the United States and college students in Namibia. Limited access to students from multiple universities in both countries limited the research team's survey populations. Thus, the team distributed the survey to students only from Worcester Polytechnic Institute (WPI) in Worcester, Massachusetts, USA and the National University of Science & Technology (NUST) in Windhoek, Namibia. The project team chose these universities due to the ease of accessibility. The students of WPI and NUST share a technical focus, which further strengthens the comparison. The team executed the survey while acknowledging that WPI and NUST students do not fully constitute a random sampling of college students or college-age individuals.

The project team distributed a link to the survey via email to WPI students. The subgroups reached may also contribute potential bias to the surveyed sample population at WPI, as the method of distribution, student email, did not reach the entire student body. The list below indicates the various campus organizations, as well as student groups, contacted to complete the survey:

- Alpha Xi Delta Women's Fraternity
- Lambda Chi Alpha Fraternity
- Phi Sigma Sigma Women's Fraternity
- Sigma Phi Epsilon Fraternity
- WPI Women's Varsity Volleyball
- Zeta Psi Fraternity

- Namibia 2017 IQP Group
- Official WPI Class of 2018 Facebook Page

Upon opening the email link, the participant sees the following disclaimer statement shown in Figure 35 and must indicate their agreement with the terms of the survey before they proceed:

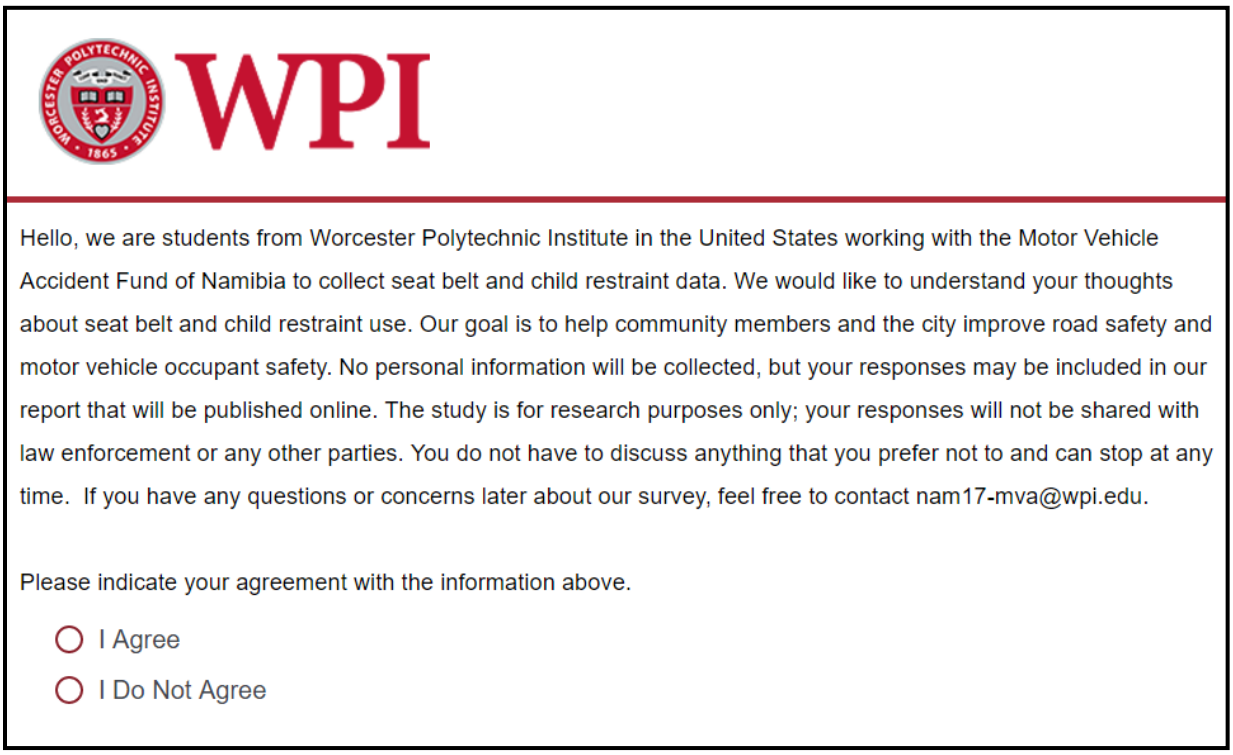


Figure 35: *Attitudinal survey disclaimer statement shown at the beginning of the survey*

After selecting "I Agree", the participant will proceed to answer the survey questions, which include a variety of question styles such as yes/no questions, 5-option ranking questions, and multiple response questions. Figure 36 through Figure 38 show examples of these question styles and preview the mobile version of the survey:

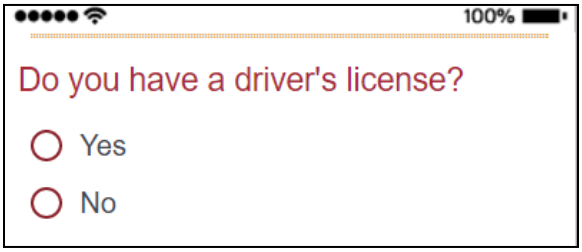


Figure 36: *Example of a yes/no attitudinal survey question*

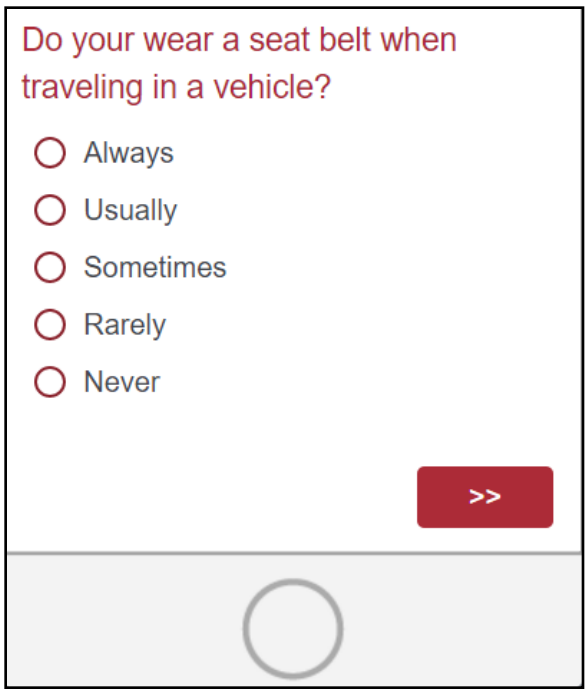


Figure 37: *Example of a 5-option ranking attitudinal survey question*

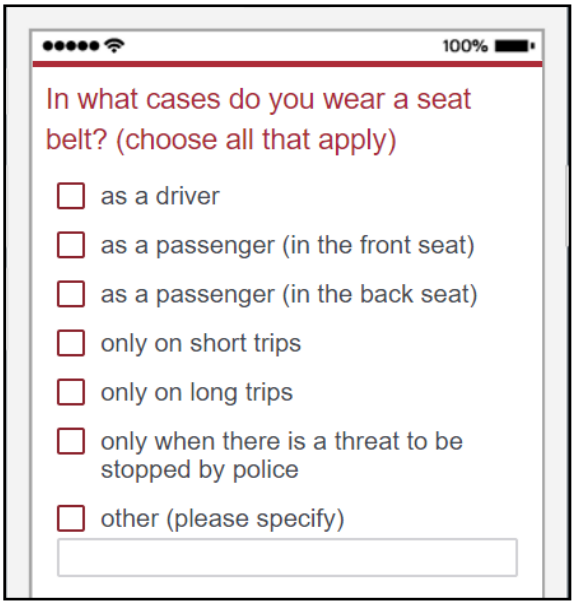


Figure 38: *Example of a multiple response attitudinal survey question*

Obtaining responses from NUST students proved challenging due to limited accessibility to social media platforms and student emails; therefore, the project team and sponsor discussed the best methods to distribute the survey. These recommendations included implementing a paper survey for NUST students rather than an online survey. The research team traveled to the NUST campus on Wednesday, April 19, 2017 and Tuesday, April 25, 2017 during the campus-wide lunch period from 12h00m to 14h00m. They asked various groups of students at busy locations around the campus to participate in the survey, shown in Appendix E. The researchers

replaced questions on driver education and seat belt use advertisements with questions on child restraints and taxi use. During the observational study period, observers recognized a high taxi density within the surveyed region. To investigate this vehicle population and its passengers more specifically, the project team adapted the attitudinal survey questions accordingly. Each respondent filled out the survey independently and then returned the form to the researchers. One researcher then input each survey response by hand into the Qualtrics software individually for electronic storage and analysis.

3.3.3 Analyze the Attitudinal Survey Results

The research questions discussed in Section 3.3.1 guided the survey questions written by the project team. The Qualtrics software collected and stored the survey results for analysis. It has the capability to output all data the research team may want to analyze, such as correlations between responses to multiple questions. This investigation created graphs and tables to document and report the results from both attitudinal surveys.

Based on participant response, the research team evaluated correlations between level of seat belt use and other factors, like extent of driver education and level of exposure to seat belt awareness advertising at WPI, and frequency of taxi and child restraint use at NUST. This evaluation employed the hypothesis testing method described in Section 3.2.

The survey responses also investigated the most common reasons for a person to choose not to wear a seat belt, as well as circumstances that influence a person to buckle up. The survey incorporated questions on reasons for non-compliance to identify potential strategies to educate the public on the importance of seat belts and child restraints. Response choices for non-compliance included that seat belts are uncomfortable, there is no threat of police enforcement, or that sitting in the back seat is a safe location that does not require a seat belt.

The 2009 GRSP study did not evaluate the impact of driver education on subsequent seat belt usage. For research questions not addressed by the GRSP questionnaire, the team created a series of original research questions included in the project team's attitudinal survey distributed to WPI students. The attitudinal survey for WPI, shown in Appendix C, investigated the level of education in classroom style driver and learner's programs by asking respondents to indicate their participation in such programs. To measure the effect of driver education on seat belt use, the survey asked participants for their age and whether or not they received classroom-style driver education. Furthermore, the survey asked if the participants have been exposed to advertising about seat belt use. After collecting this data, the next step was to find correlations between seat belt use versus driver education level and exposure to advertisements. As this survey targeted college students in the United States, the participants also indicated whether their parents or guardians wear seat belts and if they require child passengers to wear restraints. Filtering the results to investigate the frequency of drivers that always wear seat belts with parents or guardians that also always wear seat belts investigated the effect of parent's seat belt habits on their children. Through correlations between advertising on seat belt use, participation in driver education programs, and the frequency of drivers to wear seat belts, the WPI survey

aimed to assess the progress made by recent driver education in encouraging seat belt use in the United States.

The attitudinal survey designed for distribution at NUST in Namibia incorporated similar questions regarding the frequency of respondents' seat belt use and common reasons for non-compliance; however, during the observational study, the researchers identified high taxi use in the Khomas Region. To investigate seat belt compliance in this vehicle type with high prevalence in the surveyed area, the survey distributed to Namibian students substituted questions specifically on taxi use for questions on driver education and seat belt advertising. It also included questions on child restraints, as NUST students are typically older than WPI students are. The researchers again analyzed the results of the survey in a similar manner; filtering through different parameters evaluated the seat belt use levels of respondent subgroups and vehicle types. Through correlations between the percentage of respondents with a driver's license and the frequency of taxi use, the NUST survey aimed to evaluate the seat belt compliance of students in personal cars as compared to taxis, as well as to identify common reasons for non-compliance in the Khomas Region of Namibia.

The main reason to include respondents from both the United States and Namibia is to focus on comparing and contrasting seat belt compliance and driving cultures in the two countries. The benefit of this stratified sample is to eliminate any researcher bias regarding seat belt use and driver education based on experiences in the United States. The frequency of driver's licenses may differ among students in the two countries, and the circumstances in which a Namibian student tends to wear a seat belt may not match the tendencies of an American student. After analyzing these differences, the team designed promotional materials that addressed the most common reasons for non-compliance reported by the attitudinal survey from NUST students.

3.4 Formulate Recommendations

This project used results from the observational study and both attitudinal surveys to identify issues and demographics to target with public education materials. Targeting the factors that contribute the most to non-compliance increases the potential effect of the campaign, while allowing for efficient use of sponsor resources. Given the seven-week duration of this project, the researchers did not have sufficient time to implement a full public education campaign. Instead, the researchers formulated recommendations for compliance promotional materials that the sponsors can implement after completion of this project. Once the team identified the best method of information distribution, they began generating recommendations for improving compliance.

Chapter 4: Results & Analysis

This chapter frequently references the twelve observation locations throughout Windhoek used to collect seat belt and child restraint data. These locations included five primary schools, six intersections, and one police roadblock. The observation team assigned each of the sites a site ID for easy reference throughout this chapter. Sites A-F are the six intersections, sites G-K are the five primary schools, and site L is the police roadblock. Table 7 lists the observation locations by Site ID.

Table 7: *Observation Locations by Site ID with date and time of completed observation*

Observation Locations by Site ID			
Location	**Site ID**	**Date**	**Time**
Otjomuise & Sam Nujoma	A	30 March 2017	07:00-08:00
John Meinert & Hosea Kutako	B	3 April 2017	07:45-08:45
Wilibald Kapuenene & Hans-Dietrich Genscher	C	10 April 2017	12:45-13:30
Mandume Ndemufayo & Fidel Castro	D	12 April 2017	07:30-08:30
Monte Christo & Hereford	E	12 April 2017	09:00-10:00
Sam Nujoma & Independence	F	18 April 2017	10:30-11:30
Delta Primary School	G	3 April 2017	12:45-13:30
Emma Hoogenhout English Primary School	H	4 April 2017	12:45-13:30
Suiderhof Primary School	I	5 April 2017	12:45-13:30
People's Primary School	J	6 April 2017	12:45-13:30
Moses Garoeb Primary School	K	10 April 2017	12:45-13:30
Hosea Kutako B6 Airport Checkpoint	L	11 April 2017	13:30-14:30

4.1 Roadside Observational Study

The observational study collected data on the seat belt use of drivers and adult passengers at various locations in Windhoek from March 30, 2017 to April 18, 2017. The study also provided data on the seat belt and child restraint use of child passengers at these locations. In total, the study collected data from 1,504 vehicles, carrying a total of 1367 adult passengers and 437 child passengers. Through roadside observation, the research team collected information on vehicle type and driver demographics, including gender, race, and approximate age. The observation protocol included recording the number of adult and child passengers and the degree of restraint use through seat belts or child restraints into Qualtrics. Then, the researchers filtered data to find correlations and trends that could help the MVA Fund and AA target areas of need with a public education campaign. The team excluded all data collected at the police roadblock located on the B6 road between the Hosea Kutako International Airport and Windhoek as motor vehicle occupant seat belt and child restraint compliance represented outlier data in all categories. The team hypothesized that motor vehicle occupants anticipate police presents at the

well-established road block, therefore they comply with all traffic regulations, including seat belt and child restraint laws. Excluding these entries, the observers collected 1,368 vehicle entries.

4.1.1 Driver Demographics

4.1.1.1 Vehicle Type

The first observation collected in each observational study entry is vehicle type. Initially, the team used two subgroups to distinguish motor vehicles into cars and trucks. The researchers defined a car as any closed, four-wheeled vehicle that seats up to seven passengers, excluding the driver. The project team characterized any vehicle with four wheels and an open bed as a truck. The researchers excluded vans in the data collection as these vehicles often carry more passengers than the team can observe within the time constraint. Figure 39 shows the sample population of all motor vehicles recorded divided into two vehicle types.

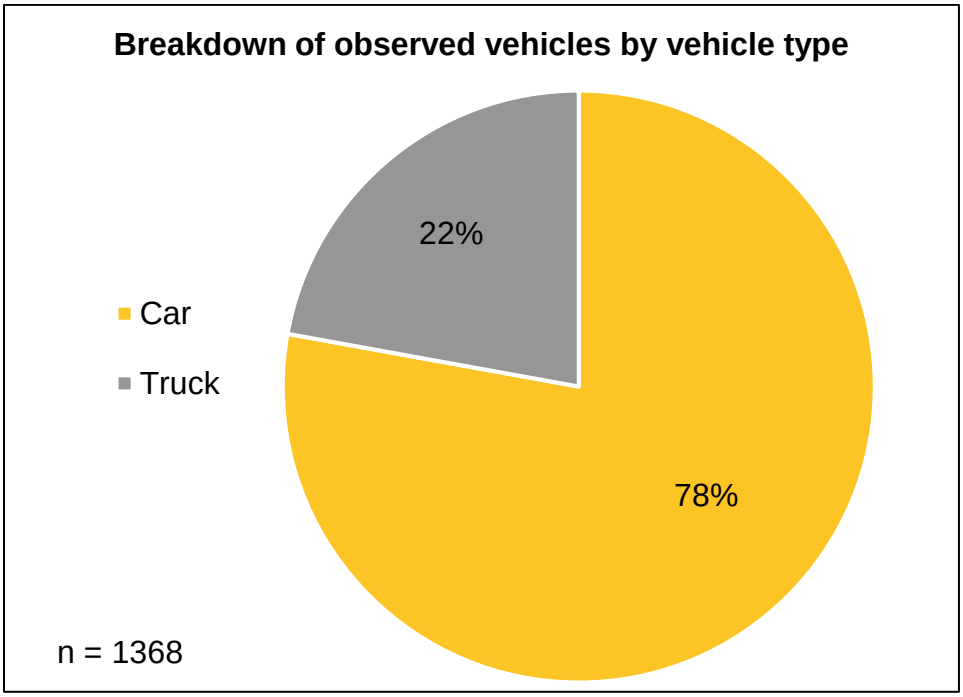


Figure 39: *Breakdown of observed vehicles by vehicle type*

Late in the observation period, the project team decided to separate taxis from private cars due to the large number of taxis in Windhoek. Data collected at sites D, E, and F made this distinction. Taxis follow the same definition as cars, but differ by large taxi identification numbers displayed on the sides and rear of the vehicle. Figure 40 shows the breakdown of taxis and private cars at these three sites, showing roughly equal representation for both vehicle types.

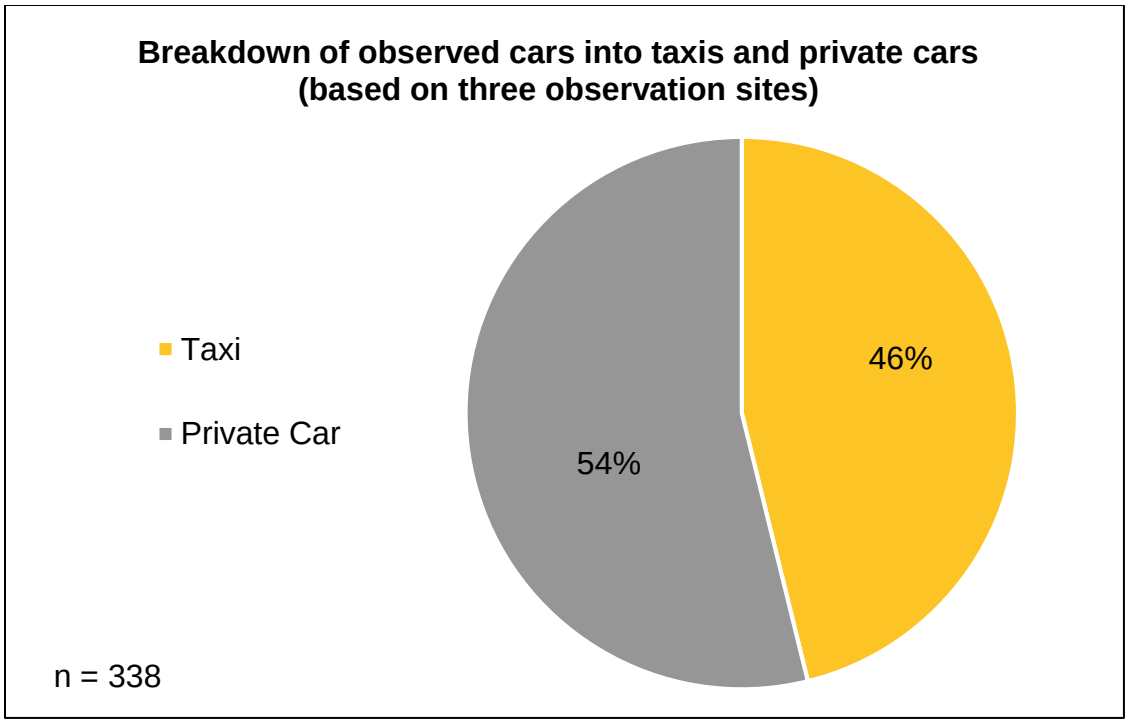


Figure 40: *Breakdown of observed cars into taxis and private cars (based on three observation sites)*

4.1.1.2 Gender

The research team observed and recorded the driver gender as the first motor vehicle occupant characteristic in each entry. The graph shown in Figure 41 represents the gender breakdown of the sample population observed in the roadside study. The researchers categorized drivers into the subgroups male and female. Observers utilized a third category, "could not see driver", to complete a data entry in which window tint or other visibility factors restricted the observers from accurately determining the driver's gender.

The sample population is predominantly male drivers, representing 81.1%. Female drivers make up 15.4% of the sample population, and observers could not see 3.5% of the drivers observed. The following calculations exclude this 3.5% of vehicles, 48 in total, of which observers could not accurately collect data, resulting in a sample size of 1320.

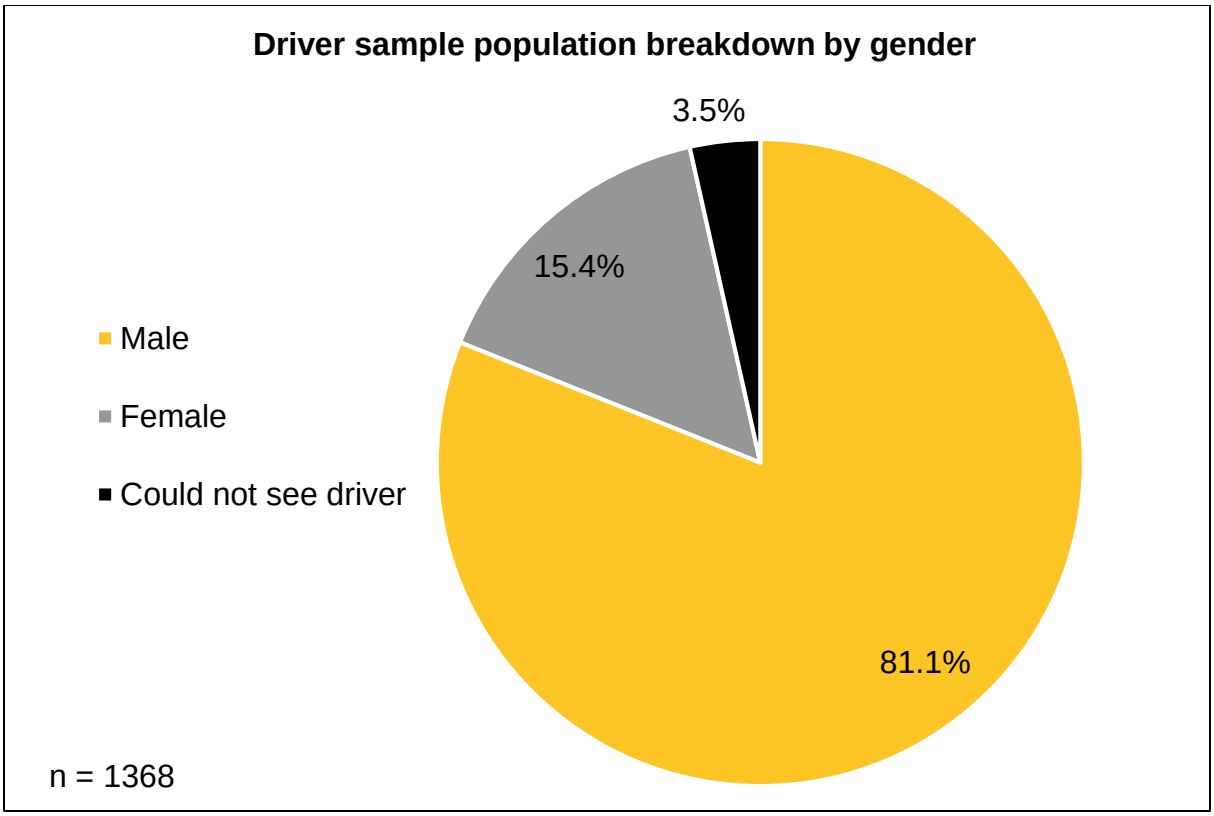


Figure 41: *Driver sample population breakdown by gender*

4.1.1.3 Race

The project team investigated driver race shown in Figure 42. Through discussion with the MVA Fund and AA, the observers categorized driver race into the following subsets: black, white, colored, and other. A white driver is a fair-skinned individual, typical of European or American nationality. A black driver has characteristically darker skin, typically from various African nationalities. Colored drivers share a combination of the first two categories. “Other” covers additional ethnicities such as Asian or Hispanic individuals. These race groups represent the majority of the population in the Khomas Region, and these study subsets adequately distinguished this demographic in the sample driver population in Khomas.

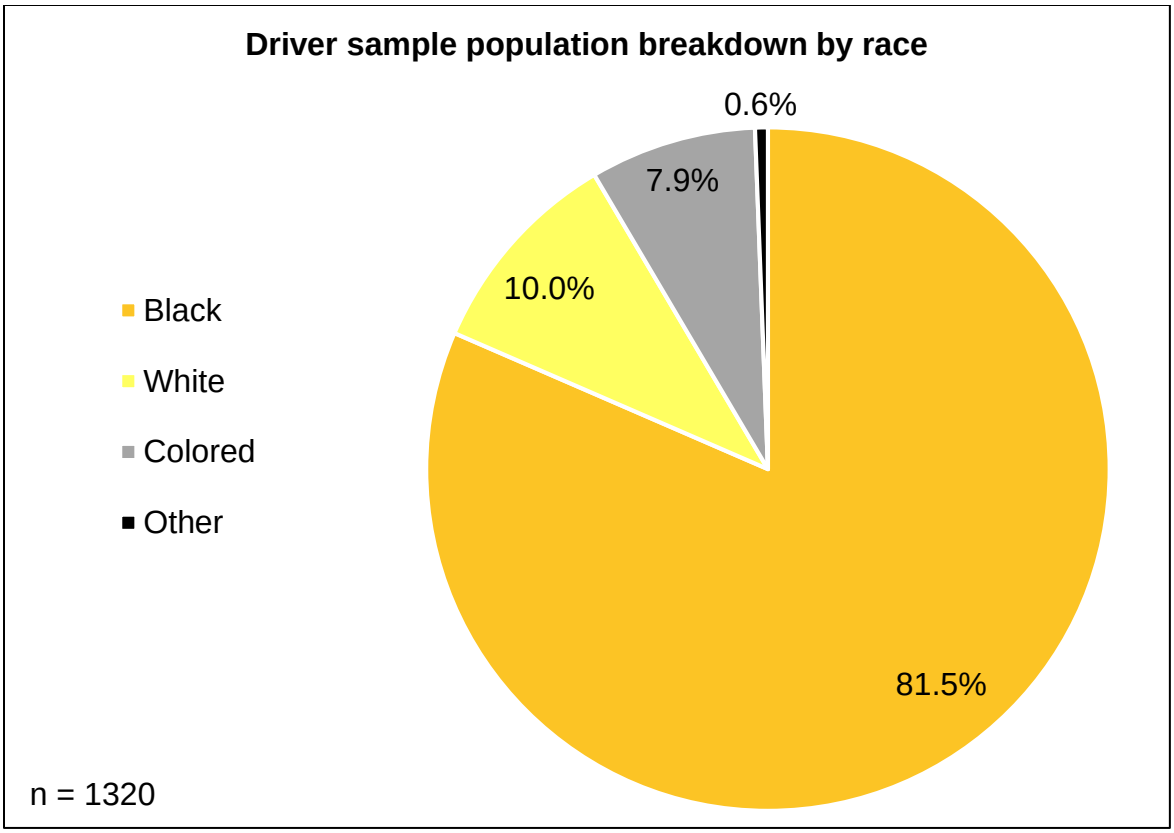


Figure 42: *Driver sample population breakdown by race*

The most common race observed in the sample population is black at 81.5%. Following that demographic subset are white drivers representing 10% and colored drivers at 7.9%. Other races constituted just 0.6% of the sample population.

4.1.1.4 Age

To evaluate another target demographic within the sample driver population, the analysts classified drivers by age. To distinguish learner drivers, ages 16-18, and young adult drivers, ages 18-21, from more experienced drivers, the observers used the following six subsets: 16-18, 18-21, 21-30, 31-40, 41-50, and over 51. The research team classified younger drivers as 16-18 if the vehicle displayed the large "L" sticker on the back window indicating a learner driver. Otherwise, the project team classified drivers who appeared under 21 as 18-21. These classifications are observer approximations, which may not be entirely accurate. To help combat this bias, the observation team assigned one team member to estimate age throughout the observation process. This helped limit inconsistency stemming from differences in observational tendencies across the team. Figure 43 shows the observational data of the sample driver population in Khomas broken down by the determined age brackets.

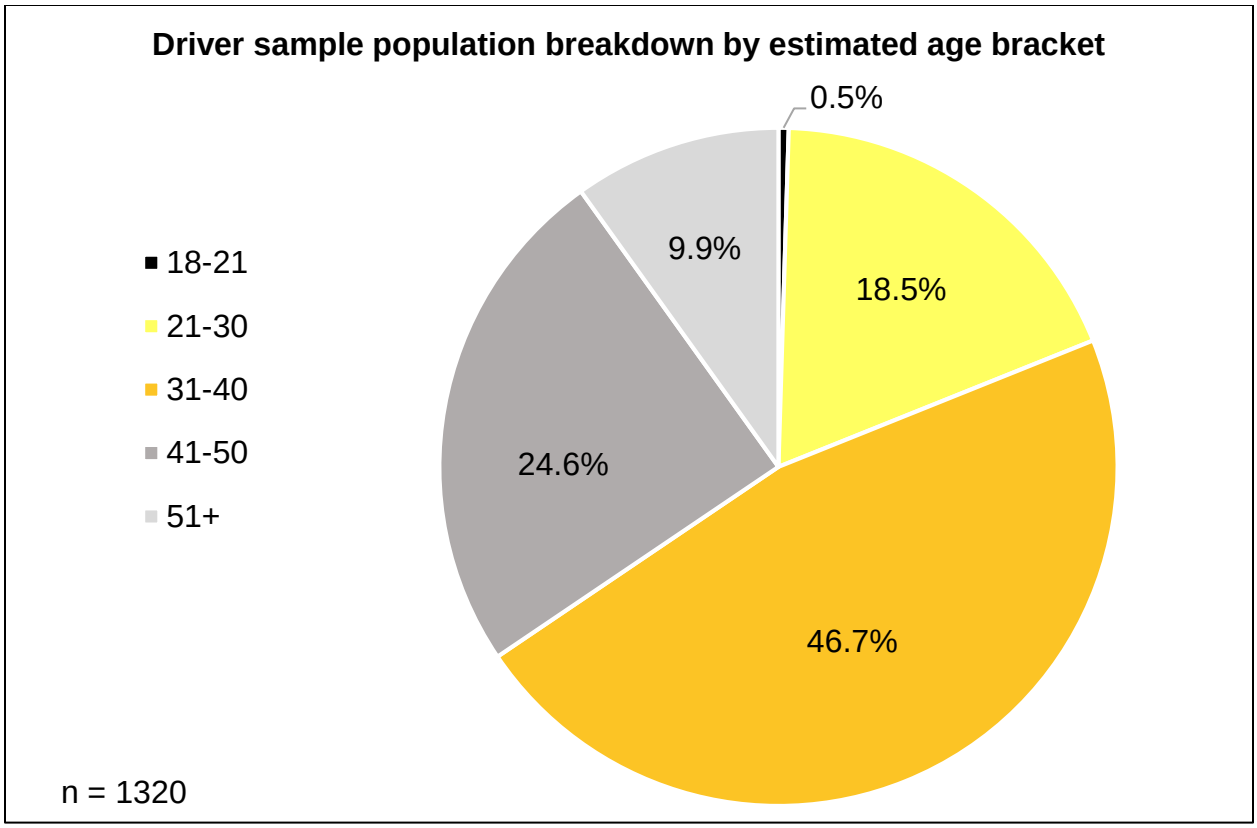


Figure 43: *Driver sample population breakdown by estimated age bracket*

The most commonly observed age demographic was drivers between 31 and 40 years old at 46.7%. Older drivers, aged 41-50 and 51+, represent another large portion of the sample population. The project team observed very few drivers under the age of 21.

4.1.2 Driver Compliance Correlations

Overall, 76.1% of drivers observed correctly wore a seat belt. To better understand the significance of this result, the project team broke down driver compliance based on vehicle type, gender, race, age, and location. To determine the strength of these correlations, the project team utilized a **two-tail, two-sample hypothesis t-test** between percentages as described in Section 3.2.

4.1.2.1 Location

The project team conducted roadside observations at twelve selected locations throughout the Khomas Region. These locations included six intersections, five primary schools, and one police roadblock on the B6 road between Windhoek and Hosea Kutako International Airport. The team investigated the variation in driver, adult passenger, and child passenger compliance at these locations. This project defines compliance as wearing a buckled seat belt with lap and shoulder strap or properly wearing a child restraint to limit mobility.

Driver seat belt compliance ranged from 59% to 100% over the twelve observation sites. The police roadblock on the B6 road between Windhoek and Hosea Kutako International Airport yielded 100% driver seat belt compliance as drivers anticipate police observation at the permanent roadblock. Consequently, the project team did not include data from the roadblock in any analysis, as it does not accurately represent the seat belt and child restraint behavior of vehicle occupants in the Khomas Region. Excluding this outlier, driver seat belt compliance ranged from 59% to 92%. Figure 44 graphically represents driver seat belt compliance based on location.

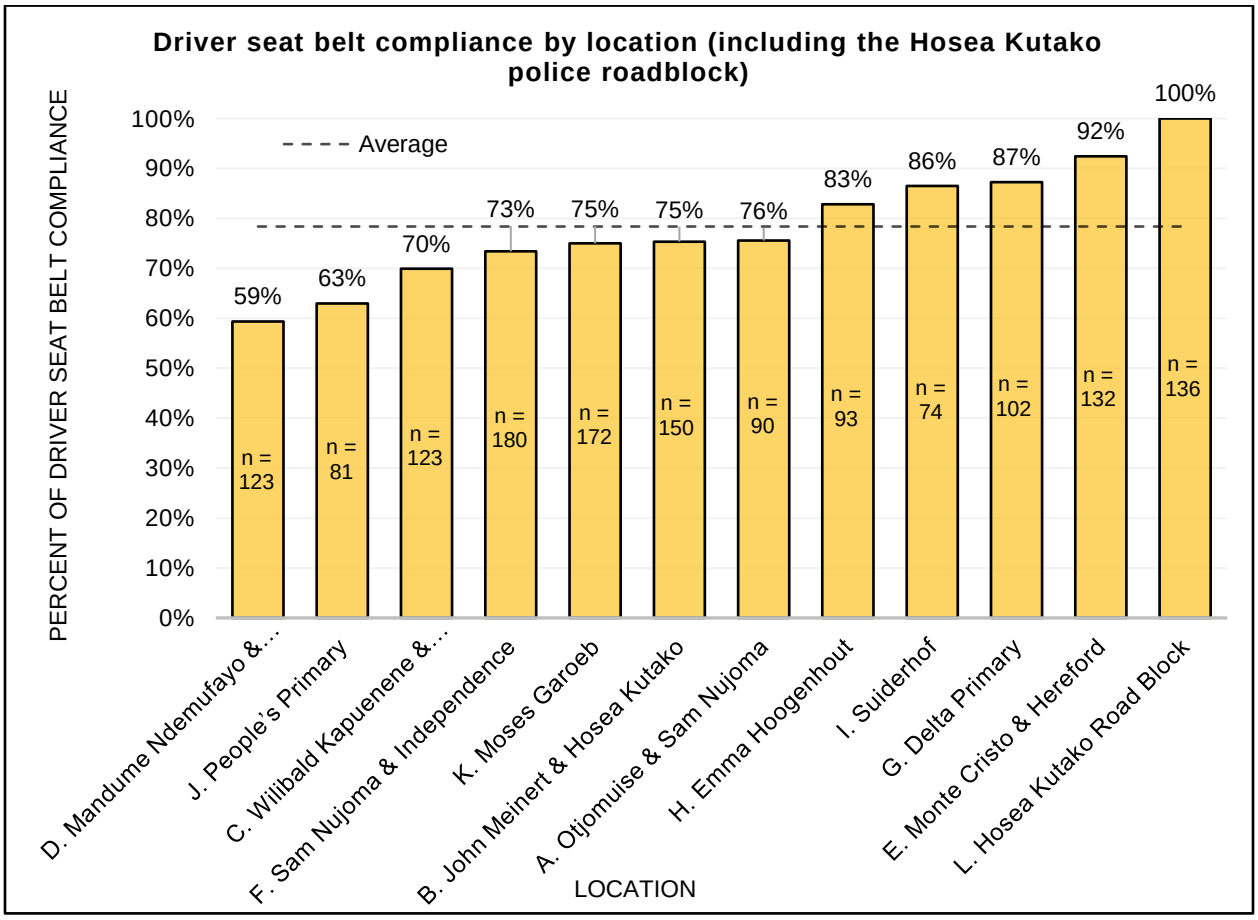


Figure 44: *Driver seat belt compliance by location with average driver compliance represented by the dashed line (including the Hosea Kutako police roadblock)*

Removing the outlier value gathered at the police roadblock provides a more accurate view of driver compliance in the Khomas Region. Figure 45 replicates Figure 44 but excludes the outlier, decreasing the average compliance from 78% to 76%.

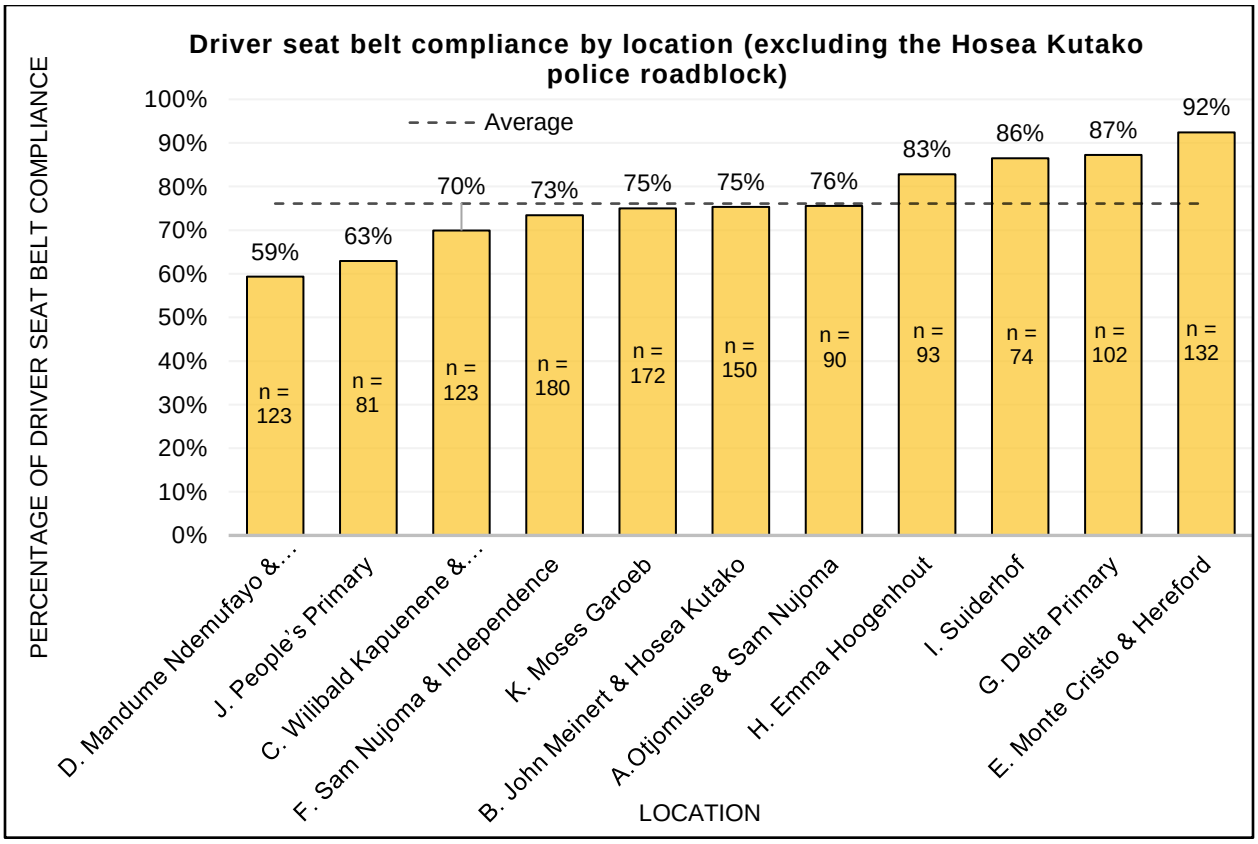


Figure 45: *Driver seat belt compliance by location with average driver compliance represented by the dashed line (excluding the Hosea Kutako police roadblock)*

Informal settlements in the northwest section of Windhoek are home to three of the four locations with the lowest driver seat belt compliance. Observed rates at these sites (sites C, J, and K) all fell below the average rate of 76%.

4.1.2.2 Vehicle Type

The research team also chose to analyze compliance rates of the driver by vehicle type. Observers classified vehicles as car, truck, or taxi. Originally, the observation team limited motor vehicle type classifications to car and truck, but after observing the high number of taxis in the region, the project team added taxis as its own subset. Because of this late alteration, only the last three observation sites, sites D, E, and F, include data with the taxi subgroup. At these sites, drivers in cars had the highest compliance at 82.9%, followed by drivers in trucks at 73.4% and drivers in taxis at 68.6% as seen in Table 8.

Table 8: *Driver Seat Belt Compliance by Vehicle Type for Sites D, E, and F*

Driver Seat Belt Compliance by Vehicle Type		
Vehicle Type	**Count***	**Compliance Percentage**
Car	170	82.9%
Truck	109	73.4%
Taxi	156	68.6%

* this excludes vehicles characterized as "could not see driver"

A.

t-statistic = 3.022	
Degrees of freedom = 324	
Two-tailed probability = .0027	

B.

t-statistic = 0.844	
Degrees of freedom = 263	
Two-tailed probability = .3996	

C.

t-statistic = 1.916	
Degrees of freedom = 277	
Two-tailed probability = .0564	

Using hypothesis testing, the analysts first tested correlations in compliance levels between cars and taxis as these two vehicle types had the greatest difference in compliance. The car to taxi statistical analysis yielded a P-value, or two-tailed probability, of 0.0027 as shown in Table 8.A. As this result is less than the defined α, the comparison provided statistically significant evidence that **car drivers wear seat belts more than taxi drivers do.** The researchers also tested between trucks and taxis and obtained a P-value of 0.3996 as shown in Table 8.B. As this result is greater than the defined α, the comparison did not prove statistically significant; from the sample, the project team has insufficient evidence to compare seat belt compliance between truck drivers and taxi drivers. The final comparison, between car drivers and truck drivers, yielded a P-value of 0.0564 as shown in Table 8.C. This result is also greater than the defined α, so there is insufficient evidence to compare seat belt compliance between car drivers and truck drivers.

4.1.2.3 Gender

Next, the team evaluated driver seat belt compliance and driver gender correlations. Male drivers showed 73.7% seat belt compliance, while females exhibited an 89.6% compliance rate. Table 9 breaks down driver compliance by gender.

Table 9: *Driver Seat Belt Compliance by Gender*

Driver Seat Belt Compliance by Gender		
Gender	**Count**	**Compliance Percentage**
Male	1109	73.7%
Female	211	89.6%

t-statistic = 4.972	
Degrees of freedom = 1318	
Two-tailed probability = .0000	

The hypothesis test for correlation between driver gender and seat belt use yielded a two-tailed probability of 0.0000. The comparison is statistically significant in suggesting that **female drivers wear a seat belt at a higher rate than male drivers do**. Additionally, the analysts investigated whether or not a correlation existed between female drivers and their respective age groups. Figure 46 graphically represents female compliance by age.

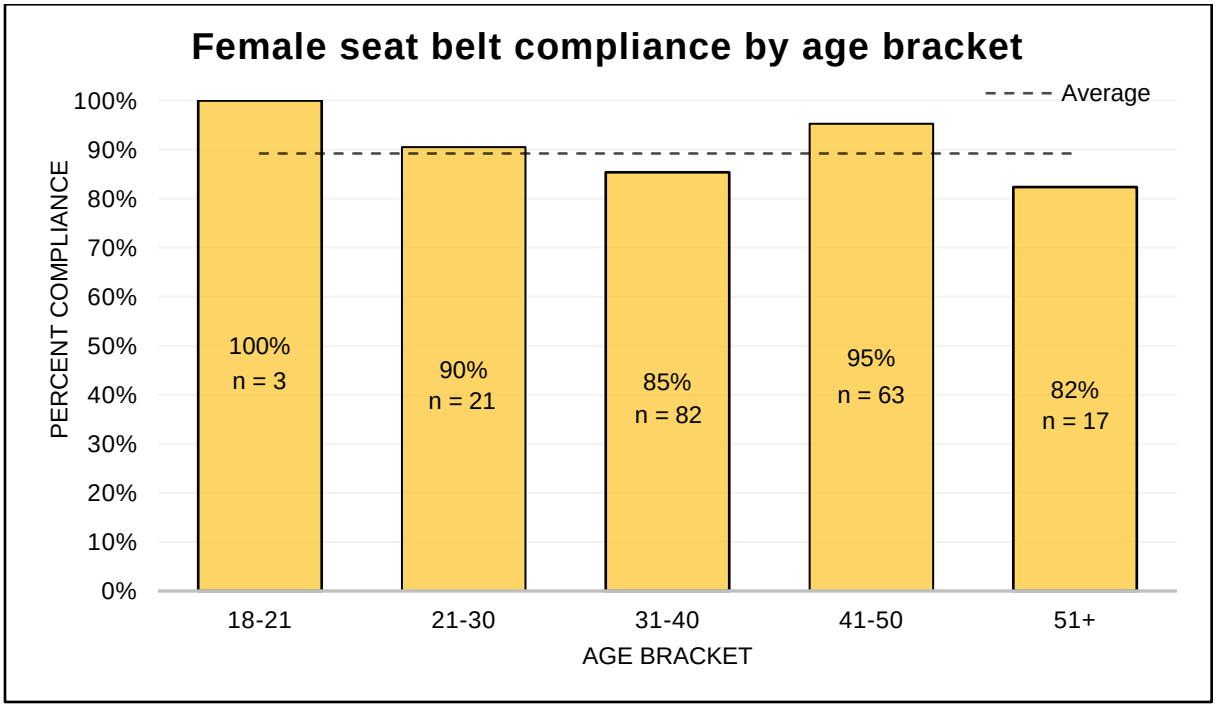


Figure 46: *Female seat belt compliance by age bracket*

While compliance in females ranged from 82% to 100%, there was no statistical significance suggesting that a female in any given age group wears their seat belt more than another age group. The project team calculated the average compliance to be 89%. The team further investigated whether or not correlation existed between male drivers and their respective age groups. Figure 47 graphically represents male compliance by age. The research team did not observe any male in the 18-21 age group during the study.

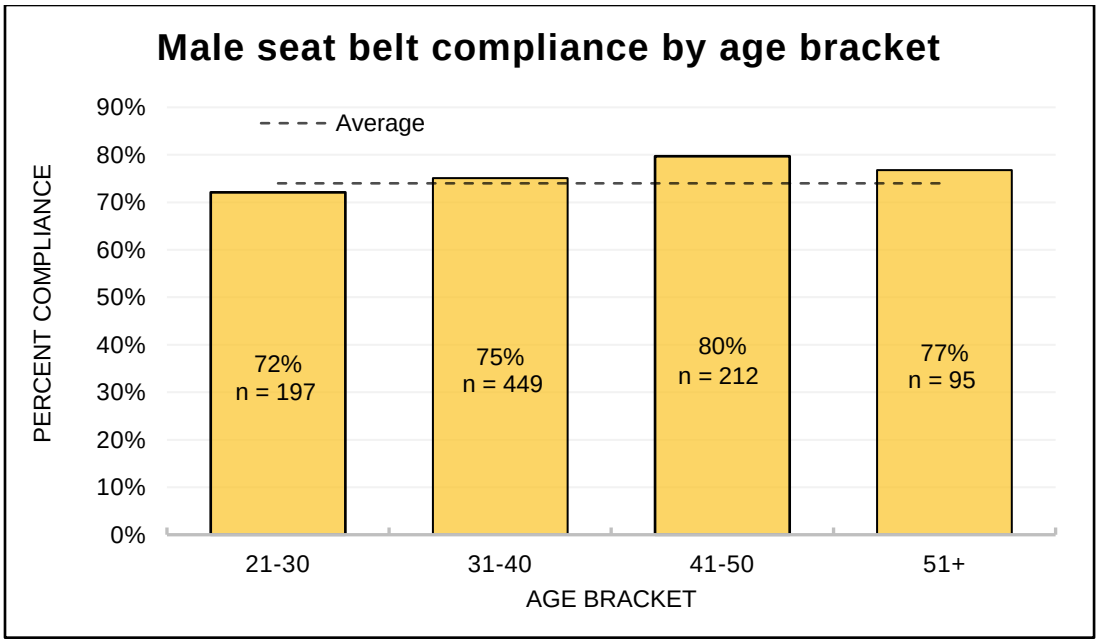


Figure 47: *Male seat belt compliance by age bracket*

While compliance in males ranged from 72% to 80%, there was no statistical significance suggesting that a male in any given age group wears their seat belt more than another age group. The team calculated the average compliance to be 74%.

4.1.2.4 Race

The research team also investigated correlations between driver seat belt compliance and driver race. Driver seat belt compliance ranged from 74.5% to 85.6% over the four race distinctions. The project team observed the lowest driver compliance rates among drivers categorized as black. In contrast, colored drivers displayed the highest compliance rates at 85.6%. Table 10 breaks down driver compliance by race.

The analysts utilized hypothesis testing to investigate the statistical significance of driver seat belt compliance and race. This method employed testing between black and colored drivers, between black and white drivers, and between colored and white drivers using $\alpha = 0.05$. The research team excluded the "other" race subset from testing due to the small number of samples collected. The black to colored hypothesis test, in Table 10.A., yielded a two-tailed probability of 0.0126. As this result is less than the defined α, the comparison provided statistically significant evidence that **colored drivers wear seat belts more than black drivers do**. The black to white hypothesis test, in Table 10.B., yielded a two-tailed probability of 0.0432. As this result is less than the defined α, the comparison provided statistically significant evidence that **white drivers wear seat belts more than black drivers do**. The colored to white hypothesis test, in Table 10.C., yielded a two-tailed probability of 0.5342. As this result is greater than the defined α, the comparison did not prove statistically significant; from our sample, the research team has insufficient evidence to compare seat belt compliance between colored drivers and white drivers.

Table 10: *Driver Seat Belt Compliance by Race*

Driver Seat Belt Compliance by Race		
Vehicle Type	**Count**	**Compliance Percentage**
White	132	82.6%
Black	1076	74.5%
Colored	104	85.6%
Other	8	75.0%

A.
t-statistic = 2.500
Degrees of freedom = 1178
Two-tailed probability = .0126

B.
t-statistic = 2.025
Degrees of freedom = 1206
Two-tailed probability = .0432

C.
t-statistic = 0.623
Degrees of freedom = 234
Two-tailed probability = .5342

4.1.2.5 Age

Additionally, the project team investigated the correlation between driver seat belt compliance and driver age. Driver seat belt compliance ranged from 72.1% to 100.0% over the six age brackets. The team observed the lowest driver compliance rates among drivers between the ages of 31 and 40. Young adult drivers, aged 18 to 21, were the smallest subset of the population but exhibited the highest seat belt compliance at 100.0%. Table 11 displays driver compliance by age.

Table 11: *Driver Seat Belt Compliance by Age Bracket*

Driver Seat Belt Compliance by Age		
Vehicle Type	**Count**	**Compliance Percentage**
16-18	0	N/A
18-21	3	100.0%
21-30	244	72.1%
31-40	617	73.7%
41-50	325	83.3%
51+	131	77.1%

t-statistic = 3.320
Degrees of freedom = 1313
Two-tailed probability = .0009

The team utilized hypothesis testing to investigate the statistical significance of driver seat belt compliance and age. To simplify the analysis, the researchers combined the 21-30 group with the 31-40 group, and combined the 41-50 group with the 51+ group. The analysts then compared percentages from the 21-40 age bracket and over 41 age bracket using $\alpha = 0.05$. The project team excluded the youngest age groups, 16-18 and 18-21, due to the small number of

samples collected. The hypothesis test yielded a two-tailed probability of 0.0009. As this result is less than the defined α, the comparison provided statistically significant evidence that **drivers over the age of 41 wear seat belts more than drivers between the ages of 21 and 41**.

4.1.3 Adult Passenger Compliance Correlations

Just 23.1% of the 1,217 observed adult passengers correctly wore a seat belt, compared to 76.5% of 1,320 successfully observed drivers. Though the observation method did not collect data to distinguish between front seat and back seat passengers, the project team noted that most of the properly restrained passengers sat in the front passenger seat. **The observation team rarely observed buckled passengers in the back seat of a vehicle.** The n values for figures in this section represent the number of adult passengers observed, not the number of vehicles.

4.1.3.1 Location

Adult passenger compliance ranged from 14% to 75% across the twelve observation sites. These values include the outlier data at the police roadblock, where observed compliance significantly exceeded the compliance at other locations. The team connected this bias in data to vehicle occupant anticipation of the roadblock location and the associated encounter with law enforcement. Figure 48 breaks down adult passenger compliance by location including the police roadblock.

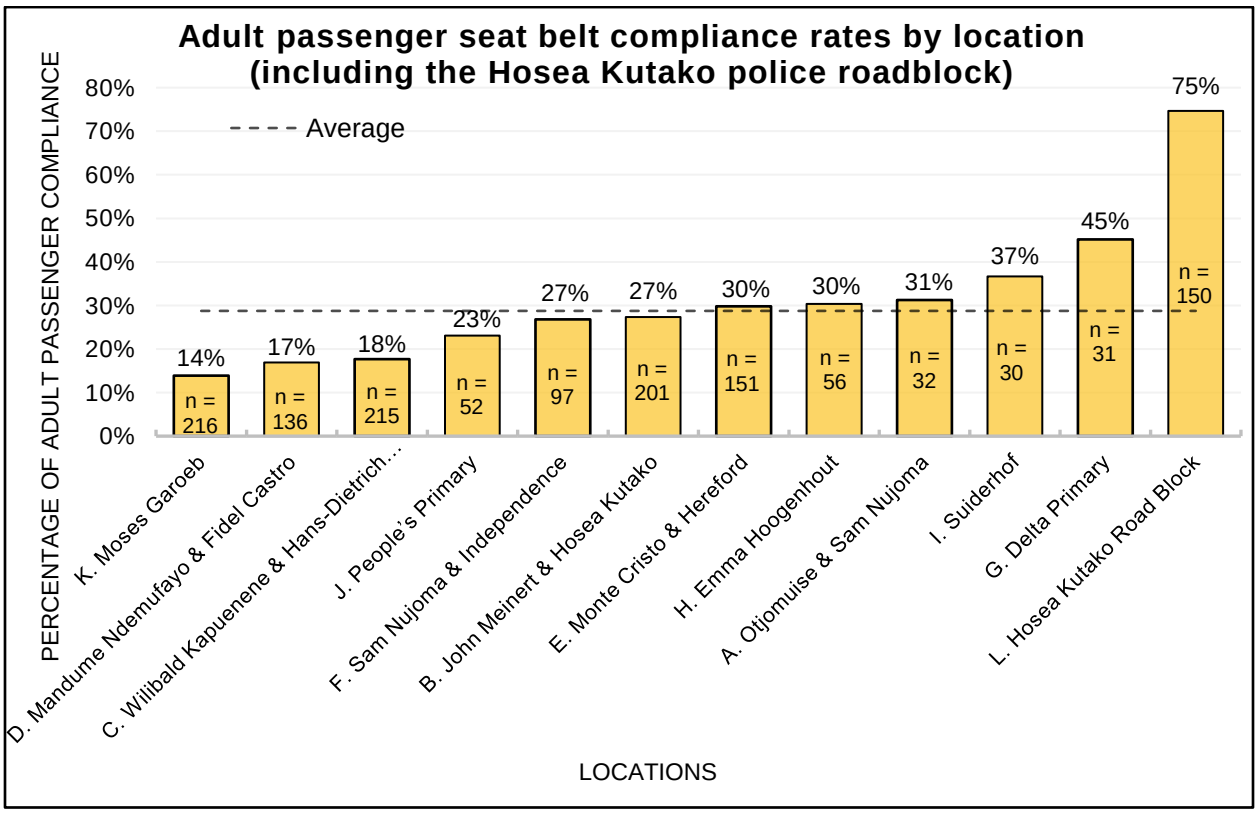


Figure 48: *Adult passenger seat belt compliance rates by location (including the Hosea Kutako police roadblock)*

Removing the outlier data collected at the police roadblock provides a better picture of regional adult passenger compliance. Without the roadblock, the highest compliance at any location is 45%. Figure 49 replicates Figure 48 but excludes the outlier, lowering the average compliance from 29% to 22%.

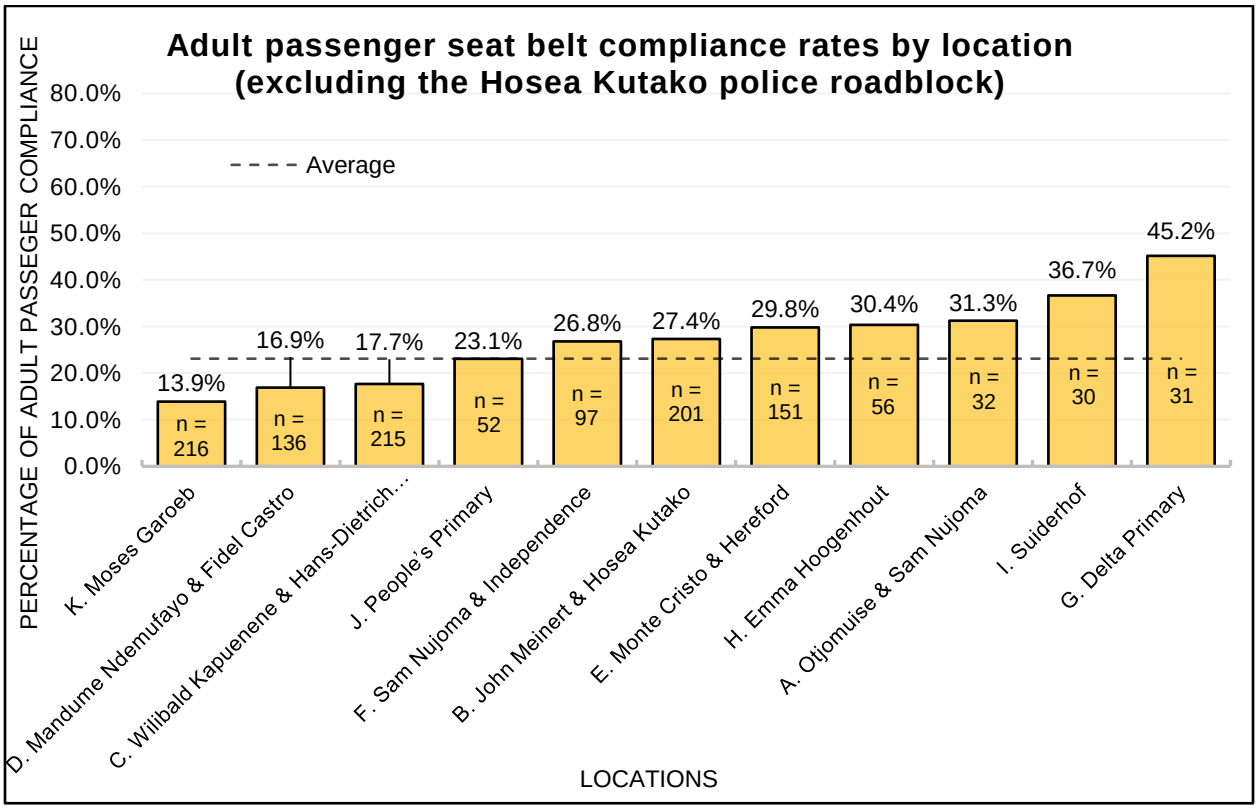
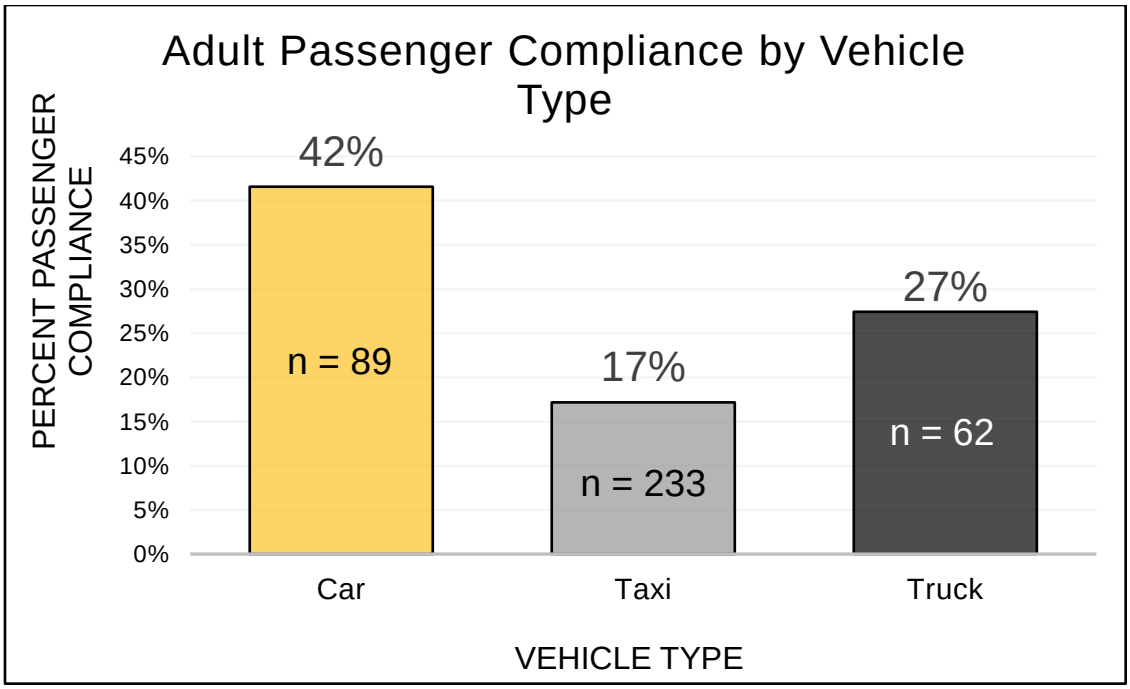


Figure 49: *Adult passenger compliance rates by location (excluding the Hosea Kutako police roadblock)*

Informal settlements in the northwest section of Windhoek are home to three of the four locations with the lowest driver seat belt compliance. Observed rates at Sites C, J, and K all fell at or below the average rate of 22.8%.

4.1.3.2 Vehicle Type

This investigation also considered possible correlations between adult passenger seat belt compliance and motor vehicle type. For this analysis, the analysts only used data from sites D, E, and F, where the observers separated taxis into their own vehicle type. At these sites, adult passenger compliance ranged from 17.2% to 41.6% between the three motor vehicle types. Figure 50 breaks down adult passenger compliance by vehicle type.



A. t-statistic = 4.588 Degrees of freedom = 320 Two-tailed probability = .0000

B. t-statistic = 1.807 Degrees of freedom = 293 Two-tailed probability = .0718

C. t-statistic = 1.791 Degrees of freedom = 149 Two-tailed probability = .0753

Figure 50: *Adult passenger seat belt compliance breakdown by vehicle type (A is car-taxi, B is taxi-truck, C is car-truck)*

The project team investigated the statistical significance of adult passenger seat belt compliance and vehicle type through hypothesis testing. The test investigated correlations between taxis and cars using $\alpha = 0.05$. The car to taxi hypothesis test, in Figure 50.A, yielded a two-tailed probability of .0000. The comparison provided statistically significant evidence suggesting that **adult passengers in taxis wear their seat belts less often than adult passengers in cars**. The taxi to truck hypothesis test, in Figure 50.B., yielded a two-tailed probability of 0.0718. The comparison did not prove statically significant. The car to truck hypothesis test, in Figure 50.C., yielded a two-tailed probability of 0.0753. This value exceeds the defined α, which suggested that the comparison did not prove to be statistically significant.

4.1.4 Child Passenger Compliance Correlations

The n values for figures in this section represent the number of child passengers observed, not the number of vehicles. Excluding the Hosea Kutako police roadblock, researchers observed a total of 428 child passengers. Of these, the team observed 389 child passengers at the five primary school locations.

4.1.4.1 Location

Combined child passenger compliance, meaning correctly wearing a seat belt and correctly wearing a child restraint, ranged from 0.00% to 50.0% over the five school observation

sites. Observations at the police roadblock on the B6 road between Windhoek and Hosea Kutako International Airport yielded a maximum 50.0% child passenger compliance, out of 16 child passengers, as drivers anticipated police observation at the permanent roadblock. Figure 51 graphically represents these child passenger compliance values by location including the airport roadblock location. The dashed line represents the average of combined child restraint and child seat belt use, which is 9.1% compliance.

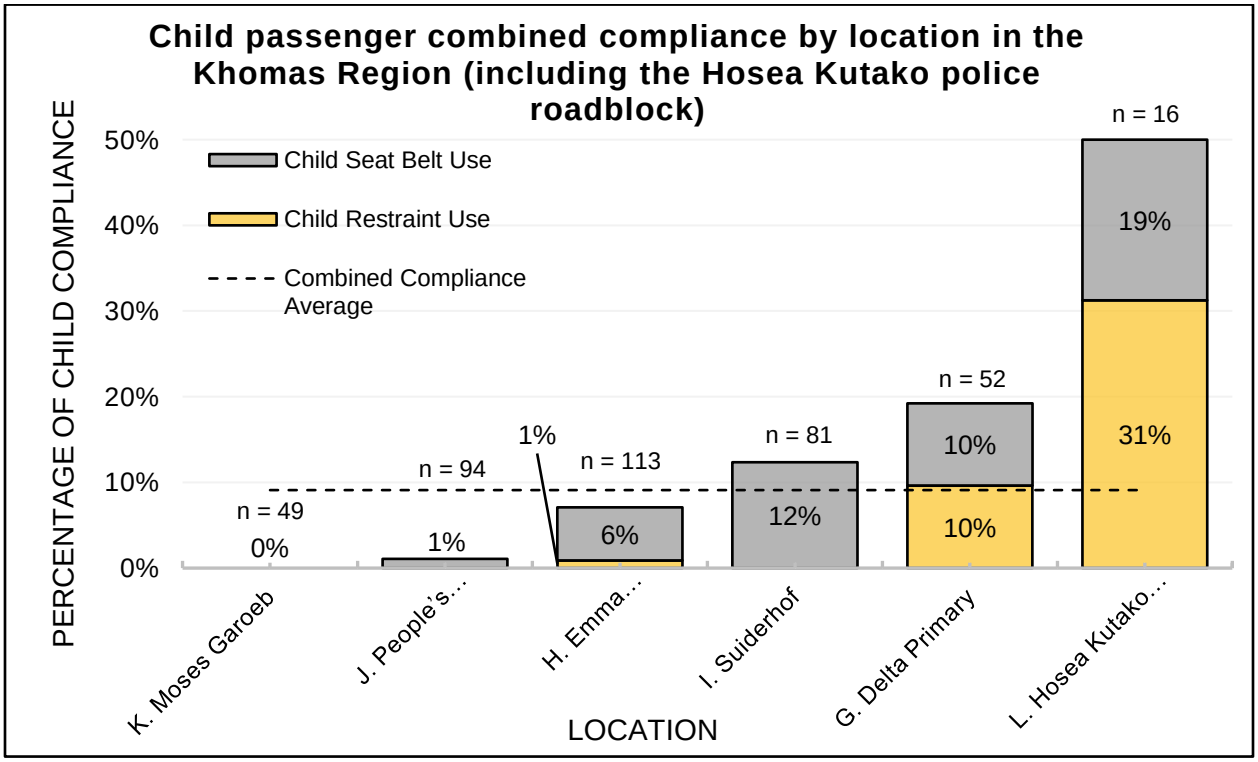


Figure 51: *Child passenger combined compliance by location in the Khomas Region (including the Hosea Kutako police roadblock)*

Figure 52 replicates Figure 51 but excludes the outlier. Removing the outlier data from the police roadblock provides a more realistic picture of overall child passenger compliance in the Khomas Region. Without the roadblock, the highest child passenger compliance at any location is 20% and the combined compliance average drops from 9% to 7%. The two lowest compliance levels are the schools near the informal settlements in the northern part of Windhoek.

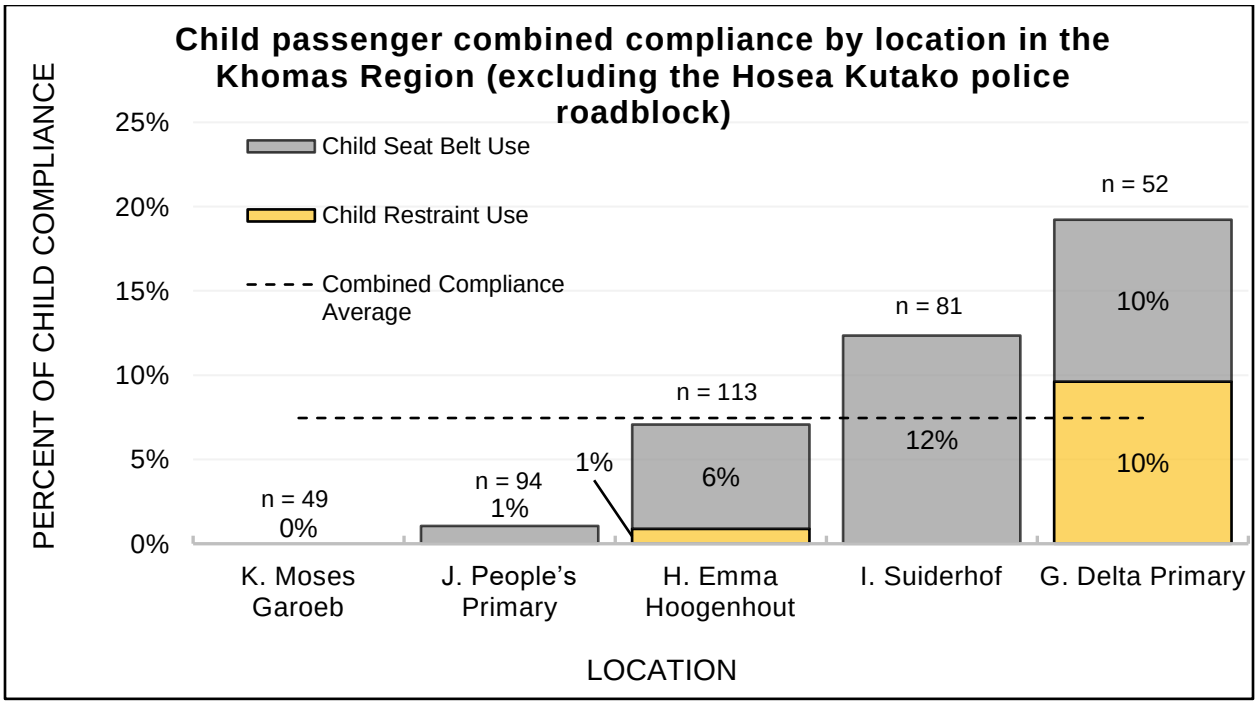


Figure 52: *Child passenger combined compliance by location in the Khomas Region (excluding the Hosea Kutako police roadblock)*

4.1.4.2 Vehicle Type

Child restraint compliance ranged from 0.0% to 1.3% between the two motor vehicle types, cars (including both private and taxis) and trucks. Child seat belt compliance ranged from 4.3% to 5.8% between the two motor vehicle types. Combined compliance in cars showed 7.1% and in trucks showed 4.3%. Figure 53 breaks down child passenger compliance by restraint type, seat belts or child restraints, and vehicle type. The figure includes the 428 child passengers observed throughout the roadside study and excludes 16 child passengers from the Hosea Kutako police roadblock.

The team investigated the statistical significance of combined compliance of child passengers and vehicle type through hypothesis testing. The test investigated correlations between cars and trucks using $\alpha = 0.05$. The test yielded a two-tailed probability of 0.2791. As this result is greater than the defined α, the research team cannot provide significant evidence to support a correlation between vehicle type and child passenger combined compliance. Despite the large number of taxis in Windhoek, the analysts could not investigate the compliance exhibited by children in taxis further.

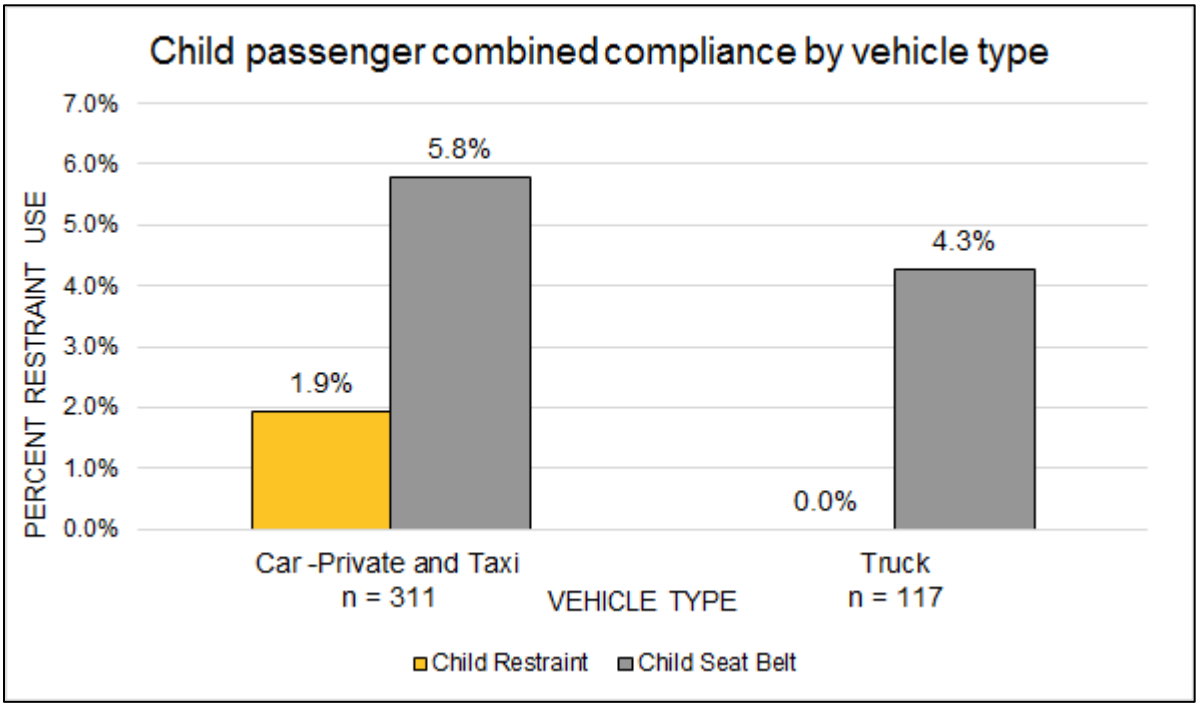


Figure 53: *Child passenger combined compliance by vehicle type*

4.2 Attitudinal Survey

To better understand the motivations behind passenger seat belt compliance, the research team distributed an attitudinal survey to students at both Worcester Polytechnic Institute (WPI), a technical university in the United States, and Namibia Institute of Science and Technology (NUST). As discussed in Section 3.3, the survey distributed to NUST students included some slight modifications to the WPI survey to gain more information on child restraints and taxi passenger behavior in Namibia. Because NUST students are on average older than WPI students, they are more likely to have children and provide useful data regarding child restraints. In addition, since NUST students are less likely to have a driver's license, they use taxis more frequently and can provide data about how seat belt behavior differs in this vehicle subset. Between the two universities, our attitudinal survey collected 351 total responses. Similar to the observational study data, this project analyzed these results to investigate correlations between different cultural, educational, and demographical factors and seat belt compliance in young adults.

4.2.1 Worcester Polytechnic Institute Survey

The attitudinal survey yielded 252 responses from students at WPI, of which 79% reported always wearing a seat belt while traveling in a vehicle. The remaining respondents answered "Usually" (16%), "Sometimes" (4%), or "Rarely" (1%). No WPI students reported that they never wear a seat belt in a motor vehicle. Respondents that did not select "Always" in

response to frequency of seat belt usage were probed further to investigate factors that influence compliance. The most common reasons respondents gave for non-compliance were the short length of a trip, the low speed of travel, the lack of seat belts in the vehicle, discomfort from wearing a seat belt, and trust in the driver's skills. Of the 52 respondents asked these additional questions, 94% said they wear a seat belt as the driver, 96% wear a seat belt as a front seat passenger, and 64% buckle up as a back seat passenger. 56% of all respondents indicated that as the driver, they always require their passengers to wear seat belts. 84% said that in general, both of their parents or guardians wear a seat belt, and 80% reported that they have seen or heard seat belt information and/or advertisements.

To investigate the correlation between self-reported seat belt use and other variables, the research team developed a weighted system to measure compliance. The analysts assigned a value to each response to the question, "Do you wear a seat belt while traveling in a vehicle?" as shown in Table 12.

Table 12: *Attitudinal Survey Weighted Response Values for Seat Belt Compliance*

Attitudinal Survey Weighted Response Values for Compliance	
Response	**Value**
Always	4
Usually	3
Sometimes	2
Rarely	1
Never	0

This weighted metric system enabled the research team to quantify the self-reported seat belt use of targeted groups with a single variable, referred to as "Weighted Compliance". This variable measures self-reported use on a scale of 0 to 4, with higher values indicating greater self-reported use. Weighted compliance, W_c, can be calculated with the following equation, where n is the number of responses:

$$C_w = \frac{4 * \text{Always} + 3 * \text{Usually} + 2 * \text{Sometimes} + 1 * \text{Rarely} + 0 * \text{Never}}{n}$$

4.2.1.1 Age

Using the weighted compliance metric, Table 13 depicts the compliance of each respondent age group for the attitudinal survey.

Table 13: *WPI Attitudinal Survey Age and Seat Belt Compliance*

WPI Attitudinal Survey Age and Compliance							
Age	**Count**	**Always**	**Usually**	**Sometimes**	**Rarely**	**Never**	**Weighted Compliance**
17	1	0	1	0	0	0	3.00
18	23	18	4	1	0	0	3.74
19	42	33	7	2	0	0	3.74
20	83	65	16	2	0	0	3.76
21	76	61	9	4	2	0	3.70
22	24	20	4	0	0	0	3.83
23	2	2	0	0	0	0	4.00

The research team tested the highest compliance, reported by 22 year-old WPI respondents, against the lowest compliance, reported by 21 year-old respondents. Analysis did not include 17 year-old or 23 year-old respondents due to low sample size. This hypothesis test utilized a **two-tailed independent groups t-test** between means with $\alpha = 0.05$. This type of test gives the probability of the means of two independent samples differing as widely as the two test samples, assuming the two population means are equal. In the context of this study, the test indicates the likelihood of observing such differing self-reported seat belt use in WPI students of various ages, assuming the true self-reported use of all ages is equal. This statistical analysis used sample standard deviation rather than population standard deviation in order to generalize the findings to all WPI students and not just those surveyed. The test resulted in a two-tailed probability value of 0.3832 seen in Figure 54.

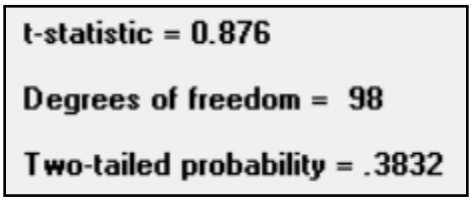


Figure 54: *Hypothesis testing results for seat belt compliance among 21 and 22 year old WPI respondents*

As this value is greater than the determined α of 0.05, this correlation lacks statistical significance to conclude that 21 year-old WPI respondents consistently wear seat belts more frequently than 22 year-old respondents.

The next statistical test involved studying self-reported compliance between the two most common age subgroups reported by respondents, 20 years and 21 years. Though these groups represented the two most common ages of respondents, the small difference in means led to a higher P-value despite the high response rates. The resulting two-tailed probability from this comparison was 0.5318, as shown in Figure 55. The test failed to report statistically significant evidence to correlate between these age groups and compliance levels.

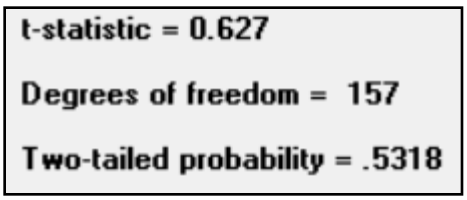


Figure 55: *Hypothesis testing results for seat belt compliance among 20 and 21 year old WPI respondents*

4.2.1.2 Gender

Using the weighted metric described previously in Section 4.2.1, the next step in our analysis calculated the weighted compliance of each respondent by gender, as shown in Table 14.

Table 14: *WPI Attitudinal Survey Gender and Seat Belt Compliance*

WPI Attitudinal Survey Gender and Compliance							
Gender	**Count**	**Always**	**Usually**	**Sometimes**	**Rarely**	**Never**	**Weighted Compliance**
Male	83	68	14	1	0	0	3.81
Female	169	132	27	8	2	0	3.71

The team investigated potential correlations between self-reported compliance and respondent gender using the same hypothesis testing as in age testing. The test resulted in a two-tailed probability value of 0.1821 seen in Figure 56.

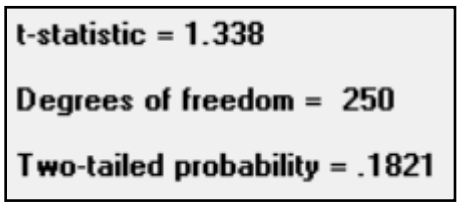


Figure 56: *Hypothesis testing results for seat belt compliance between genders among WPI students*

With the resulting two-tailed probability, 0.1821 greater than the defined α of 0.05, the analysts cannot provide significant evidence of a correlation between respondent gender and self-reported seat belt compliance.

4.2.2 Namibia Institute of Science & Technology Survey

The attitudinal survey yielded 99 responses from students at NUST, of which 42% reported always wearing a seat belt while traveling in a vehicle. The remaining respondents answered “Usually” (18%), “Sometimes” (35%), “Rarely” (3%) or “Never” (1%). The survey questions further probed respondents that did not select “Always” or “Never” in response to frequency of seat belt usage to investigate factors that influence compliance. The most common reasons respondents gave for non-compliance were short length of a trip, low speed of travel, perceived safety of sitting in the back seat, and discomfort from wearing a seat belt. Of the 56

respondents who answered these additional questions, 63% wear a seat belt as a front seat passenger compared to 7% as a back seat passenger. Only two of the 99 respondents reported having children under the age of 12. Seventy percent reported riding in a taxi every day, and 95% reported using taxis at least once per month. Only 24% reported always wearing a seat belt in a taxi, with remaining respondents answering "Usually" (19%), "Sometimes" (33%), "Rarely" (16%), or "Never" (8%). Short length of trip, low speed of travel, perceived safety of sitting in the back seat, and discomfort from wearing a seat belt remained as reasons for not wearing a seat belt in a taxi. Respondents also frequently mentioned lack of seat belts in taxis as a reason for non-compliance.

4.2.2.1 Age

Using the weighted response metric described in Section 4.2.1, the next step in our analysis was to calculate the compliance of each respondent age group, as shown in Table 15. Since all 11 respondents who answered "Other" indicated they were older than 23, the analysis includes these data points in a new category called "24+".

Table 15: *NUST Attitudinal Survey Age and Seat Belt Compliance*

NUST Attitudinal Survey Age and Compliance								
Age	**Count**	**Always**	**Usually**	**Sometimes**	**Rarely**	**Never**	**Weighted Compliance**	
17	2	0	0	2	0	0	2.00	
18	5	0	0	4	1	0	1.80	
19	18	9	4	5	0	0	3.22	
20	27	11	3	11	2	0	2.85	
21	20	7	6	7	0	0	3.00	t-statistic = 1.399
22	11	6	2	3	0	0	3.27	Degrees of freedom = 97
23	5	3	0	2	0	0	3.20	
24+	11	6	3	1	0	1	3.18	Two-tailed probability = .1650

Because the largest sample of any age is just 27, the team analyzed the relationship between age and self-reported compliance by grouping respondents into two age groups: 17-21 and 22+. A two-tailed independent groups t-test between means with $\alpha = 0.05$, the same hypothesis test used to analyze WPI attitudinal survey results, yielded a P-value of 0.1650. Since this P-value is greater than the stated significance level, the analysts cannot provide significant evidence of a correlation between respondent age and self-reported seat belt compliance.

4.2.2.2 Gender

The researchers next calculated the weighted compliance of each respondent by gender, as shown in Table 16.

Table 16: *NUST Attitudinal Survey Gender and Seat Belt Compliance*

NUST Attitudinal Survey Gender and Compliance							
Gender	**Count**	**Always**	**Usually**	**Sometimes**	**Rarely**	**Never**	**Weighted Compliance**
Male	59	29	10	18	1	1	3.10
Female	40	13	8	17	2	0	2.80

The team investigated potential correlations between self-reported compliance and respondent gender, again using a two-tailed independent groups t-test between means with $\alpha = 0.05$, the same hypothesis test used to analyze WPI attitudinal survey results. The test resulted in a two-tailed probability value of 0.1437 as seen in Figure 57.

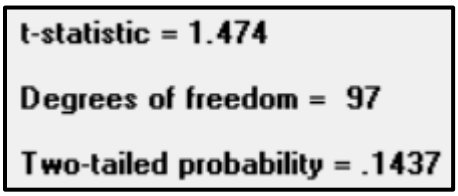


Figure 57: *Hypothesis testing results for seat belt compliance between genders (NUST)*

Since this P-value exceeds the stated significant level of $\alpha = 0.05$, the analysts cannot provide significant statistical evidence of a correlation between respondent gender and self-reported seat belt compliance.

4.2.2.3 Taxi Compliance

This project also investigated NUST students' self-reported seat belt use in taxis compared to vehicles in general. Table 17 displays a comparison of these results.

Table 17: *NUST Self-Reported Compliance Seat Belt Comparison: Taxis and All Vehicles*

NUST Self-Reported Compliance Comparison: Taxis and All Vehicles						
Vehicle	**Always**	**Usually**	**Sometimes**	**Rarely**	**Never**	**Weighted Compliance**
All Vehicles	42	18	35	3	1	2.98
Taxis	23	18	32	16	8	2.33

t-statistic = 4.046
Degrees of freedom = 194
Two-tailed probability = .0001

Hypothesis testing of this result yielded a P-value of 0.0001. Since this P-value is less than the stated significance level, the team has statistically significant evidence that **NUST students wear seat belts less often in taxis than in vehicles in general**.

4.2.3 Comparing WPI and NUST Results

After collecting data through an attitudinal survey at universities in both the United States and Namibia, our study continued by evaluating the differences in the driving habits of students

in the two countries. In particular, the analysts used statistical analysis to measure differences in the age, frequency of driver's license, and self-reported seat belt use of students at WPI and NUST.

4.2.3.1 Age

Table 18 compares the age of WPI students and NUST students. Since all 12 respondents who answered "Other" indicated they were older than 23, Table 18 identifies these data points as "24+". The calculated average age takes into account the true reported age of these respondents, which ranged from 25 to 31.

Table 18: *Age Comparison of WPI and NUST Respondents*

Age Comparison: WPI and NUST									
University	17	18	19	20	21	22	23	24+	Average Age
WPI	1	23	42	83	76	24	2	1	20.17
NUST	2	5	18	27	20	11	5	11	20.93

t-statistic = 3.985
Degrees of freedom = 349
Two-tailed probability = .0001

To determine the significance of this age difference, the researchers performed a two-tailed independent groups t-test between means with $\alpha = 0.05$, yielding a P-value of 0.0001. Since this P-value is less than the stated significance level, the team has statistically significant evidence that on average, **NUST students are older than WPI students**. This reinforces the decision to include questions regarding child restraints on the NUST survey; in general, older students are more likely to have children.

4.2.3.2 Driver's License Prevalence

Table 19 compares the prevalence of driver's licenses among WPI students and NUST students.

Table 19: *Driver's License Prevalence Comparison of WPI and NUST Respondents*

Driver's License Prevalence Comparison: WPI and NUST			
University	Yes	No	%
WPI	250	2	99.21%
NUST	32	67	32.32%

t-statistic = 14.191
Degrees of freedom = 349
Two-tailed probability = .0000

Hypothesis testing of this result yielded a P-value of 0.0000. Since this P-value is less than the stated significance level, the team has statistically significant evidence that **WPI students are more likely to have a driver's license than NUST students**. This finding

reinforces the decision to include questions regarding taxi use on the NUST survey; students without a driver's license are more likely to rely on taxis for transportation.

4.2.3.3 Self-Reported Seat Belt Compliance

Table 20 compares the self-reported seat belt use of WPI students and NUST students. This comparison utilized the weighted response metric described in Section 4.2.1 to assess the compliance levels of the two sample student groups.

Table 20: *Self-Reported Seat Belt Compliance Comparison of WPI and NUST Respondents*

Self-Reported Compliance Comparison: WPI and NUST							t-statistic = 9.019
University	**Always**	**Usually**	**Sometimes**	**Rarely**	**Never**	**Weighted Compliance**	Degrees of freedom = 349
WPI	200	41	9	2	0	3.74	Two-tailed probability = .0000
NUST	42	18	35	3	1	2.98	

Hypothesis testing of this result yielded a P-value of 0.0000. Since this P-value is less than the stated significance level, the team has statistically significant evidence that **self-reported seat belt use is greater among WPI students than NUST students**.

Chapter 5: Conclusions and Recommendations

Over the course of this project, the research team provided our sponsor with complete and relevant data on seat belt and child restraint compliance across the Khomas Region as well as a method to continue data collection across the country. The student group also identified common reasons for non-compliance among college students in the Khomas Region. They then suggested feasible recommendations to improve compliance levels for future implementation by road safety organizations in Namibia.

Child passengers exhibited the lowest compliance of all groups examined in this report. The team observed only 7.5% of children in all vehicle types properly restrained with either a seat belt or child restraint. Adult passengers also showed low compliance in all vehicle types with only 22.8% of passengers properly wearing a seat belt. Taxi passenger compliance was even lower at 17.2%.

Based on these results, our project team identified three main areas to address, listed below, to increase seat belt and child restraint use and overall road safety in the Khomas Region:

1. Child passengers in all vehicle types (cars, taxis, and trucks).
2. Adult passengers in taxis.
3. Public transportation.

The project team observed low compliance rates in the child passenger population throughout the duration of the project. Financial constraints often limit the ability of parents to buy suitable child restraints for their children. In order to address low compliance rates and monetary considerations, the project team proposes a donation system that accepts outgrown child restraints for later redistribution to families that cannot afford them. Similarly, we propose a consignment redistribution program whereby parents, who have no use for their child restraints, can sell them into consignment and families from lower socioeconomic statuses can buy them at a discounted price. Interested road safety organizations, such as the MVA Fund, AA, or NAMPOL, philanthropy groups, or even an organization at WPI could run these programs and accept the donations. Then the stakeholders can distribute these child restraints at road safety events, primary and pre-primary schools, and in regions with particularly low compliance, like Katutura. Promotions for these child restraint redistribution events could take the form of informative fliers and short presentations at schools by a member of the MVA Fund or AA concerning the benefits of child restraints.

To encourage an increase in adult passenger seat belt use in taxis, the team proposes radio advertisements broadcast in various local languages on popular Windhoek radio channels, to inform both taxi drivers and their passengers of the risks associated with failing to use their seat belts properly. Road safety organizations and other stakeholders can also distribute informational

stickers to taxi drivers that promote seat belt use, which the drivers can place on the doors or interior of the taxi to increase passenger awareness. Since the Roads Authority is responsible for conducting taxi inspections, informing them of the stickers and requesting that they put the stickers in taxis during inspections could also increase awareness among taxi passengers. Additionally, through discussion with the MVA Fund and AA, we identified that uncleanliness of seat belts in taxis may also contribute to lower passenger compliance levels. Therefore, the research team recommends distributing disposable covers or wipes for seat belts to taxi drivers and passengers that they could use prior to use of the seat belt.

This investigation demonstrated that passengers traveling in trucks also have low compliance levels at 27.4%; however, current laws in Namibia allow six unrestrained passengers to travel in the backs of trucks legally. Rather than recommend amendments to Namibian law, the researchers proposed an alternative solution to target people that often travel unrestrained in trucks and taxis. Lack of public transportation in Windhoek leads to high taxi use and unsafe transportation of workers in overcrowded trucks, both of which contribute to low passenger compliance. As Windhoek's working population grows, the Move Windhoek bus system has budding potential to provide a safe, accessible form of transportation. Because the current system operates on limited routes throughout the city and often runs behind schedule, many commuters do not choose to travel by bus as shown in Figure 58. Improving the public transportation system in Windhoek could encourage more workers to utilize the bus system as a commuting option rather than unsafely crowding the beds of trucks to travel to work quickly and cheaply. Though this issue is outside the scope of this project, the project team advises a future project to investigation strategies for improving and expanding public transportation in the City of Windhoek.

Figure 58: *Empty City of Windhoek bus during rush hour in Katutura*

In addition to the future project dedicated to improving the Move Windhoek bus system, other organizations and teams can continue efforts to increase road safety. The team recommends that, using methods from this project, road safety stakeholders conduct an observational study across all regions of Namibia to get a better sense of the general compliance across the country.

Similarly, road safety organizations should consider distributing an attitudinal survey to a larger population to get a sense of general attitudes toward seat belts in Namibia. Successful implementation of these recommendations can bring the MVA Fund and AA closer to their goal of increasing vehicle occupant safety throughout Namibia.

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Appendix A: Roadside Observation Data Collection Form

Vehicle Type

- Car
- Truck

Driver - Gender

- Male
- Female
- Could not tell gender
- Could not see driver → (end of survey if selected)

Driver - Race

- White
- Black
- Colored
- Other

Driver - Age

- 16-18 (Learner)
- 18-21
- 21-30
- 31-40
- 41-50
- 51+

Driver - Seat Belt

- Yes
- Maybe
- No

Additional Passengers in Vehicle

- Yes
- No → (end of survey if selected)

Adult Passengers?

- 0
- 1
- 2
- 3
- 4
- 5
- Over 5

Adult Passengers - Seat Belts?

- 0
- 1
- 2
- 3
- 4
- 5
- Over 5

Children Passengers?

- Yes
- No → (end of survey if selected)

Number of Child Passengers?

- 1
- 2
- 3
- 4
- 5
- Over 5

Children in Restraints?

- 0
- 1
- 2
- 3
- 4
- 5
- Over 5

Children in Seat Belts?

- 0
- 1
- 2
- 3
- 4
- 5
- Over 5

Appendix B: Roadside Observation Results by Location

Site A: Otjomuise & Sam Nujoma

30 March 2017, 07:00-08:00

1) Vehicle Type:

Response	Count	Percentage
Car	75	82.42%
Truck	16	17.58%

2) Driver - Gender:

Response	Count	Percentage
Male	85	93.41%
Female	5	5.49%
Could not see driver	1	1.10%

3) Driver - Race

Response	Count	Percentage
White	6	6.67%
Black	77	85.56%
Colored	5	5.56%
Other	2	2.22%

4) Driver - Age

Response	Count	Percentage
16-18	0	0.00%
18-21	0	0.00%
21-30	14	15.56%
31-40	49	54.44%
41-50	19	21.11%
51+	8	8.89%

5) Driver - Seat Belt

Response	Count	Percentage
Yes	68	75.56%
No	22	24.44%

6) Passengers in Vehicle?

Response	Count	Percentage
Yes	26	28.89%
No	64	71.11%

7) Passengers

Response	Count	Percentage
Adults:	32	
w/ seat belt	10	31.25%
Children:	2	
w/ child restraint	0	0.00%
w/ seat belt	0	0.00%

Site B: John Meinert & Hosea Kutako

3 April 2017, 07:45-08:45

1) Vehicle Type:		
Response	**Count**	**Percentage**
Car	117	76.47%
Truck	36	23.53%

2) Driver - Gender:		
Response	**Count**	**Percentage**
Male	124	81.05%
Female	26	16.99%
Could not see driver	3	1.96%

3) Driver - Race		
Response	**Count**	**Percentage**
White	20	13.33%
Black	112	74.67%
Colored	18	12.00%
Other	0	0.00%

4) Driver - Age		
Response	**Count**	**Percentage**
16-18	0	0.00%
18-21	0	0.00%
21-30	25	16.67%
31-40	80	53.33%
41-50	34	22.67%
51+	11	7.33%

5) Driver - Seat Belt		
Response	**Count**	**Percentage**
Yes	113	75.33%
No	37	24.67%

6) Passengers in Vehicle?		
Response	**Count**	**Percentage**
Yes	80	53.33%
No	70	46.67%

7) Passengers		
Response	**Count**	**Percentage**
Adults:	201	
w/ seat belt	55	27.36%
Children:	15	
w/ child restraint	0	0.00%
w/ seat belt	0	0.00%

Site C: Wilibald Kapuenene & Hans Dietrich

10 April 2017, 12:45-13:30

1) Vehicle Type:

Response	Count	Percentage
Car	111	86.05%
Truck	18	13.95%

2) Driver - Gender:

Response	Count	Percentage
Male	102	79.07%
Female	21	16.28%
Could not see driver	6	4.65%

3) Driver - Race

Response	Count	Percentage
White	2	1.63%
Black	120	97.56%
Colored	1	0.81%
Other	0	0.00%

4) Driver - Age

Response	Count	Percentage
16-18	0	0.00%
18-21	0	0.00%
21-30	29	23.58%
31-40	68	55.28%
41-50	19	15.45%
51+	7	5.69%

5) Driver - Seat Belt

Response	Count	Percentage
Yes	86	69.92%
No	37	30.08%

6) Passengers in Vehicle?

Response	Count	Percentage
Yes	94	76.42%
No	29	23.58%

7) Passengers

Response	Count	Percentage
Adults:	215	
w/ seat belt	38	17.67%
Children:	17	
w/ child restraint	0	0.00%
w/ seat belt	0	0.00%

Site D: Mandume Ndemufayo & Fidel Castro

12 April 2017, 07:30-08:30

1) Vehicle Type:

Response	Count	Percentage
Car	43	33.86%
Truck	37	29.13%
Taxi	47	37.01%

2) Driver - Gender:

Response	Count	Percentage
Male	115	90.55%
Female	8	6.30%
Could not see driver	4	3.15%

3) Driver - Race

Response	Count	Percentage
White	3	2.44%
Black	116	94.31%
Colored	4	3.25%
Other	0	0.00%

4) Driver - Age

Response	Count	Percentage
16-18	0	0.00%
18-21	0	0.00%
21-30	25	20.33%
31-40	63	51.22%
41-50	26	21.14%
51+	9	7.32%

5) Driver - Seat Belt

Response	Count	Percentage
Yes	73	59.35%
No	50	40.65%

6) Passengers in Vehicle?

Response	Count	Percentage
Yes	76	61.79%
No	47	38.21%

7) Passengers

Response	Count	Percentage
Adults:	136	
w/ seat belt	23	16.91%
Children:	3	
w/ child restraint	0	0.00%
w/ seat belt	0	0.00%

Site E: Monte Cristo & Hereford

12 April 2017, 09:00-10:00

1) Vehicle Type:

Response	Count	Percentage
Car	51	37.23%
Truck	20	14.60%
Taxi	66	48.18%

2) Driver - Gender:

Response	Count	Percentage
Male	110	80.29%
Female	22	16.06%
Could not see driver	5	3.65%

3) Driver - Race

Response	Count	Percentage
White	7	5.30%
Black	113	85.61%
Colored	12	9.09%
Other	0	0.00%

4) Driver - Age

Response	Count	Percentage
16-18	0	0.00%
18-21	0	0.00%
21-30	26	19.70%
31-40	61	46.21%
41-50	34	25.76%
51+	11	8.33%

5) Driver - Seat Belt

Response	Count	Percentage
Yes	122	92.42%
No	10	7.58%

6) Passengers in Vehicle?

Response	Count	Percentage
Yes	85	64.39%
No	47	35.61%

7) Passengers

Response	Count	Percentage
Adults:	151	
w/ seat belt	45	29.80%
Children:	1	
w/ child restraint	0	0.00%
w/ seat belt	0	0.00%

Site F: Sam Nujoma & Independence

18 April 2017, 10:30-11:30

1) Vehicle Type:		
Response	**Count**	**Percentage**
Car	88	46.56%
Truck	58	30.69%
Taxi	43	22.75%

2) Driver - Gender:		
Response	**Count**	**Percentage**
Male	155	82.01%
Female	25	13.23%
Could not see driver	9	4.76%

3) Driver - Race		
Response	**Count**	**Percentage**
White	27	15.00%
Black	131	72.78%
Colored	17	9.44%
Other	5	2.78%

4) Driver - Age		
Response	**Count**	**Percentage**
16-18	0	0.00%
18-21	0	0.00%
21-30	26	14.44%
31-40	85	47.22%
41-50	50	27.78%
51+	19	10.56%

5) Driver - Seat Belt		
Response	**Count**	**Percentage**
Yes	133	73.89%
No	47	26.11%

6) Passengers in Vehicle?		
Response	**Count**	**Percentage**
Yes	70	38.89%
No	110	61.11%

7) Passengers		
Response	**Count**	**Percentage**
Adults:	97	
w/ seat belt	26	26.80%
Children:	1	
w/ child restraint	0	0.00%
w/ seat belt	0	0.00%

Site G: Delta Primary School

3 April 2017, 12:45-13:30

1) Vehicle Type:		
Response	**Count**	**Percentage**
Car	76	72.38%
Truck	29	27.62%

2) Driver - Gender:		
Response	**Count**	**Percentage**
Male	65	61.90%
Female	37	35.24%
Could not see driver	3	2.86%

3) Driver - Race		
Response	**Count**	**Percentage**
White	42	41.18%
Black	49	48.04%
Colored	10	9.80%
Other	1	0.98%

4) Driver - Age		
Response	**Count**	**Percentage**
16-18	0	0.00%
18-21	0	0.00%
21-30	5	4.90%
31-40	44	43.14%
41-50	36	35.29%
51+	17	16.67%

5) Driver - Seat Belt		
Response	**Count**	**Percentage**
Yes	89	87.25%
No	13	12.75%

6) Passengers in Vehicle?		
Response	**Count**	**Percentage**
Yes	50	49.02%
No	52	50.98%

7) Passengers		
Response	**Count**	**Percentage**
Adults:	31	
w/ seat belt	14	45.16%
Children:	52	
w/ child restraint	5	9.62%
w/ seat belt	5	9.62%

Site H: Emma Hoogenhout Primary School

4 April 2017, 12:45-13:30

1) Vehicle Type:

Response	Count	Percentage
Car	69	70.41%
Truck	29	29.59%

2) Driver - Gender:

Response	Count	Percentage
Male	67	68.37%
Female	26	26.53%
Could not see driver	5	5.10%

3) Driver - Race

Response	Count	Percentage
White	11	11.83%
Black	66	70.97%
Colored	16	17.20%
Other	0	0.00%

4) Driver - Age

Response	Count	Percentage
16-18	0	0.00%
18-21	2	2.15%
21-30	14	15.05%
31-40	23	24.73%
41-50	34	36.56%
51+	20	21.51%

5) Driver - Seat Belt

Response	Count	Percentage
Yes	77	82.80%
No	16	17.20%

6) Passengers in Vehicle?

Response	Count	Percentage
Yes	82	88.17%
No	11	11.83%

7) Passengers

Response	Count	Percentage
Adults:	56	
w/ seat belt	17	30.36%
Children:	113	
w/ child restraint	1	0.88%
w/ seat belt	7	6.19%

Site I: Suiderhof Primary School

5 April 2017, 12:45-13:30

1) Vehicle Type:

Response	Count	Percentage
Car	55	70.51%
Truck	23	29.49%

2) Driver - Gender:

Response	Count	Percentage
Male	45	57.69%
Female	29	37.18%
Could not see driver	4	5.13%

3) Driver - Race

Response	Count	Percentage
White	14	18.92%
Black	43	58.11%
Colored	17	22.97%
Other	0	0.00%

4) Driver - Age

Response	Count	Percentage
16-18	0	0.00%
18-21	1	1.35%
21-30	9	12.16%
31-40	30	40.54%
41-50	24	32.43%
51+	10	13.51%

5) Driver - Seat Belt

Response	Count	Percentage
Yes	64	86.49%
No	10	13.51%

6) Passengers in Vehicle?

Response	Count	Percentage
Yes	70	94.59%
No	4	5.41%

7) Passengers

Response	Count	Percentage
Adults:	30	
w/ seat belt	11	36.67%
Children:	81	
w/ child restraint	0	0.00%
w/ seat belt	10	12.35%

Site J: People's Primary School

6 April 2017, 12:45-13:30

1) Vehicle Type:

Response	Count	Percentage
Car	61	70.93%
Truck	25	29.07%

2) Driver - Gender:

Response	Count	Percentage
Male	73	84.88%
Female	8	9.30%
Could not see driver	5	5.81%

3) Driver - Race

Response	Count	Percentage
White	0	0.00%
Black	78	96.30%
Colored	3	3.70%
Other	0	0.00%

4) Driver - Age

Response	Count	Percentage
16-18	0	0.00%
18-21	0	0.00%
21-30	17	20.99%
31-40	33	40.74%
41-50	22	27.16%
51+	9	11.11%

5) Driver - Seat Belt

Response	Count	Percentage
Yes	51	62.96%
No	30	37.04%

6) Passengers in Vehicle?

Response	Count	Percentage
Yes	60	74.07%
No	21	25.93%

7) Passengers

Response	Count	Percentage
Adults:	52	
w/ seat belt	12	23.08%
Children:	94	
w/ child restraint	0	0.00%
w/ seat belt	1	1.06%

Site K: Moses Garoeb Primary School

10 April 2017, 12:45-13:30

1) Vehicle Type:

Response	Count	Percentage
Car	163	93.14%
Truck	12	6.86%

2) Driver - Gender:

Response	Count	Percentage
Male	168	96.00%
Female	4	2.29%
Could not see driver	3	1.71%

3) Driver - Race

Response	Count	Percentage
White	0	0.00%
Black	171	99.42%
Colored	1	0.58%
Other	0	0.00%

4) Driver - Age

Response	Count	Percentage
16-18	0	0.00%
18-21	0	0.00%
21-30	54	31.40%
31-40	81	47.09%
41-50	27	15.70%
51+	10	5.81%

5) Driver - Seat Belt

Response	Count	Percentage
Yes	129	75.00%
No	43	25.00%

6) Passengers in Vehicle?

Response	Count	Percentage
Yes	141	81.98%
No	31	18.02%

7) Passengers

Response	Count	Percentage
Adults:	216	
w/ seat belt	30	13.89%
Children:	49	
w/ child restraint	0	0.00%
w/ seat belt	0	0.00%

Site L: Hosea Kutako B6 Airport Roadblock

11 April 2017, 13:30-14:30

1) Vehicle Type:

Response	Count	Percentage
Car	90	66.18%
Truck	36	26.47%
Taxi	10	7.35%

2) Driver - Gender:

Response	Count	Percentage
Male	117	86.03%
Female	19	13.97%
Could not see driver	0	0.00%

3) Driver – Race

Response	Count	Percentage
White	58	42.65%
Black	65	47.79%
Colored	12	8.82%

4) Driver - Age

Response	Count	Percentage
16-18	0	0.00%
18-21	0	0.00%
21-30	28	20.59%
31-40	47	34.56%
41-50	26	19.12%
51+	35	25.74%

5) Driver - Seat Belt

Response	Count	Percentage
Yes	136	100.00%
No	0	0.00%

6) Passengers in Vehicle?

Response	Count	Percentage
Yes	83	61.03%
No	53	38.97%

7) Passengers

Response	Count	Percentage
Adults:	150	
w/ seat belt	112	74.67%
Children:	16	
w/ child restraint	5	31.25%
w/ seat belt	3	18.75%

Total – Schools and Intersections

***excludes police roadblock**

1) Vehicle Type:		
Response	**Count**	**Percentage**
Car	909	66.45%
Truck	303	22.15%
Taxi	156	11.40%

2) Driver - Gender:		
Response	**Count**	**Percentage**
Male	1109	81.07%
Female	211	15.42%
Could not see driver	48	3.51%

3) Driver - Race		
Response	**Count**	**Percentage**
White	132	10.00%
Black	1076	81.52%
Colored	104	7.88%
Other	8	0.61%

4) Driver – Age		
Response	**Count**	**Percentage**
16-18	0	0.00%
18-21	3	0.23%
21-30	244	18.48%
31-40	617	46.74%
41-50	325	24.62%
51+	131	9.92%

5) Driver - Seat Belt		
Response	**Count**	**Percentage**
Yes	1005	76.14%
No	315	23.86%

6) Passengers in Vehicle?		
Response	**Count**	**Percentage**
Yes	834	63.18%
No	486	36.82%

7) Passengers		
Response	**Count**	**Percentage**
Adults:	1217	
w/ seat belt	281	23.09%
Children:	428	
w/ child restraint	6	1.40%
w/ seat belt	23	5.37%

Appendix C: WPI Attitudinal Survey Questions

Hello, we are students from Worcester Polytechnic Institute working with the Motor Vehicle Accident Fund of Namibia to collect seat belt and child restraint data. We would like to understand about seat belt and child restraint use. Our goal is to help community members and the city of Windhoek, Namibia improve road safety and motor vehicle occupant safety. No personal information will be collected, but your responses may be included in our report published online. The study is for research purposes only; your responses will not be shared with law enforcement or any other parties. You do not have to discuss anything that you prefer not to and can stop at any time. If you have any questions or concerns later about our survey, feel free to contact nam17-mva@wpi.edu.

Please indicate your agreement with the information above.

- I agree.
- I do not agree

Age:

- 17
- 18
- 19
- 20
- 21
- 22
- 23
- Other (please specify): _____

Gender:

- Male
- Female
- Prefer not to say

Do you have a driver's license?

- Yes
- No

Did your driver education include a classroom-style program?

- Yes
- No
- I have not participated in any driver education program

Do you wear a seat belt when traveling in a vehicle?

- Always
- Usually

- Sometimes
- Rarely
- Never

If sometimes, in what cases do you wear a seat belt? (Choose all that apply):

- As a driver
- As a passenger (in the front seat)
- As a passenger (in the back seat)
- Only on short trips
- Only on long trips
- Only when there is a threat to be stopped by police
- Other (please specify): _____

If sometimes or never, please explain when or why you do not use a seat belt. (Choose all that apply):

- It is safe to sit in the back seat, I do not need to wear my seat belt there
- If no one else in the vehicle is wearing a seat belt
- When traveling only on short trips at low speeds
- Wearing a seat belt is uncomfortable
- Sometimes I travel in a vehicle that is not equipped with seat belts
- I am confident that I will not be stopped by police
- If I trust the driver's skills
- Other (please specify): _____

While driving, do you require your passengers to wear their seat belts?

- Always
- Usually
- Sometimes
- Rarely
- Never
- I do not drive

In general, do your parent(s)/guardian(s) wear a seat belt while driving?

- Yes, both of them
- Yes, one of them
- No, neither of them
- I do not know

Have you seen/heard any seat belt information/advertisements (TV, radio, billboards, etc.)?

- Yes
- No
- Not sure

We thank you for your time spent taking this survey.

Appendix D: WPI Attitudinal Survey Results

1) Age:		
Response	**Count**	**Percentage**
17	1	0.40%
18	23	9.13%
19	42	16.67%
20	83	32.94%
21	76	30.16%
22	24	9.52%
23	2	0.79%
Other (please specify)	1	0.40%

2) Gender:		
Response	**Count**	**Percentage**
Male	83	32.94%
Female	169	67.06%
Prefer not to say	0	0.00%

3) Do you have a driver's license?		
Response	**Count**	**Percentage**
Yes	250	99.21%
No	2	0.79%

4) Did your driver education include a classroom-style program?		
Response	**Count**	**Percentage**
Yes	223	88.49%
No	16	6.35%
I have not participated in any driver education	13	5.16%

5) Do you wear a seat belt when traveling in a vehicle?		
Response	**Count**	**Percentage**
Always	200	79.37%
Usually	41	16.27%
Sometimes	9	3.57%
Rarely	2	0.79%
Never	0	0.00%

6) In what cases do you wear a seat belt? (choose all that apply) (52 respondents)		
Response	**Count**	**Percentage**
As a driver	49	94.23%
As a passenger (in the front seat)	50	96.15%
As a passenger (in the back seat)	33	63.46%
Only on short trips	5	9.62%
Only on long trips	12	23.08%
Only when there is a threat to be stopped by police	9	17.31%
Other (please specify)	2	3.85%

7) Please explain when or why you do not use a seat belt. (choose all that apply) (52 respondents)		
Response	**Count**	**Percentage**
It is safe to sit in the back seat, so I do not need to wear my seat belt there	12	23.08%
If no one else in the vehicle is wearing a seat belt	11	21.15%
When traveling only on short trips at low speeds	29	55.77%
Wearing a seat belt is uncomfortable	14	26.92%
Sometimes I travel in a vehicle that is not equipped with seat belts	15	28.85%
I am confident I will not be stopped by police	8	15.38%
If I trust the driver's skills	14	26.92%
Other (please specify)	9	17.31%

8) While driving, do you require your passengers to wear their seat belts?		
Response	**Count**	**Percentage**
Always	140	55.78%
Usually	79	31.47%
Sometimes	18	7.17%
Rarely	4	1.59%
Never	9	3.59%
I do not drive	1	0.40%

9) In general, do your parent(s)/guardians(s) wear a seat belt while driving?		
Response	**Count**	**Percentage**
Yes, both of them	212	84.46%
Yes, one of them	37	14.74%
No, neither of them	2	0.80%
I do not know	0	0.00%

10) Have you seen/heard any seat belt information/advertisements (TV, radio, billboards, etc.)?		
Response	**Count**	**Percentage**
Yes	200	79.68%
No	31	12.35%
Not sure	20	7.97%

Appendix E: NUST Attitudinal Survey Questions

Hello, we are students from Worcester Polytechnic Institute in the United States working with the Motor Vehicle Accident Fund and Automobile Association of Namibia to collect seat belt and child restraint data. Our goal is to help community members and the city improve road safety and motor vehicle occupant safety. No personal information will be collected in this survey, but your responses may contribute to our report published online. The study is for research purposes only; your responses will not be shared with law enforcement or any other parties. You do not have to discuss anything that you prefer not to and can stop at any time. If you have any questions or concerns later about our survey, feel free to contact nam17-mva@wpi.edu.

Please indicate your agreement with the information above.

- I Agree
- I Do Not Agree

Age:

- 17
- 18
- 19
- 20
- 21
- 22
- 23
- Other (Please specify):

Gender:

- Male
- Female
- Prefer not to say

Do you have a driver's license?

- Yes
- No

Do you wear a seat belt when traveling in a vehicle?

- Always
- Usually
- Sometimes
- Rarely
- Never

If sometimes, in what cases do you wear a seat belt? (Choose all that apply):

- As a driver
- As a passenger (in the front seat)
- As a passenger (in the back seat)
- Only on short trips
- Only on long trips
- Only when there is a threat to be stopped by police
- Other (Please specify):

If sometimes or never, please explain when or why you do not use a seat belt. (Choose all that apply):

- It is safe to sit in the back seat, I do not need to wear my seat belt there
- If no one else in the vehicle is wearing a seat belt
- When traveling only on short trips at low speeds
- Wearing a seat belt is uncomfortable
- Sometimes I travel in a vehicle that is not equipped with seat belts
- I am confident that I will not be stopped by police
- If I trust the driver's skills
- Other (Please specify): _____

Do you have children under the age of 12?

- Yes
- No

If yes, when traveling in a vehicle, your child is (choose all that apply):

- Always placed in a car seat, suitable for the child's weight and age
- Always buckled up
- Placed on an adult's lap
- In the back seat
- In the front seat
- Never buckled up

If you do not use a car seat, please select why. (Choose all that apply):

- Car seats are too expensive
- Car seats do not provide additional safety to children traveling in vehicles
- Seat belts are an acceptable alternative to car seats
- My child is safe sitting in my lap
- Police do not require the use of car seats
- Other (Please specify):

How often do you ride in a taxi in Windhoek?

- Every day
- At least once per week
- At least once per month
- Less than once per month
- Never

Do you wear a seat belt when traveling in a taxi?

- Always
- Usually
- Sometimes
- Rarely
- Never

If sometimes or never, please explain when or why you do not use a seat belt in a taxi. (Choose all that apply):

- It is safe to sit in the back seat, I do not need to wear my seat belt there
- When traveling only on short trips at low speeds
- Wearing a seat belt is uncomfortable
- Sometimes I travel in a vehicle that is not equipped with seat belts
- If I trust the driver's skills
- Other (Please specify): _____

We thank you for your time spent taking this survey.

Appendix F: NUST Attitudinal Survey Results

1) Age:		
Response	**Count**	**Percentage**
17	2	2.02%
18	5	5.05%
19	18	18.18%
20	27	27.27%
21	20	20.20%
22	11	11.11%
23	5	5.05%
Other (please specify)	11	11.11%

2) Gender:		
Response	**Count**	**Percentage**
Male	59	59.60%
Female	40	40.40%
Prefer not to say	0	0.00%

3) Do you have a driver's license?		
Response	**Count**	**Percentage**
Yes	32	32.32%
No	67	67.68%

4) Do you wear a seat belt when traveling in a vehicle?		
Response	**Count**	**Percentage**
Always	42	42.42%
Usually	18	18.18%
Sometimes	35	35.35%
Rarely	3	3.03%
Never	1	1.01%

5) In what cases do you wear a seat belt? (choose all that apply) (56 respondents)		
Response	**Count**	**Percentage**
As a driver	13	23.21%
As a passenger (in the front seat)	35	62.50%
As a passenger (in the back seat)	4	7.14%
Only on short trips	3	5.36%
Only on long trips	19	33.93%
Only when there is a threat to be stopped by police	21	37.50%
Other (please specify)	1	1.79%

6) Please explain when or why you do not use a seat belt. (choose all that apply) (56 respondents)		
Response	**Count**	**Percentage**
It is safe to sit in the back seat, so I do not need to wear my seat belt there	14	25.00%
If no one else in the vehicle is wearing a seat belt	9	16.07%
When traveling only on short trips at low speeds	24	42.86%
Wearing a seat belt is uncomfortable	15	26.79%
Sometimes I travel in a vehicle that is not equipped with seat belts	7	12.50%
I am confident I will not be stopped by police	5	8.93%
If I trust the driver's skills	8	14.29%
Other (please specify)	8	14.29%

7) Do you have children under the age of 12?		
Response	**Count**	**Percentage**
Yes	2	2.02%
No	97	97.98%

8) If yes, when traveling in a vehicle, your child is (choose all that apply) (2 respondents):		
Response	**Count**	**Percentage**
Always placed in a car seat, suitable for the child's weight and age	0	0.00%
Always buckled up	0	0.00%
Placed on an adult's lap	1	50.00%
In the back seat	2	100.00%
In the front seat	0	0.00%
Never buckled up	0	0.00%

9) If you do not use a car seat, please select why. (choose all that apply) (2 respondents)		
Response	**Count**	**Percentage**
Car seats are too expensive	0	0.00%
Car seats do not provide additional safety to children traveling in vehicles	0	0.00%
Seat belts are an acceptable alternative to car seats	1	50.00%
My child is safe sitting in my lap	0	0.00%
Police do not require the use of car seats	0	0.00%
Other (please specify)	1	50.00%

10) How often do you ride in a taxi in Windhoek?		
Response	**Count**	**Percentage**
Every day	69	69.70%
At least once per week	18	18.18%
At least once per month	7	7.07%
Less than once per month	3	3.03%
Never	2	2.02%

11) Do you wear a seat belt when traveling in a taxi?		
Response	**Count**	**Percentage**
Always	23	23.71%
Usually	18	18.56%
Sometimes	32	32.99%
Rarely	16	16.49%
Never	8	8.25%

12) If sometimes or never, please explain when or why you do not use a seat belt in a taxi. (choose all that apply) (64 respondents)		
Response	**Count**	**Percentage**
It is safe to sit in the back seat, I do not need to wear my seat belt there	11	17.19%
When traveling only on short trips at low speeds	28	43.75%
Wearing a seat belt is uncomfortable	16	25.00%
Sometimes I travel in a taxi that is not equipped with seat belts	18	28.13%
If I trust the driver's skills	3	4.69%
Other (please specify)	5	7.81%