A CRITICAL EXAMINATION OF DRIVER TRAFFIC CRASH FATALITY CAUSATION FACTORS IN THE UNITED STATES ACROSS AGE, RACE AND GENDER

A Dissertation

by

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ABSTRACT

This study examined the intersectionality amongst motor vehicle fatal injury crashes by age, gender and race. Importance of examining this intersectionality is that in the future, a greater number of drivers, passengers, pedestrians, bicyclist and motorcyclist of different ethnicities will be interacting on our nations roadways as seen in the changing ethnic demographics projections (US Census, 2020). The research question was: "What are the differences in driver error, behavioral issue, mode of transportation and age groups fatal injury crashes by age, gender and race in the United States for years 2012 to 2016? Motor vehicle fatal injury crash data were obtained from Fatality Analysis Reporting System. The number of overall deaths data was obtained from Wide-Ranging Online Data for Epidemiologic Research database and the variables were created from *Countermeasures that Work: A Highway Safety Countermeasure Guide for State Highway Safety Offices, Ninth Edition* (Richard, Magee, Bacon-Abdelmoteleb & Brown, 2018, USDOT, 2108 & CDC, 2020b).

Findings showed a significant difference in gender in five variables: driver error (speeding, p= .034); mode of transportation (bicycle, p = .003 and motorcycle, p = .000); and driver age groups (25 to 64, p = .022 and 65 plus, p = .013). A significant difference was found in race in the driver age group (15 to 20, p = .006).

Other findings included males of different ethnicities than White had the highest percentage in twelve of the thirteen variables. Native American males had the highest number of percentages in eight variables: driver error (alcohol involvement, speeding

and distraction); behavioral issue (restraint not used); mode of transportation (pedestrian and class C vehicle); and driver age groups (25 to 64 and 65 plus). Latinos had the highest four variables: driver error (drowsy driving); mode of transportation (bicycle and motorcycle); and driver age group (21 to 24). White Males had the highest in one variable: driver age group (15 to 20).

DEDICATION

This work is dedicated to drivers, passengers, bicyclist and motorcyclist who inspire me to continue to work towards ensuring that high quality and equitable driver and traffic safety education and countermeasures. The driver and traffic safety education and countermeasures are to provide equitable culturally responsive knowledge and skills that all can use to avoid traffic crashes and stay alive on our roadways. In addition, this work is dedicated to traffic safety professionals who work diligently to continue to implement proven strategies and who continue to develop new strategies to reduce the number of deaths, injuries, and property damage caused by traffic crashes.

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NOMENCLATURE

CDC	Centers for Disease Control and Prevention
CCHSP	Culturally Competent Highway Safety Program
CRUISE	Culturally Responsive Understanding in Safety Education
DSHS	Department of State Health Services
FARS	Fatality Analysis Reporting System
FDA	United States Food and Drug Administration
FMCSA	Federal Motor Carrier Safety Administration
FWHA	Federal Highway Administration
GHSA	Governors Highway Safety Association
IRB	Institutional Review Board
MMUCC	Model Minimum Uniform Crash Criteria
NAME	National Association for Multicultural Education
NCHS	National Center for Health Statistics
NTSB	National Transportation Safety Board
NHTSA	National Highway Traffic Safety Administration
NVSS	National Vital Statistics System
USDOT	United States Department of Transportation
WISQARS	Web-based Injury Statistics Query and Reporting System

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CHAPTER I

INTRODUCTION

Driving a vehicle provides an individual freedom and independence. Regrettably, sometimes this independence comes with a high price. In 2016, the Centers for Disease Control and Prevention (CDC) reports that an unintentional injury deaths motor vehicle traffic crashes were in the top ten leading cause of death for all ages (Centers for Disease Control and Prevention (CDC), 2019a). Also, for the year 2016 in the United States, the number of individuals fatally injured in motor vehicle crashes was 37,133 in which 23,715 fatalities were the driver of the vehicle (United States Department of Transportation (USDOT), 2020b).

There are several national agencies that include in its mission efforts to reduce the number of fatalities, injuries and property damage caused by motor vehicle crashes. These agencies include the Center for Disease and Prevention (CDC), United States Department of Transportation (USDOT), Federal Highway Department (FWHA) and National Highway Traffic Safety Administration (NHTSA). The following sections provide a brief description of these agencies and their missions.

Centers for Disease Control and Prevention (CDC) Leading Causes of Death

The Centers for Disease and Control and Prevention (CDC) mission is to responsible safeguard the United States from "health, safety and security threats, both foreign and in the United States (CDC, 2019b). To achieve its mission, the CDC fights diseases and performs research to disseminate information to protect the United States from these threats (CDC, 2091b). The CDC promise to the American people includes the following:

1. Be a diligent steward of the funds entrusted to our agency.
2. Provide an environment for intellectual and personal growth and integrity.
3. Base all public health decisions on the highest quality scientific data that is derived openly and objectively.
4. Place the benefits to society above the benefits to our institution.
5. Treat all persons with dignity, honesty, and respect (CDC, 2019b).

One of the ways the CDC accomplishes the mission is to provide data in its Wide-Ranging Online Data for Epidemiologic Research (WONDER) database that contains public health data including mortality rates and its Web-based Injury Statistics Query and Reporting System (WISQARS) database that contains "fatal and nonfatal injury, violent death, and cost of injury data" (CDC, 2020b & CDC, 2019c) WONDER provides data for epidemiologic research and provides data for births, and deaths (CDC, 2020b). The WONDER database provides overall death data by age, gender and race (CDC, 2020b). The race data categories in WONDER were as follows: African American, Asian, Latinx, Native American and White (CDC, 2020b).

The WISQARS database is an "interactive, online database that provides fatal and nonfatal injury, violent death, and cost of injury data from a variety of trusted sources" (CDC, 2019c). The data sources for WISQARS are the National Center for Health Statistics (NCHS), National Vital Statistics System (CDC, 2019c). The WISQARS database provides death data by age, gender and race (CDC, 2019c). The race data categories were as follows: African American, Asian, Latinx, Native American and White (CDC, 2019c). According to the WISQARS, unintentional injury deaths, motor vehicle traffic was in the top ten for all ages in 2016 as shown in Figure 1.1 (CDC, 2019c).

Figure 1.1

The 10 Leading Causes of Injury Deaths by Age Group Highlighting Unintentional Injury Deaths, United States 2016 (CDC, 2018).

10 Leading Causes of Injury Deaths by Age Group Highlighting Unintentional Injury Deaths, United States – 2016

Rank	<1	1-4	5-9	10-14	15-24	25-34	35-44	45-54	55-64	65+	Total
1	Unintentional Suffocation 1,023	Unintentional Drowning 425	Unintentional MV Traffic 384	Unintentional MV Traffic 455	Unintentional MV Traffic 7,037	Unintentional Poisoning 14,631	Unintentional Poisoning 13,278	Unintentional Poisoning 13,439	Unintentional Poisoning 9,438	Unintentional Fall 29,668	Unintentional Poisoning 58,335
2	Homicide Unspecified 132	Unintentional MV Traffic 334	Unintentional Drowning 147	Suicide Suffocation 247	Unintentional Poisoning 4,997	Unintentional MV Traffic 7,010	Unintentional MV Traffic 5,075	Unintentional MV Traffic 5,536	Unintentional MV Traffic 5,397	Unintentional MV Traffic 7,429	Unintentional MV Traffic 38,748
3	Unintentional MV Traffic 88	Unintentional Suffocation 118	Unintentional Fire/Burn 78	Suicide Firearm 160	Homicide Firearm 4,553	Homicide Firearm 4,510	Suicide Firearm 3,099	Suicide Firearm 3,873	Suicide Firearm 4,067	Suicide Firearm 5,756	Unintentional Fall 34,673
4	Homicide Other Spec., Classifiable 63	Homicide Unspecified 114	Homicide Firearm 68	Unintentional Drowning 103	Suicide Firearm 2,683	Suicide Firearm 3,298	Homicide Firearm 2,555	Suicide Suffocation 2,112	Unintentional Fall 2,679	Unintentional Unspecified 5,021	Suicide Firearm 22,938
5	Undetermined Suffocation 60	Unintentional Fire/Burn 107	Unintentional Suffocation 35	Homicide Firearm 95	Suicide Suffocation 2,100	Suicide Suffocation 2,643	Suicide Suffocation 2,199	Suicide Poisoning 1,736	Suicide Poisoning 1,538	Unintentional Suffocation 3,631	Homicide Firearm 14,415
6	Undetermined Unspecified 38	Unintentional Pedestrian, Other 82	Unintentional Other Land Transport 24	Unintentional Other Land Transport 64	Unintentional Drowning 530	Undetermined Poisoning 855	Suicide Poisoning 1,144	Homicide Firearm 1,420	Suicide Suffocation 1,474	Unintentional Poisoning 2,458	Suicide Suffocation 11,642
7	Unintentional Drowning 38	Homicide Firearm 64	Unintentional Pedestrian, Other 18	Unintentional Fire/Burn 52	Suicide Poisoning 426	Suicide Poisoning 767	Undetermined Poisoning 788	Unintentional Fall 1,238	Unintentional Suffocation 792	Adverse Effects 2,028	Suicide Poisoning 6,698
8	Homicide Suffocation 19	Homicide Other Spec., Classifiable 64	Unintentional Firearm 16	Unintentional Suffocation 39	Homicide Cut/Pierce 340	Unintentional Drowning 463	Unintentional Fall 515	Undetermined Poisoning 929	Homicide Firearm 738	Unintentional Fire/Burn 1,150	Unintentional Suffocation 6,610
9	Adverse Effects 18	Unintentional Firearm 34	Unintentional Struck by or Against 15	Unintentional Poisoning 28	Undetermined Poisoning 289	Homicide Cut/Pierce 420	Unintentional Drowning 396	Unintentional Drowning 478	Undetermined Poisoning 707	Suicide Poisoning 1,070	Unintentional Unspecified 6,507
10	Unintentional Natural/ Environment 18	Unintentional Poisoning 34	Unintentional Other Transport 14	Unintentional Firearm 23	Unintentional Fall 199	Unintentional Fall 326	Homicide Cut/Pierce 350	Unintentional Suffocation 419	Unintentional Unspecified 625	Suicide Suffocation 859	Undetermined Poisoning 3,827

Data Source: National Center for Health Statistics (NCHS), National Vital Statistics System.
Produced by: National Center for Injury Prevention and Control, CDC using WISQARS™.

Centers for Disease Control and Prevention
National Center for Injury Prevention and Control

United States Department of Transportation (USDOT)

An act of Congress originated the United States Department of Transportation (USDOT) in October, 1966. The mission of the U.S. Department of Transportation (USDOT) is to guarantee that the United States "has the safest, most efficient and modern transportation system in the world, which improves the quality of life for all American people and communities, from rural to urban, and increases the productivity and competitiveness of American workers and businesses" (USDOT, 2019a). The USDOT has several operating administrations. Two of the operating administrations are the Federal Highway Department (FWHA) and the National Highway Traffic Safety Administration (NHTSA) (USDOT, 2019a).

Federal Highway Department (FWHA)

The Federal Highway Department (FWHA) is an operating administration of the United States of Department of Transportation. Its priorities include "improving safety, encouraging innovation, accomplishing regulatory reform, accelerating project delivery, enabling public-private financing and promoting rural initiatives" (Federal Highway Department, 2019). The FWHA completes its mission by working with partners and stakeholders that include other federal and state governmental agencies (FWHA, 2019).

The FHWA's Highway Statistics maintains data on licensed drivers in fatal crashes in the "Travelers (or System Users)" dataset that includes the following variables:

- Licensed drivers, vehicle registrations and resident population
- License drivers, by state

- Licensed drivers, by gender and age group
- Licensed drivers, ration of licensed drivers to population
- Licensed drivers, by gender and percentage in each age group
- Licensed drivers, by state, gender and age group (FWHA, 2019).

However, licensed drivers by race is not included as a variable for the fatal crashes in the datasets (FWHA, 2019).

National Highway Traffic Safety Administration

The National Highway Traffic Safety Traffic Safety Administration (NHTSA) is another operating administration of the United States Department of Transportation (USDOT, 2019a). NHTSA's mission is to "save lives, prevent injuries and reduce economic costs due to road traffic crashes, through education, research, safety standards and enforcement activity" (USDOT, 2019a). NHTSA is unwavering in its efforts to reaching the highpoint of quality standards in traffic safety. NHTSA is dedicated to giving the public the precise and comprehensive information on United States travel (USDOT, 2019a).

NHTSA has ten Regional Offices that work with surrounding states in its lifesaving efforts connected with motor traffic crashes. The NHTSA ten Regional Offices states are as follows:

- Region I: Connecticut, Maine, Massachusetts, New Hampshire, Rhode Island and Vermont
- Region II: New York, New Jersey, Puerto Rico and Virgin Islands

- Region III: Delaware, District of Columbia, Maryland, Pennsylvania, Virginia and West Virginia
- Region IV: Alabama, Florida, Georgia, Kentucky, Mississippi, North Carolina, South Carolina and Tennessee
- Region V: Illinois, Indiana, Michigan, Minnesota, Ohio and Wisconsin
- Region VI: Arkansas, Louisiana, New Mexico, Oklahoma and Texas
- Region VII: Iowa, Kansas, Missouri and Nebraska
- Region VIII: Colorado, Montana, North Dakota, South Dakota, Utah and Wyoming
- Region IX: Arizona, California, Hawaii, Nevada, American Samoa, Guam, Mariana Islands
- Region X: Alaska, Idaho, Oregon and Washington (USDOT, 2019a).

NHTSA provides information to states, other agencies and individuals through document development, programs and databases. These include the Fatality Analysis Reporting System (FARS), Model Minimum Uniform Crash Criteria (MMUCC), Countermeasures that Work: A Highway Safety Countermeasure Guide for State Highway Safety Offices, National Guidelines for Traffic Safety Programs and Section 1906 Racial Prohibition Grants program. The following subsections provide a brief description of these documents, programs and databases.

Fatality Analysis Reporting System (FARS)

The National Highway Traffic Safety Administration (NHTSA) database, Fatality Analysis Reporting System (FARS), provides as record system for motor

vehicle fatalities crashes "(defined as a crash on a public roadway resulting in a death within 30 days of the event)" (USDOT, 2018). FARS provides detailed information about drivers involved in fatal crashes including many variables such as, age, gender, race, alcohol involvement, speeding, distraction, drowsy driving, restraint not used, pedestrians, class C drivers, bicycles, motorcycles, and age groups (USDOT, 2018).

Model Minimum Uniform Crash Criteria (MMUCC)

In 1998, the original *Model Minimum Uniform Crash Criteria* (MMUCC) was created by the National Highway Traffic Safety Administration (NHTSA), the Federal Highway Administration (FHWA), the Federal Motor Carrier Safety Administration (FMCSA), the National Transportation Safety Board (NTSB), the GHSA, and subject matter experts from State DOTs, local law enforcement, emergency medical services, safety organizations, industry partners, and academia (USDOT, 2019c). Together this group outlined a voluntary and minimum set of motor vehicle crash data variables that states may use to gather its own crash data (USDOT, 2019c).

The MMUCC includes the following variables: crash data elements; vehicle data elements; person data elements; roadway data elements included; fatal section data elements; large vehicle and hazardous materials section; non-motorists section data elements; and dynamic data elements (USDOT, 2019c). The personal data element includes the following:

- Name of person involved, date of birth, sex, person type, injury status
- Occupant's motor vehicle unit number, seating position
- Restraint systems/motorcycle helmet use, air bag deployed, ejection;

- Driver license jurisdiction; driver license number, class, CDL, and endorsements;
- Speeding-related, driver actions at time of crash;
- Violation codes;
- Driver license restrictions; driver license status;
- Distracted by;
- Condition at time of the crash;
- Law enforcement suspects alcohol use, alcohol test;
- Law enforcement suspects drug use, drug test; and
- Transported to first medical facility by; injury area; injury diagnosis; and injury severity (USDOT, 2019c).

The MMUCC does not include in the person data elements the variable of race nor ethnicity (USDOT, 2019c).

Countermeasures that Work

To combat traffic crash fatalities, states respond to traffic safety problem areas (crashes, injuries, deaths, and property damage) by implementing traffic safety countermeasures that are effective and evidence-based. The National Highway Traffic Safety Administration's Office of Behavioral Safety Research sponsors the creation of the document. The document, *Countermeasures that Work: A Highway Safety Countermeasure Guide for State Highway Safety Offices, Ninth Edition* (2018), provides the main effective, science-based traffic safety countermeasures that are appropriate to States' highway safety offices. Currently, those traffic safety countermeasures areas include nine problem areas as follows:

- Alcohol- and drug-impaired driving;
- Seat belts and child restraints;
- Speeding and speed management;
- Distracted and drowsy driving;
- Motorcycle safety;
- Young drivers;
- Older drivers;
- Pedestrian safety; and
- Bicycle safety (Richard, Magee, Bacon-Abdelmoteleb & Brown, 2018).

In *Countermeasures that Work: A Highway Safety Countermeasure Guide for State Highway Safety Offices, Ninth Edition* (2018), age and gender are mention in all of the nine problem areas including alcohol- and drug-impaired driving; speeding and speed management; seat belts and child restraints; distracted and drowsy driving; motorcycle safety; young drivers; older drivers; pedestrian safety; and bicycle safety (Richard, Magee, Bacon-Abdelmoteleb & Brown, 2018). However, race is only mention only in three of the problem areas that include alcohol-and drug-impaired driving, seat belts and child restraints and pedestrian safety (Richard, Magee, Bacon-Abdelmoteleb & Brown, 2018).

National Guidelines for Traffic Safety Programs

In compliance with Sections 402 of the Title 23 of the United States Code, the United States Secretary of Transportation publishes uniform guidelines for State highway safety programs. The guidelines provide recommendations to States in

creating its highway safety plans for traffic safety initiatives. The guidelines provide a structure for establishing equitable highway safety program and process in which States can evaluate the of its traffic safety programs (NHTSA, 2009). States are encouraged to use these guidelines and build upon them to optimize the "effectiveness of highway safety programs" conducted at the State and local levels. The National Highway Traffic Safety Administration (NHTSA) publishes these guidelines (NHTSA, 2009). In the Highway Safety Program Guideline No. 4 Driver Education, NHTSA recommends for states to "develop and implement a culturally competent highway safety program, reflective of State demographics, to achieve a significant reduction in traffic crashes, fatalities and injuries on public roads" (NHTSA, 2009). In addition, NHTSA recommends that all programs be data driven and the highway safety program should include a "driver education and training program designed to educate new drivers and provide remedial training for existing drivers" (NHTSA, 2009). Larke and Saint have presented a definition of a culturally competent highway safety program as follows:

> A Culturally Competent Highway Safety Program (CCHSP) is defined as a highway safety program that embodies a culturally competent/relevant framework that integrates four principles of multicultural education while using a state's demographic information to address reduction in traffic crashes, fatalities and injuries (Larke & Saint, In Press).

The four principles of multicultural education mentioned in the definition include cultural pluralism (acceptance and respect for human dignity), social justice (removing discrimination and prejudices), culture (how individuals think, feel and behave) and

culturally responsive instruction (instruction that connects, relates and is appropriate for the education) (Larke & Saint, In Press). States are able to obtain its demographic information from its health department or the U.S. Census.

Section 1906 Racial Prohibition Grants Program

Currently funded highway safety grants encourage States to collect data during traffic stops concerning race and ethnicity of the driver. NHTSA at the federal level and the State Highway Safety Offices (SHSOs) at the State level administer highway safety grants that provides states funding to implement traffic safety activities. Section 1906 Racial Prohibition Grants program was authorized under Safe, Accountable, Flexible, Efficient Transportation Equity Act: A Legacy for Users (SAFETEA-LU) (2006-2009) signed into law by George W. Bush on August 12, 2005 (Governors Highway Safety Association (GHSA), 2018). This program provided grants to encourage states to maintain and allow public inspection of statistical information on the race and ethnicity of the driver for all motor vehicle stops by a law enforcement officer of a Federal highway and on all public roads except local or minor rural roads (GHSA, 2018). This program was not reauthorized under Moving Ahead for Progress in the 21st Century Act (MAP-21) (2013-2014) and *Fixing America's Surface Transportation Act* (FAST) (2016-2020) act that were signed into law by President Obama. However, the program was reauthorized in the *Fixing America's Surface Transportation Act* (FAST) (2016-2020) signed into law in December 2018 under President Trump. The FAST Act authorizes the Section 1906 program at $7.5 million each year for FY2017 – 2020. Such authorization allows states to use grant funds only for the costs of "a) collecting

and maintaining data on traffic stops and b) evaluating the results of the data" (GHSA, 2018).

Statement of the Problem

The problem for this research study was that crash data by race is not required or collected, not mandated on states' crash reports, and not reported in driver license datasets. Additionally, the changing demographics of motor vehicle drivers/operators, occupants, pedestrians, and bicyclists indicated by the changes in population demographic projections from US Census projections from 2020 to 2060 showing an increase in different ethnic populations (US Census, 2020). Finally, traffic crash fatality research has been conducted by the variables age, gender or race; however, there is somewhat limited research that focuses on all three variables. The intent of the research was to provide a critical analysis of Fatality Analysis Reporting System (FARS) data provided by the National Highway Traffic Safety Administrations by age, gender and race. This analysis provides a specific data set for future research to build upon to explore the connections and intersectionality across age, gender and race and traffic crash fatalities.

Purpose of the Study

The purpose of this research study was to examine differences in motor vehicle fatality causation factors and behavioral issue across age, race, and gender. The focus of this research study was to critically examine the difference and commonalities of driver fatality causation factors across age, gender and race in the United States from 2012 to

2016. These years were chosen because they provide validated fatality motor vehicle crash fatal injury data.

Additionally, the research study examined the intersectionality of the data to among traffic safety countermeasures by age, gender and race. The researcher was particularly interested in the intersectionality connections of the data across age, gender, race and fatality traffic safety countermeasures causation factors and behavior issues to discover if there is any diverse culture being marginalized or discrimination against any ethnic group in traffic safety countermeasures. This critical analysis provides specific data sets for further research studies examining the intersectionality of these sociocultural variables in relation to traffic crash fatality causation factors.

Research Questions

The guiding research question for this study was "What are the differences in driver error, behavioral issues, mode of transportation and age groups fatal injury crashes by age, gender and race in the United States for years 2012 to 2016? To that avail, there were four specific research questions. They were:

1. What are differences in driver error (alcohol involvement, speeding, distraction, and drowsy driving) fatal injury crashes by age, gender and in the United States for years 2012 to 2016?
2. What are differences in individuals' behavioral issue (restraint not used) fatal injury crashes by age, gender and race in the United States for years 2012 to 2016?

3. What are differences in driver mode of transportation (pedestrian, Class C vehicle, bicycle and motorcycle) fatal injury crashes by age, gender and race in the United States for years 2012 to 2016?
4. What are differences in driver age groups (young driver 15 to 20 years of age, 21 to 24 years of age, 25 to 64 years of age and older driver 65 plus years of age) fatal injury crashes by age, gender and race in the United States for years 2012 to 2016?

Significance of the Study

The significance of the study was to explore the United States fatal injury data from 2012 to 2016 to determine its relationship across age, gender, race and traffic crash fatalities causation and behavioral factors. With the rapidly changing race demographics as projected by the United States Census Bureau, this research will provide a critical analysis of traffic crash fatalities to create theory and practice that will improve adequate countermeasures to assist in the in the reduction of traffic crashes across the nation by age, gender and race. The research is needed to understand the intersectionality across age, gender and race in traffic crash fatalities to create federal and state program policies and practices that mandate traffic safety countermeasures be designed or redesigned by age, gender and race.

One of the reasons to critically examining the traffic crash fatalities causation factors by race is shown clearly in the disaggregation in of projected changes in the United States population as indicated by the United States Census Projections. The United States Census projection change by race from 2020 to 2060 indicate that there

will be the following: decrease White -15.41%, increase African American 1.15%; increase Asian 3.08%, other Pacific Islander 62.6%, increase Latinx 8.87%, increase Multi Race 3.36% and increase Native American 0.11% as shown in Table 1.1 (United States Census Bureau (US Census), 2020). In the future, these projected changes to the population indicate that there will be more drivers, passengers, pedestrians, bicyclist and motorcyclist of different ethnicities on our nation's roadways.

Table 1.1

United States Population Projections by the United States Census (US Census, 2020)

Race	2020	2030	2040	2050	2060	Change from 2020 to 2060
African American	13.45	13.80	14.17	14.59	15.00	1.55
Asian	6.02	6.87	7.69	8.45	9.10	3.08
Pacific Islander	0.24	0.26	0.27	0.28	0.28	0.04
Latinx	18.73	21.07	23.46	25.66	27.50	8.77
Multi-Race	2.88	3.57	4.36	5.26	6.24	3.36
Native American	1.27	1.31	1.35	1.37	1.38	0.11
White	59.70	55.76	51.73	47.81	44.29	-15.41
Total Population (In Thousands)	332,639	355,101	373,528	388,922	404,483	

Intersectionality

Intersectionality of diverse social factors in the development of traffic safety countermeasures was another significance of this study. Corusa and Saatcioglub (2015) describe the theory of intersectionality as the" interactivity of social identities in shaping individuals' experiences" (Corusa & Saatcioglub, 2015). This study examines how the theory of intersectionality explores the relationship among individual demographics

(age, gender and race) and how they intersect to traffic safety countermeasures to show if any diverse social groups experiences are marginalized in the development of traffic safety countermeasures. Examining this intersectionality provides importance for federal and state highway safety policy makers to create policies to ensure equitable redesign or development of traffic safety countermeasures to include age, gender and race. These policies would lead to the development of traffic safety countermeasures that would lead to the reduction of motor vehicle crashes, fatal injuries, injuries and property damage across all ages, genders and races.

Definitions of Terms

For the purpose of this study, the following definitions were used:

Age: The interval of time between the day, month and year of birth and the day and year of occurrence of the event (Organisation for Economic Co-operation and Development, 2018).

Countermeasure: An activity or initiative to prevent, neutralize, or correct a specific problem (NHTSA, 2019b).

Ethnicity: Observed as the "heritage, nationality, lineage, or country of birth of the person or the person's parents or ancestors before arriving in the United States" (US Census, 2018b).

Gender: Individuals that identify or have been identified as male or female for demographic purposes (USDOT, 2019b).

Population: The number of people calculated by geographic area, age, gender, race, ethnicity, migration, language use, etc. (US Census, 2018).

Race: for purposes of this study, an individual's self-identification with one or more social groups such as African American, Asian (including Pacific Islander), Latinx, Native American (including Alaska Native) and White (US Census, 2018).

Organization of the Study

The study is divided into five major chapters. Chapter I provided an introduction, statement of the problem, significance of the study, purpose for study, research questions, definition of terms, assumptions and limitations, and organization of the study. Chapter II consisted of the review of related literature. Chapter III explained the research methodology followed in the study. Chapter IV analyzed the data and provides the findings. Chapter V contained a summary, conclusions, discussion, and recommendations.

CHAPTER II

REVIEW OF LITERATURE

The review of literature is discussed in five sections. These sections include: (1) history of traffic crash research; (2) traffic crash research by age, gender or race; (3) culturally competent programs increasing quality of education; (4) theoretical and conceptual framework; and (5) summary.

History of Traffic Safety Research

In the early days of traffic safety research, traffic crashes were related to "chance phenomenon, bad luck, or crash prone drivers" (Hagenzieker, Commandeur & Bijleveld, 2014). Therefore, most of the research was focused on people even though some vehicle modifications were put in place, such as safety glass. In the 1950s, the research emphasis began to move toward other factors such as roadway design and vehicle design (Songer, 2001).

Before the 1970s, traffic safety research articles published were around "40 articles per year:" however, in 2010 there were well over 2,000 articles (Hagenzieker, Commandeur & Bijleveld, 2014). They also note that from the 1950 until 1970 the principal way researchers analyzed motor vehicle crashes was to examine only one cause, whether it was the roadway user, the vehicle or the roadway. However, in the 1960s until 1980s, some researchers started using a "multi-causal" approach or a combination of factors that led up to the crash to analyze the crashes (Hagenzieker, Commandeur & Bijleveld, 2014).

In the 1980s, William Haddon created the Haddon Matrix to bring epidemiology principles to the analysis of a motor vehicle crash. Haddon proposed that what happens before, during and after a crash should be investigated by the following three areas: “the circumstances surrounding the event prior to the crash occurring, the circumstances involved during the crash, and those involved after the crash” (Haddon, 1980). In each of the three areas, there are associated with the crash the “human, vehicular, and environmental factors” and knowing how the areas work together would benefit researchers in the developing countermeasures. (Songer, 2001).

In 2015, Peter Norton provided four different models on how the United States viewed motor vehicle safety one the last century. The “Four Paradigms” included (Norton, 2015):

1. "1900s–1920s: Safety First
2. 1920s–1960s: Control
3. 1960s–1980s: Crashworthiness
4. 1980s–present: Responsibility" (Norton, 2015).

The following is a summary of Norton’s Four Paradigms. Paradigm 1: Safety First covered up to the 1920s and reflected the idea that the vehicle was a “dangerous newcomer” and was blamed for the crash (Norton, 2015). Paradigm 2: Control began in the 1930s and continued to the 1960s and reflected the idea that with skillful control crashes could be averted. The focus during this time period was on the “jaywalker (or undisciplined pedestrian), the nut behind the wheel (the reckless driver); and the dead man’s curve (the poorly designed road)” (Norton, 2015). Paradigm 3: Crashworthiness

began in the 1960s and reflected the idea that the driver could not be controlled and safety personnel needed to be concerned with roadway design and vehicle design to reduce the consequences of driver error. Lastly, Paradigm 4: Responsibility began in the 1970s and gained momentum in the 1980s and continues to this day. Paradigm 4 focus is on "driver responsibility" (Norton, 2015).

Federal, state, and private-sector entities provide funding for highway traffic safety research. The focus of this research is on "the human (driver and occupant), the vehicle, the roadway, and the socioeconomic environment" (Institute of Medicine, 1999). Examples of the funding sources for traffic safety research include:

- NHTSA funds research primarily on human factors and vehicle safety;
- Federal Highway Administration funds research on improving highway safety;
- National Institute on Aging funds some research on the effects of aging on driving performance;
- National Institute on Alcohol Abuse and Alcoholism has funded some research on the effect of alcohol on motor vehicle injury and on adolescent alcohol use and high-risk driving behaviors;
- National Institute for Occupational Safety and Health (NIOSH) studies work-related vehicle safety issues;
- Health Resources and Services Administration and the National Center for Injury Prevention and Control (NCIPC) have funded EMS and trauma systems development and evaluation research; and

- Insurance Institute for Highway Safety (funded by more than 75 insurance companies). (Institute of Medicine, 1999).

In the 20th century, 'the significant accomplishments from traffic safety research in the areas of "vehicle safety, roadway design and driver/passenger behaviors" has reduced the annual death rate per vehicle mile driven from "18 per 100 million miles traveled in 1923 to 1.17 per 100 million vehicle miles traveled in 2017 (CDC, 2018 & USDOT, 2020b). The research in the area of vehicle safety features included "head rests, energy-absorbing steering wheels, shatter-resistant windshield and safety belts" had led to this reduction. Research in the area of roadway design included "better delineation of curves (edge and center line stripes and reflectors, use of breakaway sign and utility poles, improved illumination, addition of barriers separating oncoming traffic and guardrails" have also contributed to this reduction. Finally, the research in driver and passenger behavior included providing public information and education to drivers and enforcement of traffic laws (CDC, 1999).

The Behavioral Traffic Safety Cooperative Research Program's (BTSCRP) goal is to supervise outstanding research program that subscribe to advancing traffic safety. The BTSCRP is a collaboration between the Governors Highway Safety Association (GHSA), NHTSA, and the Transportation Research Board (Transportation Research Board (TRB), 2020). The 2020 research projects selected by the BTSCRP include:

- "BTS-10, E-Scooter Safety: Issues and Solutions
- BTS-11, Ensuring Child Safety in New Travel Modes
- BTS-12, State Practices Promoting Older Driver Safety

- BTS-13, Communicating Safe Behavior Practices to Vulnerable Road Users
- BTS-14/NCHRP 22-45, Understanding and Analyzing Crash Contributing Factors
- BTS-15, Highway Safety Strategies for Rural Communities" (TRB, 2020).

Currently, the National Highway Traffic Safety Administration (NHTSA) maintains an Office of Vehicle Safety Research which research areas include: "Automotive Cybersecurity, Biomechanics and Trauma, Crash Avoidance, Crashworthiness, Enhanced Safety of Vehicles, Human Factors, Behavioral Research, Vehicle Safety Research, Crash Injury Research, Driver Simulation, Event Data Recorder and Child Seat Research" (National Highway Traffic Safety Administration (NHTSA), 2020a). NHTSA uses the research to create and redraft traffic safety countermeasures to enhance safe driving behaviors and lead the way to safer driving decisions (NHTSA, 2020a).

In the 2020 budget requests for NHTSA included $151,000,000 for vehicle safety programs, "$155,300,000 for highway safety research and development and $623,017,000 for highway safety grants" (USDOT, 2020a). The vehicle safety programs would concentrate on vehicle safety initiatives and research in advanced vehicle technologies. The highway safety area would concentrate on "educate roadway users and community leaders" about safe driving practices along with stricter laws and potent law enforcement. The highway safety grants offer grants to state and local governments that include "Section 402 State and Community Highway Safety Program and the Section 405 National Priority Safety Programs and the Section 1906 Racial Profiling

Data Collection Grants" (USDOT, 2020a). Section 1906 Racial Profiling Data Collection Grants purpose is to encourage states to allow law enforcement to examine a driver's race and ethnicity during a traffic stop (USDOT, 2020d).

The federal government uses the NTHSA Section 402 and 405 program grants to encourage states to move ahead with significant transportation initiatives. For states to qualify for the NHTSA grant awards, each program area has certain criteria that must be met before the grant is awarded (NHTSA, 2020b). For example, in the Priority Safety Programs Grants (405) the following are the categories and a brief explanation of the criteria:

- "Section 405(b): Occupant Protection: States have to satisfy a maintenance of effort requirement and provide a 20% matching share. There are two types of grants: high belt use (90%+) and low belt use (below 90%). High belt use states must have an occupant protection plan, participate in national mobilizations, have an active network of child restraint inspection stations and maintain a sufficient number of CPS technicians. Low belt use states have to satisfy these criteria plus three out of six more. Under the FAST Act, High belt use states now may use up to 100 percent of their funds for any purpose under Section 402.
- Section 405(c): State Traffic Safety Information System Improvements: States have to satisfy a maintenance of effort requirement and provide a 20% matching share. Eligible states have to have a Traffic Records Coordinating Committee, a designated traffic records coordinator, an

assessment within the last five years and a traffic records strategic plan. States would also have to show quantifiable progress in improving their traffic records systems according to six specific measures.

- Section 405(d): Impaired Driving Countermeasures: All states receive funds under this tier. They are divided into low-, medium-, and high-range states based on the most recent three years of FARS data. Low-range states do not have to satisfy specific eligibility requirements. The requirements increase for the other two types of states. Low-range states have more flexibility in the use of funds than medium- or high-range states and may use up to 50% of the funds for any Section 402 purpose, in addition to qualifying by having an interlock program. States with a compliant 24-7 sobriety program also qualify for funding. The State must have a law the requires all individuals convicted of driving while intoxicated to receive restricted driving privileges for at least 30 days, and, must have a law or program that authorizes a statewide 24-7 sobriety program. Twelve percent of this tier is earmarked for ignition interlock incentive funds. States that have an all-offender ignition interlock law, with certain limited exceptions allowed by the FAST Act, will be eligible for these grants. Eligible states can use these funds for any purpose under 402. States qualifying with a 24-7 program receive 3% of available funding States can qualify with both provisions and receive a total of 15% of available funding.

- Section 405(e): Distracted Driving: The FAST Act amended the qualifications, revising the Comprehensive Distracted Driving grant to provide more flexibility and establishing a new Special Distracted Driving grant for two fiscal years for States that do not qualify for the Comprehensive grant. States must enact and enforce a prohibition on texting as well as a ban of the use of all electronic devices for all drivers aged 18 and younger, plus additional requirements. Eligible states can use 50% of the funds for Section 402 purposes and 50% for distracted driving purposes. The FAST Act allows states with distracted driving data that conforms to the most recent MMUCC to use 75% of the funds for Section 402 purposes. $5 million of these funds are earmarked for a national media campaign on distracted driving.
- Section 405(f): Motorcyclist Safety: A state must satisfy two out of six eligibility criteria in order to receive funds, and the use of funds is limited to only certain motorcycle training and awareness programs. The FAST Act amended the allocation of funds, provides flexibility in the use of funds and added a requirement that the Secretary update and provide model Share the Road language. States with the lowest 25% of motorcycle deaths per 10,000 registrations based on the most recent calendar year for which final FARS data are available are allowed to use 50% of their grant funds for any Section 402 purpose.

- Section 405(g): State Graduated Driver Licensing Laws; States have to require a two-stage driver license and satisfy specific criteria for the learner's and intermediate stages. The FAST Act changed the age requirement to 18 (rather than younger than 21) and some other requirements are less prescriptive. Eligible states can use 25% of the funds for GDL-related purposes and 75% for any purpose under Section 402. If a state is in the lowest 25% of states for under-18 age drivers involved in fatal crashes per the total number of under-18 drivers in the state, the state may use 100% of the funds for any Section 402 purpose.
- Section 405(h): Nonmotorized Safety; States are eligible if the annual combined pedestrian and bicyclist fatalities in the state exceed 15 percent of the total annual crash fatalities in the State using the most recently available final data from NHTSA's FARS. Eligible states may use grant funds *only* for training law enforcement on state laws applicable to pedestrian and bicycle safety; enforcement mobilizations and campaigns designed to enforce those state laws, or, public education and awareness programs designed to inform motorists, pedestrians and bicyclists of those state laws. (GHSA, Section 405 National Priority Safety Program 2020 (GHSA, 2020)."

The NTHSA Priority Safety Program grants correlate to several of the countermeasures in the *Countermeasures that Work: A Highway Safety Countermeasure Guide for State Highway Safety Offices, Ninth Edition (2018)*

including: alcohol- and drug-impaired driving; seat belts and child restraints; distracted driving; motorcycle safety; pedestrian safety; and bicycle safety (Richard, Magee, Bacon-Abdelmoteleb & Brown, 2018). The NHTSA Priority Safety Programs Grant Awards (405 Grants) 2019 Summary for Applied, Awarded, Not Awarded, Did Not Apply, and Not Eligible to jurisdictions is shown in Table 2.1

Table 2.1

NHTSA Priority Safety Programs Grant Awards (405 Grants) 2019 Summary (NHTSA, 2020b)

Grants	Applied	Awarded	Not Awarded	Did Not Apply	Not Eligible
Occupant Protection Grants (405b)	52	52	0	4	0
State Traffic Safety Information System Improvements Grants (405c)	55	54	1	1	0
Impaired Driving Countermeasures Grants (405d)	52	52	0	0	4
Ignition Interlock Law Grants (405d)	13	5	8	43	0
24-7 Sobriety Program Grants (405d)	11	5	6	45	0
Comprehensive Distracted Driving Grants (405e)	17	4	13	39	0
Motorcyclist Safety Grants (405f)	46	44	2	6	4
Graduated Driver Licensing Law Grants (405g)	4	0	4	52	0
Non-Motorized Safety Grants (405h)	25	25	0	0	31

Traffic Crash Research by Age, Gender or Race

Several researchers examine traffic crash fatalities by age and gender; however very few researchers examine traffic crash fatalities by race. Chang (2008) examined crash fatalities by age and gender in the study, "Comparison of Crash Fatalities by Sex and Age Group" (Chang, 2008). The study looked at traffic crashes from 1996 - 2006 and the findings indicated that traffic crash fatalities are higher for males than for females in all age groups (Chang, 2008).

Van der Bossche, Geert, and Brijs (2007) examined road risk by age and gender in their study, "Analysis of Road Risk Per Age and Gender Category: A Time Series Approach" (Van den Bossche, Geert, and Brijs, 2007). The finding indicated that males have a higher road risk than females. Further, the risk is decreasing over time but not at the same rate for all age and gender groups. The highest yearly reduction in risk is found for the oldest and youngest road users (Van den Bossche, et. al., 2007).

Cordellieri, Baralla, Ferlazzo, Gala, Piccardi, and Giannini (2016) examined gender effects in young drivers on safety attitudes, behaviors, and risk perception in the study, "Gender Effects in Young Road Users on road Safety Attitudes, Behaviors and Risk Perception" (Cordeliers, Barellan, Ferlazzo, Scala, Piccardi, & Giannini, 2016). The findings indicated that gender effect on being involved in a traffic crash because of driving skills are either non-existent or because of the differences the amount of alcohol consumed. The findings indicated that there are gender differences in "road safety attitudes (i.e., "negative attitude toward traffic rules and risky driving"; "negative attitude toward drugs and alcohol" and "tolerance toward speeding") and in driver

behavior (i.e., “errors in inattentive driving” and “driving violations” (Cordellieri, et. al., 2016). The findings also indicated the level of risk perception is the same for male and female drivers age 18 -22. However, these two groups differ in the “level of concern about this risk,” which may supply new understandings the creation of gender-based prevention programs, with males being less concerned about the risk of a traffic crash Cordellieri, et. al., 2016).

Boot, Stothart, and Charness examined older drivers’ risk for injury in a traffic crash in the study, “Improving the Safety of Aging Road Users – A Mini-Review” (Boot, Stothart, & Charness, 2014). The findings indicated that older drivers are at the greatest risk for injury or death as a result of a traffic crash (Boot, Stothart, & Charness, 2014).

Tefft (2017) examined motor vehicle crashes, injuries and deaths by driver’s age in his study, “Rates of Motor Vehicle Crashes, Injuries and Deaths in Relation to Driver Age” (Tefft, 2017). This study used data on traffic crashes from the United States Department of Transportation and data on driving mileage from the AAA Foundation's American Driving Survey. The findings indicated that drivers ages 16-17 have the highest rates of traffic crash involvement, injuries to themselves and others, and “deaths of others in crashes in which they are involved,” drivers age 80 and older have the highest rates of driver deaths, and drivers ages 60-69 were the safest drivers in most of the variables examined (Tefft, 2017).

Hamden (2013) examined racial/ethnic differences in fatality rates from traffic crashes in the study, “Racial/Ethnic Differences in Fatality Rates from Motor Vehicle

Crashes: An Analysis from a "Behavioral and Cultural Perspective" (Hamdan, 2013). The findings indicated that there is a signifiant correlation between race/ethnicity (Non-White and White) and driving while under the influence of alcohol/drugs (Hamdan, 2013).

Romano, Fell, and Voas (2011) examined the role of race and ethnicity on the effects of graduated diver licensing in the United States in the study, "The Role of Race and Ethnicity on the Effect of Graduated Driver Licensing Laws in the United States" (Romano, Fell, & Voas, 2011). The results indicated that the largest reductions in fatal crashes in States with Graduated Licensing Laws were for White ($p<.01$), African American ($p>,05$), Asian ($p>.05$) drivers (Romano, Fell, and Voas, 2011).

Sloan, Chepke, and Davis examined the role of race, gender, and risk perceptions on drinking and driving in their study, "Race, Gender, and Risk Perceptions of the Legal Consequences of Drinking and Driving" (Sloan, Chepke, & Davis, 2017). The findings indicated that drinking and driving (DWI) was higher for males than for females among all races and that African American males had a higher chance of stops and jail for DWI than White men.

Hilton (2006) examined the role of race and the motor vehicle deaths as compared to overall deaths in the study, "Race and Ethnicity in Fatal Motor Vehicle Traffic Crashes 1999 – 2004" (Hilton, 2006). The findings showed that when viewed from overall deaths , motor vehicle crash deaths have "accounted for disproportionately large percentages" specifically with Native Americans and Latinx.

Culturally Competent Programs Increasing Quality of Education

Duhon-Sells (2015), National Association for Multicultural Education's (NAME) founding mother, describes culturally competent programs as providing the ability to inform individuals "how to accept, respect, and appreciate each other regardless of their differences, including race, gender and ethnicity" (Duhon-Sells, 2015). A culturally competent program would increase the "quality of education" for all using multicultural education principles (*2*). Multicultural education principles emphasis is to have equitable programs for all people from diverse racial/ethnic, social class, gender differences and cultural groups and religious groups (Duhon-Sells, 2015).

According to Nieto (1992) multicultural education principles have the following attributes critical, intentional, transformational, antiracist education, basic education, important to all students, pervasive, education for social justice, and critical pedagogy (Neito, 1993). These attributes are described as follows:

- Critical – Helps student to look at knowledge/driving from various perspectives.
- Intentional – Realizes that values and cultures are different and should be shared.
- Transformational – Changes the views of the world and society. Finds ways to promote risk reduction efforts. Involves changes in the personal as well as professional.
- Is Antiracist Education - Paying attention to all discriminatory practices (curriculum, choices, relationships).
- Is Basic Education - It is the cannon, central to the curriculum.
- Is Important for ALL Students - Not just for students of color but for everyone.

- Is Pervasive - It permeates the entire curriculum, not a subject, month, or something to be covered.
- Is Education for Social Justice - Learning how to think and behave in ways the ensure. fairness and that people have the power to make changes.
- Is a Process – It is ongoing and dynamic. No one stops becoming.
- Is Critical Pedagogy - Includes transformative process to think in multiple ways that leads to action (Neito, 1993).

According to Gay (2000) culturally responsive teaching components consists of cultural competence, critical consciousness, and academic/driving success (Gay, 2000). Gay (2000) states that culturally responsive teaching components for a program be culturally competent as follows:

- Uses cultural characteristics, experiences, and perspectives of ethnically diverse students as conduits of teaching — Geographic experiences, cultural … Cultural Competence.
- Helps students develop a broader perspective of the sociopolitical consciousness, the tools to critical analyze societal relationships -- How does driving work in the society… rage… Critical Consciousness.
- Improves academic achievement and driving skills of ethnically diverse students by teaching them through their own cultural and experimental filters — Traffic Safety Behavior…. Academic/Driving Success (Gay, 2000).

The inclusion of diversity principles helps a program be culturally competent. Diversity principles include: Be Aware, Know Others, High Expectations, Accept and

Respect, Value, and Sensitive Actions (Larke & Saint, 2013). These diversity principles are described as follows:

- Be Aware - Students are different – No two students are alike. Each one is different with sameness not deficits.
- Know Others - Educate yourself - More than food and fashion. Ask questions about life experiences
- High Expectations - Expectations with real meanings. All clients can learn. Deliver instruction with a passing assurance.
- Accept and Respect - Tolerance is not acceptance acceptance-Build - Build respect – find out information about client – use in responding to client
- Value - Value all Languages - Learn another language…When the language is valued, the client feels valued.
- Sensitive Actions - Demonstrate words and actions. Derogatory words are never acceptable. Use kind words and sensitive actions (Larke & Saint, 2013).

Bank's levels of diversity awareness include "Contributions, Additive, Transformation, and Social Action" (Banks & Banks, 2016). Bank's levels of diversity awareness are described as follows:

- Contributions – Share heroes and sheroes - food, fashion, fun, folklore, list of people, adds a few pictures.
- Additive – Use as extra credit, not part of the "cannon." Discuss concepts within, not alone—race, gender as relate to driving.

- Transformation – Increase the knowledge to change the subject area. Showing how to drive in diverse areas.
- Social Action – Change views of society. Reducing crashes, fatalities… Safe driving habits (Banks & Banks, 2016).

The 6 C's and 3 P's of Culturally Responsive Practices in Driver Education and Traffic Safety

Larke (2013) adapted Larke, Elbert, Webb-Johnson, Larke, and Brisco's (2006) Culturally *Meaningful Classrooms: The Five C's of Best Practices* to create *The 6 C's and 3 P's of Culturally Responsive Practices in Driver Education and Traffic Safety* (Larke, Elbert, Webb-Johnson, Larke, & Brisco, 2006). The 6 C's and 3 P's of Culturally Responsive Practices in Driver Education and Traffic Safety created to provide direction in determining if a driver education program is culturally competent and if meets multicultural education principles. The 6 C's and 3 P's of Culturally Responsive Practices in Driver Education and Traffic Safety are as follows:

- Power - The authority and control to make a change. Make it a part of your vision and goal statement. Who are the power players in your state who can make changes?
- Policies – What informal and formal policies are prevalent. What are the rules, guiding principles for involving CRP practices? CRP is policy in the state. It is something that must be done.
- Plans – How will you begin? What are some reasonable goals? What is your plan of action? What are your short-term goals, long-term goals?

- Commitment – What is the level of commitment? Is it lip service, just talk? What action plans do you have to change your content delivery? Where is the "beef?" Making sure that programs/ projects are responsive to class, race and gender, sex and religious inequalities.
- Co-Responsibility – This includes instructors, students and parents/significant others sharing in the knowledge about driver education and traffic safety. All must share the role in making traffic safety a priority.
- Communication – What messages do you send to your students about diversity? How do culturally linguistically, ethnically, economically, diverse students know that you want them in your program/school?
- Cultural Understanding – What do you know about cultural issues that are accurate and up to date? What have you read lately about diversity issues in driver education? What do you know about rural students and students of color?
- Courage –- How do you find the strength to make efforts ? Realizing that many classrooms support classism, racism and sexism in subtle but powerful ways.
- Change – How do you alter, adjust and transform your instruction to accommodate differences (language, disabilities, race, gender, religious beliefs)? (Larke & Saint, 2013).

Select Appropriate Curriculum Materials for Traffic Safety Countermeasures

Curriculum is defined as any document or plan that exists in a school or school system that defines the work of teachers, at least to the extent of identifying the content to be taught students and the methods to be used in the process. However, in driver

education and traffic safety, curriculum is defined aa document or plan that defines the work of driver education teachers (Larke & Saint, 2013).

Curriculum also includes the experiences that students have in an education program. It includes materials, media and technology that are used for instruction. When selecting curriculum materials, media and technology for instruction, careful attention must be given to ways to analyze those curriculum materials for inclusion of multicultural education principles. The curriculum materials need to be analyzed for invisibility, stereotyping, selectivity and imbalance, fragmentation and isolation, as well as improper linguistic, loaded words, activity bias, tokenism, and the role of women as described below (Larke & Saint, 2013).

- **Invisibility.** Invisibility occurs in the written curriculum when the subject matter disproportionately represents "certain" people in the curriculum, especially when some students are not represented at all in the written curriculum. If students do not see themselves within the curriculum, the students often feel less valued. They feel that the curriculum does to apply to them.

  Example: When taking about driving trucks and only males are mentioned, female students may not relate to the information. In addition, if the examples in the curriculum were from only European Americans' cultures, students from other cultures may not relate to the information.
- **Stereotyping.** Stereotyping occurs in the written curriculum when the subject matter makes disparaging or discriminating statements about a certain race, sex, or group.

Descriptive words that describe people, especially people who have "differently-abled conditions" must be reviewed for stereotyping undertones.

Examples: If words are found that have stereotyping undertones, the words must be removed or replaced with acceptable language.

- **Selectivity and Imbalance.** Selectivity and imbalance occur in the written curriculum when subject matter and circumstances are only viewed from one culture's viewpoint. The authors determine what is important. Often history, origins, heritage and contributions are written from the Eurocentric perspective.

  Example: If only a description of luxury vehicles is used in the curriculum, it implies that other vehicles are not appropriate or important.

- **Unreality.** Unreality occurs in the written curriculum when the subject matter represents an unrealistic depiction of a theme or when touchy topics are brushed over.

  Example: If only a description of suburbs is used to illustrate the driving environment in the curriculum, students who live in rural or the inner-city environments, may not relate to the information.

- **Fragmentation and Isolation.** Fragmentation and isolation occur in the written curriculum when the subject matter segregates information from certain diverse or religious groups form the other material.

  Example: Only a description of one culture or one religious group is used to illustrate individuals in the curriculum, then students from other cultures or religious

groups may not relate to the information. This may imply or impose feelings of superiority and inferiority on particular students.

- **Improper Linguistic**. Improper linguistic engagement occurs in the written curriculum when the subject matter contains sexist or bias words. Remove any language in the curriculum that demeans, humiliates, or degrades any individuals no matter the ethnicity, gender, physical ability, beliefs, sexual orientation, social status, etc.

  Example: The words describe only cars driven by blond females in sexually provocative a manner that implies both sexist and racist tenants.

- **Loaded Words**. Loaded words occur in the written curriculum when the subject matter contains words that have repugnant implications. Any racist or sexist connotations should be removed.

  Example: The word policeman should be changed to police officer, mailman to mail carrier, etc.

- **Activity Bias.** Activity bias occurs in the curriculum when the subject matter represents only one culture in positions of power and the relationships among cultures is not represented equitably.

  Example: The images or pictures portray only one culture as the authority figures or only females as authority figures.

- **Tokenism.** Tokenism occurs when visual images that attempt to show diverse populations are not accurate.

Example: The photographs or pictures must accurately portray the culture and not just be a retouched picture of "Europeans" with added color or tint.

- **Role of Women.** The inaccurate portrayal of the role of women occurs when visual images place women in menial or unskilled roles.

  Example: Illustrate women in roles of law enforcement, maintenance workers, or truck drivers (Larke & Saint, 2013). These are shown in Table 2.2.

Table 2.2

Culturally Relevancy Principles for Curriculum Transformation (Larke & Saint, 2013).

Principles	Examples Curriculum Transformation
Invisibility	To remove invisibility whereby all students may see herself/himself in the curriculum, include: all types of vehicles (cars, trucks, pickup trucks, motorcycles, SUVs, bicycles, large trucks, RV, etc.); both female and male drivers included in curriculum; many student cultures/demographics; many types of neighborhoods; and different traffic environments
Stereotyping	To remove stereotyping from the curriculum, remove any words that indicate stereotyping to one specific gender, race, religion or country.
Selectivity and Imbalance	To remove selectivity and imbalance from the curriculum describe all types of vehicles, neighborhoods, and traffic environments so that one does not have more importance than another.
Fragmentation and Isolation	To remove fragmentation and isolation from the curriculum, include many cultures and religious groups. Remove any description or illustrations that may imply superiority or inferiority to one specific group
Improper Linguistic	To use proper linguistic, describe people, places and things with the proper terms and not slang. Also, remove all sexist and racist tenants.
Loaded Words	To remove loaded words from the curriculum, utilize words such as law enforcement, police officer, mail carrier, etc.
Activity Bias	To remove activity bias from the curriculum, use images or illustrations that does not indicate that only one culture is the authority figures or only females as authority figures over males or vice versa.
Tokenism	To remove tokenism from the curriculum, use images and descriptions that accurately portray the culture and not just be a retouched picture of "Europeans" with added color or tint.
Role of Women	To ensure the role of women is illustrate in the curriculum, illustrate women in roles of law enforcement, maintenance workers, or truck drivers, etc.

Conceptual and Theoretical Framework

Unquestionably, traffic safety countermeasure policy aimed at fatal crashes causation and behavioral factors should embrace and demonstrate the individuality of diverse cultures to be both practical, powerful, and welcomed within the diverse cultural societies. To work toward this, an appropriate theoretical framework should be created that encompasses diverse cultures and makes application of this to a model that relates diverse cultural variables to safety countermeasures. The framework is necessary to progress the field in studying, measuring, analyzing, and improving traffic safety countermeasures. However, this framework may not recurrently create answers, it may enable a need to study the various elements of diverse cultures that have the largest impact on traffic crash fatality causation factors and behavioral issues, to assist research to support countermeasures that could be used to possibly prevent motor vehicle crashes, deaths, injuries and property damage. The conceptual framework includes traffic safety countermeasures and theoretical frameworks includes the Social Cognitive Theory Model and intersectionality.

Conceptual Framework - Traffic Safety Countermeasures

Cooper (2000) suggests that by identifying issues that can be seen as by-products of a traffic safety culture, can support an effective and research-based collection of traffic safety countermeasures. Once identified such by-products could be used as building blocks for a safety culture framework to include traffic safety countermeasures (Cooper, 2000).

A large portion of States' highway safety program activities is dedicated to behavioral traffic safety countermeasures. The countermeasures include all of traffic safety, such as, education, licensing, laws, and traffic enforcement (Preusser, Williams, Nichols, Tison, & Chaudhary, 2008). Traffic safety behavioral countermeasures are important in reducing traffic crash fatalities, injuries and property damage and should be put into action as skillfully as possible. Driver behavior can be changed, although this is not easily accomplished (Presser, et. al., 2008). Traffic safety countermeasures used in highway safety belong in one of the following four classification:

1. "Voluntary action (public information, education, mass media, training);
2. Laws, regulations, policies;
3. Laws plus enhancements (enforcement plus publicity); or
4. Sanctions and treatments (fines, points, jail, alcohol school, license suspension)" (Presser, et. al., 2008).

Theoretical Frameworks - Social Cognitive Theory Model and Intersectionality

Bandura's (1989) reciprocal model of Social Cognitive Theory is one of the theoretical frameworks that was used in this study. In this theory, individual abilities variances that are developed or not developed are influenced by a variety of performances. This model has three components that influence this development: "the environment, the individual, and the behavior (Bandura, 1989). Individuals supply their own incentive, conduct, and growth in a system of "reciprocally interacting influences" (Bandura, 1989). This theory indicates that mutual relationships are about the collaboration between "personal characteristics and environmental influences" (Bandura,

1989). In this mutual relationship, the interconnections of "behavior, cognition and other personal factors, and environmental influences" effect each other in multiple ways; however, not in matching power or at the same time" (Bandura, 1989). Time is a contributory factor in the application of the effects on the mutual relationship (Bandura, 1989).

Bandura (1989) states that individuals are "both products and producers of their environment (Bandura, 1989). Environmental factors governed behavior and controls the types of behaviors (Bandura, 1989). In this theory, individuals are "neither driven by inner forces nor automatically shaped and controlled by the environment" (Bandura, 1989). Individual's cognitive factors decides "which environmental events will be observed, what meaning will be conferred on them, whether they leave any lasting effects, what emotional impact and motivating power they will have, and how the information they convey will be organized for future use" (Bandura, 1989).

Within the environment, individuals' happenstance encounters in life can influence in minor or major life-changing ways. These encounters do not make life foreseeable, despite anyone's amount of knowledge of human behavior (Bandura, 1989). They also do not mean that behaviors are just random. Once these encounters have occurred they becomes a causation factor in the identical way that planned encounters are (Bandura, 1989). An individual own characteristics, behaviors, societal connections and environment provides for more opportunities for certain encounters to be more likely than other forms (Bandura, 1989).

These Social Cognitive Theory's three components mimic the traits those of many crash causation relationships. The theory supports the reciprocal connections between the environment, individual and behavior that can be studied to show behavior in certain circumstances (Bandura, 1989).

Environmental Perspective

Current research tools are created to examine traffic crashes resulting from poor traffic safety behavior that occurs from actions among drivers including attitudes, perceptions and environments. The environment for this study was the traffic scene. Efforts to alter an individual's behavior many times does not consider the norms of diverse cultures which leads to lack effectiveness. Therefore, a framework for producing effective traffic safety countermeasures will need to put in place a program that is culturally competent and uses multicultural education principles. The multicultural education principles must include cultural pluralism (acceptance and respect for human dignity), social justice (removing discrimination and prejudices), culture (how individuals think, feel and behave) and culturally responsive instruction (instruction that connects, relates and is appropriate for the education) (Larke & Saint, In Press).

Individual

Individual characteristics have a major part in forming an individuals' decision-making process in the choice to perform risky behaviors that cause fatality crashes. For instance, young drivers have higher chances of risk behaviors that lead to unintentional death, such as impaired driving and speeding (CDC, 2018). The individuals for this

study were drivers/operators, pedestrians, passengers, bicyclist and motorcyclist. The individual ages include all ages, fifteen plus and age groups (15 to 20 years of age, 21 to 24 years of age, 25 to 64 years of age and 65 plus years of age).

Goals for changing an individual's decision-making process may examine the values, beliefs, and attitudes of individuals to affect risk-taking behaviors. Specifically, traffic safety countermeasures should address misperceived norms in traffic safety, teach about risk reduction, and increase traffic safety skills, such as maintaining adequate space around your vehicle.

Societal Level

Cultural transformation at the societal level involves leadership at the national and state level who is willing to have cultural change to occur. When addressing the development or redesign of traffic safety countermeasures, this federal or state leadership should place importance on altering society's misunderstanding that different ethnic groups do not have any relationship to traffic safety countermeasures. Encouraging continued research and development to address traffic safety countermeasures including different ethnic groups may create a positive traffic safety culture for those ethnic groups, along with including best practices and strategies concerning laws and standards.

For social change to occur for diverse cultures in traffic safety countermeasures, social action must change societies' view concerning reducing traffic crash fatalities, injuries, and property damage (Banks & Banks, 2016). For traffic safety countermeasures to be culturally competent, they must provide an individual with the

tools on “how to accept, respect, and appreciate each other regardless of their differences, including race, gender and ethnicity” (Duhon-Sells, 2015). The selection of curriculum materials for traffic safety countermeasures must utilize multicultural education principles that include examining the traffic safety countermeasure(s) for invisibility, stereotyping, selectivity and imbalance, fragmentation and isolation, as well as improper linguistic, loaded words, activity bias, tokenism, and the role of women (Larke & Saint, 2013).

Intersectionality

The second theoretical framework for this research was the theory of intersectionality. Crenshaw (1989) first mentioned intersectionality in her article, "Demarginalizing the Intersection of Race and Sex: A Black Feminist Critique of Antidiscrimination Doctrine, Feminist Theory and Antiracist Politics” (Crenshaw, 1989). Her article speaks to the discrimination of African-American women (Crenshaw, 1989).

Corusa and Saatcioglub (2015) describe the theory of intersectionality as the” interactivity of social identities in shaping individuals’ experiences” (Corusa & Saatcioglub, 2015). This intersectionality can show the experiences of individuals who belong to diverse social groups, such as age, gender and race. Research in this area can encourage equitable services for the improvement of individuals and communities including “access to services, quality of product and service offerings” (Corusa & Saatcioglub, 2015).

Intersectionality stipulates that within groups of individuals with a shared identity, whether it be age, gender, or race, there are group differences. Studying intersectionality within subgroups permits researchers to examine and better comprehend the subgroups. Also, it permits researchers to comprehend intersectionality inside conventional society through associations (Corusa & Saatcioglub, 2015).

Studying intersectionality within groups shows how different types and operational forces interrelate to form participants' experience, including if these experiences involve "marginalization or discrimination" (Corusa & Saatcioglub, 2015). Intersectionality displays the "power relationships" that occur within society and that inequities such as necessary lifesaving resources (Corusa & Saatcioglub, 2015). This study examines how the theory of intersectionality explores the relationship among individual demographics (age, gender and race) and how they intersect to traffic safety countermeasures. This shows if any diverse social groups experiences by age, gender and race are marginalized or discriminated against in the development of traffic safety countermeasures.

Corusa and Saatcioglub (2015) provides five recommendations for strategies for an intersectional approach in health care that could be adapted for other research areas (Corusa & Saatcioglub, 2015). The five recommendations are as follows:

- "Recommendation 1: Assess the relevance of the intersectionality paradigm for the study.
- Recommendation 2: Determine who should be included in the population of interest and identify which identity axes need to be considered.

- Recommendation 3: Determine what type of intersectionality is appropriate for the study.
- Recommendation 4: Consider the impact of power dynamics at both the interpersonal and structural levels.
- Recommendation 5: Determine and discuss practical and policy implications of intersectional analyses" (Corusa & Saatcioglub, 2015).

Corusa and Saatcioglub (2015) recommendation one states “assess the relevance of the intersectionality paradigm for the study” (Corusa & Saatcioglub, 2015). This recommendation refers to examining the disparities that may occur from the intersection across social groups experiences that may lead to unfair opportunities to services. An intersectional study of traffic safety countermeasures examined by age, gender and race as it relates to the motor vehicle fatal injuries in relationship to states traffic safety countermeasures and policies to reduce those motor vehicle crashes. An intersectional viewpoint could place importance on federal and state highway safety policies role in ensuring equitable development of countermeasures to include age, gender and race removing domination of any group.

Corusa and Saatcioglub (2015) recommendation two states “determine who should be included in the population of interest and identify which identity axes need to be considered” (Corusa & Saatcioglub, 2015). A researcher must identify the relevant participants for the study, such as in this study, examining motor vehicle fatal injury crashes by age, gender and race. Intersectionality research proposes to study

dominated groups who have been ignored. However, in some instances, groups may be "marginalization" and "privileged" at the same time (Corusa & Saatcioglub, 2015).

Corusa and Saatcioglub (2015) recommendation three states "determine what type of intersectionality is appropriate for the study" (Corusa & Saatcioglub, 2015). Corusa and Saatcioglub (2015) describe three forms of intersectionality that include:" intracategorical, intercategorical, or anticategorical" (Corusa & Saatcioglub, 2015). The researcher must choose whichever form fits the study the best. For a study that examines a "social group in depth" an intracategorical form would be suitable (Corusa & Saatcioglub, 2015). For a study that examines the "well-being of collectives" inside the community an intercategorical form would be best. Finally, the anticategorical form would be best to unravelling the "political, social, cultural, and historical context in which intersecting disadvantages occur" (Corusa & Saatcioglub, 2015).

Corusa and Saatcioglub (2015) recommendation four states "consider the impact of power dynamics at both the interpersonal and structural levels" (Corusa & Saatcioglub, 2015). A researcher must contemplate how the power forces at work effect on a personal and operational level. Intersectionality of the power forces at work and the group should show the researcher how the powers lead to the creation of the appropriate and equitable countermeasures (Corusa & Saatcioglub, 2015).

Corusa and Saatcioglub (2015) recommendation five states "determine and discuss practical and policy implications of intersectional analyses" (Corusa & Saatcioglub, 2015). Once the study has been conducted, the researcher must be able to decide and debate policy recommendations of the intersectionality. For example, an

intersectional study of traffic safety countermeasures could examine age, gender and race as it relates to the motor vehicle fatal injuries in relationship to states traffic safety countermeasures and policies to reduce those motor vehicle crashes. A discussion for recommendations should be placed on the importance on federal and state highway safety policies to ensure equitable development of countermeasures to include age, gender and race.

Summary

Traffic safety research began in the early 1900s and continues on today. Research continually analyzes motor vehicle crash data to discover way to reduce the number of motor vehicle crashes, fatal injuries, injuries and property damage. Research has shown that vehicle crash-worthiness design, roadway engineering, individual's behavioral issues, and education are areas of concern in increasing traffic safety. Actions in these areas have reduced the annual death rate per vehicle mile driven from "18 per 100 million miles traveled in 1925 to 1.17 per 100 million vehicle miles traveled in 2017 (CDC, 1999 & NHTSA, 2020a); but there is still a long road to travel to get to zero deaths on our roadways.

In efforts to continue to reduce the death rate per vehicle mile driven, NHTSA continues to support traffic safety research to help create and re-create traffic safety countermeasures. In addition, NHTSA supports states by offering highway safety grants to states that implement these traffic safety countermeasures.

Research studies have been conducted examining age, gender or race in relationship to motor vehicle crashes. Research has shown that an individual's age,

gender or race are linked to the motor vehicle crash causation and behavioral factors. The research findings have shown that these variables play a role crash risk perception, alcohol usage, driving attitudes, etc.

To ensure that states have a culturally competent highway safety program equality for all demographic populations, the use of diversity principles and multi-cultural principles are imperative to achieve this goal. Society view of how to create equitable traffic safety countermeasures must be relevant to the diverse population without the implementation of activity bias, invisibility and stereotyping.

The conceptual and theoretical framework for this study includes: traffic safety countermeasures; Bandura's (1989) reciprocal model of social cognitive theory; and theory of intersectionality. The traffic safety countermeasure include alcohol- and drug-impaired driving; seat belts and child restraints; distracted driving; motorcycle safety; pedestrian safety; and bicycle safety (Richard, Magee, Bacon-Abdelmoteleb & Brown, 2018). Traffic safety countermeasures policies must include different ethnic groups to reduce motor vehicle crashes equitably to all demographic populations to be effective. The countermeasures for diverse cultures must be real-world, significant, and received within the diverse cultural societies. Answers may not be immediately apparent but the study may push research forward to study the variables age, gender and race that have the largest impact on traffic crash fatality causation factors and behavioral issues, thereby the appropriate traffic safety countermeasure can be implemented.

The social cognitive theory has three components that influence behavior: “the environment, the individual, and the behavior” (Bandura, 1989). This theory indicates

that a mutual relationship exists between "personal characteristics and environmental influences" (Bandura, 1989). In this mutual relationship, the interconnections of "behavior, cognition and other personal factors, and environmental influences" effect each other in multiple ways; however, not in matching power or at the same time (Bandura, 1989). Bandura (1989) states that individuals are "both products and producers of their environment (Bandura, 1989).

Within this theory, environmental factors that materialize are governed by behavior and also controls behaviors (Bandura, (1989). Cognitive factors decide "which environmental events will be observed, what meaning will be conferred on them, whether they leave any lasting effects, what emotional impact and motivating power they will have, and how the information they convey will be organized for future use" (Bandura, 1989).

The theoretical framework for this study includes examining the intersectionality percentages obtained by dividing motor vehicle crash fatal injuries by overall deaths by age, gender and race. This intersectional study of the percentages was conducted to place importance on federal and state highway safety policies role in ensuring equitable development of countermeasures to include age, gender and race removing domination, inaccessibility or seclusion of any group.

CHAPTER III

METHODOLOGY

The methodology chapter for this quantitative research study is divided into eight sections. The eight sections include: (1) research questions, (2) rationale for research methodology, (3) data collection; (4) research participants, (5) instrumentation; (6) data analysis; (7) limitations; (8) and assumptions.

Research Questions

The guiding research question for this study was "What are the differences in driver error, behavioral issues, mode of transportation and age groups fatal injury crashes by age, gender and race in the United States for years 2012 to 2016? To that avail, there were four specific research questions. They were:

1. What are differences in driver error (alcohol, speeding, distraction, and drowsy driving) fatal injury crashes by age, gender and race in the United States for years 2012 to 2016?
2. What are differences in individuals' behavioral issue (restraint not used) fatal injury crashes by age, gender and race in the United States for years 2012 to 2016?
3. What are differences in driver mode of transportation (pedestrian, Class C vehicle, bicycle and motorcycle) fatal injury crashes by age, gender and race in the United States for years 2012 to 2016?

4. What are differences in driver age groups (young driver 15 to 20 years of age, 21 to 24 years of age, 25 to 64 years of age and older driver 65 plus years of age) fatal injury crashes by age, gender and race in the United States for years 2012 to 2016?

Rationale for Research Methodology

For this research study, the best method to analyze the research questions was a quantitative research method. This method allowed for the numerical testing of the research variables to answer the research questions. The quantitative research method focuses on counts to construct statistical models and the use of tables to explain the finding (Creswell & Creswell, 2018). The quantitative research method examines theories by scrutiny of the associations amongst variables age, gender and race. The variables are measured so that the number data can be analyzed using statistical calculations. The method also allowed for examination of the research questions by participants. To examine tendencies, quantitative research methods utilized a longitudinal data collection (Creswell & Creswell, 2018).

This methodology was used to find any differences among the variables that include the number of fatal injury crashes by age, gender and race related to the *Countermeasures that Work: A Highway Safety Countermeasure Guide for State Highway Safety Offices, Ninth Edition (2018)*. Those traffic safety countermeasures areas include:

- Alcohol- and drug-impaired driving;
- Seat belts and child restraints;

- Speeding and speed management;
- Distracted and drowsy driving;
- Motorcycle safety;
- Young drivers;
- Older drivers;
- Pedestrian safety; and
- Bicycle safety (Richard, Magee, Bacon-Abdelmoteleb & Brown, 2018).

Quantitative Research Method Design

A quantitative research method was used to examine data regarding motor vehicle crash fatal injuries for the five years, 2012 through 2016, percentages in the variables driver error, behavioral issues, mode of transportation and age groups by age, gender and race in the United States obtained by dividing the motor vehicle fatal injury crashes by overall deaths for the same time period. The 2012 through 2016 years were chosen as this was verified motor vehicle fatal injury crash data. A time lag occurred as time was taken by NHTSA to review the race category and change it to what is on an individual's death certificate if it differs from what was submitted to FARS from the states (USDOT, 2018).

The five race groups in this study were African American, Asian (including Pacific Islander), Latinx, Native American (including Native Alaskan), and White. The gender categories included male and female. The driver age groups included 15- to 20-year-old, 21- to 24-year-old, 25- to 64-year-old and 65-year-old plus. The 2012 through 2016 motor fatal injury data were obtained from FARS (USDOT, 2020b). The data on

overall deaths for the years 2012 through 2016 were obtained from Center for Disease Control and Prevention's Wide-Ranging Online Data for Epidemiologic Research (WONDER) database that contains public health data (CDC, 2020b). The percentage was obtained by dividing the five-year number of motor vehicle fatal injury crashes by the five-year number of overall deaths. The findings are presented in descriptive forms and written text and tables.

In this study, Independent Samples T Test was performed to compare the percentages by gender and a Statistical Analysis of Variance (ANOVA) was performed to compare the percentages by race. A significant difference was noted with a $p < .05$. In addition, data were further examined to identify percentages associated with age, gender and race by percentages.

Data Collection

Prior to any data collection, I received approval from Texas A&M's Institutional Review Board (IRB). A copy of the approval letter is in Appendix B of this study.

The 2012 to 2016 fatal injury crash data were be obtained from the Fatality Analysis Reporting System (FARS) by age, gender and race for the United States (USDOT, 2020b). In addition, 2012 to 2016 driver fatal injury crash data concerning driver error, behavioral issue, mode of transportation and age groups data were obtained from the Fatality Analysis Reporting System (FARS). These data files that were used in this study were downloaded and merged into Excel files.

For the data collection, the following variables were collected from FARS:

- 5 Year Period: 2012 to 2016.

    - Age Groups: Young drivers 15 to 20 years of age; 21 to 24 years of age, 25 to 65 years of age, older driver age 65 plus.
    - Other variables will be mode of transportation (pedestrians, Class C vehicle, motorcyclist, bicyclist), behavioral issue (restraint not used), and driver error (alcohol involvement, speeding, distracted driver, drowsy driver).
    - Gender: Male and Female.
    - Person Type: Driver of motor vehicle in-transport, pedestrian, bicyclist, passenger, motorcyclist, bicyclist.
    - Hispanic Origin: Hispanic and not Hispanic.
    - Injury Severity: Fatal injury.
- Race: African American, Asian (including Pacific Islander), Latinx, Native American (including Alaskan Native), and White.

The 2012 through 2016 number of overall deaths data were be obtained from the Wide-Ranging Online Data for Epidemiologic Research (WONDER) database by age, gender and race for the United States (CDC, 2020b). These data files that were used in this study were downloaded and merged into Excel files. For the data collection, the following variables were collected from WONDER:

- 5 Year Period: 2012 to 2016.
- Ages: All ages; 15+ years of age (drivers); age group 15 to 20 years of age; age group 21 to 24 years of age; age group 25 to 65 years of age; and age group older driver age 65 plus.
- Gender: Male and Female.

- Hispanic Origin: Hispanic and not Hispanic.
- Number of deaths.
- Race: African American, Asian (including Pacific Islander), Latinx, Native American (including Alaskan Native), and White.

Research Participants

The research participants for this study were individuals and drivers involved in fatal injury crashes from 2012 to 2016 according to FARS and the overall deaths by age, gender and race according to WONDER. The variables are selected as they represent the areas used in the *Countermeasures that Work: A Highway Safety Countermeasure Guide for State Highway Safety Offices, Ninth Edition (2018)* (Richard, Magee, Bacon-Abdelmoteleb & Brown, 2018). The individuals and drivers involved in fatal injury crashes in 2012 through 2016 per countermeasures problem areas by age, gender and race as shown in Tables 3.1 through 3.13 (USDOT, 2020b).

Table 3.1

Participants: Driver Error, Alcohol Involvement (0.01+%) (Drivers 15+ Years of Age) (USDOT, 2020b)

Gender	African American	Asian	Latinx	Native American	White
	n	*n*	*n*	*n*	*n*
Male	4,501	286	4,434	603	20,839
Female	935	58	801	224	4,467

Table 3.2

Participants: Driver Error, Speeding (Drivers 15+ Years of Age) (USDOT, 2020b)

Gender	African American	Asian	Latinx	Native American	White
	n	*n*	*n*	*n*	*n*
Male	3,495	287	3,136	382	14,678
Female	620	43	447	150	3,118

Table 3.3

Participants: Driver Error, Distraction (Drivers 15+ Years of Age) (USDOT, 2020b)

Gender	African American	Asian	Latinx	Native American	White
	n	*n*	*n*	*n*	*n*
Male	537	56	550	79	3,211
Female	166	16	174	37	1,376

Table 3.4

Participants: Driver Error, Drowsy Driver (Drivers 15+ Years of Age) (USDOT, 2020b)

Gender	African American	Asian	Latinx	Native American	White
	n	*n*	*n*	*n*	*n*
Male	162	11	229	21	851
Female	38	3	46	6	267

Table 3.5

Participants: Behavioral Issue, Restraint Not Used (All Ages) (USDOT, 2020b)

Gender	African American	Asian	Latinx	Native American	White
	n	*n*	*n*	*n*	*n*
Male	5,773	298	5,040	886	28,134
Female	1,948	192	1,678	440	9,620

Table 3.6

Participants: Mode of Transportation, Pedestrian (All Ages) (USDOT, 2020b)

Gender	African American	Asian	Latinx	Native American	White
	n	*n*	*n*	*n*	*n*
Male	3,243	409	2,807	412	8,271
Female	1,295	385	1,042	141	3,723

Table 3.7

Participants: Mode of Transportation, Class C Vehicle (Drivers 15+ Years of Age) (USDOT, 2020b)

Gender	African American	Asian	Latinx	Native American	White
	n	*n*	*n*	*n*	*n*
Male	6,663	553	6,254	766	31,372
Female	2,494	217	1,835	387	15,376

Table 3.8

Participants: Mode of Transportation, Bicycle (All Ages) (USDOT, 2020b)

Gender	African American	Asian	Latinx	Native American	White
	n	*n*	*n*	*n*	*n*
Male	437	75	492	31	1,795
Female	35	16	36	5	359

Table 3.9

Participants: Mode of Transportation, Motorcycle (Operators 15+ Years of Age) (USDOT, 2020b)

Gender	African American	Asian	Latinx	Native American	White
	n	*n*	*n*	*n*	*n*
Male	2,230	227	1,968	147	14,603
Female	61	11	50	6	606

Table 3.10

Participants: Driver Age Group, 15 to 20 Years of Age (USDOT, 2020b)

Gender	African American	Asian	Latinx	Native American	White
	n	*n*	*n*	*n*	*n*
Male	693	73	1,058	99	3,752
Female	262	19	271	49	1,474

Table 3.11

Participants: Driver Age Group, 21 to 24 Years of Age (USDOT, 2020b)

Gender	African American	Asian	Latinx	Native American	White
	n	n	n	n	n
Male	14,473	1,619	9,855	1,088	34,014
Female	4,382	716	2,883	474	12,461

Table 3.12

Participants: Driver Age Group, 25 to 64 Years of Age (USDOT, 2020b)

Gender	African American	Asian	Latinx	Native American	White
	n	*n*	*n*	*n*	*n*
Male	6,842	488	5,569	709	43,633
Female	1,700	139	1,216	272	9, 283

Table 3.13

Participants: Driver Age Group, 65 Plus Years of Age (USDOT, 2020b)

Gender	African American	Asian	Latinx	Native American	White
	n	*n*	*n*	*n*	*n*
Male	789	134	483	84	10,044
Female	293	50	115	33	4,092

The individuals involved in overall deaths in 2012 to 2016 by age, gender and race are shown in Tables 3.14 through 3.19 (CDC, 2020b).

Table 3.14

Participants: Deaths, All Ages (CDC, 2020b)

Gender	African American	Asian	Latinx	Native American	White
	n	*n*	*n*	*n*	*n*
Male	786,441	157,794	455,498	46,925	5,196,379
Female	749,873	150,142	378,052	38,771	5,197,220

Table 3.15

Participants: Deaths, 15+ Years of Age (CDC, 2020b)

Gender	African American	Asian	Latinx	Native American	White
	n	*n*	*n*	*n*	*n*
Male	761,331	154,396	438,239	45,550	5,153,370
Female	730,050	147,442	364,124	37,765	5,164,464

Table 3.16

Participants: Deaths, Driver Age Group 15 to 20 Years of Age (CDC, 2020b)

Gender	African American	Asian	Latinx	Native American	White
	n	*n*	*n*	*n*	*n*
Male	11,842	1,323	8,492	801	25,179
Female	3,531	595	3,062	356	11,004

Table 3.17

Participants: Deaths, Driver Age Group 21 to 24 Years of Age (CDC, 2020b)

Gender	African American	Asian	Latinx	Native American	White
	n	*n*	*n*	*n*	*n*
Male	14,473	1,619	9,855	1,088	34,014
Female	4,382	584	2,883	474	12,461

Table 3.18

Participants: Deaths, Driver Age Group 25 to 64 Years of Age (CDC, 2020b)

Gender	African American	Asian	Latinx	Native American	White
	n	*n*	*n*	*n*	*n*
Male	338,740	45,953	183,492	22,926	1,382,416
Female	234,780	30,421	96,684	14,851	855,310

Table 3.19

Participants: Deaths, Driver Age Group 65 Plus Years of Age (CDC, 2020b)

Gender	African American	Asian	Latinx	Native American	White
	n	*n*	*n*	*n*	*n*
Male	396,276	105,501	236,400	20,735	3,711,761
Female	487,357	115,842	261,488	22,084	4,285,689

The gender categories include were male and female. The race categories included were African American, Asian (including Pacific Islander), Latinx, Native American including Alaska Native) and White (USDOT, 2020b & CDC 2020b).

Instrumentation

The FARS dataset was used as the instrument to examine the United States driver fatal injury crashes. FARS receives its data from motor vehicle crash reports submitted by states (USDOT, 2018). The number of overall deaths was obtained from the Center of Disease Control and Prevention's WONDER database by age, gender and race (CDC, 2020b).

The researcher made an attempt to obtain the fatal injury crash data from states by contacting each states' department responsible for motor vehicle crash statistics via e-

mail. Even though states maintain its own traffic crash database, many of the state's databases did not include race as a variable. Therefore, FARS database was selected to collect data (USDOT, 2020b).

Data Analysis

This quantitative study used descriptive statistics to examine the percentage differences in 2012 to 2016 in the United States using FARS and WONDER data. Gall, Gall, and Borg (2007) define descriptive statistics as "mathematical techniques for organizing and summarizing a set of numerical data" (Gall & Gall, 2007). The descriptive analysis included analyzing the percentages obtain by dividing the motor vehicle fatal injury count (*n*) by number of overall deaths by age, gender, and race 2012 to 2016 driver fatal injury crashes.

In the data analysis, the fatal injury data were downloaded from FARS database for age and gender for African Americans, Asians (including Pacific Islanders), Latinx, Native Americans (including Alaska Natives), and White male and females from 2012 to 2016. The number of overall death data were downloaded from WONDER database by age and gender for African Americans, Asians (including Pacific Islanders), Latinx, Native Americans (including Alaska Natives), and White male and females from 2012 to 2016. The data analysis included the percentages calculated by dividing the number of motor vehicle fatal injuries by overall deaths by age, gender and race.

These percentages were entered into the Statistical Package for the Social Sciences (SPSS) software. The Independent Samples T Test was used to conducted to determine significance by gender. The Statistical Analysis of Variance (One-Way

ANOVA) was used to conducted to determine significance by race. A statistical significance was noted with a $p<0.05$. If a statistical significance could not be determined, the researcher relied on practical significance in percentages that were obtained by dividing the motor vehicle fatal injuries by overall deaths to discuss the differences between the variables.

Limitations

There were limitations to this study. The limitations in this study include:

1. The FARS dataset may be the only dataset used for fatal injury crashes.
2. There may be inconsistency between state's crash reports designs.
3. Information in FARS data set on race may be incomplete. In 1999, race was added to the list of variables collected in the FARS system. This information is available only for fatally injured individuals and stems mostly from death certificates. Because death certificates cannot always be obtained, some data will be missing (Hilton, 2006).

Assumptions

For the purpose of this study, the researcher made the assumption that FARS data are the most accurate data and have not been manipulated or compromised. From a *critical race perspective*, the researcher assumes that fatality traffic crash causation factors influence on age, gender and race effects driver traffic fatality crashes.

CHAPTER IV

FINDINGS

This chapter is divided into five sections. The sections include: (1) research questions; (2) driver error (alcohol involvement, speeding, distraction, and drowsy driving) fatal injury crashes; (3) behavioral issue (restraint not used) fatal injury crashes; (4) mode of transportation (pedestrian, class C vehicle, bicycle and motorcycle) fatal injury crashes; and (5) driver age groups (young driver 15 to 20 years of age, 21 to 24 years of age, 25 to 64 years of age and Older driver 65 plus) fatal injury crashes.

Research Questions

The guiding research question for this study was "What are the differences in driver error, behavioral issues, mode of transportation and age groups fatal injury crashes by age, gender and race in the United States for years 2012 to 2016? To that avail, there were four specific research questions. They were:

1. What are differences in driver error (alcohol, speeding, distraction, and drowsy driving) fatal injury crashes by age, gender and race in the United States for years 2012 to 2016?
2. What are differences in individuals' behavioral issue (restraint not used) fatal injury crashes by age, gender and race in the United States for years 2012 to 2016?

3. What are differences in driver mode of transportation (pedestrian, Class C vehicle, bicycle and motorcycle) fatal injury crashes by age, gender and race in the United States for years 2012 to 2016?
4. What are differences in driver age groups (young driver 15 to 20 years of age, 21 to 24 years of age, 25 to 64 years of age and older driver 65 plus years of age) fatal injury crashes by age, gender and race in the United States for years 2012 to 2016?

Driver Error (Alcohol Involvement, Speeding, Distraction, and Drowsy Driving) Fatal Injury Crashes

For driver error, alcohol involvement (0.01+%) there was no statistically significant difference between gender as demonstrated by the Independent Samples T Test (p = .066) as shown in Table 4.1. There was no statistically significant difference for race as demonstrated by the one-way ANOVA (p = .232) as shown in Table 4.2.

The percentages showed that the highest three percentages were Native American males (1.32%) followed by Latinos (1.01%) and American females (0.593%) as shown in Table 4.3. The male mean was higher than the female as shown in Table 4.1. In addition, the male percentages were higher than the female percentages in the same race as shown in Table 4.3. In comparing percentages among male and females in all races, Native American females (0.593%) percentage was higher than African American males (0.591%), Asian males (0.19%), and White males (0.40%) as shown in Table 4.3. Also, Latinas (0.22%) percentage was higher than Asian males (0.19%) as shown in Table 4.3.

Table 4.1

Independent Samples T Test Driver Error - Alcohol Involvement (0.01+%) Fatal Injuries, Gender

Rate	Gender	Race	Mean	Std. Deviation	Std. Error Mean
	Male	5	.7020	.45899	.20527
	Female	5	.2160	.22457	.10043
	t	df	Sig. (2-tailed)		
Rate	2.127	8	.066		

Table 4.2

One-Way ANOVA Table Driver Error - Alcohol Involvement (0.01+%) Fatal Injuries, Race

		Sum of Squares	df	Mean Square	F	Sig.
Race	Between Groups	.899	4	.225	1.52	.323
	Within Groups	.736	5	.147		
	Total	1.635	9			

Table 4.3

Driver Error - Alcohol Involvement (0.01+%) Driver Fatal Injuries Percentages by Deaths (USDOT, 2020b & CDC, 2020b)

Race & Gender	2012	2013	2014	2015	2016	Total	5-Year Deaths	Percentage
African American Males	813	854	835	939	1,060	4,501	761,331	0.591%
African American Females	180	190	161	195	209	935	730,050	0.13%
Asian Males	52	39	63	63	69	286	154396	0.19%
Asian Females	14	9	16	10	9	58	147,442	0.04%
Latinos	793	843	907	907	984	4,434	438,239	1.01%
Latinas	130	152	139	182	198	801	364,124	0.22%
Native American Males	129	108	118	116	132	603	45,550	1.32%
Native American Females	35	39	49	52	49	224	37,765	0.593%
White Males	4,149	4,027	4,033	4,150	4,480	20,839	5,153,370	0.40%
White Females	798	851	900	934	984	4,467	5,164,464	0.09%

For driver error, speeding, there was a statistically significant difference between gender as demonstrated by the Independent Samples T Test (p = .034) as shown in Table

4.4. There was no statistically significant difference for race as demonstrated by the one-way ANOVA (p = .450) as shown in Table 4.5.

The percentages showed that the highest three percentages were Native American males (0.84%) followed by Latinos (0.72%) and African American males (0.46%) as shown in Table 4.6. The male mean was higher than the female as shown in Table 4.4. In addition, the male percentages were higher than the female percentages in the same race as shown in Table 4.6. In comparing percentages among male and females in all races, Native American female percentage (0.40%) was higher than Asian males (0.19%) and White males (0.28%) as shown in Table 4.6.

Table 4.4

Independent Samples T Test Driver Error - Speeding Fatal Injuries, Gender

Rate		N	Mean	Std. Deviation	Std. Error Mean
	Male	5	.4980	.27842	.12452
	Female	5	.1380	.15007	.06711
	t	df	Sig. (2-tailed)		
Rate	2.545	8	.034*		
*p<0.05.					

Table 4.5

One-Way ANOVA Driver Error - Speeding Fatal Injuries, Race

		Sum of Squares	df	Mean Square	F	Sig.
Race	Between Groups	.338	4	.085	1.095	.450
	Within Groups	.386	5	.077		
	Total	.724	9			
*p<0.05.						

Table 4.6

Driver Error - Speeding Driver Fatal Injuries Percentages by Deaths (USDOT, 2020b & CDC, 2020b)

Race & Gender	2012	2013	2014	2015	2016	Total	5-Year Deaths	Percentage
African American Males	635	660	679	707	814	3,495	761,331	0.46%
African American Females	134	130	87	122	147	620	730,050	0.08%
Asian Males	56	42	60	64	65	287	154,396	0.19%
Asian Females	10	11	8	8	6	43	147,442	0.03%
Latinos	567	602	639	638	690	3,136	438,239	0.72%
Latinas	78	95	95	82	97	447	364,124	0.12%
Native American Males	91	67	83	67	74	382	45,550	0.84%
Native American Females	25	31	30	32	32	150	37,765	0.40%
White Males	3,018	2,868	2,729	2,910	3,153	14,678	5,153,370	0.28%
White Females	615	624	590	622	667	3,118	5,164,464	0.06%

For driver error, distraction, there was no statistically significant difference between gender as demonstrated by the Independent Samples T Test (p = .111) as shown in Table 4.7. There was no statistically significant difference for race as demonstrated by the one-way ANOVA (p = .169) as shown in Table 4.8.

The percentages showed that the highest three percentages were Native American males (0.17%) followed by Latinos (0.13%) and Native American females (0.10%) as shown in Table 4.9. The male mean was higher than the female as shown in Table 4.7. In addition, the male percentages were higher than the female percentages in the same race as shown in Table 4.9. In comparing percentages among male and females in all races, Native American female percentage (0.10%) was higher than African American males (0.07%), Asian males (0.04%), Latinos (0.07%) and White

males (0.06%) as shown in Table 4.9. Also, Latinas (0.05%) percentage was higher than Asian males (0.04%) as show in Table 4.9.

Table 4.7

Independent Samples T Test Driver Error - Distraction Driver Fatal Injuries, Gender

Rate	Gender	Race	Mean	Std. Deviation	Std. Error Mean
	Male	5	.0940	.05413	.02421
	Female	5	.0420	.03564	.01594
	t	df	Sig. (2-tailed)		
Rate	1.794	8	.111		

Table 4.8

One-Way ANOVA Driver Error – Distraction Driver Fatal Injuries, Race

		Sum of Squares	df	Mean Square	F	Sig.
Race	Between Groups	.016	4	.004	2.526	.169
	Within Groups	.008	5	.002		
	Total	.024	9			

Table 4.9

Driver Error - Distraction Driver Fatal Injuries Percentages by Deaths (USDOT, 2020b & CDC, 2020b)

Race & Gender	2012	2013	2014	2015	2016	Total	5-Year Deaths	Percentage
African American Males	114	103	94	110	116	537	761,331	0.07%
African American Females	35	33	23	29	46	166	730,050	0.02%
Asian Males	12	4	15	13	12	56	154396	0.04%
Asian Females	4	2	3	4	3	16	147,442	0.01%
Latinos	105	95	118	124	108	550	438,239	0.13%
Latinas	31	31	29	44	39	174	364,124	0.05%
Native American Males	18	10	16	18	17	79	45,550	0.17%
Native American Females	9	6	6	11	5	37	37,765	0.10%
White Males	631	604	629	677	670	3,211	5,153,370	0.06%
White Females	255	281	242	305	293	1,376	5,164,464	0.03%

For driver error, drowsy driving, there was no statistically significant difference between gender as demonstrated by the Independent Samples T Test (p = .065) as shown in Table 4.10. There was no statistically significant difference for race as demonstrated by the one-way ANOVA (p = .458) as shown in Table 4.11.

The percentages showed that the highest three percentages were Latinos (0.052%) followed by Native American males (0.046%) and African American males (0.021%) as shown in Table 4.12. The male mean was higher than the female as shown in Table 4.10. In addition, the male percentages were higher than the female percentages in the same race as shown in Table 4.12. In comparing percentages among male and females in all races, Native American female percentage (0.016%) was higher than Asian males (0.01%) as shown in Table 4.12.

Table 4.10

Independent Samples T Test Driver Error – Drowsy Driving Fatal Injuries, Gender

Rate	Gender	Race	Mean	Std. Deviation	Std. Error Mean
	Male	5	.0300	.01817	.00837
	Female	5	.0100	.00707	.00316
	t	df	Sig. (2-tailed)		
Rate	2.236	8	.065		

Table 4.11

One-Way ANOVA Driver Error – Drowsy Driving Fatal Injuries, Race

		Sum of Squares	df	Mean Square	F	Sig.
Race	Between Groups	.001	4	.000	1.071	.458
	Within Groups	.001	5	.000		
	Total	.003	9			

Table 4.12

Driver Error - Drowsy Driver Fatal Injuries Percentages by Deaths (USDOT, 2020b & CDC, 2020b)

Race & Gender	2012	2013	2014	2015	2016	Total	5-Year Deaths	Percentage
African American Males	25	31	39	25	42	162	761,331	0.021%
African American Females	7	9	7	5	10	38	730,050	0.01%
Asian Males	2	2	1	5	1	11	154396	0.01%
Asian Females	0	1	1	1	0	3	147,442	0.00%
Latinos	38	50	51	50	40	229	438,239	0.052%
Latinas	8	11	13	7	7	46	364,124	0.01%
Native American Males	3	5	6	3	4	21	45,550	0.046%
Native American Females	1	1	0	2	2	6	37,765	0.016%
White Males	152	162	173	192	172	851	5,153,370	0.017%
White Females	55	48	54	52	58	267	5,164,464	0.01%

Behavioral Issue Restraint Not Used Fatal Injury Crashes

For behavioral issue, restraint not used, there was no statistically significant difference between gender as demonstrated by the Independent Samples T Test (p = .215) as shown in Table 4.13. There was no statistically significant difference for race as demonstrated by the one-way ANOVA (p = .080) as shown in Table 4.14.

The percentages showed that the highest three percentages were Native American males (1.89%) followed by Native American females (1.13%) and Latinos (1.11%) shown in Table 4.15. The male mean was higher than the female as shown in Table 4.13. In addition, the male percentages were higher than the female percentages in the same race as shown in Table 4.15. In comparing percentages among male and females in all races, Native American females (1.13%) percentage was higher than

African American males (0.73%), Asian males (0.19%), Latinos (1.11%) and White males (0.54%) as shown in Table 4.3. Also, African American females (0.26%) and Latinas (0.44%) percentages were higher than or equal to Asian males (0.19%) as shown in Table 4.3.

Table 4.13

Independent Samples T Test Behavioral Issue – Restraint Not Used Fatal Injuries, Gender

Rate	Gender	Race	Mean	Std. Deviation	Std. Error Mean
	Male	5	.8920	.64932	.29039
	Female	5	.4300	.40823	.18257
	t	df	Sig. (2-tailed)		
Rate	1.347	8	.215		

Table 4.14

One-Way ANOVA Behavioral Issue – Restraint Not Used Fatal Injuries, Race

		Sum of Squares	df	Mean Square	F	Sig.
Race	Between Groups	2.200	4	.550	4.004	.080
	Within Groups	.687	5	.137		
	Total	2.887	9			

Table 4.15

Behavioral Issue - Restraint Not Used Fatal Injuries Percentages by Deaths (USDOT, 2020b & CDC, 2020b)

Race & Gender	2012	2013	2014	2015	2016	Total	5-Year Deaths	Percentage
African American Males	1,105	1,015	1,056	1,218	1,379	5,773	786,441	0.73%
African American Females	367	327	336	422	496	1,948	749,873	0.26%
Asian Males	59	48	57	68	66	298	157,794	0.19%
Asian Females	38	32	31	59	32	192	150,142	0.13%
Latinos	961	961	955	1,049	1,114	5,040	455,498	1.11%
Latinas	309	317	332	317	403	1,678	378,052	0.44%
Native American Males	189	134	192	158	213	886	46,925	1.89%
Native American Females	80	85	83	99	93	440	38,771	1.13%
White Males	5,654	5,392	5,225	5,651	6,212	28,134	5,196,379	0.54%
White Females	1,945	1,789	1,786	1,982	2,118	9,620	5,197,220	0.19%

Mode of Transportation (Pedestrian, Class C Vehicle, Bicycle and Motorcycle) Fatal Injury Crashes

For mode of transportation, pedestrian, there was no statistically significant difference between gender as demonstrated by the Independent Samples T Test (p = .124) as shown in Table 4.16. There was no statistically significant difference for race as demonstrated by the one-way ANOVA (p = .294) as shown in Table 4.17.

The percentages showed that the highest three percentages were Native American males (0.88%) followed by Latinos (0.62%), and African American males (0.41%) as shown in Table 4.18. The male mean was higher than the female as shown in Table 4.16. In addition, the male percentages were higher than the female percentages in the same race as shown in table 4.18. In comparing percentages among male and

females in all races, Latinas (0.28%) and Native American females (0.36%) percentages were higher than Asian males (0.259%) and White males (0.16%) shown in Table 4.18.

Table 4.16

Independent Samples T Test Mode of Transportation - Pedestrian Fatal Injuries, Gender

Rate	Gender	Race	Mean	Std. Deviation	Std. Error Mean
	Male	5	.4660	.28910	.12929
	Female	5	.2280	.11122	.04974
	t	df	Sig. (2-tailed)		
Rate	1.718	8	.124		

Table 4.17

One-Way ANOVA Mode of Transportation - Pedestrian Fatal Injuries, Race

		Sum of Squares	df	Mean Square	F	Sig.
Race	Between Groups	.300	4	.075	1.658	.294
	Within Groups	.226	5	.045		
	Total	.525	9			

Table 4.18

Mode of Transportation - Pedestrian Fatal Injuries Percentages by Deaths (USDOT, 2020b & CDC, 2020b)

Race & Gender	2012	2013	2014	2015	2016	Total	5-Year Deaths	Percentage
African American Males	548	563	590	732	810	3,243	786,441	0.41%
African American Females	220	232	226	291	326	1,295	749,873	0.17%
Asian Males	57	70	98	78	106	409	157,794	0.259%
Asian Females	54	82	73	87	89	385	150,142	0.256%
Latinos	483	491	564	619	650	2,807	455,498	0.62%
Latinas	188	184	186	220	264	1,042	37,8052	0.28%
Native American Males	74	66	91	92	89	412	46,925	0.88%
Native American Females	26	27	24	34	30	141	38,771	0.36%
White Males	1,454	1,453	1,557	1,774	2,033	8,271	5,196379	0.16%
White Females	673	679	731	776	864	3,723	5197220	0.07%

For mode of transportation, class C vehicle, there was no statistically significant difference between gender as demonstrated by the Independent Samples T Test (p = .094) as shown in Table 4.19. There was no statistically significant difference for race as demonstrated by the one-way ANOVA (p = .220) as shown in Table 4.20.

The percentages showed that the highest three percentages were Native American males (1.68%) followed by Latinos (1.43%) and Native American females (1.02%) as shown in Table 4.21. The male mean was higher than the female as shown in Table 4.19. In addition, the male percentages were higher than the female percentages in the same race as shown in Table 4.21. In comparing percentages among male and females in all races, Native American females (1.02%) percentage was higher than African American males (0.88 percent), Asian males (0.36%), and White males (0.67%) as shown in Table 4.21. Also, Latinas (0.50%) percentage was higher than Asian males (0.36%) as shown in Table 4.21.

Table 4.19

Independent Samples T Test Mode of Transportation - Class C Vehicle Driver Fatal Injuries, Gender

Rate	Gender	Race	Mean	Std. Deviation	Std. Error Mean
	Male	5	1.0040	.54317	.24291
	Female	5	.4620	.33589	.15021
	t	df	Sig. (2-tailed)		
Rate	1.898	8	.094		

Table 4.20

One-Way ANOVA Mode of Transportation - Class C Vehicle Driver Fatal Injuries, Race

		Sum of Squares	df	Mean Square	F	Sig.
Race	Between Groups	1.479	4	.370	2.086	.220
	Within Groups		5	.177		
	Total	2.366	9			

Table 4.21

Mode of Transportation - Class C Vehicle Driver Fatal Injuries* Percentages by Deaths *(USDOT, 2020b & CDC, 2020b)*

Race & Gender	2012	2013	2014	2015	2016	Total	5-Year Deaths	Percentage
African American Males	1,134	1,187	1,224	1,439	1,679	6,663	761,331	0.88%
African American Females	489	468	421	492	624	2,494	730,050	0.34%
Asian Males	89	80	128	131	125	553	154,396	0.36%
Asian Females	38	33	46	52	48	217	147,442	0.15%
Latinos	1,123	1,127	1,221	1,342	1,441	6,254	438,239	1.43%
Latinas	317	338	331	410	439	1,835	364,124	0.50%
Native American Males	149	135	170	150	162	766	45,550	1.68%
Native American Females	65	69	73	86	94	387	37,765	1.02%
White Males	6,523	6,517	6,583	7,238	7,703	31,372	5,153,370	0.67%
White Females	2,884	2,954	2,959	3,143	3,436	15,376	5,164,464	0.30%

Note: Class C Vehicle: Passenger Car, Light Truck, Pickup, Utility Truck or Van

For mode of transportation, bicycle, there was a statistically significant difference between gender as demonstrated by the Independent Samples T Test (p = .003) as shown in Table 4.22. There was no statistically significant difference for race as demonstrated by the one-way ANOVA (p = .904) as shown in Table 4.23.

The percentages showed that the highest three percentages were Latinos (0.11%) followed by Native American males (0.07%), and African American males (0.06%) as

shown in Table 4.24. The male mean was higher than the female as shown in Table 4.22. In addition, the male percentages were higher than the female percentages in the same race and in all races as shown in Table 4.24.

Table 4.22

Independent Samples T Test Mode of Transportation -Bicycle Fatal Injuries, Gender

Rate	Gender	Race	Mean	Std. Deviation	Std. Error Mean
	Male	5	.0640	.02966	.01327
	Female	5	.0080	.00447	.00200
	t	df	Sig. (2-tailed)		
Rate	4.174	8	.003*		
*p<0.05					

Table 4.23

One-Way ANOVA Mode of Transportation – Bicycle Fatal Injuries, Race

		Sum of Squares	df	Mean Square	F	Sig.
Race	Between Groups	.002	4	.000	.240	.904
	Within Groups	.010	5	.002		
	Total	.011	9			

Table 4.24

Mode of Transportation - Bicycle Fatal Injuries Percentages by Deaths (USDOT, 2020b & CDC, 2020b)

Race & Gender	2012	2013	2014	2015	2016	Total	5-Year Deaths	Percentage
African American Males	75	74	80	102	106	437	786,441	0.06%
African American Females	10	4	3	10	8	35	749,873	0.00%
Asian Males	10	15	16	19	15	75	157,794	0.05%
Asian Females	1	2	6	5	2	16	150,142	0.01%
Latinos	94	89	115	113	81	492	455,498	0.11%
Latinas	6	7	6	10	7	36	378052	0.01%
Native American Males	7	7	1	8	8	31	46,925	0.07%
Native American Females	0	1	2	2	0	5	38,771	0.01%
White Males	327	363	325	360	420	1,795	5,196,379	0.03%
White Females	54	70	54	78	103	359	5,197,220	0.01%

For mode of transportation, motorcycle, there was a statistically significant difference between gender as demonstrated by the Independent Samples T Test, p = .000) as shown in Table 4.25. There was no statistically significant difference for race as demonstrated by the one-way ANOVA (p = .966) as shown in Table 4.26.

The percentages showed that the highest three percentages were Latinos (0.45%) followed by Native American males (0.32%) and African American males (0.29%) as shown in Table 4.27. The male mean was higher than the female as shown in Table 4.25. In addition, the male percentages were higher than the female percentages in the same race and in all races as shown in Table 4.27.

Table 4.25

Independent Samples T Test Mode of Transportation - Motorcycle Fatal Injuries, Gender

Rate	Gender	Race	Mean	Std. Deviation	Std. Error Mean
	Male	5	.2980	.10710	.04790
	Female	5	.0120	.00447	.00200
	t	df	Sig. (2-tailed)		
Rate	5.966	8	.000*		
*p<0.05					

Table 4.26

One-Way ANOVA Mode of Transportation - Motorcycle Fatal Injuries, Race

		Sum of Squares	df	Mean Square	F	Sig.
Race	Between Groups	.023	4	.006	.128	.966
	Within Groups	.227	5	.045		
	Total	.250	9			

Table 4.27

Mode of Transportation - Motorcycle Fatal Injuries Percentages by Deaths (USDOT, 2020b & CDC, 2020b)

Race & Gender	2012	2013	2014	2015	2016	Total	5-Year Deaths	Percentage
African American Males	415	395	415	484	521	2,230	761,331	0.29%
African American Females	13	14	9	15	10	61	730,050	0.01%
Asian Males	39	36	43	49	60	227	154396	0.15%
Asian Females	3	2	1	3	2	11	147,442	0.01%
Latinos	283	372	409	426	478	1,968	438,239	0.45%
Latinas	8	7	9	12	14	50	364,124	0.01%
Native American Males	34	22	27	28	36	147	45,550	0.32%
Native American Females	2	1	2	0	1	6	37,765	0.02%
White Males	2,863	2,736	2,684	3,015	3,305	14,603	5,153,370	0.28%
White Females	110	122	116	143	115	606	5,164,464	0.01%

Driver Age Groups (Young driver 15 to 20 Years of Age, 21 to 24 Years of Age, 25 to 64 Years of Age and Older Driver 65 Plus) Fatal Injury Crashes

For age group 15 to 20 years of age, there was no statistically significant difference between gender as demonstrated by the Independent Samples T Test (p = .753) as shown in Table 4.28. There was a statistically significant difference for race as demonstrated by the one-way ANOVA (p = .006) as shown in Table 4.29.

The percentages showed that the highest three percentages were White males (14.90%) followed by Native American females (13.76%) and White females (13.40%) as shown in Table 4.30. The male mean was higher than the female as shown in Table 4.28. In addition, the female percentages were higher than the male percentages in African American and Native American races as shown in Table 4.30. In comparing percentages among male and females in all races, African American females (7.42%), Latinas (8.85%), Native American females (13.76%) and White females (13.40%) percentages were higher than African American males (5.85%) and Asian males (5.52%) as shown in Table 4.30. Also, Native American females (13.76%) and White females (13.40%) percentages were higher than Latinos (12.46%) and Native American males (12.36%) as shown in Table 4.30.

Table 4.28

Independent Samples T Test Age Group 15 through 20 Years of Age, Gender

Rate	Gender	Race	Mean	Std. Deviation	Std. Error Mean
	Male	5	10.2180	4.26282	1.90639
	Female	5	9.3240	4.40930	1.97190
	t	df	Sig. (2-tailed)		
Rate	.304	8	.753		

Table 4.29

One-Way ANOVA Driver Age Group 15 to 20 Years of Age, Race

		Sum of Squares	df	Mean Square	F	Sig.
Race	Between Groups	139.884	4	34.971	13.913	.006*
	Within Groups	12.568	5	2.514		
	Total	152.452	9			

*p<0.05

Table 4.30

Driver Age Group - 15 to 20 Years of Age Percentages by Deaths (USDOT, 2020b & CDC, 2020b)

Race & Gender	2012	2013	2014	2015	2016	Total	5-Year Deaths	Percentage
African American Males	120	124	133	148	168	693	11,842	5.85%
African American Females	48	43	51	53	67	262	3,531	7.42%
Asian Males	9	12	15	19	18	73	1,323	5.52%
Asian Females	3	2	4	4	6	19	595	3.19%
Latinos	177	201	218	213	249	1,058	8,492	12.46%
Latinas	53	41	56	57	64	271	3,062	8.85%
Native American Males	19	22	26	17	15	99	801	12.36%
Native American Females	12	10	7	13	7	49	356	13.76%
White Males	772	687	706	795	792	3,752	25,179	14.90%
White Females	287	271	273	313	330	1,474	11,004	13.40%

For age group 21 to 24 years of age, there was no statistically significant difference between gender as demonstrated by the Independent Samples T Test (p = .443) as shown in Table 4.31. There was no statistically significant difference for race as demonstrated by the one-way ANOVA (p = .093) as shown in Table 4.32.

The percentages showed that the highest three percentages were Latinos (15.05%) followed by White males (14.75%) and Native American females (13.29%) as

shown in Table 4.33. The male mean was higher than the female as shown in Table 4.31. In addition, the male percentages were higher than the female percentages in the same race except that the female percentages were higher in African Americans and Native Americans as shown in Table 4.33. In comparing percentages among male and females in all races, African American females (7.46%), Latinas (10.34%), Native American females (13.29%) and White females (10.54%) percentages were higher than African American males (7.30%) and Asian males (7.16%) as shown in Table 4.33. Also, Latinas (10.34%) and Native American females (13.29%) percentages were higher that Native American males (10.29%) as shown in Table 4.33.

Table 4.31

Independent Samples T Test Age Group 21 through 24 Years of Age, Gender

Rate	Gender	Race	Mean	Std. Deviation	Std. Error Mean
	Male	5	10.9100	3.85241	1,72285
	Female	5	8.9400	3.87588	1.73335
	t	df	Sig. (2-tailed)		
Rate	.806	8	.443		

Table 4.32

One-Way ANOVA Driver Age Group 21 to 24 Years of Age, Race

		Sum of Squares	df	Mean Square	F	Sig.
Race	Between Groups	96.325	4	24.081	3.667	.093
	Within Groups	32.831	5			
	Total	129.156	9			

Table 4.33

Driver Age Group - 21 to 24 Years of Age Fatal Injuries Percentages by Deaths (USDOT, 2020b & CDC, 2020b)

Race & Gender	2012	2013	2014	2015	2016	Total	5-Year Deaths	Percentage
African American Males	159	189	197	249	263	1,057	14,473	7.30%
African American Females	74	59	42	68	84	327	4,382	7.46%
Asian Males	15	14	28	29	30	116	1,619	7.16%
Asian Females	3	6	3	7	3	22	716	3.07%
Latinos	249	251	308	323	352	1,483	9,855	15.05%
Latinas	47	51	50	72	78	298	2,883	10.34%
Native American Males	20	26	24	20	22	112	1,088	10.29%
Native American Females	10	12	12	11	18	63	474	13.29%
White Males	1,012	958	989	991	1,068	5,018	34,014	14.75%
White Females	256	266	248	262	281	1,313	12,461	10.54%

For age group 24 to 64 years of age, there was a statistically significant difference between gender as demonstrated by the Independent Samples T Test (p = .022) as shown in Table 4.34. There was no statistically significant difference for race as demonstrated by the one-way ANOVA (p = .472) as shown in Table 4.35.

The percentages showed that the highest three percentages were Native American males (3.09%) followed by Latinos (3.04%) and White males (2.42%) as shown in Table 4.36. The male mean was higher than the female as shown in Table 4.34. In addition, the male percentages were higher than the female percentages in the same race as shown in table 4.36. In comparing percentages among male and females in

all races, Latinas (1.26%) and Native American females (1.83%) percentages were higher than Asian males (1.06%) as shown in Table 4.36.

Table 4.34

Independent Samples T Test Age Group 25 through 64 Years of Age, Gender

Rate	Gender	Race	Mean	Std. Deviation	Std. Error Mean
	Male	5	2.3260	.83647	.37408
	Female	5	1.0720	.52647	.23544
	t	df	Sig. (2-tailed)		
Rate	2.837	8	.022*		
*p<0.05					

Table 4.35

One-Way ANOVA Driver Age Group 25 to 64 Years of Age, Race

		Sum of Squares	df	Mean Square	F	Sig.
Race	Between Groups	3.551	4	.888	1.035	.472
	Within Groups	4.287	5	.857		
	Total	7.839	9			

Table 4.36

Driver Age Group - 25 to 64 Years of Age Fatal Injuries Percentages by Deaths (USDOT, 2020b & CDC, 2020b)

Race & Gender	2012	2013	2014	2015	2016	Total	5-Year Deaths	Percentage
African American Males	1,221	1,218	1,257	1,474	1,672	6,842	338,740	2.02%
African American Females	330	337	289	334	410	1,700	234,780	0.72%
Asian Males	89	76	105	107	111	488	45,953	1.06%
Asian Females	31	19	37	29	23	139	30,421	0.46%
Latinos	967	1,015	1,086	1,209	1,292	5,569	183,492	3.04%
Latinas	201	236	227	269	283	1,216	96,684	1.26%
Native American Males	147	112	148	145	157	709	22,926	3.09%
Native American Females	45	48	54	61	64	272	14,851	1.83%
White Males	6,408	6,303	6,317	6,901	7,507	33,436	1,382,416	2.42%
White Females	1,760	1,801	1,761	1,910	2,051	9,283	855,310	1.09%

For age group 65 plus years of age there was a statistically significant difference between gender as demonstrated by the Independent Samples T Test (p = .013) as shown in Table 4.38. There was no statistically significant difference for race as demonstrated by the one-way ANOVA (p = .587) as shown in Table 4.39.

The percentages showed that the highest three percentages were Native American males (0.41%) followed by White males (0.27%) and Latinos (0.204%) as shown in Table 4.39. The male mean was higher than the female as shown in Table 4.37. In addition, the male percentages were higher than the female percentages in the same race as shown in table 4.39. In comparing percentages among male and females in all races, Native American females (0.15%) percentage was higher than Asian males (0.13%) as shown in Table 4.39.

Table 4.37

Independent Samples T Test Age Group 65 Plus Years of Age, Gender

Rate	Gender	Race	Mean	Std. Deviation	Std. Error Mean
	Male	5	.2420	.10616	.04748
	Female	5	.0780	.04712	.02107
	t	df	Sig. (2-tailed)		
Rate	3.157	8	.013*		
*p<0.05					

Table 4.38

One-Way ANOVA Driver Age Group 65 Plus Years of Age, Race

		Sum of Squares	df	Mean Square	F	Sig.
Race	Between Groups	.046	4	.012	.773	.587
	Within Groups	.075	5	.015		
	Total	.121	9			

Table 4.39

Driver Age Group - Older Driver 65 Plus Age Group Percentages by Deaths (USDOT, 2020b & CDC, 2020b)

Race & Gender	2012	2013	2014	2015	2016	Total	5-Year Deaths	Percentage
African American Males	148	141	145	158	206	798	396,276	0.201%
African American Females	54	50	53	57	79	293	487,357	0.06%
Asian Males	22	22	25	30	35	134	105,501	0.13%
Asian Females	4	8	5	15	18	50	115,842	0.04%
Latinos	73	91	97	101	121	483	236,400	0.204%
Latinas	26	21	12	25	31	115	261,488	0.04%
Native American Males	10	13	23	21	17	84	20,735	0.41%
Native American Females	5	5	7	6	10	33	22,084	0.15%
White Males	1,743	1,891	1,828	2,187	2,395	10,044	3,711,761	0.27%
White Females	723	776	832	833	928	4,092	4,285,689	0.10%

CHAPTER V

SUMMARY AND CONCLUSION

This chapter is divided into five sections. The sections include (1) summary, (2) conclusions, (3) discussion, (4) recommendations and (5) future research.

Summary

The guiding research question for this study was "What are the differences in driver error, behavioral issues, mode of transportation and age groups fatal injury crashes by age, gender and race in the United States for years 2012 to 2016? To that avail, there were four specific research questions. They were:

Research Question 1

1. What are differences in driver error (alcohol, speeding, distraction, and drowsy driving) fatal injury crashes by age, gender and race in the United States for years 2012 to 2016?

For research Question 1, in driver error (alcohol involvement (0.01+%), speeding, distraction, and drowsy driving) fatal injury crashes by gender and race in the United States for years 2012 to 2016 are as follows:

For driver error, alcohol involvement (0.01+%) there was no statistically significant difference between gender as demonstrated by the Independent Samples T Test (p = .066) and for race as demonstrated by the one-way ANOVA (p = .232). The highest three percentages were Native American males (1.32%) followed by Latinos (1.01%) and American females (0.60%). The male mean was higher than the female

and the male percentages were higher than the female percentages in the same race. In comparing percentages among male and females in all races, Native American females (0.593%) percentage was higher than African American males (0.591%), Asian males (0.19%) and White males (0.40%). Also, Latinas (0.22%) percentage was higher than Asian males (0.19%).

For driver error, speeding, there was a statistically significant difference between gender as demonstrated by the Independent Samples T Test (p = .034) and there was no statistically significant difference for race as demonstrated by the one-way ANOVA (p = .450). The highest three percentages were Native American males (0.84%) followed by Latinos (0.72%) and African American males (0.46%). The male mean was higher than the female as shown and the male percentages were higher than the female percentages in the same race. In comparing percentages among male and females in all races, Native American female percentage (0.40%) was higher than Asian males (0.19%) and White males (0.28%).

For driver error, distraction, there was no statistically significant difference between gender as demonstrated by the Independent Samples T Test (p = .111) and for race as demonstrated by the one-way ANOVA (p = .169). The highest three percentages were Native American males (0.17%) followed by Latinos (0.13%) and Native American females (0.10%). The male mean was higher than the female and the male percentages were higher than the female percentages in the same race. In comparing percentages among male and females in all races, Native American female percentage (0.10%) was higher than African American males (0.07%), Asian males (0.04%),

Latinos (0.07%) and White males (0.06%). Also, Latinas (0.05%) percentage was higher than Asian males (0.04%).

For driver error, drowsy driving, there was no statistically significant difference between gender as demonstrated by the Independent Samples T Test (p = .065) and for race as demonstrated by the one-way ANOVA (p = .458). The highest three percentages were Latinos (0.052%) followed by Native American males (0.046%) and African American males (0.021%). The male mean was higher than the female and the male percentages were higher than the female percentages in the same race. In comparing percentages among male and females in all races, Native American female percentage (0.016%) was higher than Asian males (0.01%).

Research Question 2

2. What are differences in individuals' behavioral issue (restraint not used) fatal injury crashes by age, gender and race in the United States for years 2012 to 2016?

For research question 2, the differences in individuals' behavioral issue (restraint not used) fatal injury crashes by gender and race in the United States for years 2012 to 2016 was as follows:

For behavioral issue, restraint not used, there was no statistically significant difference between gender as demonstrated by the Independent Samples T Test (p = .215) and for race as demonstrated by the one-way ANOVA (p = .080). The highest three percentages were Native American males (1.89%) followed by Native American females (1.13%) and Latinos (1.11%). The male mean was higher than the female and the male percentages were higher than the female percentages in the same race. In

comparing percentages among male and females in all races, Native American females (1.13%) percentage was higher than African American males (0.73%), Asian males (0.19%), Latinos (1.11%) and White males (0.54%). Also, African American females (0.26%) and Latinas (0.44%) percentages were higher than or equal to Asian males (0.19%).

Research Question 3

3. What are differences in driver mode of transportation (pedestrian, Class C vehicle, bicycle and motorcycle) fatal injury crashes by age, gender and race in the United States for years 2012 to 2016?

For research question 3, the differences in driver mode of transportation (pedestrian, Class C vehicle, bicycle and motorcycle) fatal injury crashes by gender and race in the United States for years 2012 to 2016 were as follows:

For mode of transportation, pedestrian, there was no statistically significant difference between gender as demonstrated by the Independent Samples T Test (p = .124) and for race as demonstrated by the one-way ANOVA (p = .294). The highest three percentages were Native American males (0.88%) followed by Latinos (0.62%), and African American males (0.41%). The male mean was higher than the female and the male percentages were higher than the female percentages in the same race. In comparing percentages among male and females in all races, Latinas (0.28%) and Native American females (0.36%) percentages were higher than Asian males (0.259%) and White males (0.16%).

For mode of transportation, class C vehicle, there was no statistically significant difference between gender as demonstrated by the Independent Samples T Test (p = .094) and for race as demonstrated by the one-way ANOVA (p = .220). The highest three percentages were Native American males (1.68%) followed by Latinos (1.43%) and Native American females (1.02%). The male mean was higher than the female and the male percentages were higher than the female percentages in the same race. In comparing percentages among male and females in all races, Native American females (1.02%) percentage was higher than African American males (0.88 percent), Asian males (0.36%), and White males (0.67%). Also, Latinas (0.50%) percentage was higher than Asian males (0.36%).

For mode of transportation, bicycle, there was a statistically significant difference between gender as demonstrated by the Independent Samples T Test (p = .003) and there was no statistically significant difference for race as demonstrated by the one-way ANOVA (p = .904). The highest three percentages were Latinos (0.11%) followed by Native American males (0.07%), and African American males (0.06%). The male mean was higher than the female as shown and the male percentages were higher than the female percentages in the same race and in all races.

For mode of transportation, motorcycle, there was a statistically significant difference between gender as demonstrated by the Independent Samples T Test, p = .000) and there was no statistically significant difference for race as demonstrated by the one-way ANOVA (p = .966). The highest three percentages were Latinos (0.45%) followed by Native American males (0.32%) and African American males (0.29%).

The male mean was higher than the female as shown and the male percentages were higher than the female percentages in the same race and in all races.

Research Question 4

4. What are differences in driver age groups (young driver 15 to 20 years of age, 21 to 24 years of age, 25 to 64 years of age and older driver 65 plus years of age) fatal injury crashes by age, gender and race in the United States for years 2012 to 2016?

For research question 4, the differences in driver age groups (young driver 15 to 20 years of age, 21 to 24 years of age, 25 to 64 years of age and older driver 65 plus years of age) fatal injury crashes by age, gender and race in the United States for years 2012 to 2016 were as follows:

For age group 15 to 20 years of age, there was no statistically significant difference between gender as demonstrated by the Independent Samples T Test (p = .753) and there was a statistically significant difference for race as demonstrated by the one-way ANOVA (p = .006). The highest three percentages were White males (14.90%) followed by Native American females (13.76%) and White females (13.40%). The male mean was higher than the female and the female percentages were higher than the male percentages in African American and Native American races. In comparing percentages among male and females in all races, African American females (7.42%), Latinas (8.85%), Native American females (13.76%) and White females (13.40%) percentages were higher than African American males (5.85%) and Asian males (5.52%). Also, Native American females (13.76%) and White females (13.40%) percentages were higher than Latinos (12.46%) and Native American males (12.36%).

For age group 21 to 24 years of age, there was no statistically significant difference between gender as demonstrated by the Independent Samples T Test (p = .443) and for race as demonstrated by the one-way ANOVA (p = .093). The highest three percentages were Latinos (15.05%) followed by White males (14.75%) and Native American females (13.29%). The male mean was higher than the female and the male percentages were higher than the female percentages in the same race except that the female percentages were higher in African Americans and Native Americans. In comparing percentages among male and females in all races, African American females (7.46%), Latinas (10.34%), Native American females (13.29%) and White females (10.54%) percentages were higher than African American males (7.30%) and Asian males (7.16%). Also, Latinas (10.34%) and Native American females (13.29%) percentages were higher that Native American males (10.29%).

For age group 24 to 64 years of age, there was a statistically significant difference between gender as demonstrated by the Independent Samples T Test (p = .022) and there was no statistically significant difference for race as demonstrated by the one-way ANOVA (p = .472). The highest three percentages were Native American males (3.09%) followed by Latinos (3.04%) and White males (2.42%). The male mean was higher than the female and the male percentages were higher than the female percentages in the same race. In comparing percentages among male and females in all races, Latinas (1.26%) and Native American females (1.83%) percentages were higher than Asian males (1.06%).

For age group 65 plus years of age there was a statistically significant difference between gender as demonstrated by the Independent Samples T Test (p = .013) and there was no statistically significant difference for race as demonstrated by the one-way ANOVA (p = .587). The highest three percentages were Native American males (0.41%) followed by White males (0.27%) and Latinos (0.204%). The male mean was higher than the female and the male percentages were higher than the female percentages in the same race. In comparing percentages among male and females in all races, Native American females (0.15%) percentage was higher than Asian males (0.13%).

Conclusions

Traffic safety countermeasures are implemented by every state in its efforts to reduce motor vehicle crashes, deaths, injuries and property damage. Many of the countermeasures are aimed at educating individuals to motivate them to change behavior voluntary. To have acceptance of the changes to behaviors and to identify a traffic safety culture, the characteristics of the traffic safety culture must be identified and once the characteristics are identified, then the countermeasures can be created and implemented to build a traffic safety culture (Cooper, 2000.) This is also true when endeavoring to identify a traffic safety culture by differences in age, gender and race through its societal actions (Banks & Banks, 2016). For different ethnic groups to accept traffic safety countermeasures within their community, the traffic safety countermeasure must be relevant and relatable to that particular group regardless of differences in age, gender and race (Banks & Banks, 2016 & Duhon-Sells, 2015). To open the pathway to acceptance of traffic safety countermeasure within different ethnic

groups, the countermeasure must be viewed through its "own cultural and experimental filters" and we must "think and behave in ways the ensure fairness and that people have the power to make changes" (Gay, 2000 & Neito, 1993). Also, when creating traffic safety countermeasures for different ethnic groups, the experiences for the individuals must be culturally responsive without invisibility, stereotyping, selectivity and imbalance, fragmentation and isolation, as well as improper linguistic, loaded words, activity bias, tokenism, and the role of women being subservient (Larke & Saint, 2013).

The conceptual and theoretical frameworks may not constantly create answers; however, they may be the incentive that encourages the re-design, development and implementation of federal and/or state policies concerning traffic safety countermeasures. The conceptual framework for this study was traffic safety countermeasures and the theoretical frameworks for this study included social cognitive theory and intersectionality. Such an advancement importance for different ethnic groups may exist because they would have the largest impact on reducing traffic crash fatality causation factors and behavioral issues.

Bandura's Social Cognitive Theory Model indicates that there at three components that influence behavior which are "the environment, the individual and the behavior (Bandura, 1989). These three components can be utilized to change traffic safety behavior through identifying the individual and how the behavior and environment relates to that individual within age, gender and race (Bandura, 1989). Within this study the environment was the traffic scene. The individual was the driver,

passenger, pedestrian, bicyclist or motorcyclist. Finally, the behavior was driver error or behavioral issue.

The intersectionality allows for the data to be examined by multiple variables and examine how these variables interact with each other (Corusa & Saatcioglub, 2015 & Crenshaw, 1989). The intersectionality allows for discovery of any marginalization, discrimination or prejudice toward any ethnic group. This study examines motor vehicle traffic fatality crashes by age, gender and race. This intersectionality placed an importance on federal and state highway safety policies concerning the re-design or equitable development of countermeasures to include age, gender and race removing any discrimination or prejudice of any of ethnic group.

Recognizing the characteristics of a traffic safety culture allows the development of an effective and research-based collection of traffic safety countermeasures (Cooper, 2000). Using these countermeasures to change behavior may be difficult but can be accomplished by policy, law, enforcement, voluntary action and sanctions (Bandura, 1989 & Preusser, Williams, Nichols, Tison, & Chaudhary, 2008). The inclusion of culturally competent and diversity principles including be aware; know others; high eexpectations; accept and respect; value; and sensitive actions will produce equatible traffic safety countermearsures for all cultures (Larke & Saint, 2013). An individual's values, beliefs, and attitudes should be considered to aim the traffic safety countermeasures in the direction of reducing risk-taking behaviors.

To identify the characteristics of a traffic safety culture, this research study examined percentages of motor vehicle fatal injury divided by overall deaths according

to age, gender and race. To relate the percentages to current traffic safety countermeasures, this research study examined used the traffic safety countermeasures as they are outlined in the document, *Work: A Highway Safety Countermeasure Guide for State Highway Safety Offices, Ninth Edition (2018)* including alcohol involvement; restraint not used; speeding, distraction, drowsy driving, motorcycle, driver age groups (15 to 20 years of age, 21 to 24 years of age, 25 to 64 years of age and 65 plus years of age), pedestrians and bicycle (Richard, Magee, Bacon-Abdelmoteleb & Brown, 2018).

This research study guiding research question for this study was "What are the differences in driver error, behavioral issues, mode of transportation and age groups fatal injury crashes by age, gender and race in the United States for years 2012 to 2016?" The results of this research study showed a significant difference ($p < 0.05$) in gender in the following five variables: driver error (speeding, $p = .034$); mode of transportation (bicycle, $p = .003$) and motorcycle, $p = .000$); and driver age groups (25 to 64 years of age, $p = .022$) and 65 plus years of age, $p = .013$). In addition, the study showed significant difference ($p < 0.05$) in race in the driver age group (15 to 20 years of age, $p = .006$).

This study had four specific research questions. They were:

1. What are differences in driver error (alcohol, speeding, distraction, and drowsy driving) fatal injury crashes by age, gender and race in the United States for years 2012 to 2016?

2. What are differences in individuals' behavioral issue (restraint not used) fatal injury crashes by age, gender and race in the United States for years 2012 to 2016?
3. What are differences in driver mode of transportation (pedestrian, Class C vehicle, bicycle and motorcycle) fatal injury crashes by age, gender and race in the United States for years 2012 to 2016?
4. What are differences in driver age groups (young driver 15 to 20 years of age, 21 to 24 years of age, 25 to 64 years of age and older driver 65 plus years of age) fatal injury crashes by age, gender and race in the United States for years 2012 to 2016?

Other finding in this study showed that males of diverse races had the highest percentage in twelve of the thirteen variables. Native American males had the highest percentage in eight of the variables including: driver error (alcohol involvement (0.01+%), speeding and distraction); behavioral issue (restraint not used); mode of transportation (pedestrian and Class C vehicle); and driver age groups (25 to 64 years of age and older driver 65 plus years of age). Latinos had the highest percentage in four of the variables including: driver error (drowsy driving); mode of transportation (bicycle and motorcycle); and driver age group (21 to 24 years of age). Finally, White males had the highest percentage in the driver age group (15 to 20 years of age group).

Additionally, results of this research study showed that males had higher percentages than females of the same race expect in two of the thirteen variables. Native American females had a higher percentage in the driver age group (15 to 20 years of

age). African American females and Native American females had a higher percentage than their male counterparts in driver age group (21 to 24 years old). Another finding was that Native American females has a higher percentage in all variables than any other female race.

These findings of this study involving males having higher percentages than females corresponded to the findings in other studies conducted previously. Chang (2008) examined crash fatalities by age and gender in the study, "Comparison of Crash Fatalities by Sex and Age Group" (Chang, 2008) and the findings indicated that traffic crash fatalities are higher for males than for females in all age groups (Chang, 2008). In Van der Bossche, Geert, and Brijs (2007) study, "Analysis of Road Risk Per Age and Gender Category: A Time Series Approach" their finding also showed males have a higher road risk than females (Van den Bossche, Geert, and Brijs, 2007). Hilton (2006) study "Race and Ethnicity in Fatal Motor Vehicle Traffic Crashes 1999 – 2004" examined deaths from all causes against motor vehicle traffic crashes deaths and the study showed that "disproportionately large percentages" of motor vehicle crash deaths in diverse cultures especially amongst Native Americans and Latinx (Hilton, 2006). Cordellieri, Baralla, Ferlazzo, Gala, Piccardi, and Giannini (2016) study "Gender Effects in Young Road Users on road Safety Attitudes, Behaviors and Risk Perception" showed that gender had an effect on young drivers being involved in a traffic crash (Cordeliers, et al, 2016). Finally, Romano, Fell, and Voas (2011) study "The Role of Race and Ethnicity on the Effect of Graduated Driver Licensing Laws in the United States" finding showed largest reductions in fatal crashes in States with Graduated Licensing

Laws were for White (p<.01), African American (p>,05), Asian (p>.05) drivers (Romano, Fell, and Voas, 2011).

When combining male and female percentages by race, the data showed that African American, Latinx, and Native American combined male and female percentages were higher than the White male and female combined percentages in the seven of the variables that included: driver error (alcohol involvement (0.01+%) and speeding), behavioral issue (restraints not used), mode of transportation (pedestrian, class C vehicle, bicycle and motorcycle). In combination, Asian male and female combined percentages showed a lower percentage in all variables except for mode of transportation (pedestrian and bicycle) than White.

These findings in this study involving males of diverse cultures and the combination male and female percentages of different races corresponded to the findings in other studies conducted previously. Hamdan (2013) study, "Racial/Ethnic Differences in Fatality Rates from Motor Vehicle Crashes: An Analysis from a "Behavioral and Cultural Perspective," showed that there is a signifiant correlation between race/ethnicity (Non-White and White) and driving while under the influence of alcohol which may associate to the higher number of fatal injury percentages by deaths for diverse cultures in driver error alcohol involvement (0.01+%) in this study; however, findings showed that gender and age group had no significance (Hamdan, 2013). Additionally, Sloan, Chepke, and Davis study, "Race, Gender, and Risk Perceptions of the Legal Consequences of Drinking and Driving" examined the role of race, gender, and risk perceptions and their findings showed drinking and driving

(DWI) was higher for males than for females among all races (Sloan, Chepke & Davis, 2017).

The finding for this study involving age groups showed the following results for the age groups. In driver age group (15 to 20 years of age), there was a statistically significant difference for race as demonstrated by the one-way ANOVA (p = .006). Also, in this age group, the percentages showed that the highest three percentages were White males (14.90%) followed by Native American females (13.76%) and White females (13.40%). In the age group 21 to 24 years of age, the percentages showed that the highest three percentages were Latinos (15.05%) followed by White males (14.75%) and Native American females (13.29%). In age group 25 to 64 years of age, there was a statistically significant difference between gender as demonstrated by the Independent Samples T Test (p = .022) and the percentages showed that the highest three percentages were Native American males (3.09%) followed by Latinos (3.04%) and White males (2.42%). In the age group 65 plus years of age, there was a statistically significant difference between gender as demonstrated by the Independent Samples T Test (p = .013) and the percentages showed that the highest three percentages were Native American males (0.41%) followed by White males (0.27%) and Latinos (0.204%).

These findings of this study for age groups corresponded to the findings in other studies conducted previously. Boot, Stothart, and Charness study "Improving the Safety of Aging Road Users – A Mini-Review" findings showed older drivers are at the greatest risk for injury or death as a result of a traffic crash (Boot, Stothart, & Charness, 2014). Tefft (2017) study "Rates of Motor Vehicle Crashes, Injuries and Deaths in

Relation to Driver Age" findings showed that drivers ages 16-17 have the highest rates of traffic crash involvement, injuries to themselves and others, and "deaths of others in crashes in which they are involved" (Tefft, 2017). In addition, drivers age 80 and older have the highest rates of driver deaths, and drivers ages 60-69 were the safest drivers in most of the variables examined (Tefft, 2017). Romano, Fell, and Voas (2011) study "The Role of Race and Ethnicity on the Effect of Graduated Driver Licensing Laws in the United States" results showed that the largest reductions in fatal crashes in States with Graduated Licensing Laws were for White ($p<.01$), African American ($p>,05$), Asian ($p>.05$) drivers (Romano, Fell, and Voas, 2011).

Discussion

The United States rapidly changing racial demographics demonstrates the need for traffic safety research in the area of race to ensure that the proper traffic safety countermeasures are being implemented in each state to reduce the number of motor vehicle crashes, deaths, injuries and property damage. When researching the literature on traffic safety countermeasures outlined in the document, *Work: A Highway Safety Countermeasure Guide for State Highway Safety Offices, Ninth Edition (2018)* age and gender are represented in all countermeasure nine problem areas. However, race is only mentioned in three problem areas (Richard, Magee, Bacon-Abdelmoteleb & Brown, 2018).

After examining the intersectionality among motor vehicle fatal injury crashes by age, gender and race, the study showed that race does matter and must be an area that is taken into consideration. This is especially true for the equitable development or

redesign of traffic safety countermeasures in efforts to reduce motor vehicle crashes, fatal injuries, injuries and property damage for males from different ethnic groups as the study showed that males of different ethnicities had the highest fatal injury percentage by deaths in twelve of the thirteen variables. This included Native American males having the highest fatal injury percentage by deaths in eight of the variables including: driver error (alcohol involvement (0.01+%), speeding and distraction); behavioral issue (restraint not used); mode of transportation (pedestrian and Class C vehicle); and driver age groups (25 to 64 years of age and older driver 65 plus years of age). Latinos having the highest fatal injury percentage four of the variables including: driver error (drowsy driving); mode of transportation (bicycle and motorcycle); and driver age group (21 to 24 years of age). While White males had the highest fatal injury percentage by deaths in the only the driver age group (15 to 20 years of age group). Findings showed that in the driver age group (15 to 20 years of age), there was a statistically significant difference for race as demonstrated by the one-way ANOVA ($p = .006$).

The ability to obtain data concerning traffic crashes concerning age and gender is abundant. However, it is difficult to disaggregate data by age, gender and race due to inaccuracies in the datasets. And, when the data were given, it appeared limited. Thus, there is a need for uniformity in collecting data by age, gender and race. This issue created challenges in obtaining data by race and a reluctance to trust the accuracy of the data as a researcher.

Additional factors hindering the ability to obtain data by race is that law enforcement did gather information on drivers' race during traffic stops. Another factor

in obtaining data by race was that the majority of states do not collect or report fatal injury motor vehicle crashes by race on crash reports as seen in Appendix A. The United States Department of Transportation (USDOT) Model Minimum Uniform Crash Criteria (MMUCC) document, which is a document that provides guidelines to states for data to collect on crash reports, does not provide any direction to states on how to collect data by race. Several states have chosen to collect race data and place it on crash reports; but many states do not. The states provide this crash data, with or without accurate race data, to the USDOT to be entered into the FARS database. The race data in the FARS database is updated using the individual's race that is indicated on his/her death certificate. This conversion takes time making the current years data unverifiable data.

The classification of races was an additional challenge to conducting study. The FARS database containing motor vehicle fatal injury data and the WONDER database that contains deaths data do not have the same classification for race. For example, the FARS database has mixed race, but the WONDER database does not. Therefore, for consistency, the African American, Asian (including Pacific Islander), Latinx, Native American (including Alaska Native), and White were the races chooses to conduct this study.

Obtaining an exposure measurement was another challenge to conducting this study. It seems logical when reviewing the data by driver to use the number of driver's licenses held by age, gender and race. However, the Federal Highway Department maintain a database Highway Statistics where you can locate information of the travelers

by age and gender, but not by race. Therefore, overall deaths from the WONDER database was then chosen as exposure data to conduct this study as information can be obtained on deaths by age, gender and race.

Recommendations

The findings from this study showed that race is a factor that needs to be addressed when re-designing or creating traffic safety countermeasures. In addition, the study also suggests that more thorough research on the association of race and the risk of fatal injury deaths in a motor vehicle traffic crash is crucial, especially in the necessity to re-design or create traffic safety countermeasure to reduce the motor vehicle crashes for individuals of different ethnicities. Recommendations from this study for traffic safety areas include: intersectionality framework to analysis crash data, driver education programs, federal and states policies for highway safety programs, databases and manuals to include race as a reported and collected element.

Intersectionality Framework to Analysis Crash Data

Research needs to become more specific concerning analysis of crash data as it is important that the data be analyzed using the intersectionality framework. The intersectionality framework allows for data to be analyzed by multiple variables and to examine how these variables interact with each other. This analysis will show any marginalization or discrimination against any of the variables within the study. In addition, such an analysis will provide greater details to incorporate diversity issues in driver education and traffic safety countermeasures.

Driver Education Programs

Driver education programs need to become more culturally responsive to the needs of individual drivers, such as something is happening with the Native American population in motor vehicle crash fatalities. Driver education programs need to connect and relate all ethnicities to the instruction. Driver education students may be only one dominate ethnic group; however, they become part of the driving community and need to be aware of what is happening with other ethnicities.

Federal and State Policies for Highway Safety Programs

It is important that federal and state policies for highway safety programs include the data concerning age, gender and race. The inclusion of this information will increase equality in highway safety programs and reduce the discrimination or marginalization of any different demographic population or ethnic group. This research provides baseline data for the need to provide specific information about motor vehicle crashes fatal injuries by age, gender and race.

Update Databases and Manuals to Include Race as a Collected and Reported Element

Recommendations are being made in this study to update the databases and manuals to include race as an element to be collected and reported. After these issues are updated, it would be advisable to conduct this study again to view the differences, if any, in the findings. The following are recommendations for changes to state and federal policies and future studies. The recommendations are as follows:

- Advocate to states that racial information be mandated for crash reports so this data can be entered into FARS and available for future research.

- Advocate to the United States Department of Transportation, Center for Disease Control and Prevention, National Highway Traffic Safety Administration, U. S. Census the need for a consistent coding for race and ethnicity among their databases and to include other races such as Arabs.
- Advocate to the National Highway Traffic Safety Administration to have race and ethnic origin be added as an element in the Model Minimum Uniform Crash Criteria (MMUCC).
- Advocate to states and to the United States Department of Transportation and the Federal Highway Department to have racial information be included in driver license datasets to have use of this for future research.
- Advocate to the National Highway Traffic Safety Administration to have researchers consider race a factor in all the traffic safety countermeasures in the document *Countermeasures That Work: A Highway Safety Countermeasure Guide for State Highway Safety Offices.*"

Final Thoughts

Given at the time of writing this dissertation and looking at the ethnic groups affected by COVID-19, it had become more apparent that race data must be collected not only from a public health perspective but also from the driver education and traffic safety viewpoint. The CDC reports that "COVID-19 effects the health of different races as the data shows that there is a disproportionate "illness and death" among different ethnic groups(CDC, 2020a). The CDC reports with 580 hospitalized individuals with

COVID-19 that "45% of individuals for whom race or ethnicity data was available were White, compared to 55% of individuals in the surrounding community, 33% of hospitalized patients were African American compared to 18% in the community and 8% were Latinx, compared to 14% in the community" (CDC, 2020a). Additionally, COVID-19 deaths rates among "African American persons (92.3 deaths per 100,000 population) and Latinx persons (74.3) that were substantially higher than that of White (45.2) or Asian (34.5)" individuals (CDC, 2020a).

Likewise, this study shows that race does matter within many ethnic groups. There is an overrepresentation of crash fatalities when you examine the data by countermeasures as in twelve of the thirteen variables in this study different ethnicities other than White had the highest percentage. Native American males had the highest fatal injury percentage by deaths in eight of the variables including: driver error (alcohol involvement (0.01+%), speeding and distraction); behavioral issue (restraint not used); mode of transportation (pedestrian and Class C vehicle); and driver age groups (25 to 64 years of age and older driver 65 plus years of age). Latinos had the highest fatal injury percentage four of the variables including: driver error (drowsy driving); mode of transportation (bicycle and motorcycle); and driver age group (21 to 24 years of age). Additionally, given that the Latinx U.S. Census population projections from 2020 to 2060 shows the largest increase of any ethnicity with an increase in population by 8.55% (US Census, 2020).

Future Research

This research study lead to thoughts for future research. The future research studies are as follows:

- Replicate the study after racial data are entered accurately into FARS and driver license datasets.
- Further critically examine Native American males motor vehicle fatal injuries by driver error, behavioral issue, mode of transportation and age groups as Native American males were the highest percentage in eight variables.
- Further critically examine Native American females motor vehicle fatal injuries by driver error, behavioral issue, mode of transportation and age groups as Native American females were consistently had a higher percentage than males in other races.
- Further critically examine age group 15 to 20 years of age vehicle fatal injuries age, gender and race as examining why the male and female mean are closer than in any of the other variables (male 10.2180 and female 9.3240).

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APPENDIX A

STATES' CRASH DATA REPORTED BY RACE

It was attempted to collect motor vehicle crash fatal injuries data from individual states. The states reported the data by age and gender; however, a little over 17% of states reported data by race as noted in Table A-1.

Table A-1

States Reporting Motor Vehicle Crash Data by Race

State	State Agency	Response
Alabama	Department of Transportation	Yes
Alaska	Department of Transportation & Public Facilities	Yes
Arizona	Department of Records	Yes
Arkansas	State Police	No
California	Office of Traffic Safety	No
Colorado	Department of Transportation	No
Connecticut	University of Connecticut	No
Delaware	Office of Highway Safety	No
District of Columbia	Department of Transportation	No
Florida	Department of Transportation	No
Georgia	Office of Highway Safety	No
Hawaii	Department of Transportation	No
Idaho	Office of Highway Safety	No
Illinois	Department of Transportation	No
Indiana	ISP	No
Iowa	Department of Transportation	No
Kansas	Department of Transportation	No
Kentucky	Kentucky State Police	No
Louisiana	LACRASH	Yes
Maine	Bureau of Highway Safety	No
Maryland	Motor Vehicle Administration	Yes
Massachusetts	Department of Transportation	No
Michigan	Transportation Research Institute	No

Table A-1

States Reporting Motor Vehicle Crash Data by Race, continued

State	State Agency	Response
Minnesota	Department of Public Safety	No
Mississippi	Department of Public Safety	Yes
Missouri	State Highway Patrol	No
Montana	Department of Transportation	No
Nebraska	Department of Transportation	No
Nevada	Department of Transportation	No
New Hampshire	Department of Safety	No
New Jersey	Department of Transportation	No
New Mexico	Department of Transportation	No
New York	Department of Motor Vehicles	No
North Carolina	Department of Transportation	No
North Dakota	Traffic Safety Division	No
Ohio	State Highway Patrol	No
Oklahoma	Highway Safety Office	No
Oregon	Department of Transportation	No
Pennsylvania	Department of Transportation	No
Rhode Island	State Police	Yes
South Carolina	Department of Public Safety	Yes
South Dakota	Department of Public Safety	No
Tennessee	Highway Patrol	Yes
Texas	Department of Transportation	Yes
Utah	Department of Public Safety	No
Vermont	Agency of Transportation	No
Virginia	Department of Motor Vehicles	No
Washington	Department of Transportation	No
West Virginia	Department of Transportation	No
Wisconsin	Department of Transportation	No
Wyoming	Department of Transportation	No

APPENDIX B

APPENDIX B IRB LETTER

DIVISION OF RESEARCH

750 Agronomy Road, Suite 2701

1186 TAMU College Station, TX 77843-1186

Tel. 979.458.1467 Fax. 979.862.3176 http://rcb.tamu.edu

NOT HUMAN RESEARCH DETERMINATION

September 21, 2018

Dear Nina Jo Saint:

The Institution determined that the proposed activity is not research involving human subjects as defined by DHHS and FDA regulations. Further IRB review and approval by this organization is not required because this is not human research. This determination applies only to the activities described in this IRB submission and does not apply should any changes be made. If changes are made you must immediately contact the IRB about whether these activities are research involving humans in which the organization is engaged. You will also be required to submit a new request to the IRB for a determination. Please be aware that receiving a 'Not Human Research Determination' is not the same as IRB review and approval of the activity. You are not to use IRB consent forms or templates for these activities. If you have any questions, please contact the IRB Administrative Office at 1-979-458-4067, toll free at 1-855-795-8636.
Sincerely,

Type of Review: Initial Review Submission Form Title: A Critical Examination of Traffic Crash Fatality Causation Factors in the United States for Four Driver Age Groups by Race and Gender Investigator: Nina Jo Saint IRB ID: IRB2018-1226 Reference Number: 082630 Funding: Documents Received: IRB Application (Human Research) - (Version 1.0) Saint Proposal Quant Research 9-19-2018 - (Version 1)