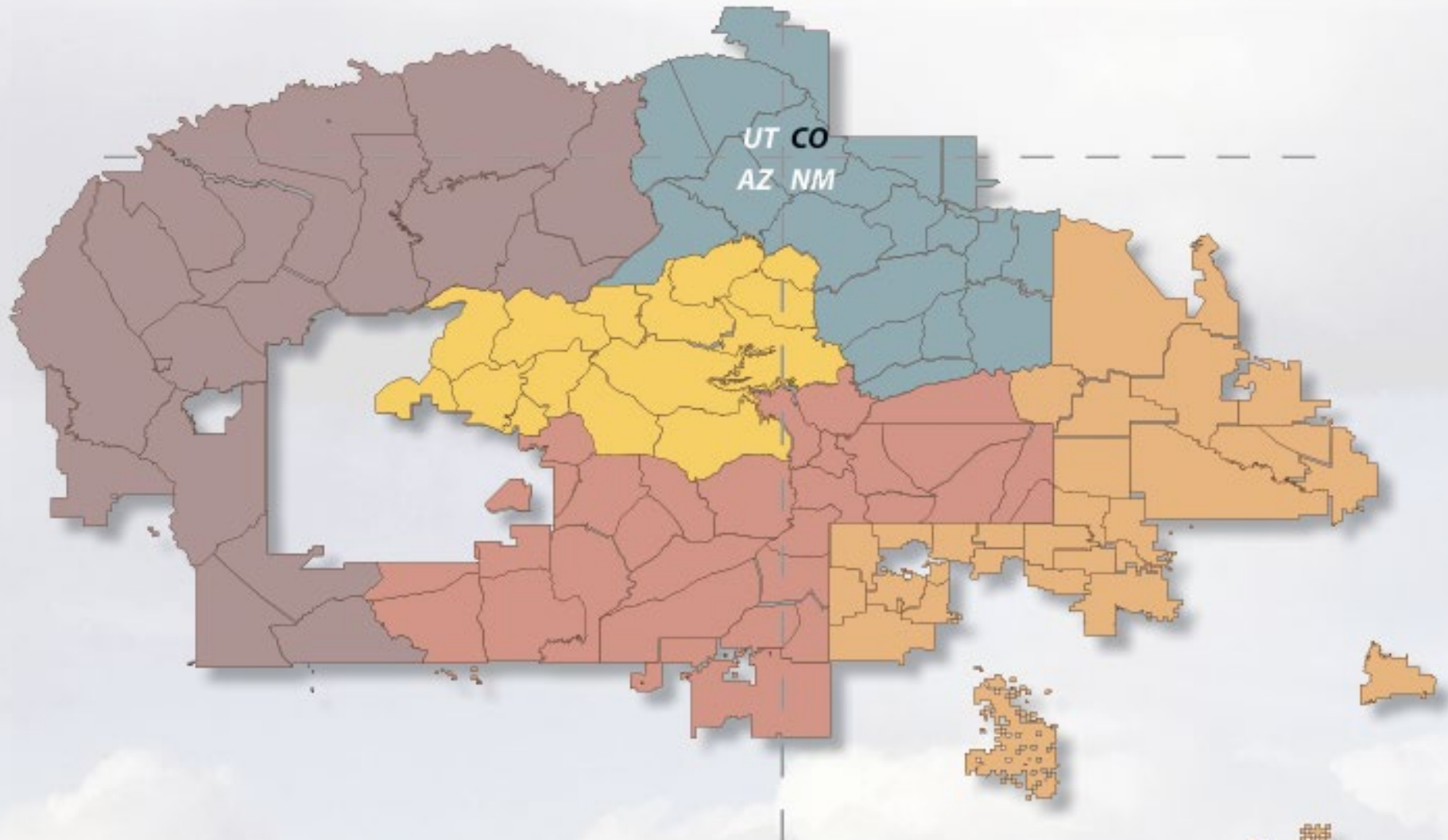




# A Description of Fatal Car Crashes Occurring Within or Near the Navajo Nation 2012-2021



## Introduction

Car crashes are a significant public health problem throughout the United States and within the Navajo Nation. According to the *Navajo Nation Mortality Report, 2015-2017* motor vehicle injuries and pedestrian injuries account for 7.4% of all Navajo deaths. The age adjusted death rate for motor vehicle injuries and pedestrian injuries were 47.10/100,000 and 21.40/100,000 respectively. The age adjusted death rate for all transport accidents in the U.S. in 2021 was 13.3/100,000, and the rate for all American Indian or Alaska Natives was 20.2.<sup>1</sup> The IHS report *Indian Health Focus: Injuries 2017 Edition (accessed 11/2/23)* indicates that the third leading cause of death among all AIAN was unintentional injury between 2008-2010 with 43% of all injury deaths being attributed to motor vehicle crash. The Navajo Nation had the third highest motor vehicle crash death rate among the 12 IHS regions (Table 1). Approximately 1 in 5 (20.8%) of these motor vehicle deaths were pedestrian injuries. From 2015-2017 motor vehicle-related crashes were two times higher among American Indians than other residents of New Mexico.<sup>2</sup>

The purpose of this report is to characterize fatal car crashes occurring within the Navajo Nation and its border towns, identify possible clusters of fatal car crashes, and identify key risk factors that may lead to fatalities in these severe crashes. Ideally this information would then be used to implement countermeasures to decrease the most serious car crash injuries. Crashes were included from border areas if it occurred (based on GPS coordinates) within 2 miles of the Navajo Nation legal jurisdiction boundaries. This report is limited because data for all types of car crashes were not available. There may be clusters of crashes that impact health and quality of life, although not fatal, that will not be identified in this report. It is also impossible to compare factors associated in fatal car crashes to factors among non-fatal car crashes. Consequently, some important crash risk factors might not be identified.

All data were taken from the Fatality Analysis Report System (FARS) managed by the National Highway Traffic Safety Administration (NHTSA). FARS is a census of fatal crash data for the U.S. collected from Police Accident Reports. NHTSA produces reports at the State level and county level but not on the tribal level. Data from car crashes occurring within and near the boundaries of the Navajo Nation were compiled by the author. Crashes included in this report came from the years 2012 through 2021 (2021 is the most recent year data were available at the time this report was completed). Within FARS there are 3 report levels: Crash, Vehicle,

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<sup>1</sup> Centers for Disease Control and Prevention. WISQARS Explore Fatal and Non-Fatal Data. <https://wisqars.cdc.gov/explore>. Accessed April 24, 2024

<sup>2</sup> Kunkel KM. Health Equity in New Mexico, 13<sup>th</sup> Edition. New Mexico Department of Health January 2019. Accessed September 25, 2019.

and Person. This report presents the results according to those 3 levels. Another limitation of this report is that many data fields are left empty by reporting agencies, which could lead to identifying false risk factors, missing true risk factors, or missing fatal crash clusters.

Table 1 Motor Vehicle Crashes by IHS Service Areas (2008-2010)

<b>IHS Service Area</b>	<b>Age Adjusted Motor Vehicle Injury Death Rate per 100,000</b>	<b>Percent of Motor Vehicle Crash Deaths Pedestrian Related</b>
<b>Alaska</b>	<b>21.9</b>	<b>24.1%</b>
<b>Albuquerque</b>	<b>30.7</b>	<b>19.0%</b>
<b>Bemidji</b>	<b>33.6</b>	<b>10.0%</b>
<b>Billings</b>	<b>65.8</b>	<b>9.2%</b>
<b>California</b>	<b>27.6</b>	<b>25.3%</b>
<b>Great Plains</b>	<b>53.3</b>	<b>18.0%</b>
<b>Nashville</b>	<b>22.5</b>	<b>15.6%</b>
<b>Navajo</b>	<b>51.1</b>	<b>20.8%</b>
<b>Oklahoma</b>	<b>41.7</b>	<b>10.5%</b>
<b>Phoenix</b>	<b>30.5</b>	<b>27.8%</b>
<b>Portland</b>	<b>28.5</b>	<b>18.4%</b>
<b>Tucson</b>	<b>37.3</b>	<b>27.7%</b>

Table 2 Motor Vehicle Death Rates in New Mexico, 2019-2021 (NM IBIS, accessed November 2, 2023)

<b>Race/Ethnicity</b>	<b>2019-2021 Rate (per 100,000)</b>
American Indian	45.1
Hispanic	20.0
White	13.8
African American	18.7
Asian/Pacific Islanders	1.9*

\*Based on fewer than 20 cases and may fluctuate from year to year.

## Crash Level

There were 856 fatal crashes within the boundaries of or in the border towns of the Navajo Nation from 2012 through 2021 (Table 3). This is a 7.7% decrease from the first report period (2005-2014). Crashes were selected based on State of crash occurrence and then by GPS coordinates. Three States contain a portion of Navajo Nation lands: Arizona, New Mexico and Utah. State of crash occurrence can be found in Tables 4a and 4b. Based on land mass there are more crashes in New Mexico than expected and fewer crashes in Utah than expected. Much of the Utah portion of the Navajo Nation is uninhabited and no Interstate highways are found in that portion of the State. The presence of Interstate 40 in the southern part of the New Mexico portion likely explains the high number of crashes in New Mexico. If GPS coordinates were not available crashes were included if the crash was identified as occurring on a street or highway exclusively found within the Navajo Nation. Any crashes with GPS coordinates within 2 miles of the Navajo Nation were included and are considered “Border” crashes. Crashes occurring on Hopi lands were included if they occurred on State Highway 264 since this is a principal highway connecting the Western Agency and Ft. Defiance Agency of the Navajo Nation, and therefore may be utilized frequently by Navajo Nation residents. A crash was “likely” within the Navajo Nation if GPS coordinates were unavailable and the road on which the crash occurred is primarily found within the Navajo Nation. A crash was a “possible” Navajo crash if the GPS coordinates and road were unknown but the crash occurred on tribal lands within a county found within the Navajo Nation boundaries (i.e. Apache, Coconino, & Navajo counties in Arizona; Bernalillo, Cibola, McKinley, Rio Arriba, Sandoval, San Juan & Socorro counties in New Mexico; San Juan County in Utah). These 856 crashes were stratified into the likelihood that the crash occurred within the Navajo Nation (Table 5). Among the crashes included in this report 73.6% were reported to be on Navajo tribal lands. However, in some crash reports a crash is identified as occurring on non-tribal lands even though the GPS coordinates provided pinpoint the crash on tribal lands.

The Navajo Nation is organized into 5 geo-political areas (similar to counties). Crashes occurring within these Agencies can be found in Table 6, which includes the border areas, and Table 6a which condenses the border areas into the Agency they are nearest. The Eastern Agency appears to have the highest burden of fatal crashes. Some of this can be explained by Interstate 40, but Interstate 40 also runs along the southern edge of the Ft. Defiance agency and their portion of fatal crashes does not approach the Eastern Agency.

The roads with the highest number of crashes per mile of road are found in Table 7. While Interstate 40 is still the road with the highest number of crashes, crashes per mile have decreased by 8% since the first report. Crashes have increased on US 550, NM State Route 118, NR 36, SR 371 each of which are major roads on the edge of Navajo Nation and are connected to border towns. Several of the leading roads for crashes have seen a decrease since the 2019 report (US 160, US 191, US 491, SR 264, BIA 12) all of which run through the Navajo Nation and are not affiliated with a border town.

One of the purposes of this report was to identify potential geographic crash clusters. An image of crash occurrence can be found in Map 1. Eighty-five percent of crashes had GPS coordinates recorded. Of the 130 crashes with missing GPS coordinates 94.6% occurred in Arizona and 5.4% occurred in New Mexico. Table 8 identifies crash clusters that warrant additional investigation for prevention measures. To be categorized as a cluster there had to be at least 3 crashes, half the crashes had to have occurred since January 1, 2017 (i.e. within the previous 5 years), and the average distance between crashes needed to be less than half a mile apart. The table does not include any of the crashes occurring on Interstate 40 as the Navajo Nation will likely have less influence in making engineering or enforcement changes. In this report the average number of crashes in a cluster was 3.87 crashes. In the previous report the average number of crashes was 5.9. This may indicate that true clusters may be decreasing due to improved road conditions, signage, etc.

Crashes were organized and mapped based on the 110 Navajo Nation Chapter boundaries (Map 1). Table 9 displays the crash occurrences organized by Navajo Agency boundaries, and Table 10 displays the Chapters with the largest rate by population. The Chapter of Huerfano has many fatal car crashes. These crashes primarily occur on the edge of the Chapter along US-550 which connects the Farmington NM area with Albuquerque NM. Additional investigation may be able to indicate how many of the victims and drivers are from Navajo Chapters driving routinely and how many are motorists likely traveling to or from Albuquerque. Table 11 displays the driver's ZIP code location organized by Council Delegate district. Grouping by Council Delegate district was done because many people in more outlying, rural areas have a ZIP code in the largest community near them. This method allows the data to be smoothed so Chapters with small populations aren't overly influential in the analysis. The greatest number of Navajo drivers involved in these car crashes come from Chapters in and around Shiprock, Chinle, and east of Gallup. Additionally, Table 12 displays the most common communities of residence for non-Navajo Nation drivers. Once again crashes occurring in Arizona are missing data points at a high percentage with 29% not having driver ZIP code recorded, while Utah had 18% missing and New Mexico only 7%.

The vast majority of these crashes occurred away from intersections and interchanges (Table 13) and where the roadway was straight (Table 14).

Crashes were categorized as occurring in 6 distinct time periods. Crashes were more likely to have occurred between 4:00 p.m. and midnight than any other time period. This is likely a time period of peak travel, but since miles driven per time period are not available further analysis in this regard is not possible currently. Results can be seen in Table 15.

Adverse road and weather conditions may contribute to the occurrence and frequency of car crashes. Among crashes with data recorded, 92.3% occurred on blacktop, and 7.0% occurred on dirt or gravel (Table 16). Atmospheric conditions at the time of the crashes can be found in Table 17. The majority of crashes occurred with no adverse weather conditions. Among crashes with data recorded 90.2% (n=635) occurred on dry roads, only about 1 in 35 (2.9%) occurred with snow/slush, ice/frost on the road, and an additional 1 in 19 (5.3%) occurred on wet roads. Nearly half (44.2%, n = 754) of crashes occurred during daylight, and another 5.2% occurred at dawn or dusk. Among the 382 crashes that occurred in the dark, 9.9% were in lighted areas and 21.5% had unknown lighting conditions.

A crash could have up to 5 adverse conditions (Roadway Alignment, Roadway Surface Type, Roadway Surface Conditions, Light Conditions, and Atmospheric Conditions). There were 620 (72.4%) that had information recorded for at least one of these adverse conditions. Among these, 69% reported at least one adverse condition present. Table 18 displays the frequency of adverse events.

It is rare that crash time, EMS call time, and EMS arrival time were all recorded. EMS response time could be established for 370 crashes (43.2%). For these crashes the average EMS response time was 13.7 minutes, and average total response time was 28.0 minutes. EMS response time is the time it took for EMS to arrive at the scene after being notified of the crash. Total response time was the time it took for EMS to arrive from the time of the crash occurrence.

Only a handful of factors related to road conditions were recorded as contributing to the crash. These can be seen in Table 19. **Table 20** displays the unique crash identifiers where road conditions were a factor. This information can be used to further investigate the physical location of the crash and if construction or engineering measures can improve road safety.

Crashes occurred throughout the year. There wasn't a significant difference in the number of crashes by month, (Table 21) or by Quarter (Table 22).

Table 3 Crashes by Year

<b>Year</b>	<b>Frequency</b>	<b>Percent</b>	<b>Cumulative Frequency</b>	<b>Cumulative Percent</b>
<b>2012</b>	85	9.9	85	9.9
<b>2013</b>	86	10.1	171	20.0
<b>2014</b>	83	9.7	254	29.7
<b>2015</b>	98	11.5	352	41.1
<b>2016</b>	98	11.5	450	52.6
<b>2017</b>	91	10.6	541	63.2
<b>2018</b>	90	10.5	631	73.7
<b>2019</b>	77	9.0	708	82.7
<b>2020</b>	74	8.6	782	91.4
<b>2021</b>	74	8.6	856	100
<b>Total</b>	856			

Table 4a State of Crash Occurrence

<b>State</b>	<b>Frequency</b>	<b>Percent</b>	<b>Cumulative Frequency</b>	<b>Cumulative Percent</b>
Arizona	429	50.1	429	50.1
New Mexico	396	46.3	825	96.4
Utah	31	3.6	856	100.00



Table 4b State of Crash Occurrence if crash is within the Navajo Nation

State	Frequency	Percent	Cumulative Frequency	Cumulative Percent
Arizona	311	49.4	311	49.4
New Mexico	288	45.7	599	95.1
Utah	31	4.9	630	100

Table 5 Designation of Crashes Within the Navajo Nation

Within	Frequency	Percent	Cumulative Frequency	Cumulative Percent
Yes	630	73.6	630	73.6
Likely	45	5.2	675	78.9
Probable	14	1.6	689	80.5
Border	108	12.6	797	93.1
Hopi	26	3.0	823	96.1
Possible	33	3.9	856	100.00

Table 6 Crashes by Agency

Agency	Count	Percent	Cumulative Percent
Eastern	178	24.5	24.5
Northern	148	20.4	44.8
Western	130	17.9	62.7
Ft. Defiance	82	11.3	74.0
Border Eastern	64	8.8	82.8
Chinle	52	7.2	90.0
Border Northern	28	3.9	93.8
Hopi	16	2.2	96.0
Border Western	15	2.1	98.1
Border Ft. Defiance	14	1.9	100

Table 6a Crashes by Agency with Border Areas Condensed (removed Hopi)

Agency	Frequency	Percent of Crashes	Population	Percent of Navajo Nation Population
Chinle	52	7.3	25,948	12.8
Eastern	242	34.0	45,605	22.5
Ft. Defiance	96	13.5	40,780	20.1
Northern	176	24.8	49,504	24.4
Western	145	20.4	41,008	20.2

Table 7 Most Common Roads of Fatal Crash Occurrence: minimum 1 crash per year

Road	Crashes	Percent	Approximate Miles of Road Within or Bordering Navajo Nation	Crashes per 100 road miles per year	Trend
Interstate 40 (AZ/NM)	104	12.2%	83.6	12.44	↑
US 160 (AZ)	63	7.4%	160.2	3.93	↓
US 191 (AZ)	54	6.3%	179.1	3.015	↓
SR/US 491 (NM)	54	6.3%	103.1	5.238	↓
State Route 264 (AZ/NM)	51	6.0%	90.1	5.660	↓
BIA/US 64 (NM)	39	4.6%	51.5	7.573	↔
US 89 (AZ)	26	3.0%	86.0	3.023	↑
US 550 (NM)	25	2.9%	23.6	10.593	↑
BIA/IR/NR 36 (NM)	24	2.8%	28.8	8.333	↑
SR 118 (NM)	23	2.7%	24.1	9.544	↑
BIA/IR/NR 12 (AZ)	22	2.6%	96.7	2.275	↓
SR 371 (NM)	22	2.6%	97.9	2.247	↑
SR/US 98 (AZ)	19	2.2%	63.3	3.002	↔
BIA/NR 15 (AZ)	18	2.1%	103.1	1.746	↑
SR/US 163 (AZ/UT)	16	1.9%	44.2	3.620	↔
BIA/IR/NR 13 (AZ/NM)	13	1.5%	44.6	2.915	↔
NR 59 (AZ)	11	1.3%	44.1	2.494	↔
NR 9 (NM)	11	1.3%	58.9	1.868	↔

Map 1: Fatal Crashes 2012-2021

726 of 856 (84.8%) had GPS coordinates recorded

Red dots are strictly motor vehicle crashes, and blue dots indicate that pedestrians or bicyclists were involved.

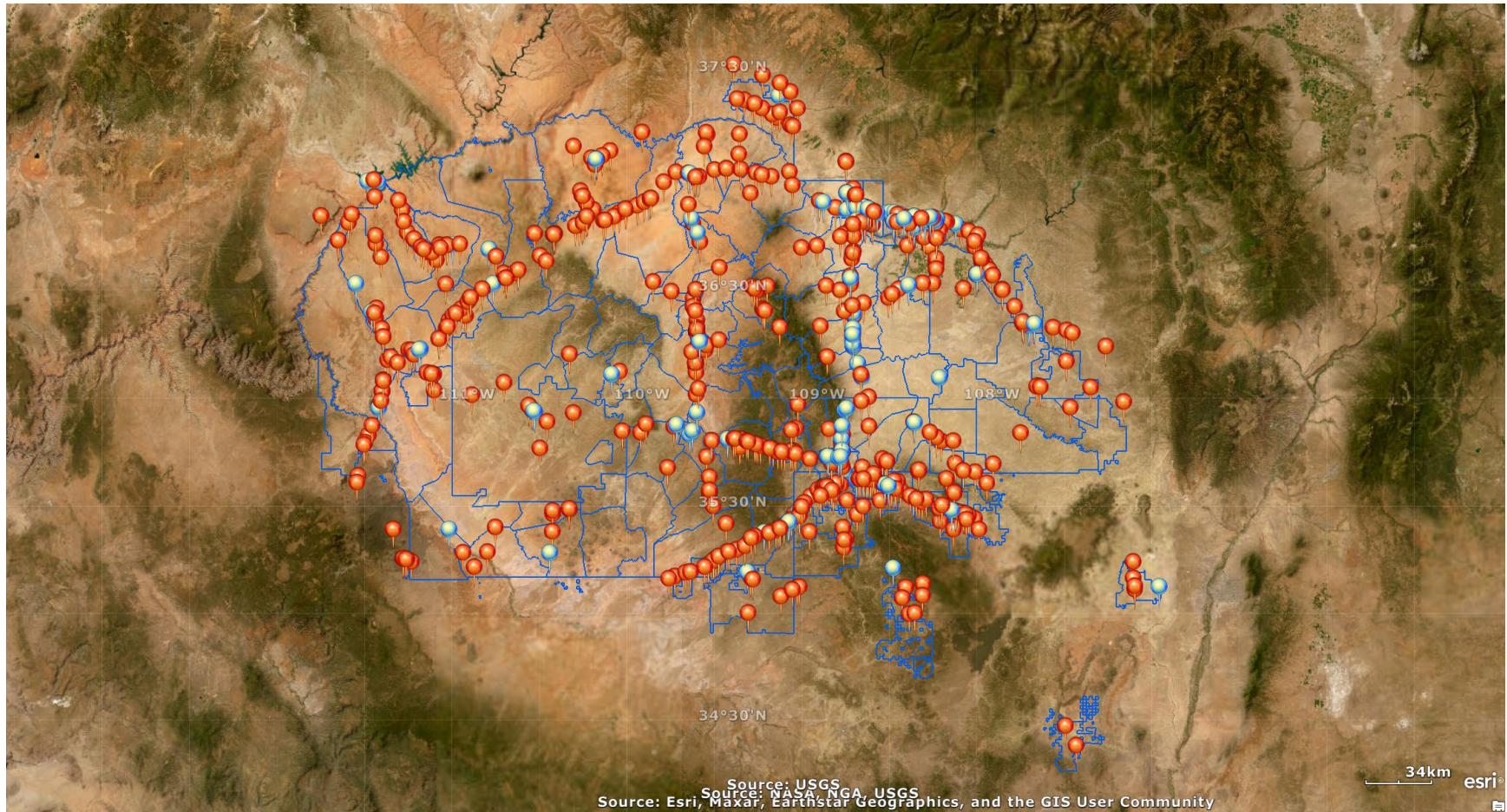


Table 8 Crash locations to investigate further

State	Road	Number of Crashes	Average distance between crashes	Chapter	Notes
UT	US-163/Monument Valley Clinic Rd.	5	0.1	Oljato	Three of these were pedestrian crashes and these are all near the round about
AZ	US-89	3	0.07 Miles	Coalmine Mesa	100% were in the previous 5 years; all three on a straight away—possibly a passing zone or no passing zone
AZ	US-160	5	0.15 Miles	Kayenta	80% were in the previous 5 years; 1 Pedestrian crash; 3 crashes almost on top of each other
AZ	US-163	3	0.15 Miles	Kayenta	Looks like a slight bend in the road close to the border of Oljato
NM	US-491	4	0.22 Miles	Sheepsprings	75% were in the previous 5 years; 3 Pedestrian crashes; primarily at the intersection of US-491 and NR-34
NM	County Road 19?	5	0.23 Miles	Baca/Prewitt	80% in the past 5 years; one pedestrian
NM	US-491	4	0.29 Miles	Rock Springs/Twin Lakes	50% were in the previous 5 years; 2 Pedestrian crashes
NM	US-64	6	0.30 Miles	Hogback	50% were in the previous 5 years; 1 Pedestrian crashes
NM	US-491/SR-264	4	0.34 Miles	Rock Springs	All 4 are pedestrian; 50% in the previous 5 years

Table 8 Continued on Next Page

State	Road	Number of Crashes	Average distance between crashes	Chapter	Notes
NM	NR-9/Dirt road	3	0.36 Miles	Pinedale	All 3 in the previous 5 years
NM	NR-36	3	0.37 Miles	Upper Fruitland	1 pedestrian crash
NM	US-491	3	0.37 Miles	Sanostee	66.7% were in the previous 5 years; 1 Pedestrian crash
NM	IR-13	3	0.42 Miles	Shiprock	2 of the crashes involved pedestrians
AZ	US-191	3	0.48 Miles	Klagetoh	
NM	SR-371	4	0.50 Miles	Huerfano	1 Pedestrian crash; this is the stretch coming down off the plateau into the Farmington area

Table 9 Fatal Crash Counts by Agency of Crash Occurrence

Agency	Crash Count	Percent of Chapters within Agency with at least one crash	Percent of all Crashes	Chapter with most crashes	Leading Chapter percent of all crashes
Central	52	64.3%	8.6%	Chinle: 24	4.0%
Eastern	170	87.1%	28.1%	Huerfano: 35	5.8%
Ft. Defiance	90	64.3%	14.9%	Kinlichee: 13	2.1%
Hopi	16	NA	2.6%		
Northern	148	90.0%	24.4%	Hogback: 17 Shiprock: 17	2.8% 2.8%
Western	130	83.3%	21.5%	Kayenta: 22	3.6%

Note: other Chapters in the top 10 of crashes are Baca/Prewitt (21), Gadiiahi (14), Aneth (13), Iyanbito (12), Mexican Water (12), Oljato (12), and Upper Fruitland (12). These 13 Chapters contained 37% of all fatal crashes on the Navajo Nation.

Table 10 Leading 10 Fatal crash rates per 1,000-person years by Chapter

Chapter	Agency	Count	Percent of All Crashes	Rate per 1,000-person years
Manuelito *	Eastern	11	1.8%	4.28
Gadiiahi	Northern	14	2.3%	2.94
Baca/Prewitt*	Eastern	21	3.5%	2.83
Burnham	Northern	5	0.8%	2.50
Hogback	Northern	17	2.8%	1.67
Mexican Water	Northern	12	2.0%	1.64
Huerfano	Eastern	35	5.8%	1.47
Coalmine Mesa	Western	10	1.7%	1.45
Lupton *	Ft. Defiance	10	1.7%	1.31
Sheepsprings	Northern	9	1.5%	1.29

\*I-40 runs through this Chapter which greatly influences the rate.

Table 11 Driver ZIP, organized by Navajo Council Delegate District (Color coded by Quartile)

District Chapters	Rate per 10,000-person years	% From Average
Shiprock*	5.14	106%
Chilchinbeto, Dennehotso, Kayenta	4.73	90%
Chinle	4.36	75%
Lukachukai, Rock Point, Rough Rock, Round Rock, Tsaille/Wheatfields	4.26	71%
Burnham, Hogback, Newcomb, Nenahnezad, San Juan, Upper Fruitland**	4.21	69%
Churchrock, Iyanbito, Mariano Lake, Pinedale, Smith Lake, Thoreau***	4.00	61%
Bodaway/Gap, Coppermine, Kaibeto, LeChee, Tonalea†	3.89	56%
Aneth, Mexican Water, Red Mesa, Sweetwater, Teec Nos Pos	3.55	43%
Cornfields, Ganado, Jeddito, Kinlichee, Steamboat	3.41	37%
Oak Springs, St. Michaels	2.44	-2%
Inscription House, Navajo Mountain, Oljato, Shonto	2.34	-6%
Bread Springs, Chichiltah, Manuelito, Red Rock, Rock Springs, Tsayatoh++	2.22	-11%
Beclabito, Cove, Gadiiahi, Red Valley, Sheepsprings, Two Grey Hills	2.09	-16%
Becenti Lake, Crownpoint, Huerfano, Lake Valley, Nageezi, Nahodishgish, Standing Rock, White Rock	1.83	-27%
Low Mountain, Many Farms, Nazlini, Tachee/Blue Gap, Tselani/Cottonwood	1.59	-36%
Black Mesa, Forest Lake, Hard Rock, Pinon, Whippoorwill	1.50	-40%
Tuba City	1.25	-50%
Baca/Prewitt, Casamero Lake, Counselor, Littlewater, Ojo Encino, Pueblo Pintado, Torreon, Whitehorse Lake#	1.15	-54%
Houck, Klagetoh, Lupton, Nahatadziil, Wide Ruins <sup>s</sup>	1.11	-55%
Alamo, Ramah, Tohajiilee <sup>ss</sup>	1.11	-55%
Birdsprings, Cameron, Coalmine Mesa, Leupp, Tolani Lake <sup>sss</sup>	1.11	-55%
Coyote Canyon, Mexican Springs, Naschitti, Tohatchi, Twin Lakes	1.02	-59%
Crystal, Ft. Defiance, Red Lake, Sawmill	0.89	-64%
Dilcon, Greasewood Springs, Indian Wells, Teesto, Whitecone <sup>ssss</sup>	0.66	-73%

\*Potentially under reported due to drivers with an Aztec, Bloomfield, Farmington, Flora Vista, Kirtland, or Waterflow ZIP code that reside within this Chapter

\*\* Potentially under reported due to drivers with an Aztec, Bloomfield, Farmington, Flora Vista, Kirtland, or Waterflow ZIP code that reside within this Chapter

\*\*\* Potentially under reported due to drivers with a Gallup ZIP code that reside within this Chapter

† Potentially under reported due to drivers with a Page ZIP code that reside within this Chapter



<sup>++</sup> Potentially under reported due to drivers with a Gallup, Gamero, or Mentmore ZIP code that reside within this Chapter

<sup>#</sup> Potentially under reported due to drivers with a Cuba ZIP code that reside within this Chapter

<sup>§</sup> Potentially under reported due to drivers with a Chambers or Sanders ZIP code that reside within this Chapter

<sup>§§</sup> Potentially under reported due to drivers with a Magdalena or Socorro ZIP code that reside within this Chapter

<sup>§§§</sup> Potentially under reported due to drivers with a Flagstaff ZIP code that reside within this Chapter

<sup>§§§§</sup> Potentially under reported due to drivers with a Winslow ZIP code that reside within this Chapter

Table 12 Additional Driver License Communities

Community/State	Count	Percent of All Licensed Drivers	Percent of non-Navajo Nation Drivers
Other Arizona	64	6.8%	13.0%
Farmington, NM	41	4.4%	8.3%
Gallup, NM	38	4.1%	7.7%
California	32	3.4%	6.5%
Other New Mexico	25	2.7%	5.1%
Phoenix, AZ	19	2.0%	3.9%
Texas	19	2.0%	3.9%
Kirtland, NM	18	1.9%	3.7%
Other Colorado	18	1.9%	3.7%
Page, AZ	18	1.9%	3.7%
Albuquerque, NM	17	1.8%	3.4%
Hopi	17	1.8%	3.4%
Flagstaff, AZ	16	1.7%	3.2%
Other Utah	13	1.4%	2.6%
Winslow, AZ	12	1.3%	2.4%
Cuba, NM	10	1.1%	2.0%
Zuni, NM	8	0.9%	1.6%
Aztec, NM	8	0.9%	1.6%
Arkansas	7	0.7%	1.4%
Oklahoma	7	0.7%	1.4%
Cortez, CO	6	0.6%	1.2%
Bloomfield, NM	6	0.6%	1.2%

Table 12 Continued on Next Page



Community	Count	Percent of All Licensed Drivers	Percent of non-Navajo Nation Drivers
Idaho	5	0.5%	1.0%
Nevada	5	0.5%	1.0%
Gamercio, NM	4	0.4%	0.8%
Durango, CO	4	0.4%	0.8%
Continental Divide, NM	3	0.3%	0.6%
Grants, NM	2	0.2%	0.4%
Ramah, NM	2	0.2%	0.4%
Monticello, UT	2	0.2%	0.4%
Milan, NM	2	0.2%	0.4%
Holbrook, AZ	1	0.1%	0.2%
Bluewater, NM	1	0.1%	0.2%
Flora Vista, NM	1	0.1%	0.2%
Socorro, NM	1	0.1%	0.2%
All Other	41	4.4%	8.3%
Total (Among Known)	493	47.8%	

Total known 948

Table 13 Relation to Intersection

Location	Frequency	Percent	Percent Among Known
Driveway Access Related	10	1.2	1.4
Entrance/Exit Ramp Related	4	0.5	0.6
Intersection Related	53	6.2	7.5
Non-Junction	629	73.6	89.2
Not Reported	8	0.9	NA
Other Location within Junction	4	0.5	0.6
Through Roadway	5	0.6	0.7
Unknown	142	16.6	

Table 14 Roadway Alignment

Roadway Alignment	Frequency	Percent	Percent Among Known Alignment
Curve	152	18.0	23.5
Non-Traffic	2	0.2	NA
Not reported	37	4.4	NA
Straight	496	58.6	76.5
Unknown	159	18.8	NA

Table 15 Time of Crash

Time Category (Military Time)	Frequency	Percent	Cumulative Frequency	Cumulative Percent
0:00-3:59	90	11.0	90	11.0
4:00-7:59	112	13.7	202	24.6
8:00-11:59	81	9.9	283	34.5
12:00-15:59	152	18.5	435	53.1
16:00-19:59	185	22.6	620	75.6
20:00-23:59	200	24.4	820	100.00

Table 16 Roadway Surface Type

Surface Type	Frequency	Percent	Percent Among Known
Blacktop	632	62.9	92.3
Brick or Block	1	0.1	0.1
Concrete	4	0.5	0.6
Dirt	42	5.1	6.1
Non-Traffic	2	0.2	NA
Not reported	56	6.8	NA
Slag, Gravel, Stone	6	0.7	0.9
Unknown	37	4.5	NA

Table 17 Atmospheric Conditions

Atmospheric Conditions	Count	Percent	Percent Among Known
Blowing Sand, Soil, Dirt	2	0.2	0.3
Clear or No Adverse	543	63.4	87.6
Cloudy	26	3.0	4.2
Fog, Smog, Smoke	5	0.6	0.8
Not reported	101	11.8	NA
Other	6	0.7	1.0
Rain	23	2.7	3.7
Severe Crosswinds	3	0.4	0.5
Sleet or Hail	1	0.1	0.2
Snow	11	1.3	1.8
Unknown	135	15.8	NA

Table 18 Number of adverse conditions

Number of Adverse Conditions	Count	Percent	Cumulative Percent
0	218	31.6	31.6
1	342	49.6	81.3
2	100	14.5	95.8
3	23	3.3	99.1
4	5	0.7	99.9
5	1	0.2	100

Note: the average number of adverse conditions per crash was 0.92.

Table 19 Crash Related Factors (N=808)

Crash Related Factors	Count	Percent	Percent Among Known
None	779	91.1	96.4
Shoulder Design or Condition	1	0.1	0.1
Other Construction Created Condition	5	0.6	0.6
No or Obscured Pavement Marking	1	0.1	0.1
Inadequate Construction or Poor Design of Roadway, Bridge, Etc.	1	0.1	0.1
Surface Under Water	1	0.1	0.1
Surface Washed Out	1	0.1	0.1
Motor Vehicle Struck by Falling Cargo or Something that came loose or something that was set in motion by a vehicle	2	0.2	0.2
Date of accident and date of ems notification were not the same	2	0.2	0.2
Recent/Previous Accident Scene Nearby	3	0.4	0.4
Police Pursuit Involved	8	0.9	1.0
Indication of a stalled/disabled vehicle	4	0.5	0.5
Unstabilized situation began and all harmful events occurred off of the roadway	1	0.1	0.1
Backup due to prior crash	1	0.1	0.1

Table 20 Crash identifiers for crashes with Crash Factors

<b>Shoulder design or condition</b>					
Year	State	Case Number	Year	State	Case Number
2013	NM	18			
<b>Surface Under Water/Surface Washed Out</b>					
Year	State	Case Number	Year	State	Case Number
2018	AZ	711			
<b>Motor Vehicle Struck by Falling Cargo or Something that came loose or something that was set in motion by a vehicle</b>					
Year	State	Case Number	Year	State	Case Number
2013	NM	59	2013	NM	272
<b>Inadequate Construction or Poor Design of Roadway, Bridge, ETC</b>					
Year	State	Case Number	Year	State	Case Number
2012	AZ	183			
<b>Other Construction Created Condition</b>					
Year	State	Case Number	Year	State	Case Number
2012	AZ	650	2013	AZ	431
2019	NM	77	2019	NM	186
2020	NM	285			
<b>No or Obscured Pavement Marking</b>					
Year	State	Case Number	Year	State	Case Number
2013	AZ	464			
<b>Date of accident and date of EMS notification were not the same</b>					
Year	State	Case Number	Year	State	Case Number
2016	AZ	729	2019	AZ	58
<b>Recent/Previous Accident Scene Nearby; Backup due to prior crash</b>					
Year	State	Case Number	Year	State	Case Number
2013	NM	241	2014	NM	227
2015	AZ	159	2021	NM	180
<b>Police Pursuit Involved</b>					
Year	State	Case Number	Year	State	Case Number
2012	AZ	86	2012	AZ	587
2012	NM	335	2013	NM	48
2013	NM	139	2014	AZ	124
2016	NM	356	2020	NM	136
<b>Indication of a stalled/disabled vehicle</b>					
Year	State	Case Number	Year	State	Case Number
2012	AZ	251	2012	AZ	751
2017	NM	228	2020	AZ	231
<b>Unstabilized Situation Began and All Harmful Events Occurred Off of the Roadway</b>					
Year	State	Case Number	Year	State	Case Number
2013	NM	18			
<b>Surface washed out (caved-in, road slippage)</b>					
Year	State	Case Number	Year	State	Case Number
2018	AZ	711			

Table 21 Crashes by Month

Month	Count	Percent	Cumulative Frequency	Cumulative Percent
January	66	7.7	66	7.7
February	69	8.1	135	15.8
March	72	8.4	207	24.2
April	54	6.3	261	30.5
May	71	8.3	332	38.8
June	85	9.9	417	48.7
July	81	9.5	498	58.2
August	68	7.9	566	66.1
September	86	10.1	652	76.2
October	73	8.5	725	84.7
November	72	8.4	797	93.1
December	59	6.9	856	100.00

Table 22 Crashes by Quarter

Quarter	Count	Percent	Cumulative Frequency	Cumulative Percent
January through March	207	24.2	207	24.2
April through June	210	24.5	417	48.7
July through September	235	27.5	652	76.2
October through December	204	23.8	856	100.00

# Vehicle Level

There were 1,146 vehicles involved in these 856 crashes. The average number of vehicles in each crash was 1.34. Almost three out of four crashes (71.8%) involved only one car, 22.4% involved 2 cars, and 5.7% involved 3 or more cars. The driver license state was recorded for 945 of these vehicles. Table 23 lists the driver license state if there were 10 or more drivers from the same State. Table 23a indicates if the driver was from the Navajo Nation or the surrounding area (i.e. border towns). Approximately half (47.2%) of drivers had a ZIP code found on the Navajo Nation. Almost 7 of 10 (69.9%) drivers involved in these fatal crashes have a ZIP code on the Navajo Nation, on Hopi, or in one of the border towns. Among these drivers, 30.1% had a ZIP code found within a border town, and the Northern Agency had the highest percent of drivers (18.8%) among the 5 Navajo Nation agencies. Not all drivers were fully licensed (10% unlicensed), and some had legal actions (25% not validly licensed) against their license (Tables 24 & 25). Previous accidents, legal actions, and other harmful events were recorded for some drivers. The vast majority of drivers (96%) did not have a record of a previous crash. Approximately 15% of drivers had their license suspended or revoked. Nearly one in 16 drivers (6.5%) had a previous DWI conviction. Drivers with one DWI conviction were reported drinking alcohol in 81.8% of fatal crashes, and drivers with 2 or more DWI convictions were reported drinking alcohol in 100% of fatal crashes. Drivers with 0 DWI convictions were reported drinking alcohol in 32.7% of fatal crashes. It appears that DWI convictions don't discourage drivers from drinking and driving. Results can be found for each previous (harmful) event individually in Tables 26-31, and whether or not there was at least one in Table 32.

Speed is cited as a contributing factor in about 1 in 3 crashes (29.7%, n = 871 drivers), and 15% of drivers had a previous speeding conviction. One in 8 (12%) drivers had a previous harmful motor vehicle conviction. There is a degree of recidivism among drivers involved in fatal car crashes. Whether or not a violation was charged was only recorded for 738 (64.4%) drivers. At least one violation was given to 10.6% of drivers. The types of violations charged can be found in Table 33. Among the 78 drivers who had a violation recorded, there were 130 total violations. This explains why the sum of the percent of violations can exceed 100%. One in 25 drivers were charged with manslaughter or homicide. Whether or not there was a driver related factor was recorded for 864 (75.4%) drivers, with 55.1% of the drivers having one factor affecting them. The most commonly recorded driver factors (top 20) can be found in Table 34. Table 35 displays the most commonly recorded driver distractions. Cell phones are mentioned as a distraction for only 10 drivers. Whether a driver was distracted was recorded for only 47.7% of drivers. Among those drivers 30% were in fact distracted.

The body type of vehicles involved were known for 912 (79.6%) of the 1,146 vehicles. The 43 unique body type codes were organized into 9 categories. Sedans and pickup trucks accounted for 56.4% of all known vehicle types, and commercial vehicles represent

12.6% of all vehicles involved. Results for vehicle body type can be seen in Table 36. Travel speed was known for only 207 (18.1%) of the vehicles involved in these crashes. The average travel speed of these vehicles was 56.3 miles per hour. A histogram of travel speed can be found in Chart 1. A vehicle was recorded as speeding if the reported travel speed exceeded the recorded speed limit. Only 190 vehicles had both variables reported. A little more than one quarter (27.9%) vehicles were reported to be speeding. The maneuver of the vehicles at the time of the crash was recorded for 882 (77%) vehicles. The majority of known maneuvers (66.3%) indicated drivers were simply going straight. Full results for vehicle maneuver can be seen in Table 37. Rollover occurrence was recorded for all 1,146 vehicles, which did occur for 33.9% of vehicles. A crash occurring on a curve was 2.36 (95% CI: 1.71, 3.27 Z = 5.21, <p = 0.000) times more likely to involve a rollover than a crash on a straight section of road. Impact point is recorded for collisions using a traditional clock face as a reference. A crash with impacted point recorded as “12” indicated the first impact point was directly to the front of the vehicle, a “3” is a hit to the right side, a “6” is a rear end collision, and a “9” is a hit to the left side. An impact point of “14” indicates the undercarriage of the vehicle was the primary impact point. The first impact point for 660 vehicles involved in collisions can be seen in Table 38. Car crashes frequently involve a number of events before and after the most harmful part of the collision or rollover. For the crashes included in this report up to 7 events were recorded. Sequence of events were recorded for 846 (73.8%) vehicles and can be seen in Tables 39-46. In the crash report both the First Harmful Event and Most Harmful Event are recorded. In 927 (85.6%, n =1,083) of known vehicles the first harmful and most harmful events were the same. The most common Most Harmful Events can be found in Table 47, and fewer than half of the crashes had a harmful event involving 2 or more vehicles. Whether or not there was a vehicle related factor was recorded for 887 (77.4%) vehicles, with only 0.2% having a vehicle related factor identified. The only factor recorded was “Vehicle Registration for Handicapped.”

Table 23 Driver License State (N=945)

License State	Count	Percent	Cumulative Frequency	Cumulative Percent
Arizona	408	43.2	408	43.2
New Mexico	354	37.5	762	80.6
California	32	3.4	794	84.0
Utah	30	3.2	824	87.2
Colorado	28	3.0	852	90.2
Texas	18	1.9	870	92.1
All Other States	64	6.8	934	98.8
Foreign Country	11	1.2	945	100



Table 23a Navajo Nation Resident Drivers, By Agency (N=936)

Navajo Nation Driver	Count	Percent	Cumulative Percent	Percent Among NN, Hopi, and border town Residents (N=654)
Chinle	81	8.7	8.7	12.4%
Eastern	75	8.0	16.7	11.5%
Ft. Defiance	68	7.3	23.9	10.4%
Northern	123	13.1	37.1	18.8%
Western	95	10.1	47.2	14.5%
From Border Town	197	21.0	68.3	30.1%
Hopi	15	1.6	69.9	2.3%
Other Location	282	30.1	100	

Table 24 Driver License Type

	Count	Percent	Cumulative Frequency	Cumulative Percent	Percent Among Known
Full	816	71.2	816	71.2	83.3
Intermediate	1	0.1	817	71.3	0.1
Learner's Permit	3	0.3	820	71.6	0.3
Temporary License	1	0.1	821	71.6	0.1
No driver present	1	0.1	822	71.7	0.1
Not licensed	107	9.3	929	81.1	10.9
Unknown License Type	51	4.5	980	85.5	
Frequency Missing = 166					

Table 25 Driver License Status

	Count	Percent	Cumulative Frequency	Cumulative Percent	Percent Among Known
Canceled or Denied	7	0.6	7	0.6	0.8
Expired	11	1.0	18	1.6	1.2
No Driver Present	1	0.1	19	1.7	0.1
Not licensed	107	9.3	126	11.0	13.5
Revoked	50	4.4	176	15.4	5.4
Suspended	48	4.2	224	19.5	5.2
Unknown License Status	80	7.0	304	26.5	NA
Valid	706	61.6	1,010	88.1	75.9
Frequency Missing=136					

Table 26 Previous recorded Accidents

Number of Accidents	Count	Percent	Cumulative Percent	Percent Among Known & Reported
0	511	73.2	73.2	96.4
1	17	2.4	75.6	3.2
2	1	0.1	75.8	0.2
3	1	0.1	75.9	0.2
Not Reported	105	15.0	91.0	NA
Unknown	63	9.0	100.0	NA
Frequency Missing = 448				

Table 27 Previous Suspensions & Revocations (N= 905)

Number of Suspensions & Revocations	Count	Percent	Cumulative Percent	Percent Among Known & Reported
0	765	78.9	78.9	84.5
1	76	7.8	86.7	8.4
2	31	3.2	89.9	3.4
3	17	1.8	91.7	1.9
4	9	0.9	92.6	1.0
5	6	0.6	93.2	0.7
6	1	0.1	93.3	0.1
Unknown	65	6.7	100.00	
Frequency Missing = 176				

Table 28 Previous DWI Convictions (N=906)

Number of Convictions	Count	Percent	Cumulative Percent	Percent Among Known & Reported
0	847	87.2	87.2	93.5
1	46	4.7	92.0	5.1
2	9	0.9	92.9	1.0
3	3	0.3	93.2	0.3
4	1	0.1	93.3	0.1
Unknown	65	6.7	100.0	
Frequency Missing = 175				

Table 29 Previous Speeding Convictions (N= 906)

Number of speeding convictions	Count	Percent	Cumulative Percent	Percent Among Known & Reported
0	765	78.8	78.8	84.4
1	97	10.0	88.8	10.8
2	27	2.8	91.6	3.0
3	13	1.3	92.9	1.4
4	3	0.3	93.2	0.4
5	1	0.1	93.3	0.1
Unknown	65	6.7	100	NA
Frequency Missing = 175				

Table 30 Previous Other Harmful MV Convictions (N= 906)

Number of Previous Other Harmful MV Convictions	Count	Percent	Cumulative Percent	Percent Among Know & Reported
0	795	81.9	81.9	87.7
1	92	9.5	91.4	10.2
2	11	1.1	92.5	1.2
3	3	0.3	92.8	0.3
4	5	0.5	93.3	0.6
Unknown	65	6.7	100	NA
Frequency Missing = 175				

Table 31 Average Total Previous Harmful Events

N	Mean	Standard Deviation	Minimum	Maximum
906	0.78	1.48	0	10

Table 32 Any Previous Harmful Incidents

	Count	Percent	Cumulative Percent
Yes	303	33.4	33.4
No	603	66.6	100

Table 33 Violations Recorded

Violation	Count	Percent of all Known drivers (N=738)	Percent among those with at least one violation (N=78)
Manslaughter or homicide	31	4.2%	39.7%
Driving while intoxicated or BAC above legal limit	22	3.0%	28.2%
Inattentive, careless, improper driving	11	1.5%	14.1%
Willful reckless driving	8	1.1%	10.3%
Driving while license withdrawn	7	0.9%	9.0%
Unsafe reckless (not willful, wanton reckless) driving	6	0.8%	7.7%
Other driver license violations	4	0.5%	5.1%
Speeding	4	0.5%	5.1%
Failure to require restraint use	4	0.5%	5.1%
General alcohol, drug, or impairment violation	4	0.5%	5.1%
Lane violation, generally	4	0.5%	5.1%
Hit and run	4	0.5%	5.1%
Speed greater than reasonable	3	0.4%	3.8%

**Table 33 Continued**

<b>Violation</b>	<b>Count</b>	<b>Percent of all Known drivers (N=738)</b>	<b>Percent among those with at least one violation (N=78)</b>
Serious violation resulting in death	3	0.4%	3.8%
Fail to obey stop sign	2	0.3%	2.6%
Driving uninsured vehicle	2	0.3%	2.6%
Brake Violation	1	0.1%	1.3%
Driving on left, wrong side of road	1	0.1%	1.3%
Failure to carry insurance card	1	0.1%	1.3%
Fleeing or eluding police	1	0.1%	1.3%
Non-moving violations, generally	1	0.1%	1.3%
Vehicle registration violation	1	0.1%	1.3%
Failure to give aid, information, wait for police after crash	1	0.1%	1.3%
Turn, yield, signal violations generally	1	0.1%	1.3%
Illegal possession of alcohol or drugs	1	0.1%	1.3%
Improper, unsafe passing	1	0.1%	1.3%
Theft, unauthorized use of motor vehicle	1	0.1%	1.3%

Table 34 Driver Related Factors

<b>Driver Factor</b>	<b>Count</b>	<b>Percent of Known (n=864)</b>	<b>Percent among those with at least one driver factor (n=361)</b>
Improper lane usage	93	10.8%	25.8%
Careless Driving, Inattentive, Operation, Improper Driving	76	8.8%	21.1%
Over Correcting	68	7.9%	18.8%
Driving on wrong side of road	26	3.0%	7.2%
Failure to obey actual traffic signs	25	2.9%	6.9%
Non-traffic Violation charged (Manslaughter, homicide or other assault without malice)	23	2.6%	6.4%
Operating vehicle erratically	18	2.1%	5.0%
Skidding, swerving, sliding due to Ice, snow, slush, water, sand, dirt, oil, wet leaves	17	2.0%	4.7%

Table 34 Continued

Driver Factor	Count	Percent of Known (n=864)	Percent among those with at least one driver factor (n=361)
Passing with insufficient distance or visibility	16	1.9%	4.4%
Failure to yield right of way	14	1.6%	3.9%
Following improperly	11	1.2%	3.0%
Skidding, swerving or sliding due to Tire blown out or flat	8	0.9%	2.2%
Making other improper turn	7	0.8%	1.9%
Improper or erratic lane changing	7	0.8%	1.9%
Police pursuing or in pursuit	7	0.8%	1.9%
Skidding, swerving, sliding due to pedestrian, pedal cyclist, or other non-motorist	5	0.6%	1.4%
Aggressive Driving/Road Rage	4	0.5%	1.1%
Passing where prohibited by posted signs	4	0.5%	1.1%
Stopped in roadway	4	0.5%	1.1%
Driver has a license in more than one state	3	0.3%	0.8%
Police or law enforcement officer	3	0.3%	0.8%
Overloading or improper loading of vehicle	3	0.3%	0.8%
Alcohol and/or Drug Test refused	3	0.3%	0.8%
Driver has not complied with physical or other imposed restrictions	3	0.3%	0.8%
Skidding, swerving, sliding due to vehicle in road	3	0.3%	0.8%
Intentionally illegally driving off roadway	2	0.2%	0.6%
Skidding, swerving, sliding due to ruts or bumps in road	2		
Skidding, swerving, sliding due to live animals in road	2	0.2%	0.6%
Looked but did not see	1	0.1%	0.3%
Legally driving on a suspended or revoked license	1	0.1%	0.3%
Operating without required equipment	1	0.1%	0.3%
Making improper entry to or exit from trafficway	1	0.1%	0.3%
Starting or backing improperly	1	0.1%	0.3%
Failure to observe warnings or instructions on vehicles displaying them	1	0.1%	0.3%
Failure to signal intentions	1	0.1%	0.3%
Driving less than posted minimum	1	0.1%	0.3%
Driving with tire related problems	1	0.1%	0.3%
Skidding, swerving, sliding due to slippery or loose surface	1	0.1%	0.3%

Table 34 Continued

Driver Factor	Count	Percent of Known (n=864)	Percent among those with at least one driver factor (n=361)
Skidding, swerving, sliding due to phantom vehicle	1	0.1%	0.3%
Mother of dead fetus/Mother of infant born post-crash	1	0.1%	0.3%
Driver has not complied with learner's permit or intermediate driver license restrictions	1	0.1%	0.3%
Improper passing location	1	0.1%	0.3%

Table 35 Driver Distraction

Distraction	Frequency	Percent	Cumulative Percent	Percent Among Known
Not distracted	378	33.4%	33.4%	70.0%
Not reported	211	18.6%	52.0%	NA
Inattention, details unknown	99	8.8%	60.8%	18.3%
Distraction/Inattention	19	1.7%	62.5%	3.5%
By other occupant(s)	9	0.8%	63.3%	1.7%
Looked but did not see (Code 01)	9	0.8%	64.0%	1.7%
Distracted, details unknown	4	0.4%	64.4%	0.7%
Other Cellular phone related	4	0.4%	64.8%	0.7%
Careless/Inattentive	3	0.3%	65.0%	0.6%
While manipulating cell phone	3	0.3%	65.3%	0.6%
While talking or listening to Cellular phone	3	0.3%	65.5%	0.6%
Other Distraction	2	0.2%	65.7%	0.4%
While using or reaching for device/object brought into vehicle	2	0.2%	65.9%	0.4%
While using other component/controls integral to vehicle	2	0.2%	66.1%	0.4%
Distracted by Outside person, object or event	1	0.1%	66.2%	0.2%
Distracted/Careless	1	0.1%	66.3%	0.2%
No driver present/Unknown if driver present	1	0.1%	66.3%	0.2%
Unknown	381	33.7%	100%	540
Total	1,132			



Table 36 Vehicle Body Type

<b>Vehicle Category</b>	<b>Frequency</b>	<b>Percent</b>	<b>Cumulative Percent</b>	<b>Percent among Known (912)</b>
Off Road	8	0.7%	0.9%	0.9%
Motor Cycle	28	2.4%	3.1%	3.1%
Sedan	269	23.5%	26.6%	29.4%
Van or Station Wagon	73	6.4%	33.0%	8.0%
SUV	159	13.9%	46.9%	17.4%
Pickup Truck	246	21.5%	68.3%	27.0%
Commercial Vehicle	115	10.0%	78.4%	12.6%
Other	14	1.2%	79.6%	1.5%
Unknown or Missing	233	20.3%	100%	NA

Chart 1 Average Travel Speed

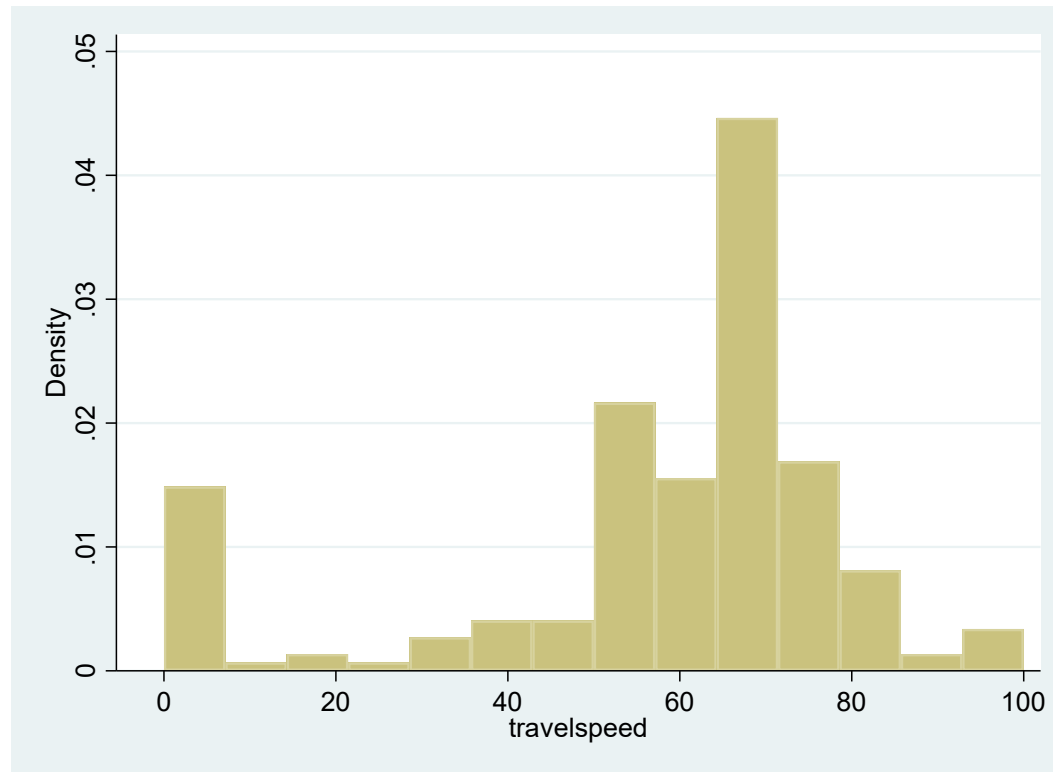


Table 37 Vehicle Maneuver at Time of Crash

Vehicle Maneuver	Frequency	Percent	Cumulative Percent	Percent of Known (N=882)
Going Straight	585	51.0%	51.0%	66.3%
Unknown	196	17.1%	68.2%	NA
Negotiating a Curve	177	15.4%	83.6%	20.1%
Missing	68	5.9%	89.5%	NA
Passing or overtaking another vehicle	38	3.3%	92.8%	4.3%
Turning Left	20	1.7%	94.6%	2.3%
Stopped in Road(way)	19	1.7%	96.2%	2.2%
Decelerating in Traffic Lane	15	1.3%	97.6%	1.7%
Changing Lanes (or merging)	7	0.6%	98.2%	0.8%
Making a U Turn	4	0.3%	98.5%	0.5%
Successful Avoidance to a previous critical event	4	0.3%	98.9%	0.5%
Accelerating in Traffic Lane	4	0.3%	99.2%	0.5%
Turning Right	2	0.2%	99.4%	0.2%
Disabled or parked in travel lane	1	0.1%	99.5%	0.1%
Other	1	0.1%	99.6%	0.1%
Backing Up	1	0.1%	99.7%	0.1%
No driver present	1	0.1%	99.7%	0.1%
Leaving a parking position	1	0.1%	99.8%	0.1%
Starting in road	1	0.1%	99.9%	0.1%
Entering a parking position	1	0.1%	100%	0.1%

Table 38 Impact Point

<b>Impact Point</b>	<b>Count</b>	<b>Percent</b>	<b>Cumulative Percent</b>	<b>Percent of Known Collisions (N=660)</b>
12 o'clock	473	41.3%	41.3%	71.7%
Non-collision	247	21.6%	62.8%	NA
Not reported	121	10.6%	73.4%	NA
Unknown	104	9.1%	82.5%	NA
6 o'clock	46	4.0%	86.5%	7.0%
11 o'clock	34	3.0%	89.4%	5.2%
9 o'clock	25	2.2%	91.6%	3.8%
3 o'clock	22	1.9%	93.5%	3.3%
1 o'clock	20	1.7%	95.3%	3.0%
Missing	14	1.2%	96.5%	NA
7 o'clock	11	1.0%	97.5%	1.7%
5 o'clock	10	0.9%	98.3%	1.5%
Undercarriage	9	0.8%	99.1%	1.4%
10 o'clock	6	0.5%	99.7%	0.9%
8 o'clock	2	0.2%	99.8%	0.3%
2 o'clock	1	0.1%	99.9%	0.2%
4 o'clock	1	0.1%	100%	0.2%

Table 39 Sequence of Events 1

Event	Frequency	Percent	Cumulative Percent	Percent Among Known (N=846)
Motor Vehicle in Transport	246	26.7%	26.7%	29.1%
Rollover	152	16.5%	43.3%	18.0%
Ran off Roadway right	128	13.9%	57.2%	15.1%
Pedestrian	117	12.7%	69.9%	13.8%
Unknown	74	8.0%	77.9%	8.7%
Cross Centerline	72	7.8%	85.8%	8.5%
Ran off Roadway left	43	4.7%	90.4%	5.1%
Parked Motor Vehicle	27	2.9%	93.4%	3.2%
Fell or Jumped from Vehicle	13	1.4%	94.8%	1.5%
Injured in Vehicle (non-collision)	10	1.1%	95.9%	1.2%
Fire/Explosion	9	1.0%	96.8%	1.1%
Ran off Roadway Direction Unknown	9	1.0%	97.8%	1.1%
Equipment Failure, blown tire, brake failure, etc.	4	0.4%	98.3%	0.5%
Cross Median	3	0.3%	98.6%	0.4%
Bicyclist	2	0.2%	98.8%	0.2%
Live Animal	2	0.2%	99.0%	0.2%
Non-motorist on personal conveyance	2	0.2%	99.2%	0.2%
Vehicle Struck by Cargo, persons or objects set in motion by another motor vehicle	2	0.2%	99.5%	0.2%
End Departure	2	0.2%	99.7%	0.2%
Other Object not Fixed	1	0.1%	99.8%	0.1%
Embankment	1	0.1%	99.9%	0.1%
Shrubbery	1	0.1%	100%	0.1%
Frequency Missing = 226				

Table 40 Sequence of Events 2

Event	Count	Percent	Cumulative Percent
Motor Vehicle in Transport	83	16.3%	16.3%
Re Entering Roadway	72	14.1%	30.4%
Rollover	65	12.7%	43.1%
Unknown (code 13, code 50, code 80, code 81, code 82, code 87, code 88, code 90)	56	11.0%	54.1%
Ran off Roadway left	33	6.5%	60.6%
Ran off Roadway right	17	3.3%	63.9%
Railway Vehicle	15	2.9%	66.9%
Vehicle Struck by Cargo, persons or objects set in motion by another motor vehicle	15	2.9%	69.8%
Cross Centerline	14	2.7%	72.5%
Mailbox	11	2.2%	74.7%
Separation of units	11	2.2%	76.9%
Cross Median	10	2.0%	78.8%
Pedestrian	8	1.6%	80.4%
Embankment	8	1.6%	82.0%
Injured in vehicle (non-collision)	7	1.4%	83.3%
Guardrail Face	7	1.4%	84.7%
Jackknife	7	1.4%	86.1%
Boulder	6	1.2%	87.3%
Guardrail End	6	1.2%	88.4%
Fire/Explosion	5	1.0%	89.4%
Pedal cyclist	5	1.0%	90.4%
Live animal	5	1.0%	91.4%
Tree	5	1.0%	92.4%
Harmful event details not recorded	5	1.0%	93.3%
Parked Motor Vehicle	4	0.8%	94.1%
Other Object not Fixed	4	0.8%	94.9%
Fell or jumped from vehicle	3	0.6%	95.5%
Vehicle Went Airborne	3	0.6%	96.1%
Other Post Other Pole or Other Supports	2	0.4%	96.5%
Ditch	2	0.4%	96.9%
Fence	2	0.4%	97.3%
Cargo equipment loss or shift	2	0.4%	97.6%
Equipment failure	2	0.4%	98.0%
Building	1	0.2%	98.2%
Bridge Rail	1	0.2%	98.4%
Concrete Traffic Barrier	1	0.2%	98.6%

Table 40 Continued			
Event	Count	Percent	Cumulative Percent
Utility Pole/Light Support	1	0.2%	98.8%
Culvert	1	0.2%	99.0%
Curb	1	0.2%	99.2%
Wall	1	0.2%	99.4%
Motor vehicle in motion outside the trafficway	1	0.2%	99.6%
Non-harmful sway or jackknife	1	0.2%	99.8%
Object that had fallen from MV in transport	1	0.2%	100%

Table 41 Sequence of Event 3

Event	Count	Percent	Cumulative Percent
Rollover	81	26.2%	26.2%
Cross Centerline	46	14.9%	41.1%
Motor Vehicle in Transport	21	6.8%	47.9%
Ran off Roadway right	19	6.1%	54.0%
Ran off Roadway left	17	5.5%	59.5%
Other non-collision	16	5.2%	64.7%
Embankment	14	4.5%	69.3%
Pedestrian	11	3.6%	72.8%
Injured in vehicle non-collision	10	3.2%	76.1%
Re Entering Roadway	9	2.9%	79.0%
Thrown or falling object	8	2.6%	81.6%
Vehicle Went Airborne	8	2.6%	84.1%
Fire/Explosion	6	1.9%	86.1%
Shrubbery	6	1.9%	88.0%
Bicyclist	5	1.6%	89.6%
Cross Median	5	1.6%	91.3%
Guardrail Face	4	1.3%	92.6%
Culvert	3	1.0%	93.5%
Fence	3	1.0%	94.5%
Boulder	2	0.6%	95.1%
Tree	2	0.6%	95.8%
Traffic Sign Support	2	0.6%	96.4%
Harmful event, details not recorded	2	0.6%	97.1%
Live Animal	1	0.3%	97.4%
Other Post Other Pole or Other Supports	1	0.3%	97.7%

Table 41 Continued			
Event	Count	Percent	Cumulative Percent
Ditch	1	0.3%	98.1%
Working Motor Vehicle	1	0.3%	98.4%
Vehicle Struck by Cargo, persons or objects set in motion by another motor vehicle	1	0.3%	98.7%
Ground	1	0.3%	99.0%
Equipment Failure, blown tire, brake failure, etc.	1	0.3%	99.4%
Separation of Units	1	0.3%	99.7%
Cargo or Equipment loss or shift	1	0.3%	100%

Table 42 Sequence of Event 4

Event	Count	Percent	Cumulative Percent
Rollover	160	46.6%	46.6%
Bicyclist	51	14.9%	61.5%
Ran off Roadway left	37	10.8%	72.3%
Fire/Explosion	26	7.6%	79.9%
Motor Vehicle in Transport	10	2.9%	82.8%
Ran off Roadway right	7	2.0%	84.8%
Cross Centerline	7	2.0%	86.9%
Embankment	6	1.7%	88.6%
Fence	6	1.7%	90.4%
Gas inhalation	5	1.5%	91.8%
Fell or jumped from vehicle	4	1.2%	93.0%
Tree	4	1.2%	94.2%
Shrubbery	3	0.9%	95.0%
Vehicle Went Airborne	3	0.9%	95.9%
Immersion or partial immersion	2	0.6%	96.5%
Ground	2	0.6%	97.1%
Cross Median	2	0.6%	97.7%
Re Entering Roadway	2	0.6%	98.3%
Boulder	1	0.3%	98.5%
Guardrail Face	1	0.3%	98.8%
Concrete Traffic Barrier	1	0.3%	99.1%
Culvert	1	0.3%	99.4%
Ditch	1	0.3%	99.7%
Other Fixed object	1	0.3%	100%



Table 43 Sequence of Event 5

Event	Frequency	Percent	Cumulative Percent
Rollover	98	34.1%	34.1%
Gas inhalation	51	17.8%	51.9%
Bicyclist	47	16.4%	68.3%
Fire/Explosion	29	10.1%	78.4%
Immersion or partial immersion	7	2.4%	80.8%
Re Entering Roadway	7	2.4%	83.3%
Fence	6	2.1%	85.4%
Motor Vehicle in Transport	5	1.7%	87.1%
Embankment	5	1.7%	88.9%
Tree	4	1.4%	90.2%
Ran off Roadway right	4	1.4%	91.6%
Injured in vehicle non-collision	3	1.0%	92.7%
Guardrail Face	2	0.7%	93.4%
Ditch	2	0.7%	94.1%
Wall	2	0.7%	94.8%
Other Fixed Object	2	0.7%	95.5%
Ground	2	0.7%	96.2%
Ran off Roadway left	2	0.7%	96.9%
Cross Median	2	0.7%	97.6%
Cross Centerline	2	0.7%	98.3%
Other non-collision	1	0.3%	98.6%
Boulder	1	0.3%	99.0%
Shrubbery	1	0.3%	99.3%
Traffic Sign Support	1	0.3%	99.7%
Vehicle Went Airborne	1	0.3%	100%

Table 44 Sequence of Event 6

Event	Frequency	Percent	Cumulative Percent
Rollover	21	42.9%	42.9%
Fence	5	10.2%	53.1%
Motor Vehicle in Transport	4	8.2%	61.2%
Embankment-Earth	4	8.2%	69.4%
Ran off road right	3	6.1%	75.5%
Cross Centerline	3	6.1%	81.6%
Fire Explosion	2	4.1%	85.7%
Culvert	2	4.1%	89.8%
Tree	2	4.1%	93.9%
Vehicle went airborne	2	4.1%	98.0%
Concrete Traffic Barrier	1	2.0%	100%

Table 45 Sequence of Event 7

Event	Frequency	Percent	Cumulative Percent
Rollover	7	38.9%	38.9%
Ran off roadway-right	2	11.1%	50.0%
Motor Vehicle in Transport	1	5.6%	55.6%
Concrete Traffic Barrier	1	5.6%	61.1%
Utility Pole/light support	1	5.6%	66.7%
Ditch	1	5.6%	72.2%
Embankment-Rock, Stone or Concrete	1	5.6%	77.8%
Fence	1	5.6%	83.3%
Ground	1	5.6%	88.9%
Vehicle went airborne	1	5.6%	94.4%
Re-entering roadway	1	5.6%	100%

Table 46 All sequence of events combined

Event	Count	Percent of cars with 1 Event (N = 846)	Percent of all events recorded (N=2,362)
Rollover	584	69.0%	24.7%
Motor Vehicle in Transport	370	43.7%	15.7%
Ran off roadway right	180	21.3%	7.6%
Cross Centerline	144	17.0%	6.1%
Pedestrian	136	16.1%	5.8%
Ran off roadway left	132	15.6%	5.6%
Bicyclist	110	13.0%	4.7%
Re-entering roadway	91	10.8%	3.9%
Fire/Explosion	77	9.1%	3.3%
Gas Inhalation	56	6.6%	2.4%
Unknown/outdated code	56	6.6%	2.4%
Embankment	34	4.0%	1.4%
Parked Motor Vehicle	31	3.7%	1.3%
Injured in Vehicle, Non-collision	30	3.5%	1.3%
Fence	23	2.7%	1.0%
Cross Median	22	2.6%	0.9%
Fell or Jumped from Vehicle	20	2.4%	0.8%
Vehicle Went Airborne	18	2.1%	0.8%
Vehicle Struck by Cargo	18	2.1%	0.8%
Tree	17	2.0%	0.7%
Other non-collision	17	2.0%	0.7%
Railway vehicle	15	1.8%	0.6%
Guardrail Face	14	1.7%	0.6%
Separation of Units	12	1.4%	0.5%

**Table 46 Continued**

<b>Event</b>	<b>Count</b>	<b>Percent of cars with 1 Event (N = 846)</b>	<b>Percent of all events recorded (N=2,362)</b>
Shrubbery	11	1.3%	0.5%
Mailbox	11	1.3%	0.5%
Boulder	10	1.2%	0.4%
Ran off roadway-direction unknown	9	1.1%	0.4%
Immersion or partial immersion	9	1.1%	0.4%
Live Animal	8	0.9%	0.3%
Thrown or falling object	8	0.9%	0.3%
Ditch	7	0.8%	0.3%
Culvert	7	0.8%	0.3%
Equipment Failure, blown tire, brake failure, etc.	7	0.8%	0.3%
Jackknife	7	0.8%	0.3%
Harmful events, details not recorded	7	0.8%	0.3%
Ground	6	0.7%	0.3%
Guardrail End	6	0.7%	0.3%
Other Object not Fixed	5	0.6%	0.2%
Embankment-Earth	4	0.5%	0.2%
Concrete Traffic Barrier	4	0.5%	0.2%
Other Post Other Pole or Other Supports	3	0.4%	0.1%
Traffic Sign Support	3	0.4%	0.1%
Other Fixed Object	3	0.4%	0.1%
Wall	3	0.4%	0.1%
Cargo or equipment loss or shift	3	0.4%	0.1%
Utility Pole/Light Support	2	0.2%	0.1%
End Departure	2	0.2%	0.1%

<b>Table 46 Continued</b>			
<b>Event</b>	<b>Count</b>	<b>Percent of cars with 1 Event (N = 846)</b>	<b>Percent of all events recorded (N=2,362)</b>
Non-motorist on personal conveyance	2	0.2%	0.1%
Embankment-Rock, stone or concrete	1	0.1%	<0.1%
Curb	1	0.1%	<0.1%
Bridge Rail	1	0.1%	<0.1%
Non-harmful sway or jackknife	1	0.1%	<0.1%
Object that had fallen from MV in transport	1	0.1%	<0.1%
Working motor vehicle	1	0.1%	<0.1%
Building	1	0.1%	<0.1%
Motor vehicle in motion outside the trafficway	1	0.1%	<0.1%

Table 47 Most Harmful Events (N=1116)

Event	Frequency	Percent	Cumulative Percent	Percent Among Known (N=1095)
MV Crash Same Road	474	41.4%	41.4%	43.3%
Rollover	340	29.7%	71.1%	31.1%
Pedestrian	192	16.8%	87.9%	17.5%
Unknown	49	4.3%	92.1%	NA
Fire/Explosion	17	1.5%	93.6%	1.6%
Fell/jumped from vehicle	12	1.1%	94.7%	1.1%
Tree	10	0.9%	95.5%	0.9%
Guardrail Face	6	0.5%	96.1%	0.5%
Bicyclist	5	0.4%	96.5%	0.5%
Boulder	4	0.4%	96.9%	0.4%
Other Fixed Object	4	0.4%	97.2%	0.4%
Ditch	3	0.3%	97.5%	0.3%
Embankment	3	0.3%	97.7%	0.3%
Guardrail End	3	0.3%	98.0%	0.3%
Immersion or Partial Immersion	2	0.2%	98.2%	0.2%
Live Animal	2	0.2%	98.3%	0.2%
Other object (not fixed)	2	0.2%	98.5%	0.2%
Concrete traffic barrier	2	0.2%	98.7%	0.2%
Culvert	2	0.2%	98.9%	0.2%
Motor Vehicle in transport struck by Cargo	2	0.2%	99.0%	0.2%
Ground	2	0.2%	99.2%	0.2%
Traffic Sign Support	2	0.2%	99.4%	0.2%
Parked Vehicle	1	0.1%	99.5%	0.1%
Bridge Pier or support	1	0.1%	99.5%	0.1%
Utility Pole/Light Support	1	0.1%	99.7%	0.1%
Wall	1	0.1%	99.7%	0.1%
Working Motor Vehicle	1	0.1%	99.8%	0.1%
Motor vehicle in motion outside the trafficway	1	0.1%	99.9%	0.1%
Harmful event, details not recorded	1	0.1%	100%	0.1%

Frequency Missing = 1

# Person Level

There were 2,394 people involved in these 856 crashes. The average age of a person involved in these crashes was 36.3 years (n=2,137). Chart 2 displays a histogram of age for those involved in a crash (median age was 34 years). The average age of the fatalities in these crashes was 41.3 years (n=1029, Chart 3, median age was 35 years). For non-pedestrian crashes, fatalities were significantly older than non-fatal victims. Gender was recorded for 2,203 (92.0%) of the people involved. Almost two thirds (65.5%) of people in these crashes were male. Injuries can be placed into one of 5 classifications: No Injury, Possible Injury, Minor Injury, Serious Injury, Fatal Injury, and Injury Severity Unknown. Injury type by gender can be seen in tables 48-48d. After removing the data fields where gender or injury type were unknown, and all pedestrian crashes, males were 1.37 (95% CI: 1.12, 1.69, p=0.002) times more likely to be killed in these crashes than females.

Persons involved in these crashes could be classified into one of 6-person type categories (e.g. passenger, driver, bicyclist, pedestrian, Table 49). Seating position among car occupants can be seen in Table 50, and more than three quarters were in the front row of a vehicle. Restraint use can be recorded for car occupants and motorists, and was recorded for 1,330 persons (Table 51). Approximately 2 out of 5 passengers involved with known and applicable restraint status were not restrained (43%, Table 52). Restraint use was organized into a new variable which identifies if the best possible restraint system was used based on vehicle type and age of passenger. A little more than half (53.7%) of persons utilized the best restraint. Best protection is impacted by age (Table 53). A simple logistic regression model indicates that for every one-year increase in age the likelihood that a person was properly restrained increased by 2.4%. A 40-year-old is more than 2 ½ times (262%) as likely to be properly restrained as a new born. However, best protection values are missing for many persons <10 years and persons 80 years old or older. Restraint use among motorcyclists can be seen in Table 54. Among those with known helmet use reported, only about a quarter (25.9%) were wearing a helmet. Restraint use among passengers less than 11 years old was recorded for 85.6% of children, and results can be found in Table 55. A simple logistic regression model indicates that children under 11 who were not properly restrained were 10.3 times more likely to be killed in a crash than children who were properly restrained (p = <0.030). Children under 11 who were not in a seat belt were 7.5 times more likely to be killed in a crash than children who were in a seat belt (p = 0.02). Air bag deployment was applicable and known for 1,317 (60.9%) occupants. An air bag was not available for 13.3% of occupants, not deployed for 39.4% of occupants, and deployed for 21.5% of occupants (Table 56). Among those to whom it applied, 20.4% of vehicle occupants were ejected either entirely or partially (n=2,048).

The location of non-motorists (pedestrians, bicyclists) was known for 149 persons (Tables 57 & 57a). No improper action, or being in the crosswalk was recorded for only 2.7% of non-motorists.

Police reported alcohol use was recorded for 754 persons involved in these crashes and 45.5% of these persons had been drinking alcohol. The method of alcohol determination was recorded for 225 persons with “Observed” being the most common at 79.1%, followed by Evidential (Breathalyzer) at 11.6%. Blood Alcohol Content (BAC) was reported for 392 persons. The average BAC was 13.7% (Minimum 0%, Maximum 45%). Other drug involvement was reported for 29 persons, with an overlap of 14 who were using both alcohol and drugs.

Of the 1,053 fatalities, 79.7% died at the scene, 0.4% died in route to the hospital, 4.0% deaths occurred at an unknown (unrecorded) time, and the remaining 16.0% died sometime after receiving the initial medical attention at a health care facility.

The average number of persons involved in each crash was 2.8. Table 58 displays the distribution of persons involved in crashes. The type of vehicle a person is traveling in might influence the injury severity of its occupant. Table 59 displays Vehicle Type and Injury Severity (among known injury), and Table 59a displays the percent for each category. The Chi-square for this table is 282.9 ( $p < 0.001$ ). More than half of the passengers of sedans and motorcycles were killed in these crashes. Passenger cars were classified as small (sedan) and large (Pickup, SUV, Van/Station Wagon), and injuries were categorized as fatal or non-fatal. After removing crashes involving pedestrians and bicyclists people in small cars were 1.67 (95% CI: 1.31, 2.13,  $p < 0.001$ ) times more likely to be killed in these crashes than people in large cars. People in small cars were 1.42 (95% CI: 1.11, 1.82,  $p = 0.005$ ) times more likely to have a severe or fatal injury than people in larger vehicles. Full tables for odds ratios by vehicle size can be found in Tables 60 and 61.

The age of the pedestrians was reported for 188 people, and the age of bicyclists was reported for 6. The average age was 37.7 years for pedestrians and 39 years for bicyclists. The age distribution can be seen in Chart 4. Among the 52 pedestrians who had alcohol involvement recorded, 78.8% had been drinking. None of the 6 bicyclists were reported to have been drinking alcohol. The average blood alcohol level for pedestrians involved in fatal crashes was 22.5%. The average driver age for all crashes was 40.9 years, and for pedestrian or bicycle crashes was 43.6 years. The distribution of driver age and driver age for pedestrian/bicyclist crashes can be seen in Charts 5 and 5a respectively. Among drivers involved in pedestrian and bicycle crashes with known gender (N=140), 75% were male. Among non-pedestrian and bicycle crashes 74.9% of drivers were male. The roadway where pedestrian crashes occurred can be seen in Table 62. Approximately 35 roads and highways were identified as locations for pedestrian and bicyclist crashes. The nine



roads with the highest number of crashes can be seen in Table 63. Table 64 displays the type of vehicles involved in pedestrian crashes. There are more commercial vehicles involved in pedestrian crashes than expected, but this result is not significant.

Logistic regression models were created to determine which variables, while controlling for each variable, were significantly associated with fatality as well as serious injury. If a variable was found to be statistically significant in a simple logistic model (i.e. single variable model) then it was considered for the multivariable model. Variables that were significantly associated with fatality (at  $\alpha = 0.10$ ) can be seen in Table 65. The most significant and meaningful variable associated with fatality in these car crashes was the type of protection passengers utilized (i.e. individuals were nearly 3 times less likely to die if using the best protection available).

Because there are so few pedestrian/bicycle crashes and even fewer individuals that survive this type of crash when at least one person dies, logistic regression analysis is not reliable. Variables that were significant for these types of crashes can be seen in table 66. Adverse road and atmospheric conditions seem to be protective. Under adverse conditions motorists may be more focused on their driving and more likely to notice pedestrians. Only one variable, police reported alcohol involvement, remained significant while running a multivariate model, however. Analysis was done to determine if the circumstances surrounding fatal pedestrian/bicyclist crashes were different than non-pedestrian related crashes. This information may lead to more specific interventions that target pedestrian/bicyclist fatality. Table 67 displays the variables that were significantly different between these two collision types.

Chart 2 Average Age of All Persons involved in Crashes

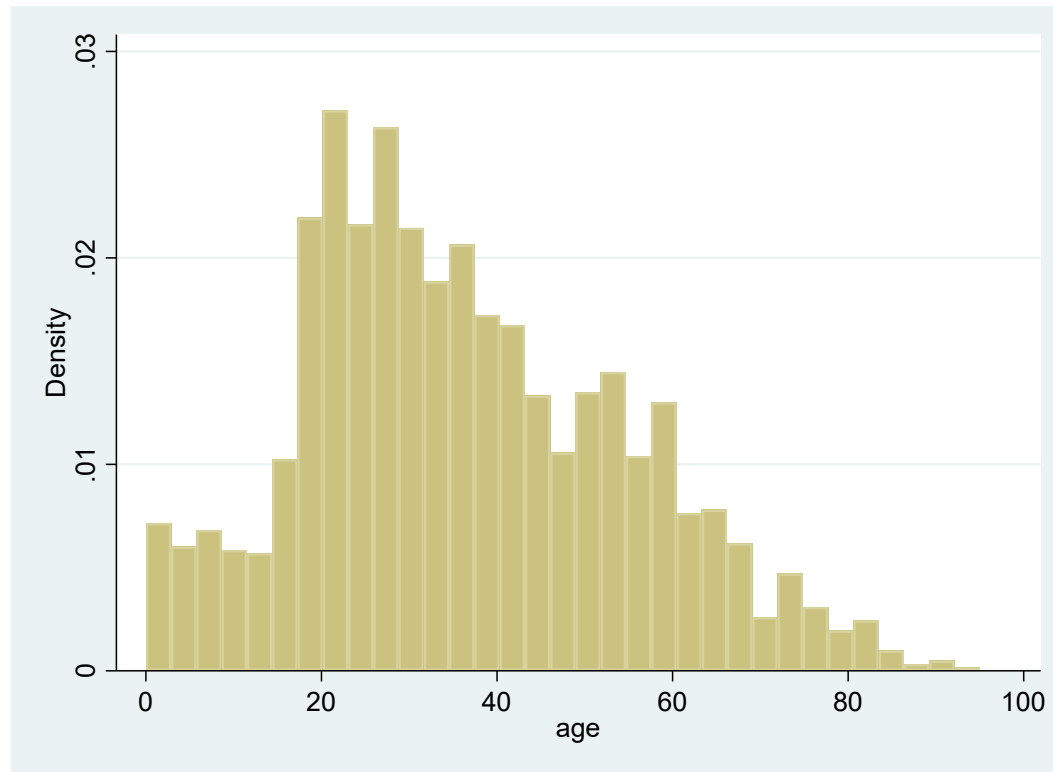


Chart 3 Average Age of Fatalities

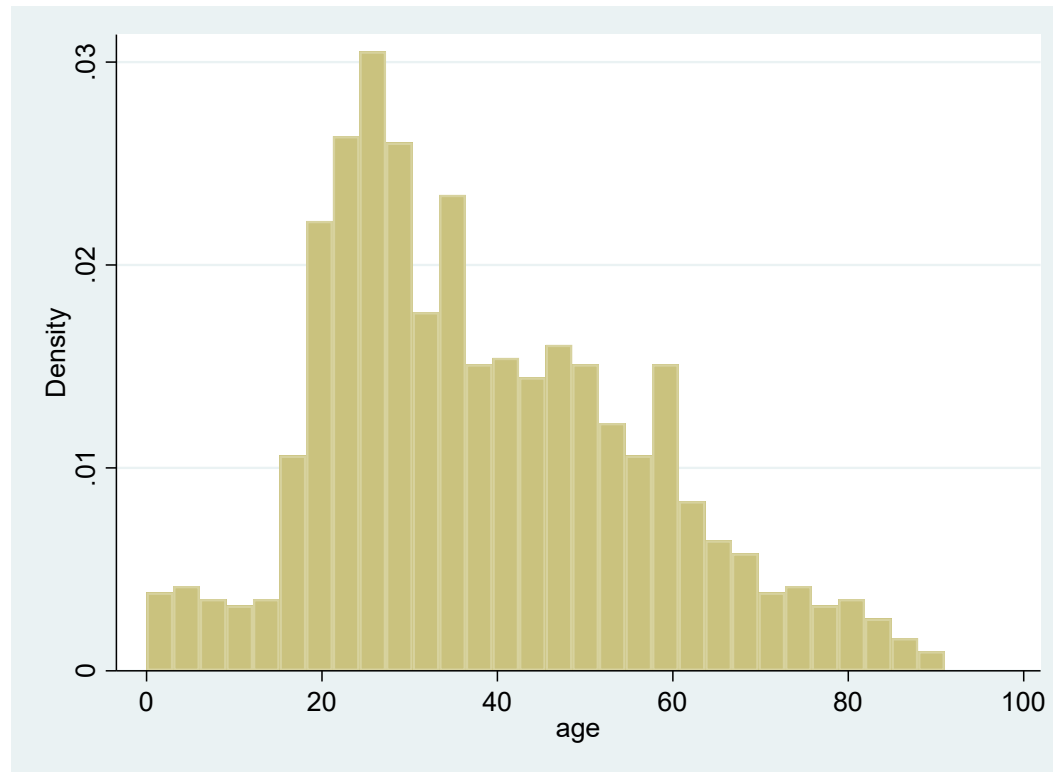


Table 48 Injury Severity by Sex

Injury Severity								
Sex	No Injury	Possible Injury	Minor Injury	Serious Injury	Fatal Injury	Injury: Severity Unknown	Unknown	Total
Female	123	77	101	121	317	10	12	761
Male	244	127	179	137	722	12	21	1,442
Total	367	204	280	258	1,039	22	33	2,203

Table 48a Injury Severity by Sex, percent of total

Injury Severity								
Sex	No Injury	Possible Injury	Minor Injury	Serious Injury	Fatal Injury	Injury: Severity Unknown	Unknown	Total
Female	5.6%	3.5%	4.6%	5.5%	14.4%	0.5%	0.5%	35.5%
Male	11.1%	5.8%	8.1%	6.2%	32.8%	0.5%	1.0%	65.5%
Total	16.7%	9.3%	12.7%	11.7%	47.2%	1.0%	1.5%	

Table 48b Injury Severity by Sex, percent by Sex

Injury Severity								
Sex	No Injury	Possible Injury	Minor Injury	Serious Injury	Fatal Injury	Injury: Severity Unknown	Unknown	Total
Female	16.2%	10.1%	13.3%	15.9%	41.7%	1.3%	1.6%	100%
Male	16.9%	8.8%	12.4%	9.5%	50.1%	0.8%	1.5%	100%

Table 48c Injury Severity by Sex, percent by Injury Type

Injury Severity								
Sex	No Injury	Possible Injury	Minor Injury	Serious Injury	Fatal Injury	Injury: Severity Unknown	Unknown	Total
Female	33.5%	37.7%	36.1%	46.9%	30.5%	45.5%	36.4%	34.5%
Male	66.5%	62.3%	63.9%	53.1%	69.5%	54.5%	63.6%	65.5%
Total	100%	100%	100%	100%	100%	100%	100%	

Table 48d Injury Severity if sex is unknown or not reported

	No Injury	Possible Injury	Minor Injury	Serious Injury	Fatal Injury	Injury: Severity Unknown	Unknown	Total
<b>Count</b>	37	2	0	0	9	12	75	135
<b>Percent</b>	27.4%	1.5%	0%	0%	6.7%	8.9%	55.6%	

Table 49 Person Type

Person Type	Count	Percent	cumulative Percent	Percent among known
Driver	1,102	46.0%	46.0%	48.0%
Passenger	991	41.4%	87.4%	43.1%
Pedestrian	195	8.1%	95.6%	8.5%
Unknown Occupant	79	3.3%	98.9%	NA
Unknown	18	0.8%	99.6%	NA
Bicyclist	6	0.3%	99.9%	0.3%
Occupant of a motor vehicle not-in transport	3	0.1%	100%	0.1%

Table 50 Seating Position

Seating Position	Frequency	Percent	Cumulative Frequency
Driver	1,105	56.6%	56.6%
Front Row	406	20.8%	77.4%
Second Row	328	16.8%	94.2%
Third Row	22	1.1%	95.3%
Fourth Row	3	0.2%	95.5%
Sleeper Section of Cab	16	0.8%	96.3%
Other Passenger Area	68	3.5%	99.8%
Riding on Exterior of Vehicle	3	0.2%	100%
Total	1,952	100%	

Table 51 Motorist Restraint Use

Restraint system use	Frequency	Percent	Cumulative Percent	Among Applicable and Known (n=1,330)
Lap/Shoulder	804	37.1%	37.1%	60.5%
None used	423	19.5%	56.6%	31.8%
Unknown	422	19.5%	76.1%	NA
None Used/Not applicable	302	13.9%	90.0%	NA
Not reported	109	5.0%	95.1%	NA
Lap belt only	30	1.4%	96.4%	2.3%
Child Restraint/Booster	27	1.2%	97.7%	2.0%
Shoulder belt only	18	0.8%	98.5%	1.4%
No helmet	10	0.5%	99.0%	0.8%
Restraint Used-type unknown	6	0.3%	99.3%	0.5%
Other	5	0.2%	99.5%	0.4%
Helmet-unknown if DOT compliant	5	0.2%	99.7%	0.4%
Unknown if helmet worn	3	0.1%	99.8%	NA
Other helmet	2	0.1%	99.9%	0.2%
Racing style harness	1	<0.1%	100%	0.1%

Table 52 Restraint Use among Car occupants only

Restraint Type	Frequency	Percent	Cumulative Percent	Percent Among Known & Applicable (N=1,601)
Lap/shoulder	803	38.3%	38.3%	50.2%
None used	688	32.8%	71.1%	43.0%
Unknown	393	18.7%	89.8%	NA
Not reported	104	5.0%	94.8%	NA
Lap belt only	30	1.4%	96.2%	1.9%
Child Restraint/booster	27	1.3%	97.5%	1.7%
Not applicable	23	1.1%	98.6%	1.4%
Shoulder belt only	18	0.9%	99.4%	1.1%
Restraint Used-Type Unknown	6	0.3%	99.7%	0.4%
Other	5	0.2%	99.9%	0.3%
Racing style harness	1	<0.1%	100%	0.1%

Table 53 Best Protection by Age Group

Group	Best Protection	N	Missing
All	53.7%	1558	620
<10 Years	35.1%	77	52
10-19 Years	42.1%	145	47
20-29 Years	47.2%	398	98
30-39 Years	54.3%	302	70
40-49 Years	56.7%	210	57
50-59 Years	65.0%	194	44
60-69 Years	72.9%	118	33
70-79 Years	84.3%	51	13
80+ Years	36.5%	63	206

Table 54 Helmet use among Motorcyclists and off-road vehicle passengers

Restraint/Helmet Use	Frequency	Percent	Cumulative Percent	Percent Among Known
No helmet	20	42.6%	42.6%	74.1%
Unknown	16	34.0%	76.6%	NA
Helmet: Unknown if DOT-Compliant	5	10.6%	87.2%	18.5%
Not reported	4	8.5%	95.7%	NA
Other Helmet	2	4.3%	100%	7.4%

Table 55 Restraint Use if <11 years (Among Known, N = 119)

Restraint Use	Count	Percent	Cumulative Percent
None	62	52.1%	52.1%
Child Restraint/Booster	27	22.7%	74.8%
Lap & Shoulder Belt	22	18.5%	93.3%
Lap Belt Only	4	3.4%	96.6%
Shoulder belt only	3	2.5%	99.2%
Other	1	0.8%	100%

Table 56 Air Bag Deployment

Airbag Deployment	Frequency	Percent	Cumulative Percent	Percent among known and available (n=1317)
Not deployed	852	39.4%	39.4%	64.7%
Unknown	392	18.1%	57.5%	NA
Not Applicable	287	13.3%	70.7%	NA
Deployed-Front	241	11.1%	81.9%	18.3%
Not reported	168	7.8%	89.6%	NA
Deployed-Combination	113	5.2%	94.9%	8.6%
Deployed-unknown direction/location	68	3.1%	98.0%	5.2%
Deployed-Side	30	1.4%	99.4%	2.3%
Deployed-curtain (roof)	11	0.5%	99.9%	0.8%
Deployed-Other	2	0.1%	100%	0.2%



Table 57 Non-Occupant Location (n=180)

Location	Frequency	Percent	Cumulative Percent	Percent Among Known (N=149)
Not at Intersection - On Roadway, Not in Marked Crosswalk	67	37.2%	37.2%	45.0%
Unknown	30	16.7%	53.9%	NA
Crossing Roadway	24	13.3%	67.2%	16.1%
In Roadway-Other (Working, Playing, etc.)	10	5.6%	72.8%	6.7%
Shoulder/Roadside	9	5.0%	77.8%	6.0%
At Intersection-Not in Crosswalk	6	3.3%	81.1%	4.0%
Improper Crossing of Roadway or Intersection (Jaywalking)	4	2.2%	83.3%	2.7%
In Roadway Improperly	4	2.2%	85.6%	2.7%
No improper action	4	2.2%	87.8%	2.7%
Not at Intersection - On Roadway, Crosswalk Availability Unknown	4	2.2%	90.0%	2.7%
Movement Along Roadway Against Traffic	3	1.7%	91.7%	2.0%
Movement Along Roadway with Traffic	3	1.7%	93.3%	2.0%
At Intersection-Unmarked/Unknown If Marked Crosswalk	2	1.1%	94.4%	1.3%
On roadway, Not in Marked Crosswalk	2	1.1%	95.6%	1.3%
Dart/Dash	1	0.6%	96.1%	0.7%
Failure to Yield Right of Way	1	0.6%	96.7%	0.7%
Intersection-Unknown Location	1	0.6%	97.2%	0.7%
Movement Along Roadway-Direction Unknown	1	0.6%	97.8%	0.7%
Not reported	1	0.6%	98.3%	NA
Not at Intersection-On Roadway, Crosswalk Availability Unknown	1	0.6%	98.9%	0.7%
Not visible	1	0.6%	99.4%	0.7%
Wrong Way Riding or Walking	1	0.6%	100%	0.7%

Table 57a Non-Occupant Location regrouped

Location Category	Frequency	Percent	Cumulative Percent
Crossing/In Roadway	112	75.2%	75.2%
Intersection	9	6.0%	81.2%
Shoulder/Roadside	9	6.0%	87.2%
Jogging/running/Movement Along Roadway	7	4.7%	91.9%
Dart/Dash/Jay Walking	5	3.4%	95.3%
No Improper Action	4	2.7%	98.0%
Not visible	1	0.7%	98.7%
Wrong way riding or walking	1	0.7%	99.3%
Failure to Yield Right of Way	1	0.7%	100%

Table 58 Number of persons involved in fatal crashes (N=541)

Number of persons	Count	Percent	Cumulative percent
One	105	19.4	19.4
Two	219	40.5	59.9
Three	78	14.4	74.3
Four	60	11.1	85.4
Five	27	5.0	90.4
Six	25	4.6	95.0
Seven	15	2.8	97.8
Eight	4	0.7	98.5
Nine	3	0.6	99.1
Twelve	3	0.6	99.6
Seventeen	1	0.2	99.8
Nineteen	1	0.2	100
Unknown	315		

Table 59 Vehicle Type and Injury Severity (non-pedestrian crashes)

Injury	None	Possible	Minor	Severe	Fatal	Total
Sedan	28	52	52	60	235	427
Pickup	38	52	70	67	179	406
SUV	23	46	50	74	129	322
Van/Station Wagon	14	15	37	23	70	159
Commercial	49	18	29	9	21	126
Motorcycle/ATV	0	6	2	3	34	45
Bus	1	0	23	13	8	45
Other	6	2	6	6	11	31
Total	159	191	269	255	687	1,561

Table 59a Vehicle Type and Injury Severity (Percent of Total)

Injury	None	Possible	Minor	Severe	Fatal
Sedan	6.6%	12.2%	12.2%	14.1%	55.0%
Pickup	9.4%	12.8%	17.2%	16.5%	44.1%
SUV	7.1%	14.3%	15.5%	23.0%	40.1%
Van/Station Wagon	8.8%	9.4%	23.3%	14.5%	44.0%
Commercial	38.9%	14.3%	23.0%	7.1%	16.7%
Motorcycle/ATV	0%	13.3%	4.4%	6.7%	75.6%
Bus	2.2%	0%	51.1%	28.9%	17.8%
Other	19.4%	6.5%	19.4%	19.4%	35.5%
Total	10.2%	12.2%	17.2%	16.3%	44.0%

Table 60 Odds Ratios for Fatality by Vehicle type (Sedan is the reference)

<b>Vehicle Type</b>	<b>Estimate</b>	<b>Lower Estimate</b>	<b>Upper Estimate</b>
Motor Cycle	2.20	1.08	4.46
Van or Station Wagon	0.65	0.45	0.96
SUV	0.52	0.39	0.71
Pickup	0.64	0.48	0.85
Other	0.56	0.25	1.26
Bus	0.15	0.07	0.34
Commercial	0.27	0.16	0.46

Table 61 Odds Ratios for Severe Injury by Vehicle (Sedan is the reference)

<b>Vehicle Type</b>	<b>Estimate</b>	<b>Lower Estimate</b>	<b>Upper Estimate</b>
Motor Cycle	2.07	0.94	4.57
Van or Station Wagon	0.63	0.43	0.92
SUV	0.76	0.56	1.04
Pickup	0.69	0.52	0.92
Other	0.54	0.26	1.13
Bus	0.39	0.21	0.73
Commercial	0.14	0.09	0.22

Chart 4 Average age of Pedestrians and Bicyclists

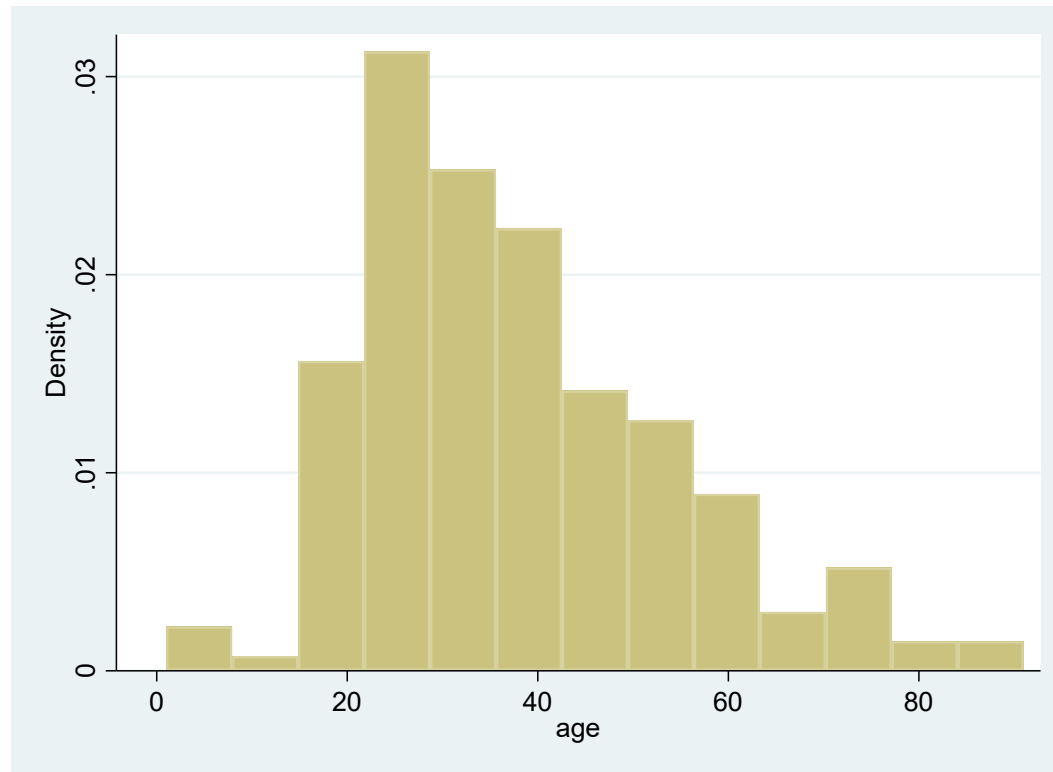


Chart 5 Average age of driver's involved in fatal crashes

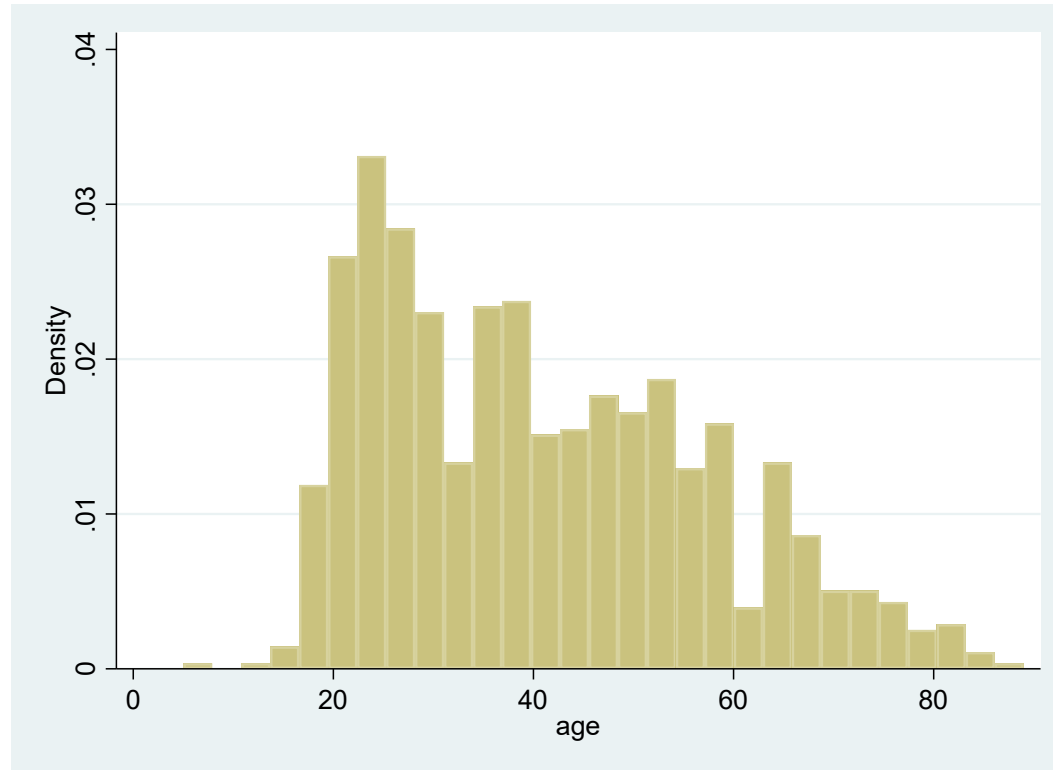


Chart 5a Average Age of Drivers involved in Pedestrian and Bicyclist Crashes (N=141)

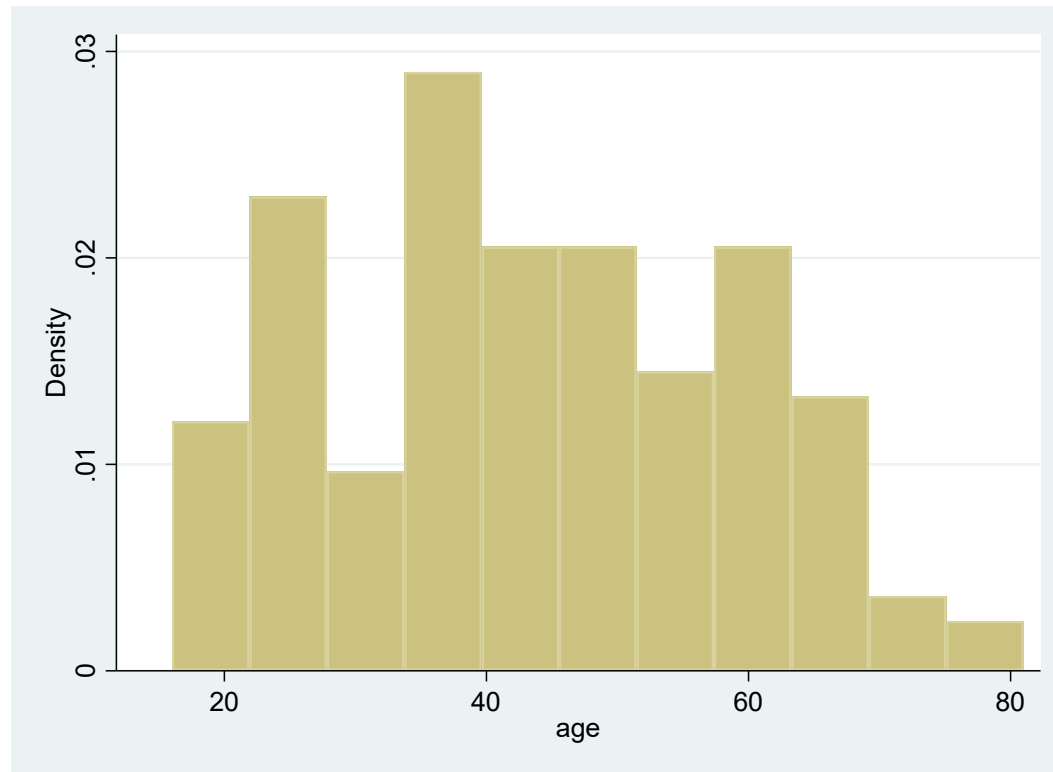


Table 62 Roadway type of crashes involving pedestrians and bicyclists

Roadway Function Class	Crashes		People	
	Frequency	Percent	Frequency	Percent
Interstate	13	9.4%	23	11.4%
Principal Arterial: Freeways and Expressways	25	18.1%	28	13.9%
Principal Arterial Other	43	31.2%	65	32.3%
Minor Arterial	17	12.3%	26	12.9%
Major Collector	16	11.6%	22	11.0%
Minor Collector	8	5.8%	11	5.5%
Local	8	5.8%	15	7.5%
Unknown	8	5.8%	11	5.5%

Table 63 Most common roads of pedestrian and bicyclist crash occurrence (There were 35 different roads identified)

Road Name	Count	Percent of all Ped/Bicyclist Crashes	Cumulative Percent of all Ped/Bicyclist Crashes
US 64	19	14.2%	14.2%
US 491	18	13.4%	27.6%
Interstate 40	13	9.7%	37.3%
US 160	11	8.2%	45.5%
US 191	10	7.5%	53.0%
State Route 118/US 66	10	7.5%	60.4%
State Route 264	9	6.7%	67.2%
Navajo Route 36	5	3.7%	70.9%
Navajo Route/BIA 15	4	3.0%	73.9%
All Others	35	26.1%	100%

Missing and Unknown:4



Table 64 Vehicle Type involved in Pedestrian and Bicycle Crashes

Car Category	Frequency of Ped & Bike crashes	Percent of Known	Cumulative Percent	Frequency of non-Ped and bike crashes	Percent of Known non-Ped and bike crashes
Sedan	39	28.5%	28.5%	230	29.8%
Pickup	37	27.0%	55.5%	209	27.0%
Commercial	25	18.2%	73.7%	87	11.3%
SUV	23	16.8%	90.5%	136	17.6%
Van/Station Wagon	11	8.0%	98.5%	62	8.0%
Other	2	1.5%	100%	12	1.6%
Motorcycle/ATV	0			35	4.5%
Bus	0			2	0.3%
Missing/Unknown	59			176	

Table 65 Significant Variables for Fatality among non-pedestrian crashes

Variable	Z-score	P-value
Ejection	8.86	<0.000
Age	4.78	<0.000
Roadway Function Class	3.34	0.001
Roadway surface type	3.26	0.001
Police Reported Alcohol Involvement	3.16	0.002
Driver distraction	2.74	0.006
Sex	2.68	0.007
Rollover	2.43	0.015
Police Reported Other Drug Involvement	2.16	0.03
Relation to Junction (dichotomous)	-2.29	0.022
Impact point (6 level: Front, Right Side, Rear, Left Side, Under carriage, Non-collision)	-3.41	0.001
Vehicle body type (Sedan, Pickup, SUV, Van/Station Wagon, Commercial, Motorcycle, Other)	-6.58	<0.000
Best occupant protection (e.g. Seat belt for adults, car seat for children <12, helmet for motorcyclist)	-6.70	<0.000
Seating position (Driver, Front row, Second row, third row, Fourth row, Cargo Area)	-8.87	<0.000
Speed Related	4.15	<0.000

Table 65a Multiple Logistic Model for non-pedestrian crashes without alcohol variables (N=1,080)

Effect	Statistical Significance		
	Odds Ratio	Z-score	P-value
Age	1.034	7.90	0.000
Vehicle type (4 door sedan is reference)			
Motorcycle	1.036	0.06	0.952
Van/Wagon	0.71	-1.40	0.162
SUV/Utility	0.46	-4.16	0.000
Pickup Truck	0.40	-5.07	0.000
Other	0.15	-3.25	0.001
Bus	0.09	-5.64	0.000
Commercial Truck	0.19	-4.78	0.000
Best Protection: seat/belt, car seat, or helmet	0.33	-7.52	0.000
Speed Related	1.34	2.02	0.044

Table 66 Simple Logistic regression model for fatality for pedestrian related crashes

Variable	Z-score	P-value
Sex (female as reference)	2.79	0.005
Wet Road	-3.57	<0.000
Presence of atmospheric conditions	-3.06	0.002
Speed Related	-2.93	0.003
Police Reported Alcohol Involvement	2.95	0.003

Table 66a Multiple logistic regression model (N=68)

Effect	Statistical Significance		
	Odds Ratio	Z-score	P-value
Police reported alcohol involvement	6.97	2.95	0.003

Table 67 Differences between pedestrian and non-pedestrian crashes.

Variable	Category	Pedestrian/Bicyclist Crash	Non-Pedestrian Crash
<b>Roadway Function Class</b>			
<b>Largest difference</b>	Minor arterial/collector	35.1%	23.8%
<b>Time of Crash</b>			
	0:00-3:59	14.0%	9.1%
	4:00-7:59	10.8%	12.8%
	8:00-11:59	1.3%	12.3%
	12:00-15:59	4.1%	26.9%
	16:00-19:59	23.3%	22.3%
	20:00-23:59	46.4%	16.6%
<b>Roadway Alignment</b>			
	Straight Road	96.9%	74.6%
	Curved Road	3.1%	25.1%
<b>Light Condition</b>			
	Daylight	7.0%	59.3%
	Dawn/Dusk	2.3%	4.7%
	Dark-lighted	14.2%	2.6%
	Dark-unknown lighted	9.0%	6.0%
	Dark-not lighted	67.5%	27.4%

**Table 67 continued**

<b>Variable</b>	<b>Category</b>	<b>Pedestrian/Bicyclist Crash</b>	<b>Non-Pedestrian Crash</b>
<b>Driver Distraction</b>			
	Distracted (all reasons)	79.3%	70.3%
<b>Total Adverse conditions</b>			
	Average	1.04	0.88
<b>Any Adverse Conditions</b>			
	Percent	88.3%	61.2%
<b>Previous record driver license suspensions</b>			
	0	97.1%	83.7%
	1	1.8%	9.0%
	2	1.2%	3.3%
	3-6	0%	4.0%
<b>Previous record of DWI convictions</b>			
	0	99.4%	93.4%
	1	0.6%	4.8%
	2+	0%	1.8%
<b>Previous record of speeding convictions</b>			
	0	81.8%	87.7%
	1	12.9%	8.5%
	2	2.7%	2.4%
	3	2.7%	1.0%
	4+	0%	0.5%
<b>Average previous events</b>		0.47	0.78
<b>Vehicle Type</b>			
	Sedan	28.2%	27.4%
	Motorcycle	0	2.6%
	Van/Wagon	9.3%	10.0%
	SUV	15.9%	21.4%
	Pickup truck	28.2%	26.0%
	Other	2.2%	2.0%
	Bus	0%	2.9%
	Commercial Truck	16.2%	7.9%
<b>Speed Related</b>		7.5%	35.9%
<i>Average Driver Age</i>		65.1 years	49.9 years

**Table 67 Continued**

<b>Variable</b>	<b>Category</b>	<b>Pedestrian/Bicyclist Crash</b>	<b>Non-Pedestrian Crash</b>
<b>Sex</b>			
	Male (All victims)	70.2%	63.9%
	Male (fatalities)	80.5%	66.3%
<b>Victim within the Navajo Nation</b>		70.0%	76.0%
<b>Police Reported Alcohol Involvement</b>		32.6%	49.2%
<b>Blood Alcohol Level</b>		19.8%	11.6%