NATIONAL TRANSPORTATION SAFETY BOARD
Safety Research Division
Washington, DC 20594

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SUPPLEMENTAL DATA REPORT: Fatal and nonfatal crashes involving pedestrians (2007-2016)

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1. DATA REQUEST

1.1. Objective

- This data report supplements the Pedestrian Safety Special Investigation Report by providing the following: (1) 10-year trend data for pedestrian fatalities and nonfatal injuries in the US (2007-2016) and (2) select characteristics of fatal pedestrian crashes with comparison to overall motor vehicle crashes, focusing on NHTSA's Fatality Analysis Reporting System (FARS) data for 2016.

2. DATA SOURCES AND LIMITATIONS

2.1. Fatality Analysis Reporting System (FARS)

- NHTSA's FARS is a census of fatal traffic crashes on trafficways customarily open to the public within the 50 States, the District of Columbia, and Puerto Rico. These crashes must involve a motor vehicle and must have resulted in the death of a motorist or a non-motorist within 30 days of the crash.
  - o All FARS data can be downloaded directly from
    - https://www.nhtsa.gov/research-data/fatality-analysis-reporting-system-fars
  - o FARS Analytical User's Manual 1975-2016 can be obtained from
    - https://crashstats.nhtsa.dot.gov/Api/Public/Publication/812447

1.2. National Automotive Sampling System (NASS) General Estimates System (GES)

- Data for GES come from a nationally representative probability sample selected from all police-reported motor vehicle crashes of all types, from minor to fatal. To be eligible for the GES sample, a police accident report must be completed for the crash, and the crash must involve at least one motor vehicle traveling on a trafficway and must result in property damage, injury, or death.
- One often cited criticism of GES is that about half of the motor vehicle crashes in the country are not reported to the police. According to NHTSA, "*the majority of these unreported crashes involve only minor property damage and no significant personal injury. By restricting attention to police-reported crashes, GES concentrates on those crashes of greatest concern to the highway safety community and the general public.*"[1]

[1] See https://www.nhtsa.gov/national-automotive-sampling-system-nass/nass-general-estimates-system

- Each week, GES data collectors visit approximately 400 police jurisdictions in 60 areas across the US that reflect the geography, roadway mileage, population, and traffic density of the country. Annually, about 50,000 police accident reports (PAR) are randomly selected.

1.3. Crash Report Sampling System (CRSS)

- CRSS replaced NASS GES in 2016. Like GES, the CRSS sample includes crashes of all severities involving all vehicle types. Additional information (including the location of the data collection sites) can be found here:
  - https://www.nhtsa.gov/national-center-statistics-and-analysis-ncsa/crash-report-sampling-system-crss
- 2016 Crash Report Sampling System (CRSS): Analytical User's Manual can be found here
  - https://crashstats.nhtsa.dot.gov/Api/Public/ViewPublication/812509
- Fan Zhang, Rajesh Subramanian, Chou-Lin Chen, Eun Young Noh (2018) *Crash Report Sampling System: Design Overview, Analytic Guidance, and FAQs* (DOT HS 812 509) provides detail description of the CRSS
  - https://crashstats.nhtsa.dot.gov/Api/Public/ViewPublication/812509
  - It includes frequently asked questions and the following 3 address questions often asked regarding the difference between GES and CRSS estimates:
    - FAQ#8 describes reasons for the difference in total crashes between 2015 GES and the 2016 CRSS estimates.
    - FAQ#9 states that the difference between 2015 GES and 2016 CRSS total crash estimate is not statistically significant.
    - FAQ#15 recommends using FARS for fatal counts (not CRSS fatal estimates).

1.4. Centers for Disease Control and Prevention (CDC) Nonfatal Injury Data

- CDC nonfatal injury estimates can be obtained by using the Injury Prevention & Control Nonfatal Injury Data website https://www.cdc.gov/injury/wisqars/nonfatal.html
- The data came from the National Electronic Injury Surveillance System All Injury Program (NEISS-AIP), which is operated by the U.S. Consumer Product Safety Commission (CPSC). The system collects data about all types and external causes of non-fatal injuries and poisonings treated in US hospital emergency departments , whether or not they are associated with consumer products, since 2000.
- National estimates of nonfatal injured pedestrians are based on the following parameters:
  - Transportation (categorized by injured person) = Pedestrian
  - Traffic-related: any vehicle incident occurring on a public highway, street, or road (i.e., originating on, terminating on, or involving a vehicle partially on the highway). If a report did not specify traffic relatedness, and the event involved a motor vehicle crash (i.e., collision involving a car, pickup truck, van, heavy truck, or SUV), this system assumes the event was traffic-related; this policy is consistent with the International Classification of Diseases, Ninth Revision, Clinical Modification (ICD-9-CM) coding rules.
    - If a report without specification involved motorcycles, ATVs, go-carts, and other off-road vehicles, this system did not assume the event was traffic-related. Also, boarding and alighting injuries fall into the category of unknown/unspecified unless the report noted the injuries occurred in traffic.
  - Non-traffic: The data system also provides non-traffic nonfatal estimates. This includes any vehicle incident that occurs entirely in any place other than a public highway, street, or road.

3. DATA ELEMENTS USED AND METHODOLOGY

3.1. FARS data

- Staff downloaded FARS data from NHTSA's website in SAS data format. ST_CASE is the unique case identifier that links all three levels of data. The following list includes select variables used in the development of tables, and their accompanied observations.
- Crash level data:
    - FATALS: number of fatally injured persons in the crash
    - ROAD_FNC: functional classification of the trafficway on which the crash occurred (before 2015)
    - RUR_URB: classification of the segment of the trafficway on which the crash occurred based on FHWA-approved adjusted Census boundaries of small urban and urbanized areas (2015-Later)
    - FUNC_SYS: functional classification of the segment of the trafficway on which the crash occurred (2015-Later)
    - HOUR: hour (24-hour military time) at which the crash occurred
    - LGT_COND: type/level of light that existed at the time of the crash as indicated in the case material
    - LATITUDE & LONGITUDE: location of crash using global position coordinates
- Vehicle level data:
    - VEH_NO: unique identifier at both vehicle and person levels
    - BODY_TYP & TOW_VEH: BODY_TYP classifies vehicle based on its general body configuration, size, shape, doors, etc., whereas TOW_VEH identifies whether the vehicle had any attached trailing units or was towing another motor vehicle. The combination of these two data elements classifies vehicle type (see page 504 of the FARS Analytical User's Manual).
    - TRAV_SP: records the speed the vehicle was traveling prior to the occurrence of the crash as reported by the investigating officer
    - VSPD_LIM: represents the speed limit just prior to the vehicle critical pre-crash event (2010-later)
- Person level data:
    - PER_NO: unique identifier at person level
    - PER_TYP: role of person involved in the crash (e.g., 4 = Pedestrian; 1 = Driver)
    - INJ_SEV: injury severity using the KABCO scale
    - ALC_RES: alcohol test result (BAC values)
    - AGE: person's age in years
    - SEX: person's sex
    - LOCATION: best describes the location of the non-motorist with respect to the roadway at the time of the crash

3.2. NASS GES and CRSS data

- Staff only use person level data in GES and CRSS data. The two data elements used are:
- PER_TYP: role of person involved in the crash
- INJSEV_IM: imputed injury severity (note, before 2010 the data element was INJSEV_H)
- WEIGHT: case weight is used to produce national estimates

3.3. CDC Nonfatal injury estimate

- Online query was conducted using: https://www.cdc.gov/injury/wisqars/nonfatal.html
- Staff limited the query to nonfatal injuries caused by "Transportation" and further limited to traffic-related accidents resulting in all dispositions (ranging from discharged to hospitalization)

3.4. Census population estimates

- Yearly (July) population estimates were extracted from the US Census website (https://factfinder.census.gov/faces/tableservices/jsf/pages/productview.xhtml?pid=PEP_2017_PEPANNRES&src=pt)
- These estimates were extracted at the state (Section 4.8) and populated place levels (Section 4.9, relevant to large cities with >=500K population in 2016)

3.5. Trend analyses

- Staff used ordinary least squares (OLS) regression models to examine the presence of trends. Although statistical significance was indicated in the following sections, due to the short time frame, they must be interpreted with caution. The main purpose of the inclusion of this method is to substantiate some visually obvious trends.

4. OBSERVATIONS AND SUMMARY

4.1. Trends of pedestrian fatalities (2007-2016)

- Table 1 shows overall motor vehicle crash deaths, fatal pedestrian crashes, pedestrian deaths, population, and pedestrian death rates for the 10-year period from 2007 to 2016. Comparing 2007 and 2016, motor vehicle crash deaths declined by 9% while pedestrian deaths rode by 27%. In 2007, the pedestrian death rate was 1.56 per 100,000 population in the US, comprising 11.4% of all crash deaths, and corresponded to 13 deaths per day. By 2016, they reached 1.85 deaths per 100,000 population, 16.0% of all crash deaths, and an average of 16 deaths per day.
- Figure 1 shows the 10-year trend of pedestrian fatalities as a percent of total motor vehicle fatalities and as a rate per 100,000 population.
- For demonstration purposes, staff used ordinary least squares regression models to test if the visually compelling increasing trends shown in Figure 1 were statistically significant. The results are shown below:
  - Percent of Motor Vehicle Fatalities (red line) increased with a 0.53 percent per year rate, and the OLS model is statistically significant ($p < 0.001$, R^2 for the model is 0.99).
  - Deaths per 100,000 Population (blue line) increased with a 0.03 deaths per 100,000 population per year rate, but the OLS model is not statistically significant ($p = 0.07$, R^2 for the model is 0.35). However, if the model was run using the period 2009-2016, the OLS model is statistically significant ($p < 0.01$, R^2 for the model is 0.84). This model shows that the yearly increase was 0.07 deaths per 100,000 population.

Table 1: Pedestrian fatalities and fatality rates with comparison to overall motor vehicle crash fatalities and population (2007-2016)

Year	Population	Total Motor Vehicle Fatalities	No. of Fatal Pedestrian Crashes	Pedestrian Fatalities: Total	Pedestrian Fatalities: Percent of Motor Vehicle Fatalities	Pedestrian Fatalities: Per 100000 Population	Pedestrian Fatalities: Change vs. Previous Year (%)	Pedestrian Fatalities: Per Day
2007	301,621,157	41,259	4,622	4,699	11.4	1.56	-2.0	13
2008	304,059,724	37,423	4,338	4,414	11.8	1.45	-6.1	12
2009	307,006,550	33,883	4,055	4,109	12.1	1.34	-6.9	11
2010	308,745,538	32,999	4,248	4,302	13.0	1.39	4.7	12
2011	311,591,917	32,479	4,391	4,457	13.7	1.43	3.6	12
2012	313,914,040	33,782	4,730	4,818	14.3	1.53	8.1	13
2013	316,128,839	32,894	4,695	4,779	14.5	1.51	-0.8	13
2014	318,857,056	32,744	4,839	4,910	15.0	1.54	2.7	13
2015	321,418,820	35,485	5,411	5,495	15.5	1.71	11.9	15
2016	323,127,513	37,461	5,900	5,987	16.0	1.85	9.0	16
10-yr Total	NA	350,409	47,229	47,970	NA	NA	NA	NA
Yearly Average	312,647,115	35,041	4,723	4,797	13.7	1.53	2.4	13.1
% Difference (2007-2016)	7.1%	-9.2%	27.7%	27.4%	40.4%	18.6%	NA	23.1%

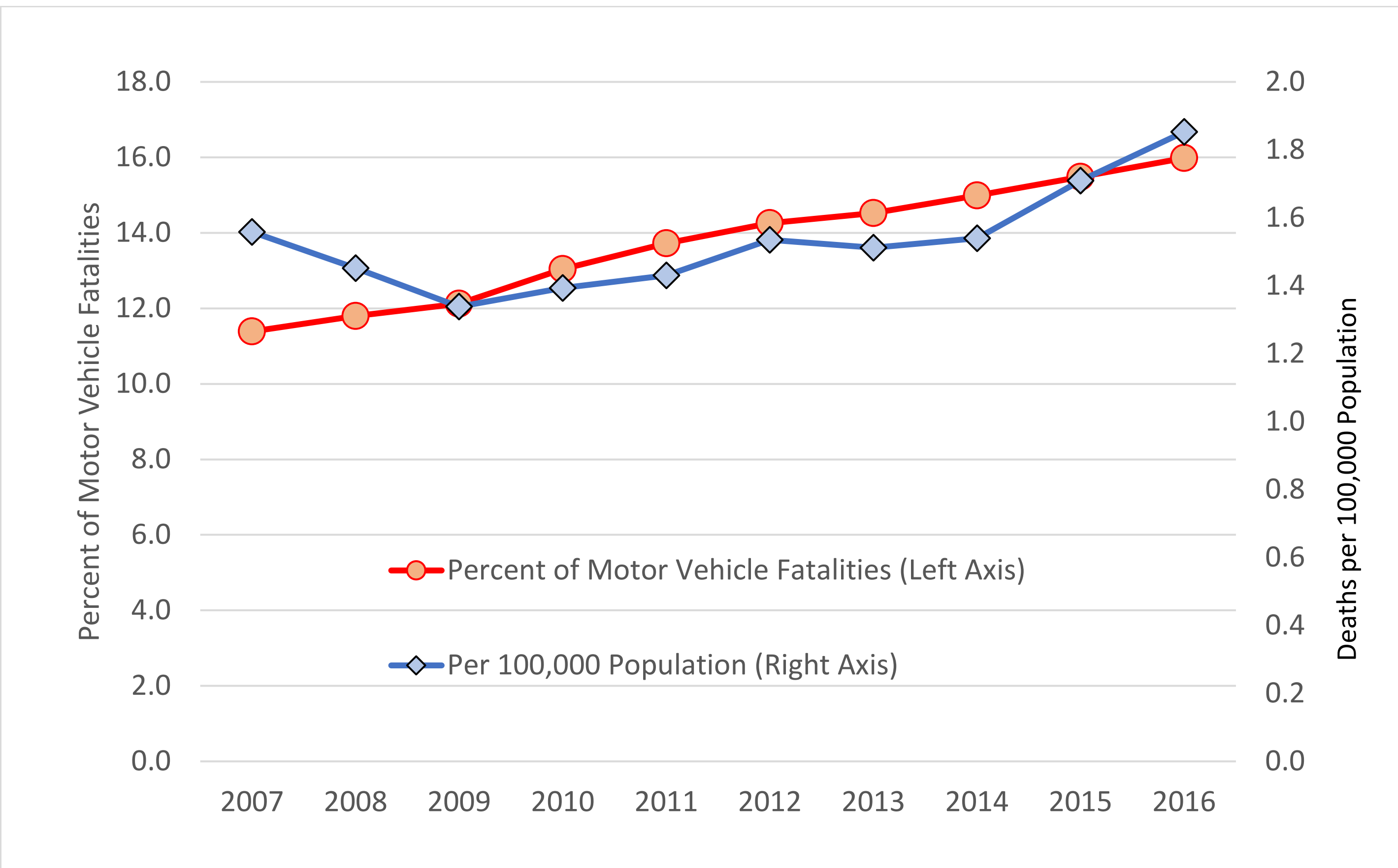

Figure 1: Pedestrian fatalities as percentages of all motor vehicle crash fatalities and as rates per 100,000 population (2007-2016)

- Figure 2 compares total motor vehicle crash deaths (left axis, bars) and pedestrian deaths (right axis, line) over the same 10-year period (2007-2016).

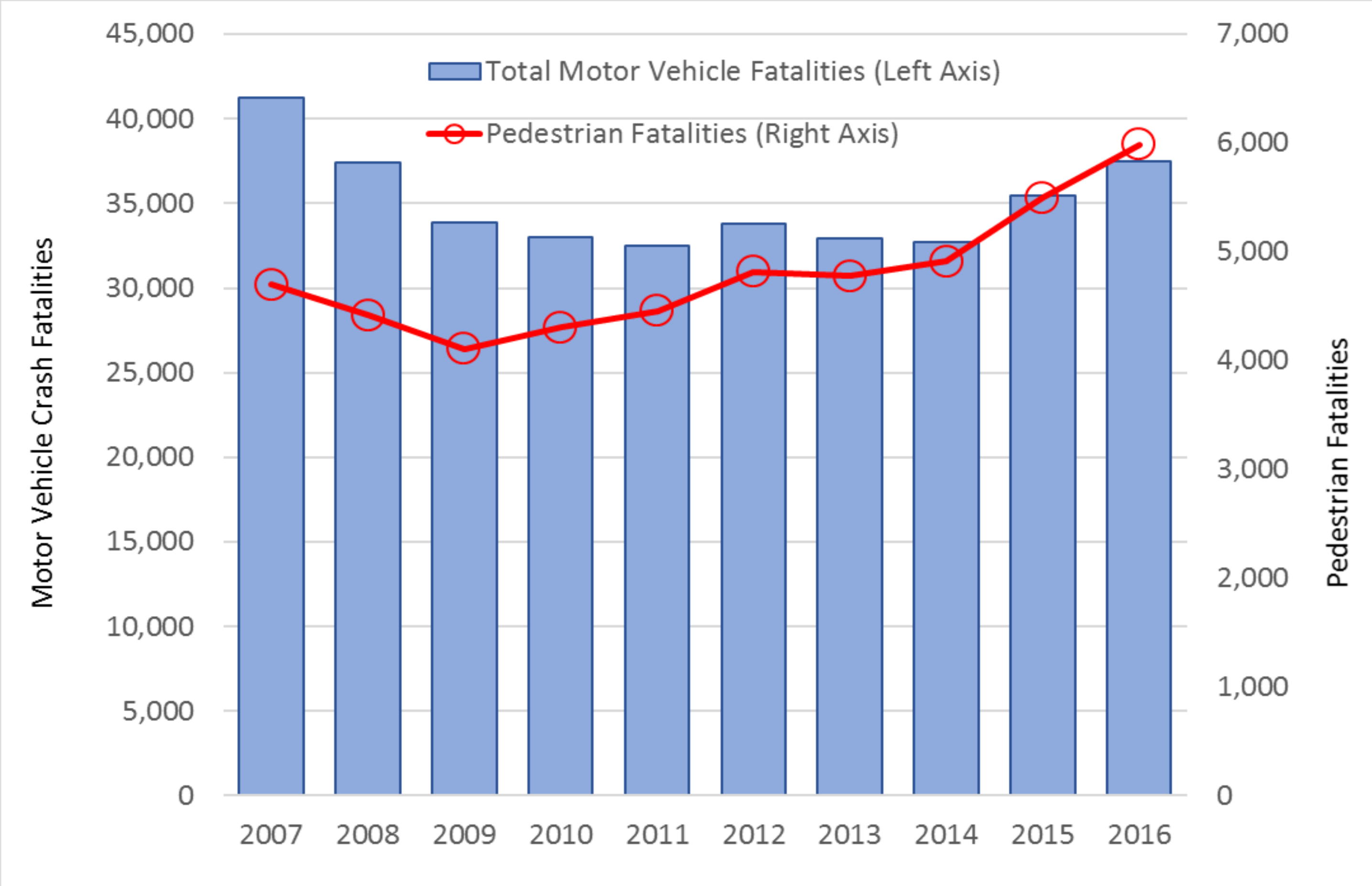

Figure 2: Total motor vehicle fatalities and pedestrian fatalities by year (2007-2016)

- Staff used OLS regression models to evaluate the 10-year trends of total motor vehicle crash and pedestrian fatalities.
  - Total motor vehicle crash fatalities did not show a statistically significant trend, even if the model was restricted to 2009 through 2016
  - Pedestrian fatalities statistically increased throughout the 10-year period at the rate of 151 additional pedestrian deaths per year ($p<0.01$, $R^2 = 0.65$). The trend was stronger during the last 8 years (2009-2016 ($p<0.001$, $R^2 = 0.91$). During those 8 years, there were 243 pedestrian deaths added each year.

4.2. Trend of estimated nonfatal injuries (2007-2016)

- There is no definitive source for nonfatal injuries in motor vehicle crashes. Table 2 includes estimates from NHTSA and CDC. NTHSA nonfatal injuries were based on sampled police reports, whereas CDC estimates were based on sampled hospital emergency department records. Similar to pedestrian fatalities based on FARS data (also shown in Table 2), estimated numbers of pedestrians involved in motor vehicle crashes (i.e., with any injury level, including no injury), and pedestrians suffering nonfatal injuries, has been increasing during the 10-year period. The trends were more evident from the estimates based on police reports, compared to those based on emergency department records.

Table 2: Estimates of pedestrians with fatal and nonfatal injuries based on police report and emergency department record samples (2007-2016)

	Estimates based on sampled police reports (NHTSA)				Estimates based on sampled emergency department records (CDC)	
Year	All Involved Including PDO	Nonfatal Injury	Fatal Injury (FARS)	Deaths per 100 involved	All Circumstances	Traffic-Related
2007	77,149	70,286	4,699	6.1	165,944	118,278
2008	73,417	68,832	4,414	6.0	190,272	138,241
2009	62,094	58,647	4,109	6.6	184,193	137,507
2010	74,649	70,076	4,302	5.8	208,385	160,512
2011	75,000	68,833	4,457	5.9	217,322	167,309
2012	81,837	76,128	4,818	5.9	213,426	162,303
2013	72,478	66,010	4,779	6.6	201,393	156,806
2014	71,732	64,808	4,910	6.8	189,581	142,622
2015	73,599	69,774	5,495	7.5	181,364	128,810
2016	93,861	85,312	5,987	6.4	185,775	137,861
10-yr Total	755,814	698,706	47,970	NA	1,937,655	1,450,249
Yearly Average	75,581	69,871	4,797	6.4	193,766	145,025

- Table 2 also shows the deaths per 100 involved pedestrians. These values were presented in Hu and Cicchino (2018) for the period 2009 to 2015. In Table 2, staff added the rate with estimates obtained from NHTSA for 2016. It is important to note that in 2016, NHTSA replaced NASS GES with CRSS. The decrease in the rate of deaths per 100 involved from 7.5 in 2015 to 6.4 in 2016 may largely be accounted for by the increase in estimated involvement from 73,599 in 2015 to 93,861 in 2016.
- Figure 3 shows the estimated numbers of persons with nonfatal injuries based on police report samples and emergency service samples during the period 2007-2016. While the traffic-related nonfatal injury estimates from CDC appeared to be gradually declining from 2011 to 2015, before rising in 2016, the NHTSA estimates have been increasing in the last three years (2014-2016). It is also noted that there were considerably higher numbers of nonfatal injuries estimated based on emergency room record samples, in comparison to those based on police reports. Further, the difference was even considerably more if nonfatal injury estimates included all circumstances (such as those occurring in private driveways and parking lots), which are shown in Figure 3 with the light blue bars.

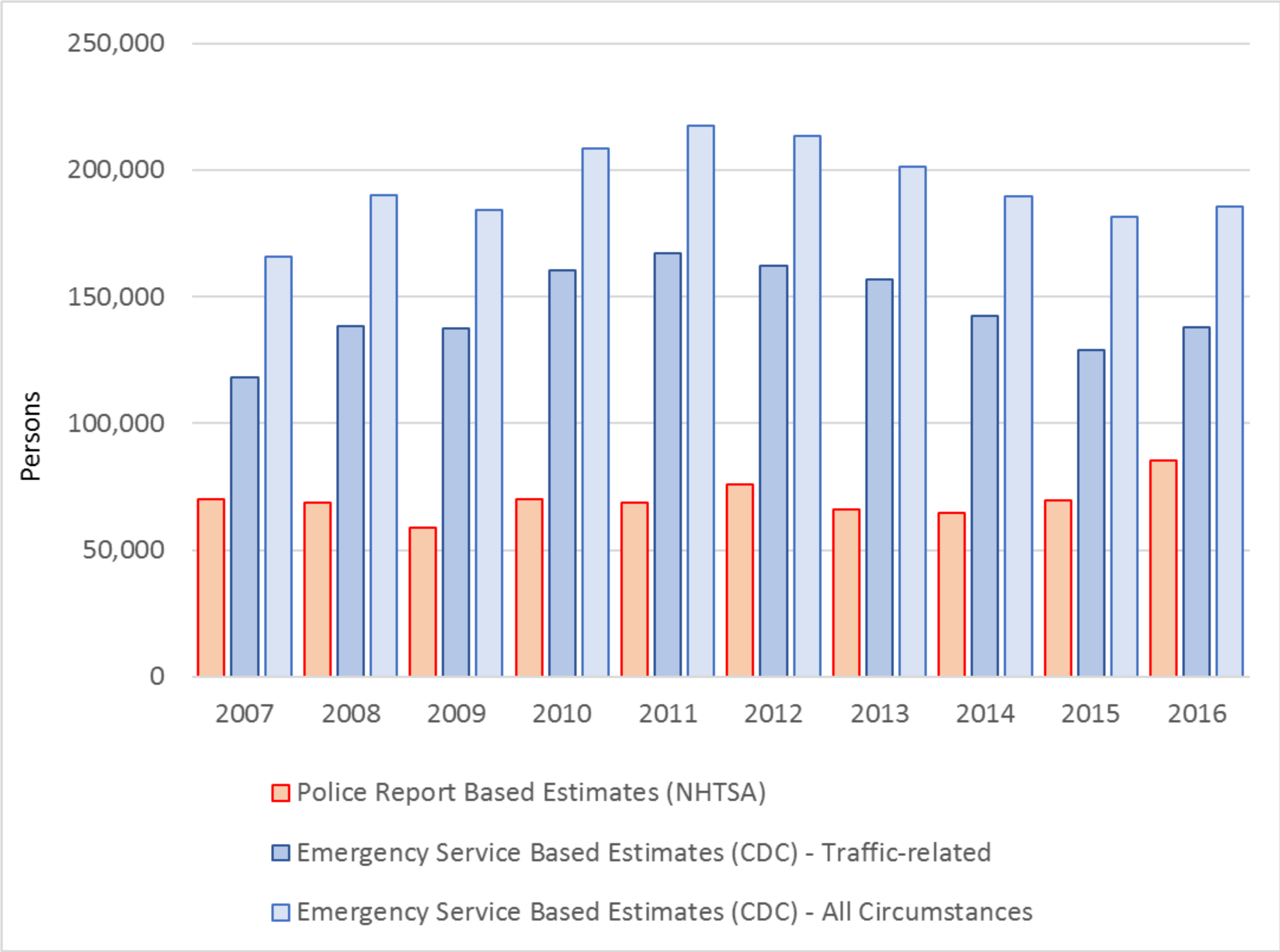

Figure 3: Estimates of nonfatal injuries based on NHTSA's NASS GES and CRSS (police reports) and CDC (emergency department records), 2007-2016

4.3. Lighting condition and time of day

- Table 3 shows that more than 71% of all pedestrian fatalities occurred in dark conditions, compared to 47% of all motor vehicle fatalities. Further, these percentages increased from about 68% in 2007 to 74% in 2016.
- Staff used an OLS regression model to evaluate the trends associated with the percent of pedestrian fatalities and all motor vehicle crash fatalities occurring in dark conditions for the 10-year period and found that there was a 0.6% increase per year for pedestrian fatalities ($p<0.001$, $R^2 = 0.87$), while there was no statistically significant trend associated with all motor vehicle crash fatalities.
- Starting in 2009, it was possible to distinguished if the roadway was lighted or not where the fatal pedestrian crashes occurred. Table 4 shows the breakdown between lighted or not lighted conditions by year. Note that known condition values in Table 4 do not match those listed under "Dark" in Table 3, because there were fatalities in dark conditions where it was not known if the roadway was lighted or not.

Table 3: Pedestrian fatalities by lighting condition (2007-2016)

	Pedestrian fatalities											All motor vehicle crash fatalities		
	Total	Daylight	%	Dawn	%	Dusk	%	Dark	%	Others	%	Total	Dark	%
2007	4,699	1,322	28.1	69	1.5	98	2.1	3,179	67.7	31	0.7	41,259	19,406	47.0
2008	4,414	1,145	25.9	88	2.0	101	2.3	3,059	69.3	21	0.5	37,423	17,741	47.4
2009	4,109	1,079	26.3	75	1.8	87	2.1	2,846	69.3	22	0.5	33,883	15,866	46.8
2010	4,302	1,092	25.4	81	1.9	80	1.9	3,030	70.4	19	0.4	32,999	15,184	46.0
2011	4,457	1,068	24.0	59	1.3	103	2.3	3,204	71.9	23	0.5	32,479	15,137	46.6
2012	4,818	1,168	24.2	76	1.6	101	2.1	3,452	71.6	21	0.4	33,782	15,922	47.1
2013	4,779	1,166	24.4	79	1.7	102	2.1	3,405	71.2	27	0.6	32,894	15,565	47.3
2014	4,910	1,191	24.3	88	1.8	97	2.0	3,510	71.5	24	0.5	32,744	15,475	47.3
2015	5,495	1,245	22.7	84	1.5	104	1.9	4,041	73.5	21	0.4	35,485	16,802	47.3
2016	5,987	1,290	21.5	81	1.4	124	2.1	4,453	74.4	39	0.7	37,461	17,924	47.8
Total	47,970	11,766	24.5	780	1.6	997	2.1	34,179	71.3	248	0.5	350,409	165,022	47.1

- Comparing Tables 3 and 4, there were more pedestrian fatalities in dark but lighted conditions than in daylight conditions. For example, 1,290 pedestrians died in daylight conditions, compared to 2,315 that died in dark but lighted conditions in 2016; nearly twice as many pedestrian fatalities occurred in dark but lighted conditions than in daylight conditions.

Table 4: Pedestrian fatalities in dark but lighted and dark not lighted condition (2007-2016)

	Pedestrian fatalities in dark condition				
Year	Known condition	Not lighted	%	Lighted	%
2009	2,800	1,275	45.5	1,525	54.5
2010	2,967	1,403	47.3	1,564	52.7
2011	3,163	1,512	47.8	1,651	52.2
2012	3,422	1,655	48.4	1,767	51.6
2013	3,373	1,644	48.7	1,729	51.3
2014	3,473	1,715	49.4	1,758	50.6
2015	3,961	1,900	48.0	2,061	52.0
2016	4,373	2,058	47.1	2,315	52.9

- Table 5 shows pedestrian and all motor vehicle crash fatalities by time of day in 2016. It is noted that there were 28 pedestrian (less than 0.5%) and 280 motor vehicle crash fatalities (less than 1%) with unknown time of day information. The most striking observation is that 49% of pedestrian fatalities occurred from 18:00 to 00:00 (6 p.m. to midnight), compared to only 31% of all motor vehicle crash fatalities.
- Figure 4 visualizes the comparison of time of day distribution between pedestrian fatalities and all motor vehicle crash fatalities in 2016. The outer ring shows the distribution of all motor vehicle crash fatalities, whereas the inner pie shows the distribution of pedestrian fatalities. The left half of the inner pie comprises only two wedges (18:00-20:59 and 21:00-23:59). In fact, 4 wedges make up almost three-quarters of the inner pie (18:00-05:59); the same 4 wedges occupy about half of the outer ring. This re-iterates the observation about pedestrian fatalities occurring during dark conditions, typically starting from 6 p.m. to 6 a.m., with the majority of pedestrian fatalities occurring in the 6 p.m. to midnight hours.

Table 5: Time of day distribution of pedestrian and all motor vehicle crash fatalities in 2016

Time of day	Pedestrian Fatalities	%	All motor vehicle crash fatalities	%
0000-0259	702	11.8	4,381	11.8
0300-0559	643	10.8	3,265	8.8
0600-0859	541	9.1	3,646	9.8
0900-1159	281	4.7	3,493	9.4
1200-1459	298	5.0	4,787	12.9
1500-1759	575	9.6	5,981	16.1
1800-2059	1,529	25.7	6,255	16.8
2100-2359	1,390	23.3	5,373	14.5
All	5,987	100.0	37,461	100.0

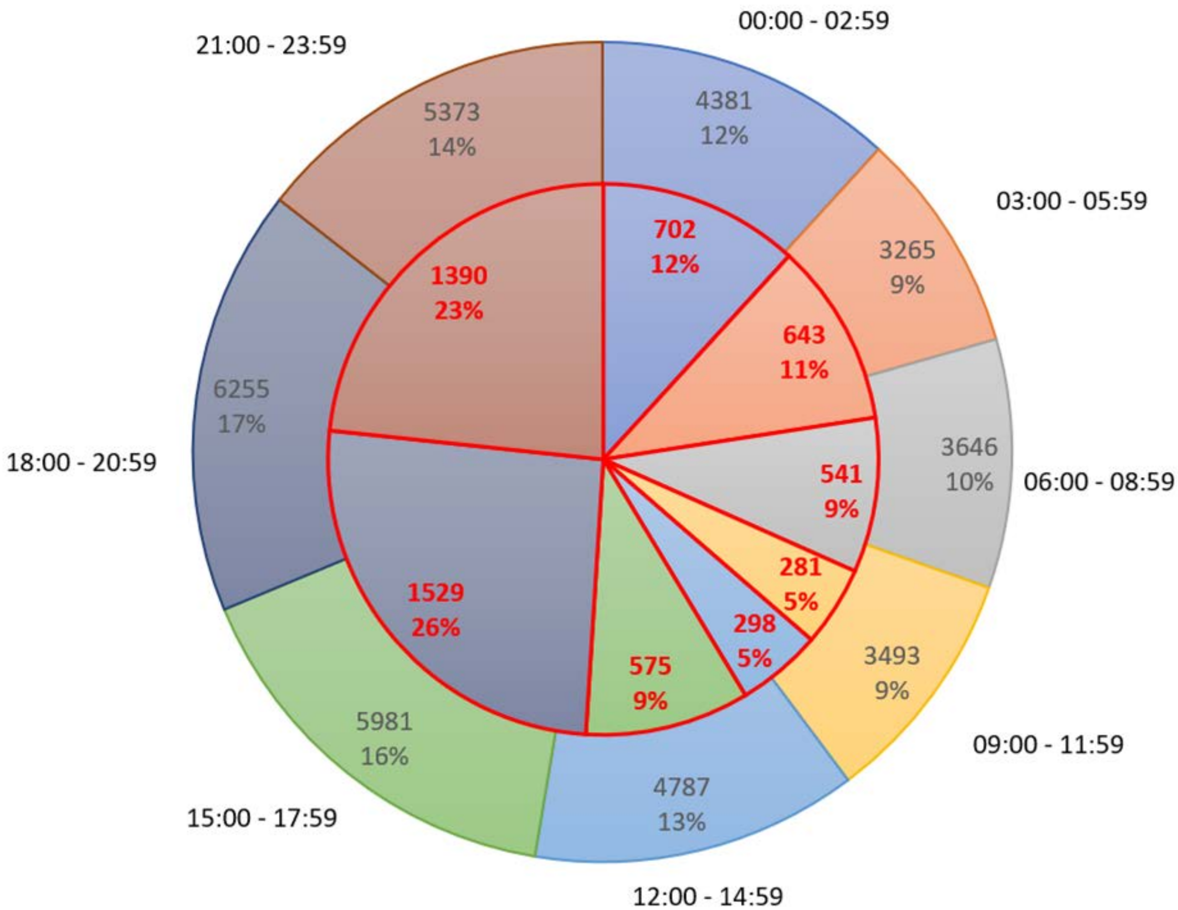

Figure 4: Visual comparison of numbers and percentages of pedestrian and all motor vehicle crash fatalities by time of day in 2016

4.4. Land use, roadway function, speed limits

- Table 6 shows that the percentage of pedestrian fatalities occurring in road segments classified as "urban" generally increased during the 10-year period, from 74% in 2007 to 77% in 2015 (with a slight decrease to 76% in 2016). It is noted that due to the changes in FARS in 2015, there were more pedestrian fatalities with unknown land use classifications (4.3% in 2015 and 5.0% in 2016). The percentages associated with urban and rural roads were based on known land use classifications.

Table 6: Pedestrian fatalities by roadway land use classification, compared to all motor vehicle crash fatalities (2007-2016)

	Pedestrian fatalities							All motor vehicle crash fatalities		Pedestrian fatalities as % of all fatalities on urban roads
YEAR	Total	Urban	%	Rural	%	Unknown	%	Urban	%	
2007	4,699	3,442	73.6	1,236	26.4	21	0.4	17,908	43.5	19.2
2008	4,414	3,184	72.5	1,210	27.5	20	0.5	16,218	43.6	19.6
2009	4,109	2,947	72.0	1,146	28.0	16	0.4	14,501	42.9	20.3
2010	4,302	3,129	73.2	1,146	26.8	27	0.6	14,659	44.8	21.3
2011	4,457	3,269	73.6	1,171	26.4	17	0.4	14,575	45.1	22.4
2012	4,818	3,541	73.6	1,267	26.4	10	0.2	15,371	45.6	23.0
2013	4,779	3,502	73.4	1,270	26.6	7	0.1	15,119	46.0	23.2
2014	4,910	3,806	77.7	1,092	22.3	12	0.2	15,917	48.7	23.9
2015	5,495	4,056	77.1	1,202	22.9	237	4.3	16,830	48.9	24.1
2016	5,987	4,317	75.9	1,368	24.1	302	5.0	17,656	48.7	24.5
total	47,970	35,193	74.4	12,108	25.6	669	1.4	158,754	45.7	22.2

- Over the entire 10-year period, about 74% of all pedestrian fatalities occurred in urban roads. In comparison, only 46% of all motor vehicle crash fatalities occurred in urban roads (also shown in Table 6). Further, in 2007 about 19% of all motor vehicle crash fatalities on urban roads were pedestrians; by 2016, the percentage climbed to almost 25%.
- Table 7 further categorizes pedestrian fatalities based on land use and roadway function classifications. Some pedestrian fatalities were excluded from this table (see the last column) because there was no land use or roadway classification information).
- Staff used OLS regression models to examine trends over the 10-year period for all categories. Table 8 summarizes those results. As discussed earlier, pedestrian fatalities had been increasing during the 10-year period; and most of the increase occurred on urban roads (e.g., the annual rate of change was 118 pedestrian deaths per year on urban roads versus 8 on rural roads). Further, Table 7 shows that it was on principal arterials (not interstates) where pedestrian fatalities had seen the most increase (i.e., 81 additional deaths per year, $p < 0.01$, $R^2 = 0.66$), followed by minor arterials (31 additional deaths per year, $p < 0.01$, $R^2 = 0.65$). On rural roadways, other principal arterials also showed a significant increase (15 additional deaths per year, $p < 0.05$, $R^2 = 0.54$).

Table 7: Pedestrian fatalities by land use and roadway function classifications (2007-2016)

YEAR	All pedestrian fatalities	Urban roads						Rural roads						Excluded
		Total	Interstate	Other Principal Arterial	Minor Arterial	Collector	Local	Total	Interstate	Other Principal Arterial	Minor Arterial	Collector	Local	
2007	4,699	3,437	586	1,201	709	226	715	1,229	185	283	191	290	280	33
2008	4,414	3,177	560	1,182	615	191	629	1,203	158	301	179	282	283	34
2009	4,109	2,940	492	1,086	598	176	588	1,143	122	336	149	278	258	26
2010	4,302	3,126	538	1,190	595	169	634	1,142	143	275	148	277	299	34
2011	4,457	3,264	546	1,153	685	232	648	1,157	138	317	194	239	269	36
2012	4,818	3,533	529	1,271	755	212	766	1,260	142	322	238	277	281	25
2013	4,779	3,498	519	1,236	674	215	854	1,265	185	362	208	225	285	16
2014	4,910	3,775	569	1,425	788	217	776	1,078	136	290	235	205	212	57
2015	5,495	4,044	405	1,822	869	264	684	1,199	159	416	187	233	204	252
2016	5,987	4,302	472	1,965	947	389	529	1,366	202	474	260	266	164	319
Total	47,970	35,096	5,216	13,531	7,235	2,291	6,823	12,042	1,570	3,376	1,989	2,572	2,535	832

Table 8: Ordinary least square (OLS) regression model results based on data presented in Table 7

All pedestrian fatalities	Annual Rate of Change	Pr > |t|	R-Sq
Urban	151	0.0049	0.65
Total	118	0.0026	0.70
Interstate	-11	0.0570	0.38
Other principal arterials	81	0.0042	0.66
Minor arterials	31	0.0047	0.65
Collectors	14	0.0326	0.45
Local	3	0.8241	0.01
Rural			
Total	8	0.3909	0.09
Interstate	2	0.4773	0.07
Other principal arterials	15	0.0149	0.54
Minor arterials	-6	0.0397	0.43
Collectors	8	0.0381	0.43
Local	-11	0.0099	0.59

- Table 7 also shows that in 2015 and 2016 there were considerably large numbers of pedestrian fatalities with no land use or roadway function classification information. Staff examined the 571 pedestrian fatalities (252 in 2015 and 319 in 2016) and found that 400 pedestrian fatalities were in Texas (70%). This suggests that the observations made regarding land use and roadway function are representative of the US, with the exception of Texas.
  - Staff looked at all fatal motor vehicle crashes for 2015 and 2016 and found that 76% of all crashes with unknown land use information were in Texas.
- Starting in 2010, FARS data include reported speed limit at the vehicle level. Staff examined all 34,214 fatal pedestrian crashes from 2010-2016 and found that 2,059 had unknown speed limits, comprising about 6% of all fatal pedestrian crashes (See Table 9).

Table 9: Numbers of fatal pedestrian crashes by reported speed limits (2010-2016)

Year	<= 25 mph	30, 35 mph	40, 45 mph	50, 55 mph	>55 mph	Unknown	Total	% Unknown
2010	393	1,103	1,187	776	519	270	4,248	6.4
2011	386	1,131	1,259	774	576	265	4,391	6.0
2012	400	1,312	1,360	838	560	260	4,730	5.5
2013	404	1,242	1,322	799	607	321	4,695	6.8
2014	470	1,229	1,390	830	615	305	4,839	6.3
2015	528	1,366	1,586	930	678	323	5,411	6.0
2016	559	1,492	1,743	989	802	315	5,900	5.3
Total	3,140	8,875	9,847	5,936	4,357	2,059	34,214	6.0

- Based on FARS 2010-2016 data, staff examined all pedestrian fatal crashes with land use, roadway function classification, and reported speed limit. This included 32,029 out of all 34,748 pedestrian deaths during the period (92%). Table 10 shows the percent distribution of the 32,029 pedestrian deaths over the 7-year period (2010-2016). All the percentages within each land use group add up to 100%. Table 10 shows that on urban roads, other principal arterials with speed limits of 40 to 45 mph comprised the highest pedestrian fatality share (18.4%), followed by other principal arterials with speed limits of 30 to 35 mph (11.6%). On rural roads, the pedestrian fatalities were more evenly shared among interstates with speed limits of >55 mph (11.7%) and other principal arterials and collectors with speed limits 50 to 55 mph (11.9% and 10.1% respectively).
- Using FARS data from 2010 to 2016, the locations where the pedestrians were struck and killed were examined. Table 11 shows that there was little change in the breakdown of whether the pedestrians were struck at intersections; there was a slight decrease of fatalities at intersections. Over the period 2010 to 2016, 19% of pedestrian fatalities occurred at intersections, 71% at non-intersection locations, while almost 10% occurred in other locations (including parking lots/zones, bicycle lanes, shoulders/roadsides, sidewalks, median/crossing islands, driveway accessways, shared-use paths, or non-trafficway areas).

Table 10: Percent distribution of pedestrian fatalities by land use, road function classification, and reported speed limit for 7-year totals (2010-2016)

	Urban pedestrian fatalities = 23,915 deaths				
Road Function	<=25	30, 35 mph	40, 45 mph	50, 55 mph	>55 mph
Interstate	0.1	0.4	1.2	3.9	9.0
Other principal arterial	1.8	11.6	18.4	6.5	1.6
Minor arterial	2.3	8.7	8.3	1.7	0.1
Collector	1.3	3.0	1.8	0.5	0.0
Local	5.7	8.1	3.5	0.4	0.0
	Rural pedestrian fatalities = 8,114 deaths				
Road Function	<=25	30, 35 mph	40, 45 mph	50, 55 mph	>55 mph
Interstate	0.0	0.0	0.2	1.4	11.7
Other principal arterial	0.4	2.2	7.3	11.9	7.8
Minor arterial	0.4	2.4	4.7	8.0	2.1
Collector	0.8	3.0	5.0	10.1	1.4
Local	3.4	5.4	6.1	4.2	0.1

Table 11: Pedestrian fatalities by intersection classification (2010-2016)

Year	All pedestrian fatalities	At intersection		Not at intersection		Other locations	
		Deaths	%	Deaths	%	Deaths	%
2010	4,302	885	20.6	3,026	70.3	391	9.1
2011	4,457	871	19.5	3,171	71.1	415	9.3
2012	4,818	954	19.8	3,390	70.4	474	9.8
2013	4,779	965	20.2	3,331	69.7	483	10.1
2014	4,910	933	19.0	3,517	71.6	460	9.4
2015	5,495	984	17.9	3,975	72.3	536	9.8
2016	5,987	1,052	17.6	4,325	72.2	610	10.2
Total	34,748	6,644	19.1	24,735	71.2	3,369	9.7

- Figure 5 focuses on the 5,685 pedestrian fatalities that occurred in urban and rural roads in 2016. While there are more than 3 times as many urban pedestrian fatalities as rural fatalities, urban pedestrian fatalities were more likely to occur at an intersection (21%) when compared to rural fatalities (only 7%). Using the Chi-square statistic, staff determined that there was a difference between the two sets of distributions; meaning that the breakdown of pedestrian fatalities among the three types of locations was different between urban and rural roads ($p<0.001$).

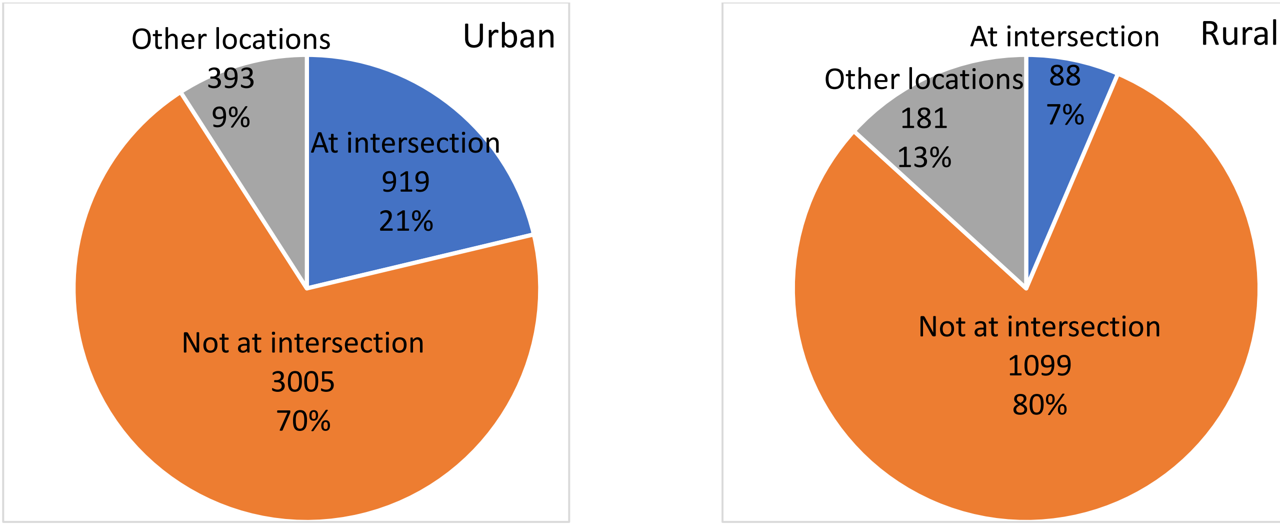

Figure 5: Pedestrian fatalities by land use and intersection location in 2016

4.5. Vehicle numbers and types

- Table 12 shows that more than 90% of all pedestrian fatalities occurred in single vehicle crashes and there was no change over the 10-year period. For comparison purposes, Table 12 also shows the percent of all motor vehicle crash fatalities involved in single vehicle crashes (last column). During the period 2007-2016, single vehicle crashes contributed to 58% of all motor vehicle crash fatalities, which was substantially lower than pedestrian fatalities.

Table 12: Pedestrian fatalities by number of vehicles involved (2007-2016)

		Single		Multiple		All motor vehicle crash deaths involving single vehicle
Year	Total	Vehicle	%	Vehicles	%	%
2007	4,699	4,305	91.6	394	8.4	57.2
2008	4,414	4,006	90.8	408	9.2	58.8
2009	4,109	3,749	91.2	360	8.8	58.8
2010	4,302	3,853	89.6	449	10.4	58.3
2011	4,457	4,011	90.0	446	10.0	59.0
2012	4,818	4,342	90.1	476	9.9	58.9
2013	4,779	4,307	90.1	472	9.9	58.4
2014	4,910	4,431	90.2	479	9.8	57.7
2015	5,495	4,960	90.3	535	9.7	56.1
2016	5,987	5,448	91.0	539	9.0	56.3
Total	47,970	43,412	90.5	4,558	9.5	57.9

- Table 13 shows the number of vehicles involved in fatal pedestrian crashes by vehicle type for the 10-year period 2007-2016. It shows that the vast majority of vehicles involved were passenger vehicles (43% passenger cars and 41% light trucks/vans, totaling 84%). Large trucks and truck-tractors comprised 6.1%, buses 1.3%, and motorcycles 0.7%. It is also noted that 8.3% of vehicles were not classified because they were hit-and-run vehicles.

Table 13: Vehicles involved in fatal pedestrian crashes by vehicle type (2007-2016)

		Passenger cars		Light trucks/vans		Motor-cycles		Large trucks		Truck-tractors		Buses		Others	
Year	No. of Vehicles	Count	%	Count	%	Count	%	Count	%	Count	%	Count	%	Count	%
2007	5,156	2,155	41.8	2,091	40.6	41	0.8	116	2.2	220	4.3	61	1.2	27	0.5
2008	4,862	2,035	41.9	1,940	39.9	48	1.0	128	2.6	191	3.9	71	1.5	30	0.6
2009	4,512	1,898	42.1	1,895	42.0	25	0.6	102	2.3	165	3.7	65	1.4	46	1.0
2010	4,835	2,007	41.5	2,002	41.4	31	0.6	113	2.3	175	3.6	73	1.5	31	0.6
2011	4,954	2,101	42.4	1,974	39.8	36	0.7	129	2.6	208	4.2	69	1.4	24	0.5
2012	5,340	2,350	44.0	2,138	40.0	30	0.6	145	2.7	160	3.0	77	1.4	23	0.4
2013	5,363	2,250	42.0	2,167	40.4	40	0.7	150	2.8	203	3.8	71	1.3	15	0.3
2014	5,457	2,330	42.7	2,275	41.7	30	0.5	125	2.3	183	3.4	77	1.4	19	0.3
2015	6,073	2,661	43.8	2,401	39.5	38	0.6	118	1.9	230	3.8	77	1.3	22	0.4
2016	6,567	2,809	42.8	2,712	41.3	47	0.7	154	2.3	210	3.2	53	0.8	15	0.2
Total	53,119	22,596	42.5	21,595	40.7	366	0.7	1,280	2.4	1,945	3.7	694	1.3	252	0.5

4.6. Pedestrian age and gender

- Table 14 shows a summary of the ages of pedestrians killed, and all fatally-injured drivers in any motor vehicle crashes for the period 2007-2016. This shows that pedestrians killed in motor vehicle crashes tended to be a little older than fatally-injured drivers in any motor vehicle crashes. And as Figure 6 shows, the mean ages of both pedestrians and drivers increased over time.

Table 14: Comparison of ages of fatality-injured pedestrians and drivers involved in fatal motor vehicle crashes by year (2007-2016)

	Fatally injured pedestrians				Fatally injured drivers in any motor vehicle crashes			
Year	Pedestrians with known age	Oldest	Median	Mean	Drivers with known age	Oldest	Median	Mean
2007	4,657	97	45	44.7	26,551	97	39	41.7
2008	4,384	95	45	44.7	24,242	97	40	42.3
2009	4,091	97	46	45.3	21,825	99	41	43.1
2010	4,285	104	46	45.2	21,062	100	42	43.9
2011	4,437	102	47	45.8	20,804	99	42	43.9
2012	4,797	101	47	45.9	21,478	102	42	44.0
2013	4,748	101	47	46.2	20,941	101	43	44.4
2014	4,862	101	48	46.8	20,778	100	43	44.4
2015	5,450	96	48	46.6	22,338	103	42	44.4
2016	5,919	101	48	46.7	23,542	101	42	44.5

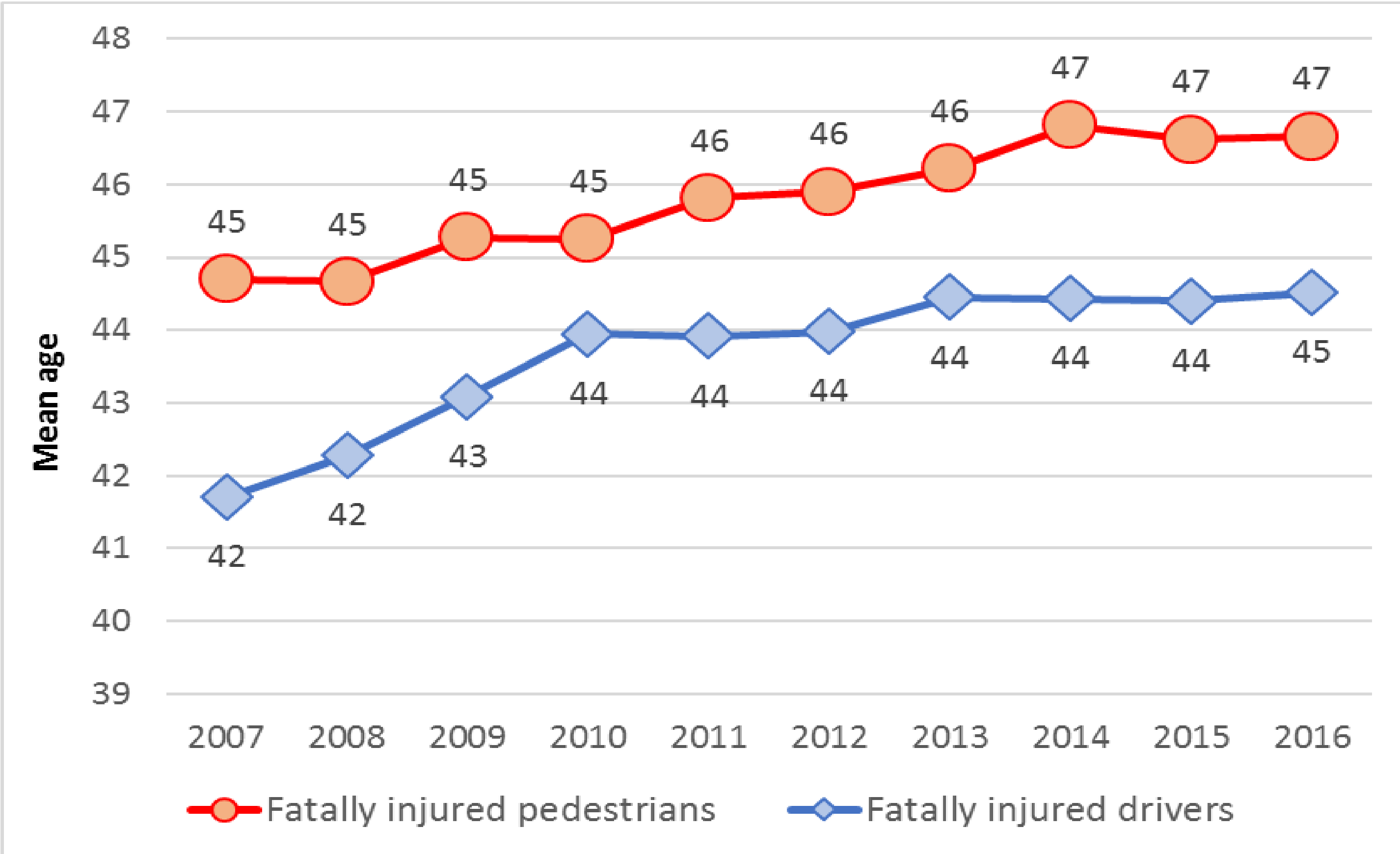

Figure 6: Mean ages of fatally injured pedestrians and drivers (involved in fatal motor vehicle crashes) by year (2007-2016)

- Table 15 shows that no discernible trend could be observed regarding gender distribution. Males comprised about 77% of all fatally-injured pedestrians, whereas only 69% of all fatally-injured drivers were males.
- Table 16 shows that the large group of fatally-injured pedestrians were age 50-54, followed by 55-59. These two age groups alone accounted for 20% of all pedestrian fatalities. This age distribution is markedly different from drivers (of any injury level) involved in fatal pedestrian crashes and those fatally injured drivers (in any motor vehicle crashes). In both categories, the largest groups were age 20-24 and 25-29 drivers.

Table 15: Gender distribution of fatally-injured pedestrians and drivers involved in fatal motor vehicle crashes by year (2007-2016)

	Fatally injured pedestrians					Fatally injured drivers (in any motor vehicle crashes)				
	All	Male	%	Female	%	All	Male	%	Female	%
2007	26,570	20,453	77.0	6,114	23.0	4,699	3,288	70.0	1,411	30.0
2008	24,254	18,764	77.4	5,483	22.6	4,414	3,078	69.7	1,331	30.2
2009	21,835	16,700	76.5	5,132	23.5	4,109	2,827	68.8	1,282	31.2
2010	21,072	15,925	75.6	5,144	24.4	4,302	2,961	68.8	1,339	31.1
2011	20,815	15,912	76.4	4,899	23.5	4,457	3,102	69.6	1,354	30.4
2012	21,490	16,604	77.3	4,885	22.7	4,818	3,337	69.3	1,478	30.7
2013	20,944	16,096	76.9	4,845	23.1	4,779	3,277	68.6	1,496	31.3
2014	20,788	16,058	77.2	4,725	22.7	4,910	3,426	69.8	1,477	30.1
2015	22,348	17,303	77.4	5,038	22.5	5,495	3,832	69.7	1,654	30.1
2016	23,560	18,221	77.3	5,325	22.6	5,987	4,179	69.8	1,783	29.8
Total	223,676	172,036	76.9	51,590	23.1	47,970	33,307	69.4	14,605	30.4

Table 16: Age distribution of fatally-injured pedestrians, drivers involved in fatal motor vehicle crashes, and fatally-injured drivers in 2016

	Fatally injured pedestrians		Drivers (of any injury level) involved in fatal pedestrian crashes		Fatally injured drivers (in any motor vehicle crashes)	
Age group	Pedestrians	%	Drivers	%	Drivers	%
LT15	245	4.1	4	0.1	45	0.2
15-19	269	4.5	340	5.3	1,393	5.9
20-24	443	7.4	747	11.7	2,947	12.5
25-29	450	7.5	655	10.2	2,641	11.2
30-34	433	7.2	577	9.0	2,162	9.2
35-39	408	6.8	500	7.8	1,740	7.4
40-44	408	6.8	470	7.4	1,634	6.9
45-49	426	7.1	441	6.9	1,636	6.9
50-54	625	10.4	454	7.1	1,820	7.7
55-59	583	9.7	450	7.0	1,764	7.5
60-64	471	7.9	378	5.9	1,556	6.6
65-69	353	5.9	241	3.8	1,295	5.5
70-74	266	4.4	153	2.4	915	3.9
75-79	226	3.8	105	1.6	707	3.0
GE80	313	5.2	102	1.6	1,287	5.5
Unknown	68	1.1	775	12.1	18	0.1
Total	5,987	100.0	6,392	100.0	23,560	100.0

- Figure 7 provides a visualization of the difference in age composition between pedestrians killed in motor vehicle crashes and the drivers involved in those crashes.

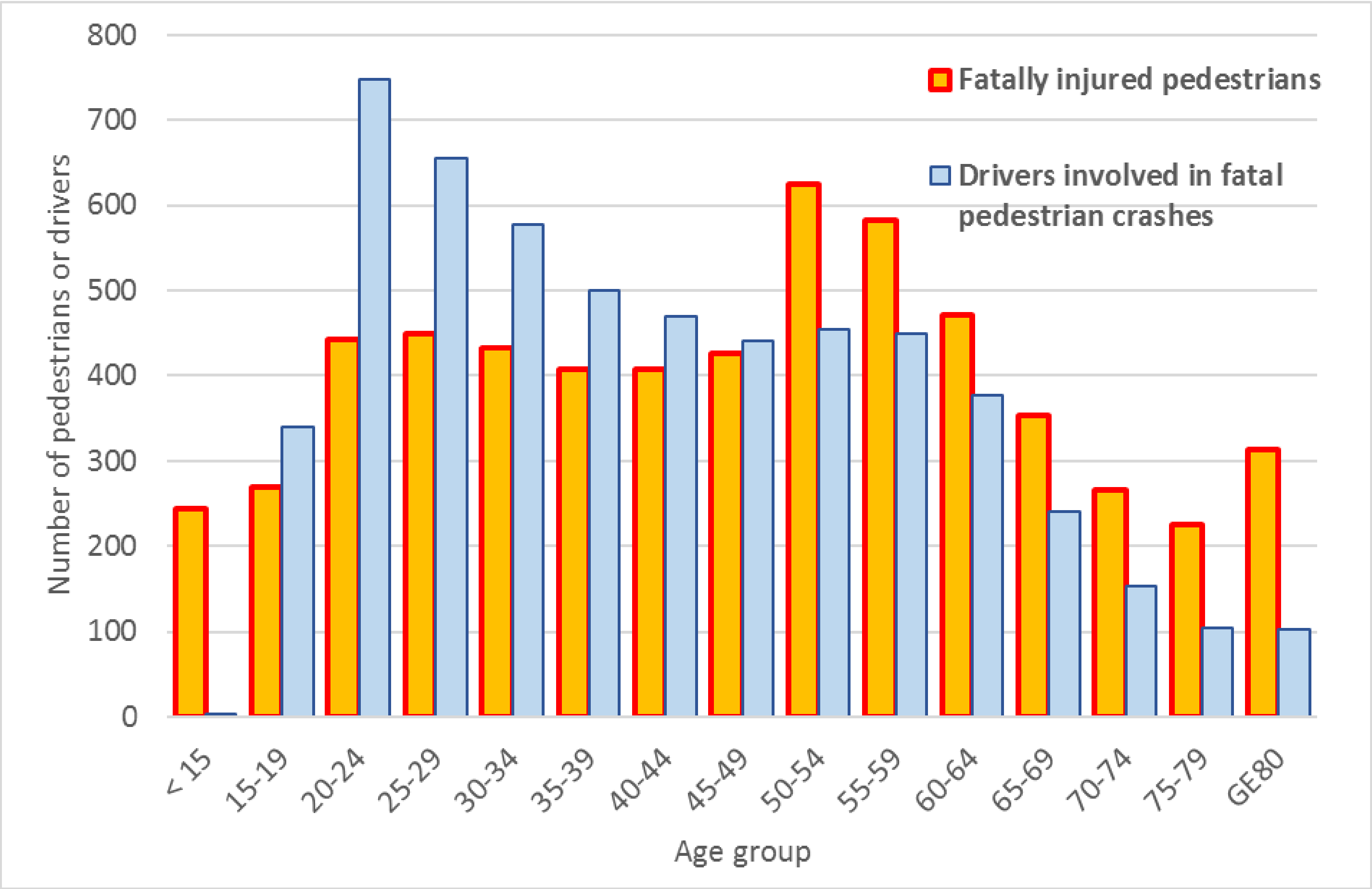

Figure 7: Fatally-injured pedestrians and drivers involved in fatal pedestrian crashes by age group in 2016

4.7. Alcohol impairment

- Table 17 shows that during the period 2007-2016, almost 68% of all fatally-injured pedestrians were tested and with valid BAC values. Of these pedestrians, about 40% had a BAC value exceeding the impairment limit of 0.05 g/dL. In comparison, a considerably smaller percentage of drivers involved in fatal pedestrian crashes were tested with valid BAC values (only 26%). This is expected because the majority of these drivers were not killed in the crashes. However, among those drivers with valid BAC values, only 17% of them had BAC values about 0.05 g/dL.
- Figure 8 clearly shows that among those with valid BAC results, compared to drivers involved in fatal pedestrian crashes, a consistently higher percentage of fatally-injured pedestrians had BAC values at or about 0.05 g/dL.

Table 17: Numbers and percentages of fatally-injured pedestrians and drivers in fatal pedestrian crashes by BAC categories (2007-2016)

	Fatally injured pedestrians							Drivers involved in fatal pedestrian crashes						
		With valid BAC values		0.00	0.01-0.04	0.05+			With valid BAC values		0.00	0.01-0.04	0.05+	
year	Total	Counts	% of total	Counts	Counts	Counts	% of valid	Total	Valid	%	Counts	Counts	Counts	% of valid
2007	4,699	3,174	67.5	1,779	101	1,294	40.8	5,037	1,205	23.9	907	53	245	20.3
2008	4,414	3,069	69.5	1,678	86	1,305	42.5	4,735	1,242	26.2	943	52	247	19.9
2009	4,109	2,917	71.0	1,650	100	1,167	40.0	4,413	1,190	27.0	955	33	202	17.0
2010	4,302	3,044	70.8	1,746	108	1,190	39.1	4,690	1,415	30.2	1,127	45	243	17.2
2011	4,457	3,148	70.6	1,752	115	1,281	40.7	4,790	1,502	31.4	1,190	57	255	17.0
2012	4,818	3,307	68.6	1,855	123	1,329	40.2	5,180	1,495	28.9	1,204	45	246	16.5
2013	4,779	3,300	69.1	1,914	102	1,284	38.9	5,205	1,361	26.1	1,070	47	244	17.9
2014	4,910	3,391	69.1	2,005	111	1,275	37.6	5,302	1,330	25.1	1,082	42	206	15.5
2015	5,495	3,785	68.9	2,164	197	1,424	37.6	5,903	1,513	25.6	1,243	60	210	13.9
2016	5,987	3,350	56.0	1,920	143	1,287	38.4	6,392	1,376	21.5	1,105	61	210	15.3
Total	47,970	32,485	67.7	18,463	1,186	12,836	39.5	51,647	13,629	26.4	10,826	495	2,308	16.9

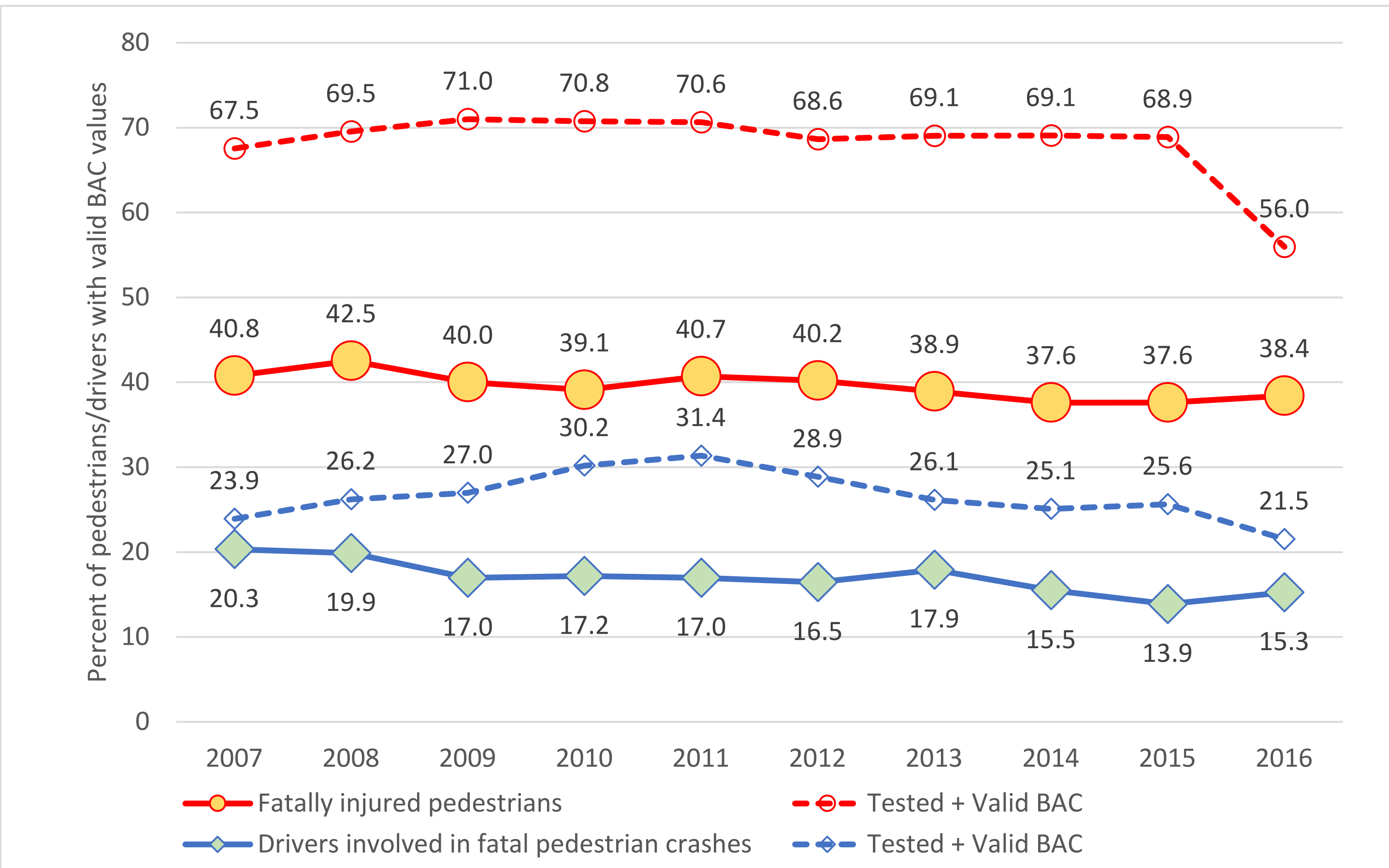

Figure 8: Percentages of fatally-injured pedestrians and drivers involved in fatal pedestrian crashes among those with valid BAC values and the respective percentages of valid BAC results by year (2007-2016)

4.8. State-by-state pedestrian fatalities and fatality rates

- Table 18 includes state-level pedestrian fatalities data for 2016. As discussed earlier, there were 5,987 pedestrian fatalities in 2016 in the US, representing 16% of all motor vehicle crash fatalities. Table 17 shows that 16 states and DC' pedestrian fatalities comprised more than 16% of all motor vehicle crash fatalities. New York had the highest percentage at almost 30%, followed closely by DC.
- In terms of per population rate, New Mexico had the highest pedestrian fatality rate of 2.74 per 100,000 population, followed by Florida at 2.24 per 100,000 population.
- In addition, Table 18 also shows the percentage share of US pedestrian and motor vehicle crash fatalities by each state. Thirty-six percent of all pedestrian fatalities in the US occurred in three states only (14% in California, 11% in Texas, and 11% in Florida). In comparison, these three states had 10%, 10%, and 8% of all motor vehicle crash fatalities in the US.
- To gauge the degree of over- or under-representation, staff computed the Locational Quotient (which is the ratio between the state's share of pedestrian fatalities and the state's share of motor vehicle crash fatalities). New York and DC had the highest over-representation of pedestrian fatalities (86% and 85% over-representation, respectively). The three states with the highest state shares of US pedestrian fatalities (CA, TX, and FL) had 50%, 29%, and 11% over-representation, respectively.
- In section 4.1, staff discussed the statistically significant increasing trend of pedestrian fatalities in the US during the 2007-2016 period in general, but more specifically during the 2009-2016 period. Table 18 also shows the evaluation of trends of pedestrian fatalities as well as pedestrian fatalities as percentages of all motor vehicle crash fatalities by state for the 2009-2016 period. As expected, states with large numbers of pedestrian fatalities each year had the highest rate of change per year. For example, in California pedestrian deaths increased by 42 deaths per year through the period, and the trend was significant at the 99% confidence level. In terms of percentages, pedestrian death had become a larger share each year, growing by 0.84% per year in California. The trend was statistically significant at the 95% confidence level. Nevada and New Mexico had the fastest, statistically significant annual growth in terms of pedestrian fatalities as percentage of all motor vehicle crash fatalities. Both states increased by 1% per year.
- Figure 9 shows a considerable degree of regionalization of pedestrian fatalities as percentages of all motor vehicle crash fatalities. In general, pedestrian fatalities in states in the south (including the southwest), southern New England, and the mid-Atlantic represented higher percentages of all motor vehicle crash fatalities (US was 16%) in 2016. Figure 9 also shows the rate of increase per year for the period 2009-2016. Those trends considered statistically significant at the 95% and 99% confidence levels are also identified.

Table 18: Pedestrian fatalities and fatality rates by state (2016) and trend analysis results (2009-2016)

			Pedestrian fatalities				Percentage share of US total			Pedestrian deaths (2009-2016)			Pedestrian deaths as % of all motor vehicle crash deaths (2009-2016)		
State Abbr.	Pop (1,000)	Total motor vehicle crash deaths	Deaths	% of all crash deaths	Per 100K persons	Per 100K persons (Standard score)	Pedestrian deaths	Total crash deaths	Locational Quotient	R^2	Rate of change (per year)	Sign. Level	R^2	Rate of change (per year)	Sign. Level
AL	4,861	1,038	111	10.69	2.28	0.95	1.85	2.77	0.67	0.6835	6.5119	95%	0.69	0.56	95%
AK	742	84	12	14.29	1.62	-0.02	0.20	0.22	0.89	0.4063	0.7619		0.25	0.67	
AZ	6,909	962	190	19.75	2.75	1.64	3.17	2.57	1.24	0.5616	6.7619	95%	0.52	0.55	
AR	2,988	545	44	8.07	1.47	-0.24	0.73	1.45	0.51	0.2057	0.7500		0.40	0.19	
CA	39,296	3,623	867	23.93	2.21	0.84	14.48	9.67	1.50	0.9411	41.6548	99%	0.83	0.84	95%
CO	5,530	608	79	12.99	1.43	-0.30	1.32	1.62	0.81	0.4952	4.3690		0.28	0.43	
CT	3,588	293	54	18.43	1.51	-0.19	0.90	0.78	1.15	0.5263	3.0119	95%	0.53	0.70	95%
DE	953	119	27	22.69	2.83	1.76	0.45	0.32	1.42	0.6447	2.0952	95%	0.63	1.26	
DC	684	27	8	29.63	1.17	-0.68	0.13	0.07	1.85	0.1541	-0.4405		0.00	0.20	
FL	20,657	3,174	652	20.54	3.16	2.24	10.89	8.47	1.29	0.825	27.6905	99%	0.70	0.60	
GA	10,314	1,554	232	14.93	2.25	0.90	3.88	4.15	0.93	0.594	9.5000	95%	0.70	0.57	
HI	1,429	120	29	24.17	2.03	0.58	0.48	0.32	1.51	0.4402	1.0238		0.59	0.90	95%
ID	1,680	253	17	6.72	1.01	-0.91	0.28	0.68	0.42	0.2535	0.6190		0.03	0.07	
IL	12,836	1,082	148	13.68	1.15	-0.70	2.47	2.89	0.86	0.5986	4.5238	95%	0.14	0.12	
IN	6,634	821	85	10.35	1.28	-0.52	1.42	2.19	0.65	0.8352	5.7143	99%	0.85	0.55	99%
IA	3,131	404	22	5.45	0.70	-1.37	0.37	1.08	0.34	0.0722	0.2857		0.32	0.20	
KS	2,908	429	41	9.56	1.41	-0.33	0.68	1.15	0.60	0.5166	2.4286	95%	0.52	0.43	95%
KY	4,436	834	81	9.71	1.83	0.28	1.35	2.23	0.61	0.6366	4.0119	95%	0.59	0.39	99%
LA	4,686	757	127	16.78	2.71	1.58	2.12	2.02	1.05	0.3085	3.5833		0.59	0.52	
ME	1,330	161	17	10.56	1.28	-0.52	0.28	0.43	0.66	0.3526	0.9048		0.43	0.46	
MD	6,025	505	104	20.59	1.73	0.14	1.74	1.35	1.29	0.2003	-1.0357		0.08	0.15	
MA	6,824	389	80	20.57	1.17	-0.68	1.34	1.04	1.29	0.5828	3.6905	95%	0.45	0.68	95%
MI	9,933	1,064	162	15.23	1.63	0.00	2.71	2.84	0.95	0.8964	6.5000	99%	0.75	0.52	95%
MN	5,525	392	58	14.80	1.05	-0.86	0.97	1.05	0.93	0.0176	0.6429		0.20	0.44	
MS	2,985	690	58	8.41	1.94	0.45	0.97	1.84	0.53	0.2139	1.0476		0.69	0.26	
MO	6,091	945	96	10.16	1.58	-0.08	1.60	2.52	0.64	0.5104	4.7619	95%	0.58	0.43	95%
MT	1,039	190	11	5.79	1.06	-0.84	0.18	0.51	0.36	0.0003	0.0357		0.04	0.13	
NE	1,908	218	12	5.50	0.63	-1.47	0.20	0.58	0.34	0.3262	0.9405		0.51	0.40	
NV	2,939	328	80	24.39	2.72	1.60	1.34	0.88	1.53	0.9381	6.5476	99%	0.71	1.20	95%
NH	1,335	136	17	12.50	1.27	-0.53	0.28	0.36	0.78	0.4322	0.9881		0.23	0.42	
NJ	8,978	601	162	26.96	1.80	0.25	2.71	1.60	1.69	0.2141	2.7857		0.51	0.76	
NM	2,085	402	73	18.16	3.50	2.74	1.22	1.07	1.14	0.6529	5.2262	95%	0.70	1.03	99%
NY	19,836	1,025	304	29.66	1.53	-0.15	5.08	2.74	1.86	0.0012	-0.2857		0.65	0.65	
NC	10,157	1,450	200	13.79	1.97	0.49	3.34	3.87	0.86	0.5065	5.3571	95%	0.56	0.37	
ND	756	113	7	6.19	0.93	-1.04	0.12	0.30	0.39	0.0269	0.1786		0.01	0.07	
OH	11,623	1,132	134	11.84	1.15	-0.70	2.24	3.02	0.74	0.3836	4.5119		0.48	0.28	
OK	3,921	683	87	12.74	2.22	0.86	1.45	1.82	0.80	0.5696	5.2262	95%	0.39	0.50	95%
OR	4,086	495	72	14.55	1.76	0.19	1.20	1.32	0.91	0.7152	4.1667	99%	0.36	0.53	
PA	12,787	1,188	169	14.23	1.32	-0.46	2.82	3.17	0.89	0.5895	3.5833	95%	0.89	0.47	99%
RI	1,058	51	14	27.45	1.32	-0.45	0.23	0.14	1.72	0.0056	-0.1190		0.15	0.75	
SC	4,960	1,015	144	14.19	2.90	1.86	2.41	2.71	0.89	0.6313	6.0595	95%	0.62	0.43	

			Pedestrian fatalities				Percentage share of US total			Pedestrian deaths (2009-2016)			Pedestrian deaths as % of all motor vehicle crash deaths (2009-2016)		
State Abbr.	Pop (1,000)	Total motor vehicle crash deaths	Deaths	% of all crash deaths	Per 100K persons	Per 100K persons (Standard score)	Pedestrian deaths	Total crash deaths	Locational Quotient	R^2	Rate of change (per year)	Sign. Level	R2	Rate of change (per year)	Sign. Level
SD	862	116	6	5.17	0.70	-1.37	0.10	0.31	0.32	0.0186	0.1429		0.01	-0.06	
TN	6,649	1,041	97	9.32	1.46	-0.26	1.62	2.78	0.58	0.4931	3.5476		0.69	0.45	
TX	27,905	3,776	672	17.80	2.41	1.14	11.22	10.08	1.11	0.8855	40.6429	99%	0.74	0.56	99%
UT	3,044	281	35	12.46	1.15	-0.71	0.58	0.75	0.78	0.607	2.5357	95%	0.44	0.50	95%
VT	623	62	4	6.45	0.64	-1.45	0.07	0.17	0.40	0.0002	-0.0119		0.26	0.55	
VA	8,414	760	122	16.05	1.45	-0.27	2.04	2.03	1.00	0.4081	4.5119		0.57	0.56	
WA	7,281	537	84	15.64	1.15	-0.70	1.40	1.43	0.98	0.5013	3.5833	95%	0.54	0.52	
WV	1,829	269	24	8.92	1.31	-0.47	0.40	0.72	0.56	0.0536	0.5357		0.47	0.43	
WI	5,773	607	51	8.40	0.88	-1.10	0.85	1.62	0.53	0.0725	0.8571		0.07	0.10	
WY	585	112	5	4.46	0.85	-1.14	0.08	0.30	0.28	0.2874	0.3095		0.27	0.24	
US	**323,406**	**37,461**	**5,987**	**15.98**	**1.85**	**NA**	**100.00**	**100.00**	**1.00**	**0.9129**	**243.2262**	**99%**	**0.99**	**0.52**	**99%**

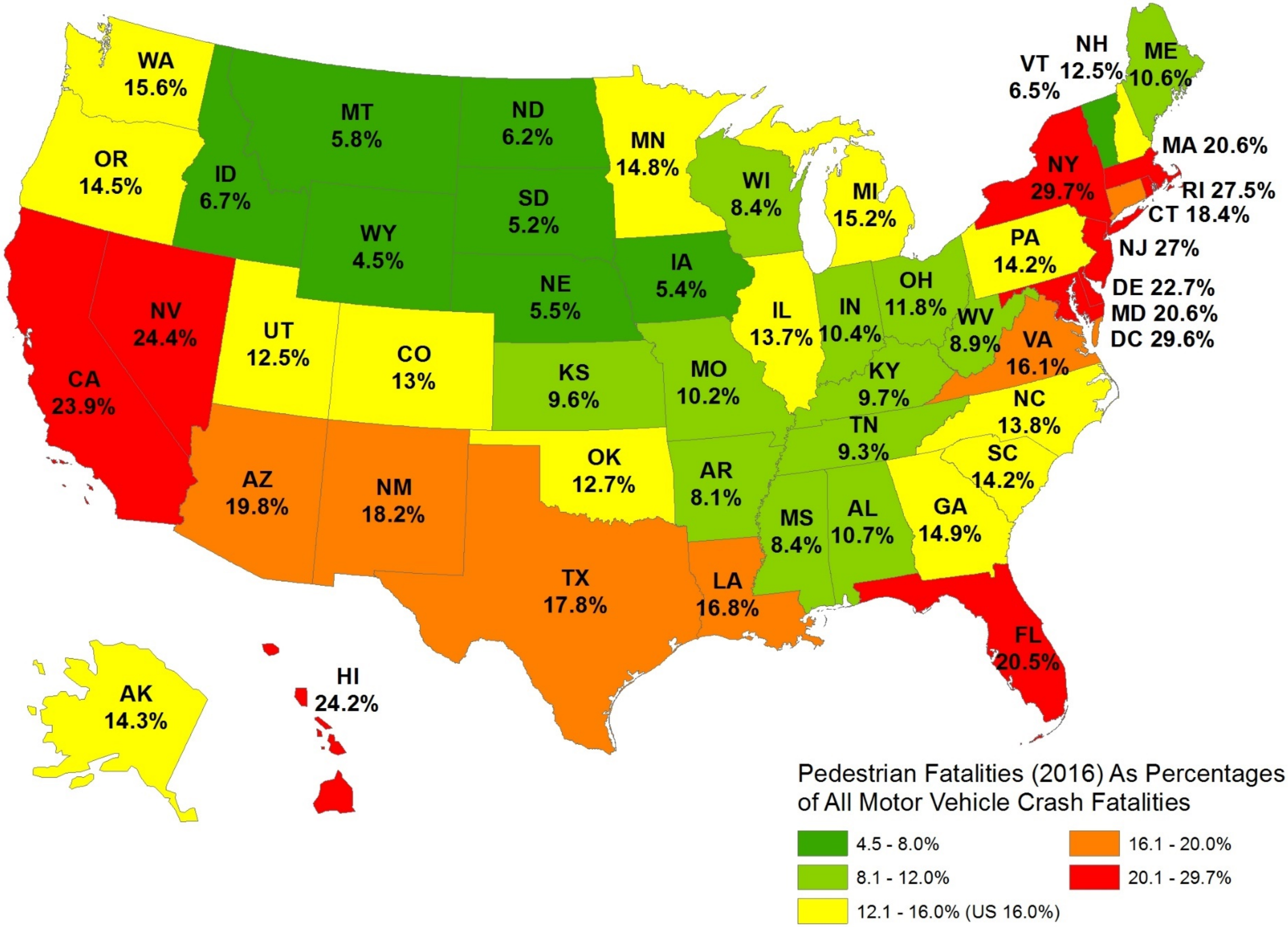

Figure 9: Map of pedestrian fatalities as percentages of all motor vehicle crash fatalities by state in 2016

4.9. Pedestrian fatalities and fatality rates by large cities (population >=500,000)

- As discussed earlier, 76% of pedestrian fatalities in 2016 occurred on urban roads. Table 19 shows pedestrian fatalities of the 34 largest US cities (with populations above 500,000) in 2016. Note that these are the same 34 largest US cities included in the NHTSA Pedestrian Traffic Safety Facts for 2016.
- Almost 60% of all motor vehicle crash deaths in New York City were pedestrians in 2016. San Francisco had the second highest at 50%. For these 34 cities, the average was 34%; US average was 16%.
- While New York City had a very high percentage of its motor vehicle crash deaths composing of pedestrian fatalities, its per population rate of 1.60 deaths per 100,000 population was actually lower than the average of 2.72 for the 34 largest cities and 1.85 for the US.
- In terms of per population fatality pedestrian rates, Phoenix, AZ, and Albuquerque, NM, had the highest rates at 5.57 and 5.54 per 100,000 population in 2016.
- Table 19 also illustrates trends over the period 2009-2016. Phoenix had the highest per year increase of pedestrian deaths at 6.7 per year, and the pedestrian deaths as percentage of motor vehicle crash deaths increased by 1.9% per year over the period; both trends were statistically significant, at the 99% and 95% confidence levels.

Table 19: Pedestrian fatalities and fatality rates by 34 largest cities (2016) and trend analysis results (2009-2016)

			Pedestrian fatalities				Percentage share of US total			Pedestrian deaths (2009-2016)			Pedestrian deaths as % of all motor vehicle crash deaths (2009-2016)		
State Abbr.	Pop (1,000)	Total motor vehicle crash deaths	Deaths	% of all crash deaths	Per 100K persons	Per 100K persons (Standard score)	Pedestrian deaths	Total crash deaths	Locational Quotient	R^2	Rate of change (per year)	Sign. Level	R^2	Rate of change (per year)	Sign. Level
New York City	8,538	230	137	59.57	1.60	-1.07	11.77	6.74	1.75	0.15	-2.82		0.00	0.13	
Los Angeles	3,976	315	130	41.27	3.27	0.34	11.17	9.23	1.21	0.38	3.95		0.06	0.37	
Chicago	2,705	123	41	33.33	1.52	-1.14	3.52	3.60	0.98	0.16	1.14		0.42	1.63	
Houston	2,303	248	79	31.85	3.43	0.48	6.79	7.27	0.93	0.78	4.98	99%	0.87	1.79	99%
Phoenix	1,615	225	90	40.00	5.57	2.29	7.73	6.59	1.17	0.73	6.68	99%	0.63	1.89	95%
Philadelphia	1,568	101	43	42.57	2.74	-0.10	3.69	2.96	1.25	0.25	1.11		0.16	0.88	
San Antonio	1,493	194	64	32.99	4.29	1.21	5.50	5.68	0.97	0.80	4.37	99%	0.52	1.27	95%
San Diego	1,407	96	42	43.75	2.99	0.10	3.61	2.81	1.28	0.76	2.62	99%	0.48	1.63	
Dallas	1,318	190	57	30.00	4.32	1.24	4.90	5.57	0.88	0.87	4.83	99%	0.48	1.10	
San Jose	1,025	60	21	35.00	2.05	-0.69	1.80	1.76	1.03	0.54	1.79	95%	0.06	1.06	
Austin	948	86	30	34.88	3.16	0.25	2.58	2.52	1.02	0.41	2.13		0.08	0.89	
Jacksonville	881	149	35	23.49	3.97	0.94	3.01	4.37	0.69	0.72	2.39	99%	0.56	1.01	95%
San Francisco	871	28	14	50.00	1.61	-1.06	1.20	0.82	1.47	0.02	0.20		0.22	1.08	
Columbus	860	53	16	30.19	1.86	-0.85	1.37	1.55	0.89	0.05	0.33		0.12	0.78	
Indianapolis	855	96	20	20.83	2.34	-0.45	1.72	2.81	0.61	0.45	1.81		0.24	1.03	
Fort Worth	854	84	29	34.52	3.40	0.45	2.49	2.46	1.01	0.79	2.36	99%	0.46	2.05	
Charlotte	842	93	22	23.66	2.61	-0.21	1.89	2.72	0.69	0.00	0.11		0.26	-1.88	
Seattle	704	27	6	22.22	0.85	-1.70	0.52	0.79	0.65	0.16	-0.57		0.15	-1.62	
Denver	693	54	19	35.19	2.74	-0.10	1.63	1.58	1.03	0.48	1.07		0.03	0.65	
El Paso	683	67	23	34.33	3.37	0.43	1.98	1.96	1.01	0.12	0.71		0.09	0.98	
Washington	681	27	8	29.63	1.17	-1.43	0.69	0.79	0.87	0.15	-0.44		0.07	-1.09	
Boston	673	27	13	48.15	1.93	-0.79	1.12	0.79	1.41	0.59	1.08	95%	0.24	2.81	
Detroit	673	118	29	24.58	4.31	1.23	2.49	3.46	0.72	0.31	2.01		0.09	0.63	
Nashville	660	65	16	24.62	2.42	-0.37	1.37	1.90	0.72	0.53	0.67	95%	0.44	1.07	
Memphis	653	120	28	23.33	4.29	1.21	2.41	3.52	0.68	0.61	2.26	95%	0.40	1.43	
Portland	640	43	14	32.56	2.19	-0.57	1.20	1.26	0.95	0.17	0.44		0.00	0.15	
Oklahoma City	638	87	28	32.18	4.39	1.29	2.41	2.55	0.94	0.38	1.89		0.35	1.99	
Las Vegas	633	58	13	22.41	2.05	-0.69	1.12	1.70	0.66	0.23	0.58		0.47	-1.09	
Louisville	616	87	17	19.54	2.76	-0.09	1.46	2.55	0.57	0.25	0.94		0.02	0.30	
Baltimore	615	37	14	37.84	2.28	-0.50	1.20	1.08	1.11	0.05	0.32		0.06	0.85	
Milwaukee	595	59	13	22.03	2.18	-0.58	1.12	1.73	0.65	0.35	1.10		0.06	0.62	
Albuquerque	559	94	31	32.98	5.54	2.27	2.66	2.75	0.97	0.64	2.76	95%	0.29	2.21	
Tucson	531	59	16	27.12	3.01	0.13	1.37	1.73	0.80	0.02	0.24		0.02	-0.42	
Fresno	522	13	6	46.15	1.15	-1.45	0.52	0.38	1.35	0.04	-0.40		0.28	2.73	
34 Large Cities	42,828	3,413	1,164	34.10	2.72	NA	100.00	100.00	1.00	0.91	52.64	99%	0.76	0.77	99%
UNITED STATES	323,406	37,461	5,987	15.98	1.85	NA	100.00	100.00	1.00	0.91	243.23	99%	0.99	0.52	99%