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National Highway Traffic Safety Administration

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Geographic Summary of Pedestrian Traffic Fatalities

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Summary

Pedestrian fatalities in crashes increased 53 percent in the last decade (2009 to 2018), with the pedestrians' share of traffic fatalities increasing 42 percent, from 12 to 17 percent. This research note examines the location of pedestrian fatalities. Key results of this analysis show:

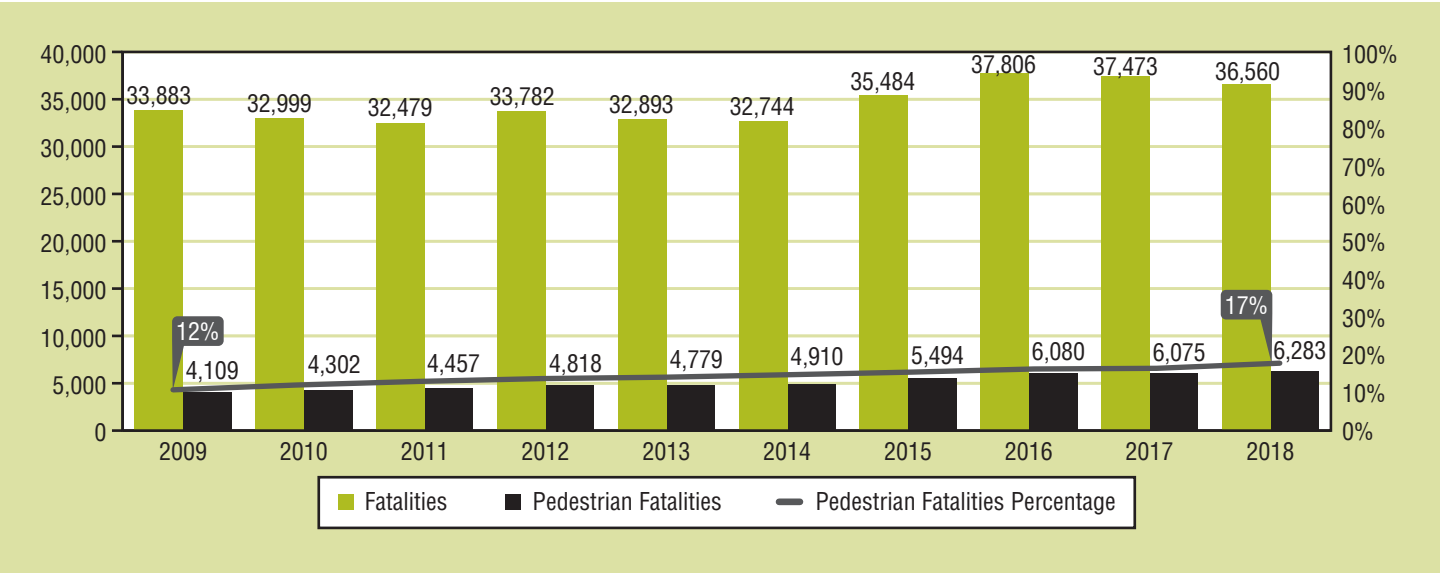
- From 2014 to 2018 the number of counties with pedestrian fatalities increased 13 percent, the number of urban areas with pedestrian fatalities increased 8 percent, and the number of metropolitan statistical areas (MSAs) with pedestrian fatalities increased 6 percent.
- In 2018 about 74 percent of pedestrian fatalities nationwide occurred in urbanized areas (UAs) and 89 percent in metropolitan statistical areas.

Introduction

From 2009 to 2018 fatalities in motor vehicle traffic crashes increased 8 percent overall. The trend of the increase over the last decade is seen in Figure 1. Pedestrian fatalities increased 53 percent during this time. In 2009 pedestrians accounted for 12 percent of all crash fatalities. This increased at varying rates, averaging 4 percent annually from 2009 to 2018, to 17 percent by 2018.

From the upcoming NHTSA report, *Geospatial Summary of Crash Fatalities* (Webb, in press), we know that fatal crashes involving pedestrians occur primarily in and around areas categorized as urban. Specifically, 80 percent occurred in areas classified as urban in 2017 and 96 percent of all pedestrian-involved fatalities are captured by adding only a 7.5-mile buffer around these areas.

Figure 1
Crash Fatalities and Pedestrian Makeup, 2009-2018



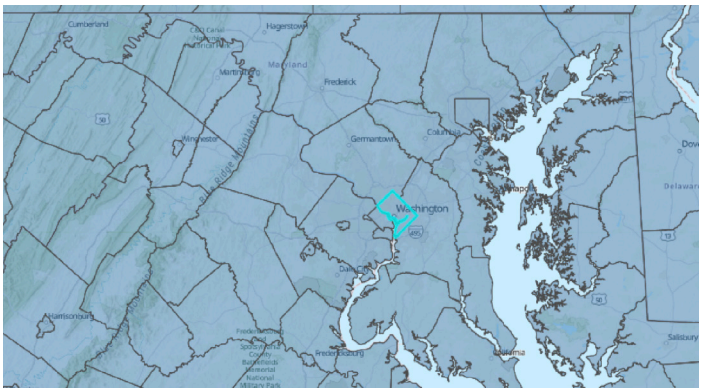
Source: FARS 2009-2017 Final File, 2018 FARS Annual Report File (ARF)

Data and Methods

Counties

There are 3,142 counties and county equivalents in the United States. For example, Washington, DC, and the adjacent Virginia, West Virginia and Maryland counties surrounding it are shown in Figure 2.

Figure 2
Washington, DC, and Other Counties and County Equivalents

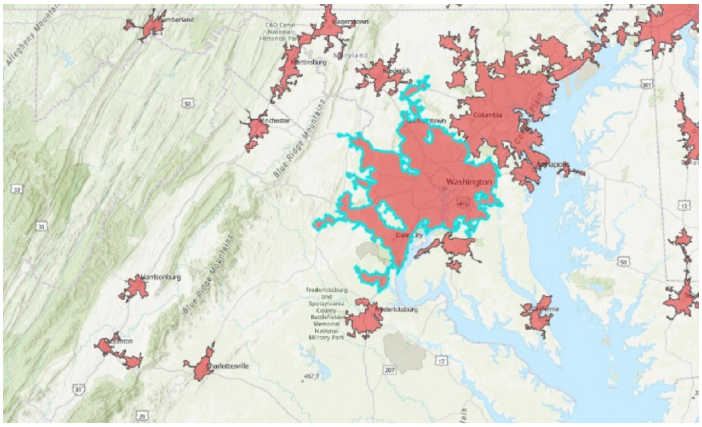


Source: 2018 TIGER/Line Shapefiles: Counties (and equivalent)

Urbanized Areas

The Census Bureau's "urbanized areas," UAs, represent densely populated (50,000 or more people) developed territory and encompass residential, commercial, and other non-residential urban land (Census, 2012). As of 2018, there are 486 UAs in the Nation. Those surrounding the Washington, DC–VA–MD Urbanized Area are shown in Figure 3 as an example.

Figure 3
Washington, DC–VA–MD Urbanized Area and Other Urbanized Areas

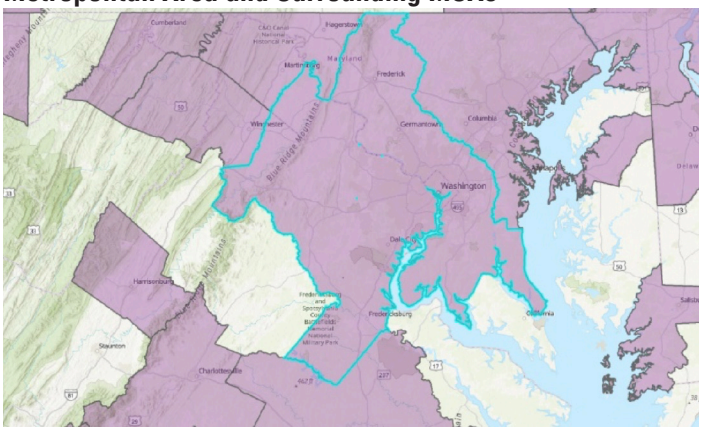


Source: 2018 TIGER/Line Shapefiles: Core Based Statistical Areas

Metropolitan Statistical Areas

A metropolitan statistical area, MSA, is a region with a UA core, made up of the central county or counties or equivalent entities containing the core, plus adjacent counties having high degrees of social and economic integration with the central county or counties as measured through commuting (Census, 2012). Using data from Census Bureau, the Office of Management and Budget defines MSAs by criteria modified most recently in 2010 (Census, 2018). As of 2018, there are 383 MSAs in the United States. The Washington–Arlington–Alexandria, DC–VA–MD–WV Metropolitan Area is shown in Figure 4.

Figure 4
Washington–Arlington–Alexandria, DC–VA–MD–WV Metropolitan Area and Surrounding MSAs



Source: 2018 TIGER/Line Shapefiles: Metropolitan Statistical Areas

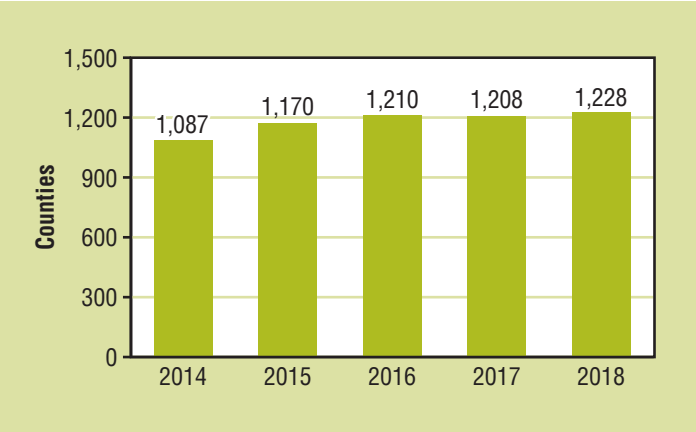
The analysis used NHTSA's Fatality Analysis Reporting System (FARS) data. The 2014-2017 FARS Final files were used along with the 2018 Annual Report File (ARF). When considering fatalities from a county level the county reported on the police crash report (PCR) was used, due to the higher accuracy compared to latitude/longitude reporting. The UA and MSA counts were generated using Esri's ArcGIS software, integrating the 2018 TIGER/Line Core Based Statistical Areas shapefile with the FARS latitude/longitude information. UAs and MSAs are defined decennially. This analysis used the most recently available files (2018) for the entire study period (2014-2018). There were 6,283 pedestrian fatalities in 2018 and 99 percent had usable latitude/longitude data (6,207).

Results

Counties

In 2014 there were 35 percent of counties (1,087) with at least one pedestrian fatality. About 16 percent (516) had one pedestrian fatality, and 18 percent (571) had two or more pedestrian fatalities. By 2018, 39 percent of counties (1,228) had at least one pedestrian fatality. About 17 percent (525) had one pedestrian fatality, and 22 percent (689) had two or more pedestrian fatalities. The number of counties with at least one pedestrian fatality increased 13 percent from 2014 to 2018, seen in Figure 5.

Figure 5
Counties With at Least One Pedestrian Fatality, 2014-2018



Source: FARS 2014-2017 Final File, FARS 2018 ARF

Approximately 10 percent (594) of all pedestrian fatalities can be accounted for in 4 counties: Los Angeles County, California; Maricopa County, Arizona; Miami–Dade County, Florida; and Harris County, Texas. These four counties also contain very large cites: Los Angeles, Phoenix, Miami, and Houston.

Twenty-five counties that had the highest pedestrian fatality counts annually from 2014 to 2018 are listed in Table 1. Some like Los Angeles County, Maricopa, Miami-Dade, and Dallas County had the most pedestrian fatalities all 5 years. Other counties like Prince Georges County, Maryland; Kings County, New York; Duval County, Florida; and Kern County, California, had the highest counts for one or several years, but not all.

Table 1
Counties With 25 Highest Annual Pedestrian Fatalities 2014-2018 by 2018 Counts

County	State	2014	2015	2016	2017	2018
Los Angeles County	California	209	209	278	265	225
Maricopa County	Arizona	91	97	131	138	160
Miami-Dade County	Florida	74	86	83	58	106
Harris County	Texas	90	98	130	109	103
San Diego County	California	77	74	73	74	93
Cook County	Illinois	63	81	73	77	75
Riverside County	California	44	42	62	65	74
Broward County	Florida	57	58	67	64	71
Dallas County	Texas	54	71	84	73	71
San Bernardino County	California	62	60	61	86	66
Clark County	Nevada	50	55	57	71	61
Orange County	California	43	58	67	57	55
Orange County	Florida	41	40	48	62	55
Bexar County	Texas	57	46	68	50	54
Hillsborough County	Florida	32	48	50	50	52
Wayne County	Michigan	52	68	47	38	48
Sacramento County	California	29	29	48	40	47
Tarrant County	Texas	29	39	40	45	46
Philadelphia County	Pennsylvania	38	26	43	37	41
Suffolk County	New York	32	52	40	37	41
Queens County	New York	37	34	29	28	40
Palm Beach County	Florida	34	37	37	41	40
Santa Clara County	California	31	36	34	28	39
Pinellas County	Florida	41	35	41	37	37
Bernalillo County	New Mexico	29	16	32	31	37
Fulton County	Georgia	25	28	41	36	36
Shelby County	Tennessee	22	30	29	37	36
Travis County	Texas	12	39	35	24	36
Kings County	New York	44	46	34	25	34
Duval County	Florida	36	39	37	40	34
Prince Georges County	Maryland	29	20	21	25	26
Nassau County	New York	22	36	27	23	20
Kern County	California	19	31	32	41	20
New York County	New York	24	20	39	17	18

*Highlighted cells were the 25 counties with the most pedestrian fatalities for that year.
Source: FARS 2014-2017 Final File, FARS 2018 ARF

Urbanized Areas

As seen in Table 2, 75 percent of pedestrian fatalities in 2014 occurred in UAs. This percentage remained mostly steady across the 5 years. In 2014, some 75 percent (363) of UAs had at least one fatality; 21 percent (100) had one pedestrian fatality and 54 percent (263) had two or more pedestrian fatalities. By 2018, about 81 percent of urbanized areas (393) had at least one pedestrian fatality; 20 percent (97) had one pedestrian fatality and 61 percent (296) had two or more pedestrian fatalities.

Table 2
Pedestrian Fatalities That Occurred Inside UAs

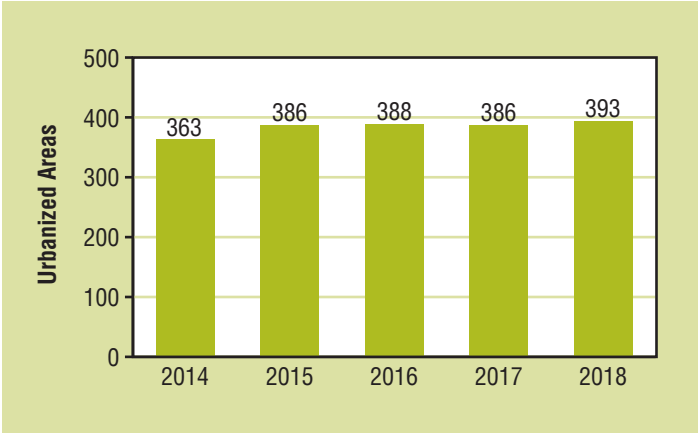
Year	Pedestrian Fatalities In UAs	Percent of All Pedestrian Fatalities
2014	3,658	75%
2015	4,086	75%
2016	4,505	74%
2017	4,532	75%
2018	4,590	74%

Sources: FARS 2014-2017 Final File, FARS 2018 ARF; 2018 TIGER/Line Shapefiles: Core Based Statistical Areas

The number of urbanized areas with at least one pedestrian fatality increased 8 percent from 2014 to 2018, seen in Figure 6. The number of UAs with no pedestrian fatalities decreased 24 percent (123 to 93) from 2014 to 2018. Despite the increase in the number of UAs having pedestrian fatalities, we know from prior NHTSA research that the spatial distribution of pedestrian-involved fatal crashes has remained mostly steady (Webb, in press).

Nine percent (559) of the pedestrian fatalities in 2018 with usable lat-long data can be accounted for considering only two urbanized areas: New York–Newark, NY–NJ–CT and Los Angeles–Long Beach–Anaheim, CA. Urbanized areas with the 25 highest annual pedestrian fatality counts from 2014 to 2018 are listed Table 3. Some like New York–Newark, NY–NJ–CT; Los Angeles–Long Beach–Anaheim, CA; Miami, FL; and San Francisco–Oakland, CA had the most pedestrian fatalities all 5 years. Other urbanized areas like Austin, Texas; Charlotte, NC–SC; New Orleans, Louisiana; and San Jose, California were only in the highest counts for one or several years, but not all.

Figure 6
Urbanized Areas With at Least One Pedestrian Fatality, 2014-2018



Sources: FARS 2014-2017 Final File, FARS 2018 ARF; 2018 TIGER/Line Shapefiles: Core Based Statistical Areas

Table 3
Urbanized Areas With 25 Highest Annual Pedestrian Fatalities 2014-2018 by 2018 Counts

Urbanized Area	2014	2015	2016	2017	2018
New York–Newark, NY–NJ–CT Urbanized Area	289	343	307	275	295
Los Angeles–Long Beach–Anaheim, CA Urbanized Area	243	254	326	308	264
Miami, FL Urbanized Area	158	174	185	158	215
Phoenix–Mesa, AZ Urbanized Area	86	83	118	131	128
Atlanta, GA Urbanized Area	80	103	129	145	127
Dallas–Fort Worth–Arlington, TX Urbanized Area	85	109	123	120	119
Philadelphia, PA–NJ–DE–MD Urbanized Area	104	90	110	111	115
Chicago, IL–IN Urbanized Area	94	117	106	112	113
Houston, TX Urbanized Area	94	106	141	119	107
Tampa–St. Petersburg, FL Urbanized Area	87	91	107	103	103
San Diego, CA Urbanized Area	69	71	72	70	87
Washington, DC–VA–MD Urbanized Area	64	66	62	59	80
Detroit, MI Urbanized Area	81	92	84	71	66
Baltimore, MD Urbanized Area	41	40	56	45	61
Las Vegas–Henderson, NV Urbanized Area	47	53	55	68	60
Riverside–San Bernardino, CA Urbanized Area	46	52	39	68	59
Orlando, FL Urbanized Area	42	45	52	68	59
San Antonio, TX Urbanized Area	56	51	64	52	52
Boston, MA–NH–RI Urbanized Area	42	41	52	40	48
San Francisco–Oakland, CA Urbanized Area	54	64	58	62	46
Denver–Aurora, CO Urbanized Area	38	31	42	45	46
Seattle, WA Urbanized Area	34	43	43	45	46
Sacramento, CA Urbanized Area	28	36	49	41	46
Memphis, TN–MS–AR Urbanized Area	23	32	34	40	43
Portland, OR–WA Urbanized Area	28	29	35	40	41
St. Louis, MO–IL Urbanized Area	24	46	44	36	38
Austin, TX Urbanized Area	13	36	38	27	38
San Jose, CA Urbanized Area	29	33	31	27	35
Jacksonville, FL Urbanized Area	38	41	39	40	34
New Orleans, LA Urbanized Area	29	18	21	22	26

*Highlighted cells were the 25 counties with the most pedestrian fatalities for that year.
Source: FARS 2014-2017 Final File, FARS 2018 ARF

Metropolitan Statistical Areas

Seen in Table 4, some 89 percent of pedestrian fatalities in 2014 occurred inside MSAs. This percentage remained steady across the 5 years. 89 percent (335) of MSAs had at least one pedestrian fatality in 2014; about 15 percent (57) had one pedestrian fatality and 73 percent (278) had two or more pedestrian fatalities. By 2018 more than 92 percent (354) of MSAs had at least one pedestrian fatality; 14 percent (52) had one pedestrian fatality and 79 percent (302) had two more pedestrian fatalities. Seen in Figure 7, MSAs with at least one pedestrian fatality increased 6 percent from 2014 to 2018. The number of MSAs with no pedestrian fatalities decreased 40 percent in the same period (48 to 29).

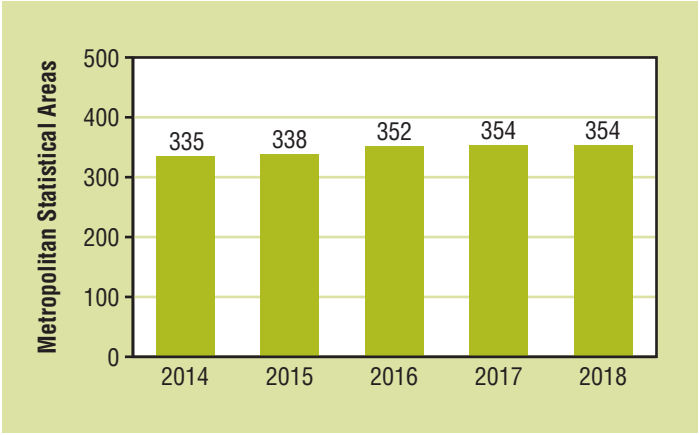
Table 4
Pedestrian Fatalities That Occurred Inside MSAs

Year	Pedestrian Fatalities In MSAs	Percent of All Pedestrian Fatalities
2014	4,325	89%
2015	4,822	88%
2016	5,392	89%
2017	5,391	89%
2018	5,496	89%

Sources: FARS 2014-2017 Final File, FARS 2018 ARF; 2018 TIGER/Line Shapefiles: Metropolitan Statistical Areas

In 2018 approximately 9 percent (586) of pedestrian fatalities with known lat-long information were accounted for considering only 2 MSAs: New York–Newark–Jersey City, NY–NJ–PA and Los Angeles–Long Beach–Anaheim, CA.

Figure 7
MSAs With at Least One Pedestrian Fatality, 2014-2018

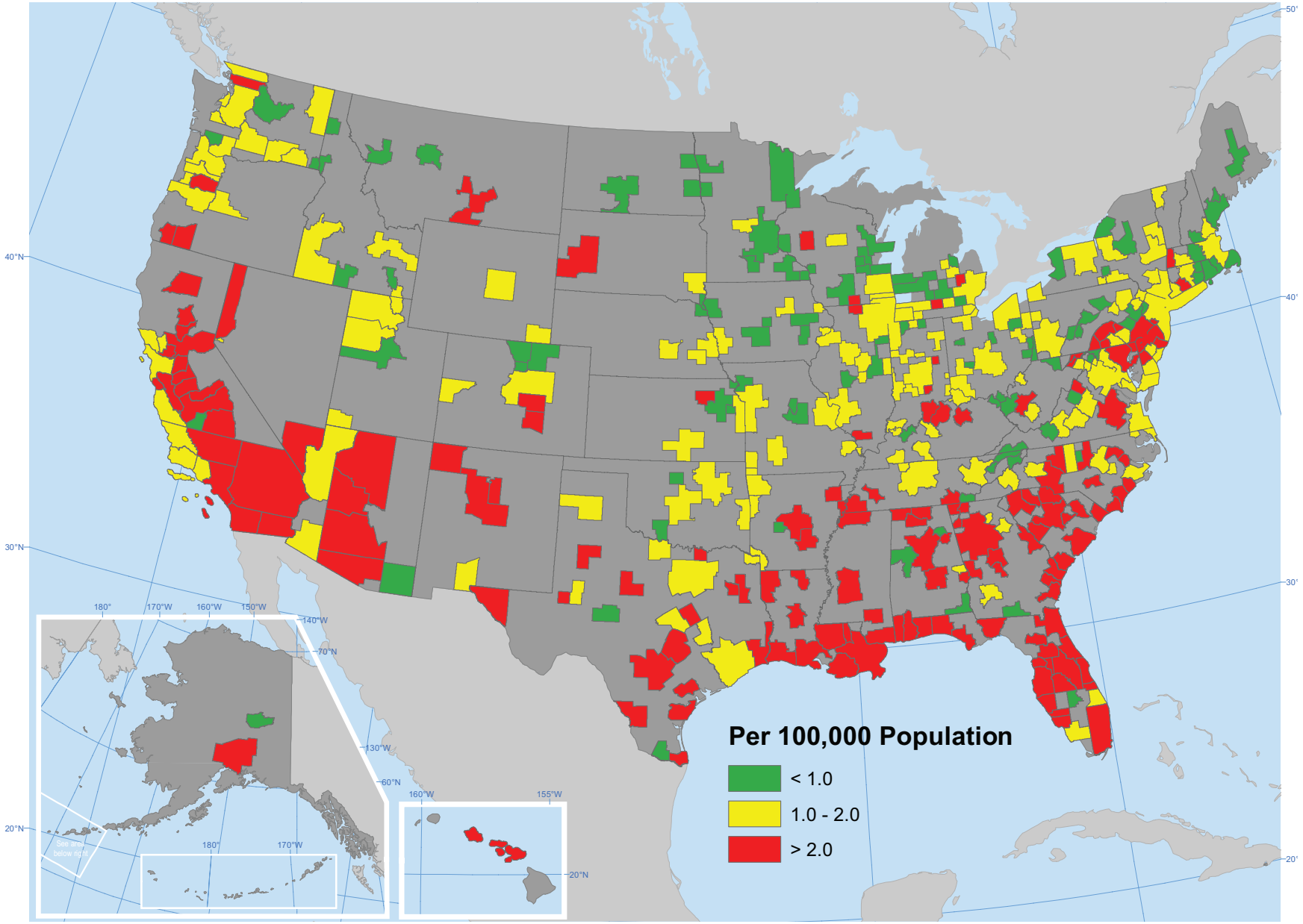


Sources: FARS 2014-2017 Final File, FARS 2018 ARF; 2018 TIGER/Line Shapefiles: Metropolitan Statistical Areas

Twenty-five MSAs with the highest annual pedestrian fatality counts from 2014 to 2018 are listed in Table 5. Some, like Los Angeles–Long Beach–Anaheim, CA; New York–Newark–Jersey City, NY–NJ–PA; Miami–Fort Lauderdale–West Palm Beach, FL; and Houston–The Woodlands–Sugar Land, TX, had the most pedestrian fatalities all 5 years. Other MSAs like Austin–Round Rock, TX; Portland–Vancouver–Hillsboro, OR–WA; and Memphis, TN–MS–AR were only in the highest counts for one or several years, but not all.

Monroe, Louisiana, had the highest pedestrian fatality rate per 100k population in 2018 (6.8), seen in Figure 8. Of the 354 MSAs with pedestrian fataities in 2018 the average rate per 100k population was 2.0 and the median rate was 1.8. Memphis, TN–MS–AR had the highest pedestrian fatality rate of the MSAs with the most pedestrian fatalities at 4.0 per 100k population, seen in Table 5.

Figure 8
Metropolitan Statistical Area Pedestrian Fatality Rate, 2018



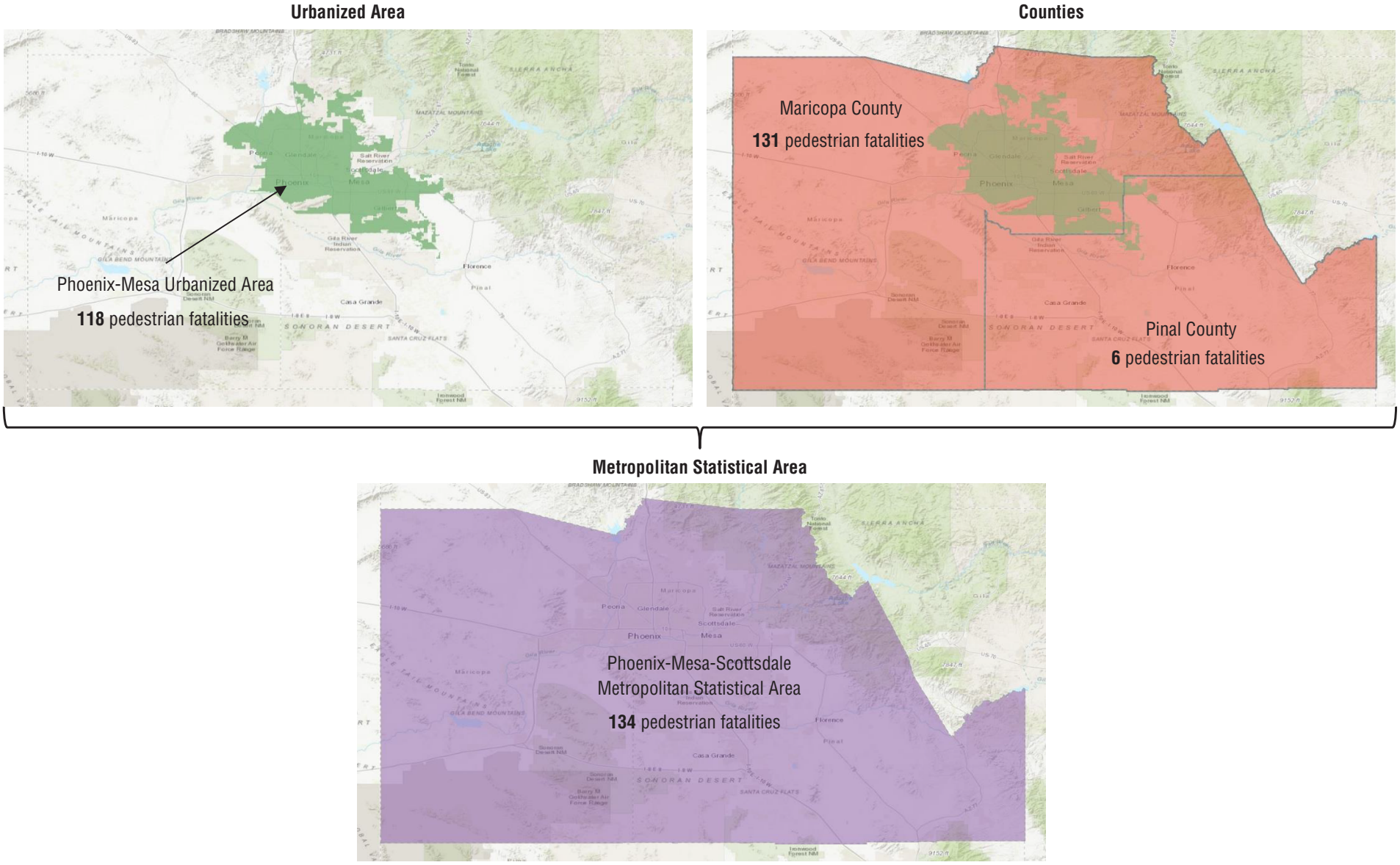
Sources: FARS 2018 ARF; 2018 TIGER/Line Shapefiles: Metropolitan Statistical Areas; 2018 Census Annual Estimates of Population

Table 5
Metropolitan Statistical Areas With 25 Highest Annual Pedestrian Fatalities 2014-2018 and 2018 Pedestrian Fatality Rate

Metropolitan Statistical Area	Pedestrian Fatalities					Fatality Rate per 100k Population
	2014	2015	2016	2017	2018	2018
New York–Newark–Jersey City, NY–NJ–PA	304	359	326	283	306	1.53
Los Angeles–Long Beach–Anaheim, CA	253	267	345	321	280	2.11
Miami–Fort Lauderdale–West Palm Beach, FL	165	181	187	163	217	3.50
Atlanta–Sandy Springs–Roswell, GA	91	115	142	159	148	2.49
Dallas–Fort Worth–Arlington, TX	95	132	150	149	146	1.94
Riverside–San Bernardino–Ontario, CA	105	102	123	151	139	3.01
Phoenix–Mesa–Scottsdale, AZ	90	96	134	145	136	2.80
Houston–The Woodlands–Sugar Land, TX	106	137	177	144	133	1.90
Chicago–Naperville–Elgin, IL–IN–WI	96	124	119	124	129	1.36
Philadelphia–Camden–Wilmington, PA–NJ–DE–MD	117	100	122	119	126	2.07
Tampa–St. Petersburg–Clearwater, FL	100	101	111	112	112	3.56
Washington–Arlington–Alexandria, DC–VA–MD–WV	79	71	75	81	95	1.52
San Diego–Carlsbad, CA	77	74	73	73	94	2.81
Orlando–Kissimmee–Sanford, FL	64	75	82	94	82	3.19
Detroit–Warren–Dearborn, MI	86	100	91	78	75	1.73
Baltimore–Columbia–Towson, MD	46	47	61	51	66	2.35
San Antonio–New Braunfels, TX	71	55	76	65	62	2.46
Las Vegas–Henderson–Paradise, NV	50	55	57	71	61	2.73
Charlotte–Concord–Gastonia, NC–SC	31	35	41	57	56	2.18
San Francisco–Oakland–Hayward, CA	63	81	77	83	55	1.16
Sacramento–Roseville–Arden–Arcade, CA	36	43	64	49	54	2.30
Memphis, TN–MS–AR	33	34	38	47	54	4.00
Seattle–Tacoma–Bellevue, WA	37	50	45	50	52	1.32
Boston–Cambridge–Newton, MA–NH	44	44	57	40	51	1.05
Jacksonville, FL	55	54	52	56	50	3.26
Denver–Aurora–Lakewood, CO	41	37	49	46	49	1.67
Austin–Round Rock, TX	16	49	49	36	48	2.21
Portland–Vancouver–Hillsboro, OR–WA	32	31	39	46	46	1.86
St. Louis, MO–IL	29	60	52	41	44	1.57

*Highlighted cells were the top 25 MSAs with the most pedestrian fatalities for that year.
Sources: FARS 2014-2017 Final File, 2018 ARF; 2018 Census TIGER/Line Shapefiles: Metropolitan Statistical Areas; 2018 Census Annual Estimates of Population

Figure 9
Phoenix–Mesa UA, Maricopa and Pinal Counties in Relation to Phoenix–Mesa–Scottsdale MSA



Sources: 2018 Census/TIGER Line Shapefiles: Core Based Statistical Areas, Metropolitan Statistical Areas, Counties (and equivalent); FARS 2016

Discussion

As discussed in the Data and Methods section, an MSA is a region with a UA core, comprised of the core's central county or counties or equivalent entities, plus adjacent counties. For example, the Phoenix–Mesa–Scottsdale MSA is made up of Maricopa and Pinal counties, with the Phoenix–Mesa UA core, as shown in Figure 9.

Figure 9 shows the UA core of Phoenix–Mesa, in green. In Table 4 we saw 118 pedestrian fatalities here in 2016. In Table 1, we saw 131 pedestrian fatalities in Maricopa County in 2016. Maricopa County is shown as the northwestern county in red. Pinal County, shown as the southeastern county in red, had 6 pedestrian fatalities in 2016, as reported on PCRs. In Table 6 we saw 134 pedestrian fatalities in the Phoenix–Mesa–Scottsdale MSA. The counties do not sum to the MSA total in this case due to erroneous latitude/longitude reporting for crashes. For example, a crash was reported in Maricopa County but the coordinates are in Pima County, outside the MSA. There were 2 pedestrian fatalities in Maricopa County without valid latitude/longitude data and thus were omitted from geo-location-based analysis.

References

Census Bureau. (2012, September). 2010 Geographic terms and concepts – core based statistical areas and related statistical areas. Retrieved from www.census.gov/geo/reference/gtv/gtv_cbsa.html

Census Bureau. (2018, January 17). Metropolitan and micropolitan. Retrieved from www.census.gov/programs-surveys/metro-micro/about.html

Census Bureau. (2012, September). 2010 Census urban area FAQs. Retrieved from www.census.gov/geo/reference/ua/uafaq.html

Webb, C. (in press). Geospatial summary of crash fatalities. (Report No. DOT HS 812 607). Washington, DC: National Highway Traffic Safety Administration.

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This Research Note was written by Caitlin N. Webb, mathematical statistician in the Mathematical Analysis Division, National Center for Statistics and Analysis, NHTSA. For questions regarding the information presented in this report, please contact NCSARequests@dot.gov. Access this Crash•Stats and other general information on traffic safety at https://crashstats.nhtsa.dot.gov/.

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