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SAFETY FINDINGS

Examining a Lost Decade for Traffic Safety in Large US Cities

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Findings

US traffic deaths increased during the 2010s, making it a global outlier. Comparing 2008-2012 with 2018-2022, traffic fatality rates increased most in the largest 100 US cities. Among these large cities, disparities between the safest and most dangerous cities increased over time. Low-income neighborhoods, pedestrians and bicyclists, 6:00-11:59 pm, and arterial and collector roadways were overrepresented factors in large city fatality rate increases. Cities that established Vision Zero policies had better safety outcomes than those without, but their fatality rates were not significantly lower when controlling for the advantages of higher density and higher income.

1. QUESTIONS

Traffic deaths increased in the US during the 2010s while continuing to decrease in most other high-income countries (International Transport Forum 2022; Badger and Parlapiano 2022). US traffic fatality rates increased the most in large cities (defined here as the 100 most populous US cities in 2020), hindering progress toward a vision of zero deaths in the US transportation system (USDOT 2022; Shahum 2016). Comparing 2008-2012 with 2018-2022, the annual traffic fatality rate per 100,000 people increased by more than 33% across the 100 largest US cities (from 6.97 to 9.28) but less than 5% in all other parts of the country (from 12.03 to 12.59) (NHTSA 2025). Fatality Analysis and Reporting System (FARS) data show similar results when 2020 is excluded. The trend started prior to the COVID-19 pandemic and continued into the 2020s.

We ask the following questions: How did large-city fatality rates change by neighborhood income level, transportation mode, hour of week, and roadway classification between 2008-2012 and 2018-2022? What city-level characteristics were associated with large city fatality rates in 2008-2012 and 2018-2022?

2. METHODS

We downloaded all 544,908 US traffic fatalities reported during 2008-2022 from the FARS database and identified fatalities in each of the 100 largest cities from FARS city codes (NHTSA 2025). FARS included information about time of crash, roadway classification, and travel mode of persons killed. We calculated five-year fatality averages to compare 2008-2012 with

2018-2022, and we normalized city fatality counts by US Census population in 2010 and 2020 to represent the exposure of the entire community to traffic fatalities during each study period (Appendix A).

We gathered 2008-2012 and 2018-2022 median household income, household vehicle ownership, and median age of housing from the American Community Survey (ACS) for states, the 100 largest cities, and all census tracts within the 100 largest cities (Manson et al. 2023). We calculated population densities in 2010 and 2020 using 2020 city boundaries. We calculated city and census tract median incomes as a proportion of their state's median household income to control regional differences in income by state. We defined low-income areas as having less than 50% and high-income areas as having more than 150% of their state's median household income. Like several previous studies, we tested ACS workers commuting by automobile, public transit, and walking as proxy measures of exposure at the city level (Merlin et al. 2020).

To broadly represent city safety policy, we noted cities that made Vision Zero commitments. Ferenchak (2023) previously identified 18 cities that established Vision Zero commitments between 2012 and 2016. Of these, 17 were among the 100 largest cities, and we coded them as "early adoption" Vision Zero cities.

Finally, we estimated a multilevel linear model to identify significant associations ($p < 0.05$) between city-level variables and traffic fatality rates in 2008-2012 and 2018-2022.

3. FINDINGS

The 100 largest US cities had a wide range of fatality rates, with the top 10 cities having fewer than 4.5 and bottom 10 cities having more than 16 fatalities per 100,000 people during 2018-2022 (Table 1). Traffic safety gaps widened during the 2010s as most of the safest cities experienced decreasing traffic fatality rates while the most dangerous cities experienced increasing fatality rates.

Within the 100 largest cities, several characteristics shifted between 2008-2012 and 2018-2022 (Figure 1). Low-income tracts in the 100 largest cities had higher fatality rates than high-income tracts, and this gap grew between 2008-2012 and 2018-2022. Low-income-tract fatality rates increased by 48% (from 12.2 to 18.1 fatalities per 100,000 people), while high-income-tract fatality rates increased by 10% (from 6.5 to 7.1 fatalities per 100,000 people).

Automobile occupants made up the largest share of people killed in traffic crashes in the 100 largest cities (68% in 2008-2012 and 63% in 2018-2022), followed by pedestrians (27% in 2008-2012 and 32% in 2018-2022). However,

Table 1. Top 10 and Bottom 10 Large Cities by Traffic Fatalities per 100,000 People, 2018-2022

Rank	Top 100 US City	Population 2010	Population 2020	5-Year Fatalities 2008-2012	5-Year Fatalities 2018-2022	Annual Fatalities per 100K 2008-2012	Annual Fatalities per 100K 2018-2022	% change in fatalities per 100K 08-12 to 18-22	Established Vision Zero 2012-2016
1	Henderson, NV	257729	317610	55	40	4.27	2.52	-41.0%	No
2	New York, NY	8175133	8804190	1377	1134	3.37	2.58	-23.5%	Yes
3	Santa Clarita, CA	176320	228673	42	34	4.76	2.97	-37.6%	No
4	Boston, MA	617594	675647	107	106	3.47	3.14	-9.4%	Yes
5	Jersey City, NJ	247597	292449	48	48	3.88	3.28	-15.3%	No
6	Irvine, CA	212375	307670	38	54	3.58	3.51	-1.9%	No
7	Boise, ID	205671	235684	34	42	3.31	3.56	7.8%	No
8	San Francisco, CA	805235	873965	165	174	4.10	3.98	-2.8%	Yes
9	Gilbert, AZ	208453	267918	35	54	3.36	4.03	20.0%	No
10	Seattle, WA	608660	737015	126	158	4.14	4.29	3.6%	Yes
91	Kansas City, MO	459787	508090	322	418	14.01	16.45	17.5%	No
92	Jacksonville, FL	821784	949611	526	792	12.80	16.68	30.3%	No
93	Tampa, FL	335709	384959	204	322	12.15	16.73	37.6%	No
94	Atlanta, GA	420003	498715	235	431	11.19	17.28	54.5%	No
95	Albuquerque, NM	545852	564559	221	525	8.10	18.60	129.7%	No
96	Tucson, AZ	520116	542629	270	544	10.38	20.05	93.1%	No
97	Detroit, MI	713777	639111	482	684	13.51	21.40	58.5%	No
98	St. Louis, MO	319294	301578	211	342	13.22	22.68	71.6%	No
99	Baton Rouge, LA	229493	227470	155	287	13.51	25.23	86.8%	No
100	Memphis, TN	646889	633104	422	937	13.05	29.60	126.9%	No
	All Top 100 US Cities	**59787162**	**65003996**	**20842**	**30164**	**6.97**	**9.28**	**33.1%**	**17 of 100 cities**
	Outside Top 100 Cities	*248958376*	*266445285*	*149724*	*167777*	*12.03*	*12.59*	*4.7%*	
	US Total	*308745538*	*331449281*	*170566*	*197941*	*11.05*	*11.94*	*8.1%*	

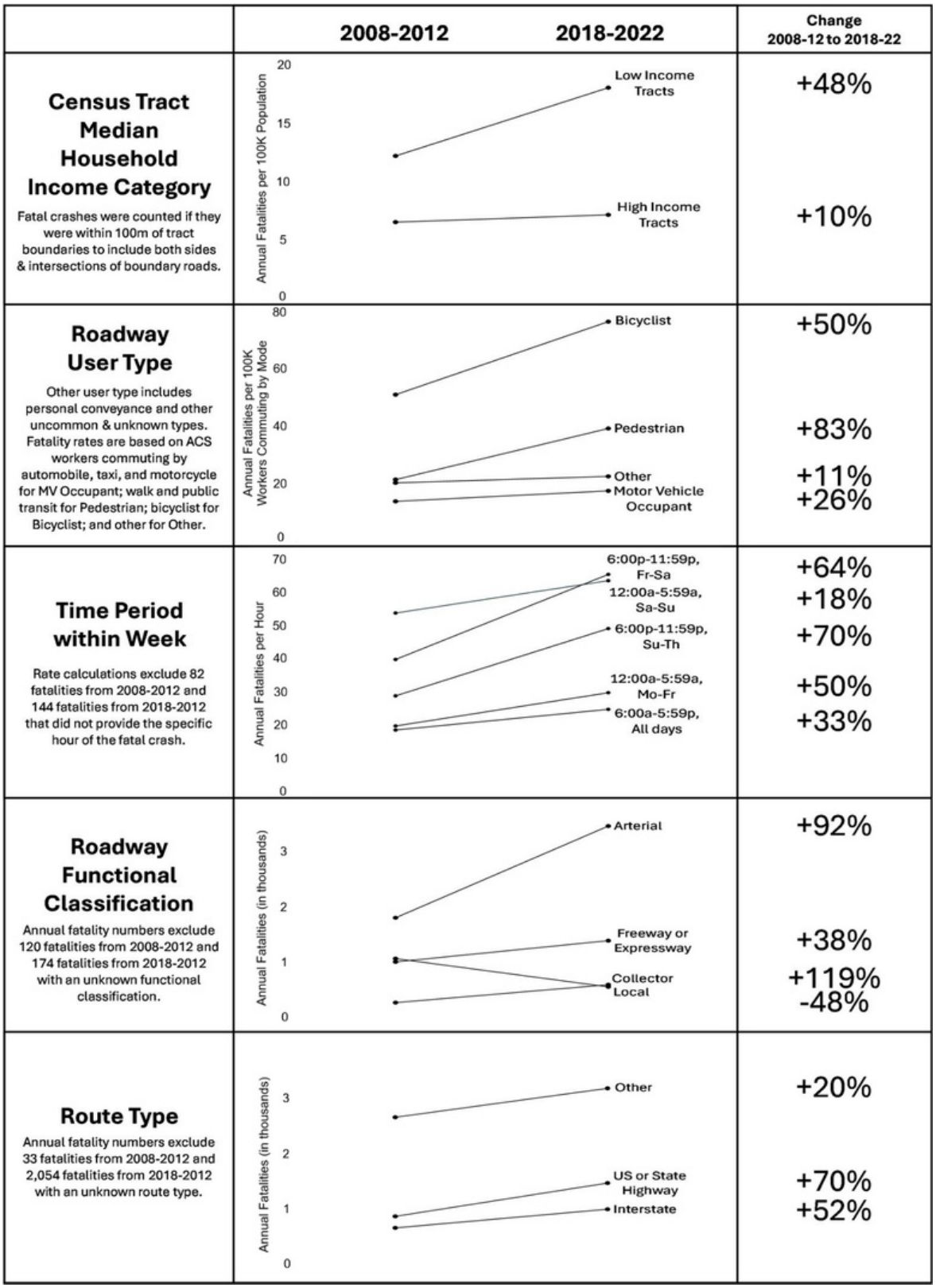

Figure 1. Change in Traffic Fatality Characteristics within 100 Largest Cities, 2008-2012 to 2018-2022

fatality rates increased more steeply for pedestrians (+83% fatalities per walk or transit commuter) and bicyclists (+50% fatalities per bicycle commuter) than for other roadway users.

Table 2. Multilevel Linear Models of Traffic Fatality Rates in the 100 Largest US Cities[1]

	Model 1			Model 2		
	Estimate	Sig.	95% Conf. Interval	Estimate	Sig.	95% Conf. Interval
Fixed Effects						
Intercept	14.952	**	(12.092 to 17.812)	14.204	**	(11.237 to 17.171)
Millions of automobile commuters	3.270	^	(-0.067 to 6.608)	3.622	*	(0.288 to 6.956)
Thousands of people per square km	-1.125	**	(-1.545 to -0.706)	-1.061	**	(-1.483 to -0.638)
Ratio of City/State median household income	-6.804	**	(-9.530 to -4.079)	-6.203	**	(-8.996 to -3.411)
Period = 2018-2022 (1 = yes; 0 = no)	3.030	**	(2.472 to 3.588)	na	na	na
Period = 2018-2022, early VZ adoption (1 = yes, 0 = no)	na	na	Na	1.989	**	(0.664 to 3.314)
Period = 2018-2022, no early VZ adoption (1 = yes, 0 = no)	na	na	Na	3.209	**	(2.617 to 3.801)
Covariance						
Residual	3.838	**	(2.909 to 5.064)	3.790	**	(2.873 to 5.001)
Variance of city-level intercept	8.603	**	(6.096 to 12.143)	8.455	**	(5.988 to 11.938)
Model						
-2 Log Likelihood	1007			1004		
Akaike's Information Criterion (AIC)	1021			1020		
Schwarz's Bayesian Criterion (BIC)	1044			1046		

1) Dependent variable is annual traffic fatalities per 100,000 people.

2) Statistical significance: ** indicates significant with $p < 0.01$; * indicates significant with $p < 0.05$; ^ indicates non-significant with $p < 0.10$.

More fatalities in the 100 largest cities occurred between 6:00 pm and 5:59 am than between 6:00 am and 5:59 pm. Comparing 2008-2012 with 2018-2022, the largest increases in fatalities per hour occurred between 6:00 pm and 11:59 pm on Sundays through Thursdays (+70%) and between 6:00 pm and 11:59 pm on Fridays and Saturdays (+64%).

More large city fatalities occurred on arterial roadways than any other roadway type, and the largest fatality increases between 2008-2012 and 2018-2022 were on arterial roadways (+92%) and collector roadways (+119%). Interstates and other US- and state-numbered highways experienced above-average increases in fatalities between the study periods.

Fatality rates in the 100 largest US cities were positively associated with the later study period and total automobile commuters but negatively associated with population density and income (Table 2, Model 1). Cities with higher population densities tend to have shorter trip lengths that are more convenient at slower speeds. They also tend to have higher public transit, walking, and bicycling mode shares, which result in less automobile traffic per person and support safer systems (Ewing and Dumbaugh 2009; Ferenchak 2023; Karaye et al. 2023; Chitturi and Dulce 2023).

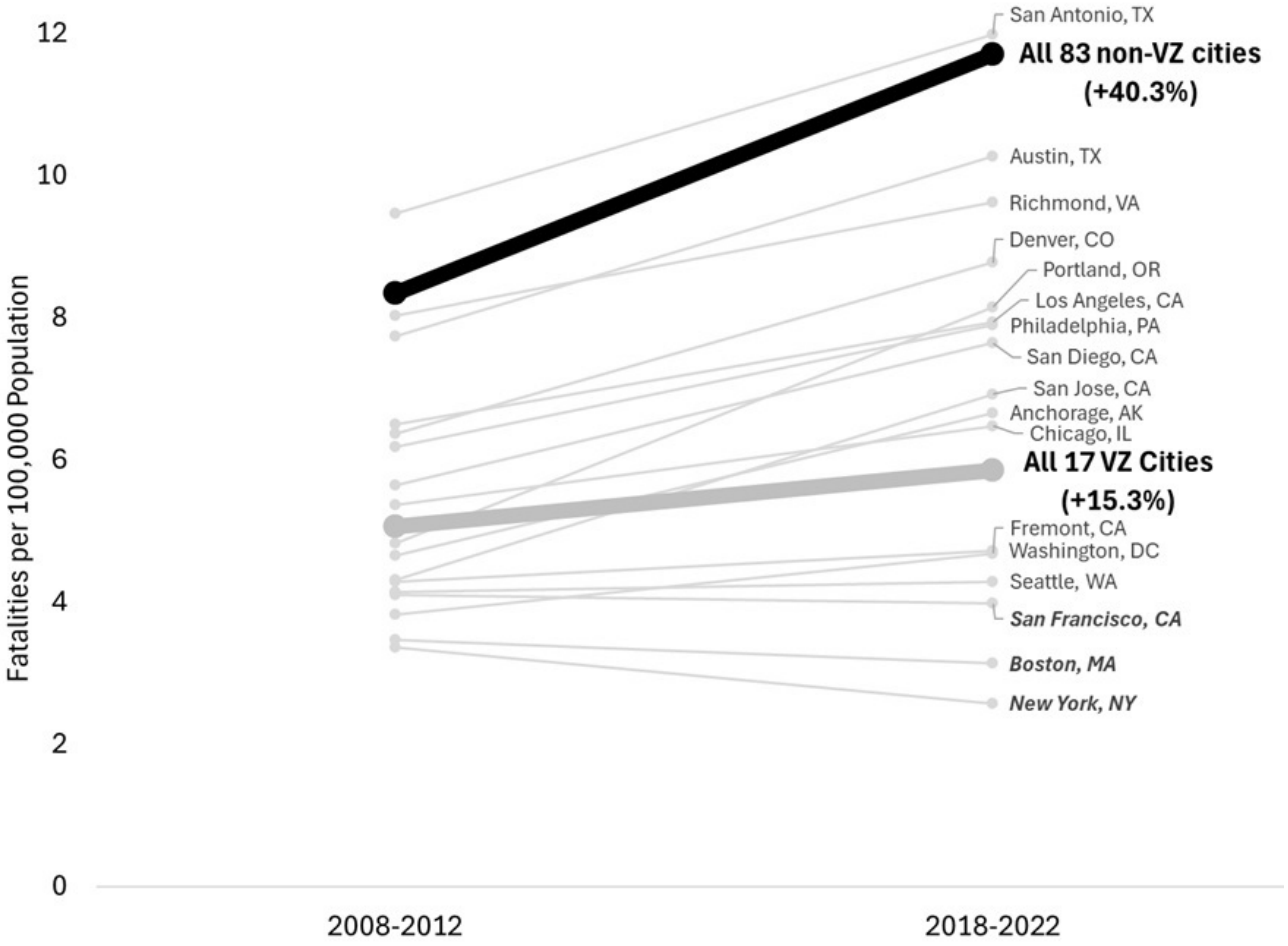

Figure 2. Change in Traffic Fatalities per 100,000 People, 2008-2012 to 2018-2022, by Vision Zero Adoption

The thin gray lines show fatality rate changes for the 17 individual Vision Zero early adopter cities. The three cities that experienced fatality rate decreases are identified with bold, italic text. The thick gray line shows the fatality rate change for all 17 Vision Zero early adopter cities combined. The thick black line shows the fatality rate change for all 83 other cities combined.

A preliminary analysis of Vision Zero policies showed that the 17 early adopter cities experienced a smaller increase in fatalities per 100,000 population (+15%) than the other 83 cities (+40%) (Figure 2). A two-sample t-test showed that this difference was statistically significant ($p < 0.01$). Still, only three Vision Zero cities actually experienced fatality rate decreases.

Many Vision Zero cities had the baseline advantage of being denser or having higher incomes than other cities. We partitioned our indicator variable for the 2018-2022 period into two different indicator variables (Table 2, Model 2). The 2018-2022 parameter estimate for the 17 early adopter cities (1.99) was lower than for the non-Vision Zero cities (3.21), but a t-test for the difference between these parameter estimates was not significant ($p = 0.11$). In addition to traditional built environment and behavioral approaches to safety, US cities should address low-density development patterns and sources of neighborhood poverty to prevent traffic deaths.

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AUTHOR CONTRIBUTION STATEMENT

The authors confirm contribution to the paper as follows: study conception and design: Schneider; data collection: Barbee, Schneider, Nelson, Gu; literature review: Schneider, Barbee; analysis and interpretation of results: Schneider, Barbee, Nelson, Gu; draft manuscript preparation: Schneider. All authors reviewed the results and approved the final version of the manuscript.

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Appendix A. Fatality Data from 100 Largest Cities

This appendix includes a table of traffic fatality data for all 100 large cities analyzed in this study, as well as summary statistics for the 17 Vision Zero cities, 83 other large cities, entire US, other parts of the US besides the 100 largest cities (Table A1). The table provides the number of traffic fatalities and fatality rates per 100,000 people for 2008-2012 and 2018-2022 and is sorted by traffic fatalities per 100,000 people for 2018-2022. It also includes percent change in fatality rates between the two periods and notes which changes are statistically significant. The fatality data are from the Fatality Analysis Reporting System (NHTSA 2025).

Table A1. Traffic Fatality Data from 100 Largest US Cities

	Top 100 US City	Population, 2010	Population, 2020	Fatalities, 2008-2012	Fatalities, 2018-2022	Fatalities per 100K, 2008-2012	Fatalities per 100K, 2018-2022	% change in fatalities per 100K, 08-12 to 18-22	Statistical Significance[1]	Established Vision Zero, 2012-2016
1	Henderson, NV	257729	317610	55	40	4.27	2.52	-41.0%	-	No
2	New York, NY	8175133	8804190	1377	1134	3.37	2.58	-23.5%	- - -	Yes
3	Santa Clarita, CA	176320	228673	42	34	4.76	2.97	-37.6%	-	No
4	Boston, MA	617594	675647	107	106	3.47	3.14	-9.4%	NS	Yes
5	Jersey City, NJ	247597	292449	48	48	3.88	3.28	-15.3%	NS	No
6	Irvine, CA	212375	307670	38	54	3.58	3.51	-1.9%	NS	No
7	Boise, ID	205671	235684	34	42	3.31	3.56	7.8%	NS	No
8	San Francisco, CA	805235	873965	165	174	4.10	3.98	-2.8%	NS	Yes
9	Gilbert, AZ	208453	267918	35	54	3.36	4.03	20.0%	NS	No
10	Seattle, WA	608660	737015	126	158	4.14	4.29	3.6%	NS	Yes
11	Plano, TX	259841	285494	52	62	4.00	4.34	8.5%	NS	No
12	Madison, WI	233209	269840	55	59	4.72	4.37	-7.3%	NS	No
13	Fremont, CA	214089	230504	41	54	3.83	4.69	22.3%	NS	Yes
14	Washington, DC	601723	689545	129	163	4.29	4.73	10.3%	NS	Yes
15	Minneapolis, MN	382578	429954	91	102	4.76	4.74	-0.3%	NS	No
16	St. Paul, MN	285068	311527	38	74	2.67	4.75	78.2%	++	No
17	Chula Vista, CA	243916	275487	56	66	4.59	4.79	4.4%	NS	No
18	Honolulu, HI	337256	350964	95	85	5.63	4.84	-14.0%	NS	No
19	Lincoln, NE	258379	291082	32	79	2.48	5.43	119.1%	+++	No
20	Buffalo, NY	261310	278349	62	88	4.75	6.32	33.2%	NS	No
21	North Las Vegas, NV	216961	262527	47	84	4.33	6.40	47.7%	+	No
22	Chicago, IL	2695598	2746388	723	890	5.36	6.48	20.8%	+++	Yes
23	VA Beach, VA	437994	459470	117	149	5.34	6.49	21.4%	NS	No
24	Las Vegas, NV	583756	641903	187	209	6.41	6.51	1.6%	NS	No
25	Reno, NV	225221	264165	59	87	5.24	6.59	25.7%	NS	No

	Top 100 US City	Population, 2010	Population, 2020	Fatalities, 2008-2012	Fatalities, 2018-2022	Fatalities per 100K, 2008-2012	Fatalities per 100K, 2018-2022	% change in fatalities per 100K, 08-12 to 18-22	Statistical Significance[1]	Established Vision Zero, 2012-2016
26	Anchorage, AK	291826	291247	68	97	4.66	6.66	42.9%	+	Yes
27	Spokane, WA	208916	228989	50	77	4.79	6.73	40.5%	NS	No
28	Chandler, AZ	236123	275987	53	93	4.49	6.74	50.1%	+	No
29	Chesapeake, VA	222209	249422	80	86	7.20	6.90	-4.2%	NS	No
30	San Jose, CA	945942	1013240	204	351	4.31	6.93	60.6%	+++	Yes
31	Santa Ana, CA	324528	310227	68	109	4.19	7.03	67.7%	+++	No
32	Pittsburgh, PA	305704	302971	83	107	5.43	7.06	30.1%	NS	No
33	Omaha, NE	408958	486051	104	173	5.09	7.12	40.0%	++	No
34	Garland, TX	226876	246018	61	88	5.38	7.15	33.0%	NS	No
35	Baltimore, MD	620961	585708	179	212	5.77	7.24	25.6%	+	No
36	Irving, TX	216290	256684	73	93	6.75	7.25	7.3%	NS	No
37	Raleigh, NC	403892	467665	155	172	7.68	7.36	-4.2%	NS	No
38	Laredo, TX	236091	255205	78	94	6.61	7.37	11.5%	NS	No
39	San Diego, CA	1307402	1386932	369	530	5.64	7.64	35.4%	+++	Yes
40	Oakland, CA	390724	440646	136	169	6.96	7.67	10.2%	NS	No
41	Durham, NC	228330	283506	61	111	5.34	7.83	46.6%	+	No
42	Philadelphia, PA	1526006	1603797	472	633	6.19	7.89	27.6%	+++	Yes
43	Los Angeles, CA	3792621	3898747	1233	1548	6.50	7.94	22.1%	+++	Yes
44	Anaheim, CA	336265	346824	99	138	5.89	7.96	35.2%	+	No
45	Portland, OR	583776	652503	141	266	4.83	8.15	68.8%	+++	Yes
46	Arlington, TX	365438	394266	138	168	7.55	8.52	12.8%	NS	No
47	Long Beach, CA	462257	466742	153	202	6.62	8.66	30.8%	+	No
48	Denver, CO	600158	715522	191	314	6.36	8.78	37.9%	+++	Yes
49	Newark, NJ	277140	311549	117	140	8.44	8.99	6.4%	NS	No
50	Columbus, OH	787033	905748	285	411	7.24	9.08	25.3%	++	No
51	Fort Wayne, IN	253691	263886	92	120	7.25	9.09	25.4%	NS	No

	Top 100 US City	Population, 2010	Population, 2020	Fatalities, 2008-2012	Fatalities, 2018-2022	Fatalities per 100K, 2008-2012	Fatalities per 100K, 2018-2022	% change in fatalities per 100K, 08-12 to 18-22	Statistical Significance[1]	Established Vision Zero, 2012-2016
52	Scottsdale, AZ	217385	241361	70	111	6.44	9.20	42.8%	+	No
53	Richmond, VA	204214	226610	82	109	8.03	9.62	19.8%	NS	Yes
54	Aurora, CO	325078	386261	85	188	5.23	9.73	86.1%	+++	No
55	Norfolk, VA	242803	238005	86	116	7.08	9.75	37.6%	+	No
56	Mesa, AZ	439041	504258	152	252	6.92	9.99	44.3%	+++	No
57	Colorado Springs, CO	416427	478961	113	240	5.43	10.02	84.7%	+++	No
58	Winston Salem, NC	229617	249545	96	127	8.36	10.18	21.7%	NS	No
59	Austin, TX	790390	961855	306	494	7.74	10.27	32.7%	+++	Yes
60	El Paso, TX	649121	678815	281	356	8.66	10.49	21.1%	+	No
61	Lexington-Fayette, KY	295803	322570	135	171	9.13	10.60	16.2%	NS	No
62	Corpus Christi, TX	305215	317863	120	169	7.86	10.63	35.2%	+	No
63	Stockton, CA	291707	320804	125	175	8.57	10.91	27.3%	+	No
64	Fresno, CA	494665	542107	168	297	6.79	10.96	61.3%	+++	No
65	Charlotte, NC	731424	874579	280	490	7.66	11.21	46.4%	+++	No
66	Sacramento, CA	466488	524943	175	295	7.50	11.24	49.8%	+++	No
67	Cincinnati, OH	296943	309317	101	176	6.80	11.38	67.3%	+++	No
68	Wichita, KS	382368	397532	141	229	7.38	11.52	56.2%	+++	No
69	Toledo, OH	287208	270871	110	159	7.66	11.74	53.3%	+++	No
70	Bakersfield, CA	347483	403455	138	239	7.94	11.85	49.2%	+++	No
71	San Antonio, TX	1327407	1434625	628	860	9.46	11.99	26.7%	+++	Yes
72	Houston, TX	2099451	2304580	1047	1393	9.97	12.09	21.2%	+++	No
73	Greensboro, NC	269666	299035	115	182	8.53	12.17	42.7%	++	No
74	Fort Worth, TX	741206	918915	313	560	8.45	12.19	44.3%	+++	No
75	Milwaukee, WI	594833	577222	197	359	6.62	12.44	87.8%	+++	No
76	Oklahoma City, OK	579999	681054	374	425	12.90	12.48	-3.2%	NS	No
77	Riverside, CA	303871	314998	117	198	7.70	12.57	63.3%	+++	No

	Top 100 US City	Population, 2010	Population, 2020	Fatalities, 2008-2012	Fatalities, 2018-2022	Fatalities per 100K, 2008-2012	Fatalities per 100K, 2018-2022	% change in fatalities per 100K, 08-12 to 18-22	Statistical Significance[1]	Established Vision Zero, 2012-2016
78	Lubbock, TX	229573	257141	125	172	10.89	13.38	22.8%	NS	No
79	Indianapolis, IN	820445	887642	374	618	9.12	13.92	52.7%	+++	No
80	Tulsa, OK	391906	413066	247	295	12.61	14.28	13.3%	NS	No
81	Orlando, FL	238300	307573	155	220	13.01	14.31	10.0%	NS	No
82	New Orleans, LA	343829	383997	172	278	10.00	14.48	44.7%	+++	No
83	Nashville, TN	601222	689447	317	501	10.55	14.53	37.8%	+++	No
84	Miami, FL	399457	442241	213	323	10.66	14.61	37.0%	+++	No
85	Saint Petersburg, FL	244769	258308	152	191	12.42	14.79	19.1%	NS	No
86	Cleveland, OH	396815	372624	163	285	8.22	15.30	86.2%	+++	No
87	Louisville, KY	597337	633045	314	498	10.51	15.73	49.7%	+++	No
88	Phoenix, AZ	1445632	1608139	730	1277	10.10	15.88	57.3%	+++	No
89	Glendale, AZ	226721	248325	94	198	8.29	15.95	92.3%	+++	No
90	Dallas, TX	1197816	1304379	629	1059	10.50	16.24	54.6%	+++	No
91	Kansas City, MO	459787	508090	322	418	14.01	16.45	17.5%	+	No
92	Jacksonville, FL	821784	949611	526	792	12.80	16.68	30.3%	+++	No
93	Tampa, FL	335709	384959	204	322	12.15	16.73	37.6%	+++	No
94	Atlanta, GA	420003	498715	235	431	11.19	17.28	54.5%	+++	No
95	Albuquerque, NM	545852	564559	221	525	8.10	18.60	129.7%	+++	No
96	Tucson, AZ	520116	542629	270	544	10.38	20.05	93.1%	+++	No
97	Detroit, MI	713777	639111	482	684	13.51	21.40	58.5%	+++	No
98	St. Louis, MO	319294	301578	211	342	13.22	22.68	71.6%	+++	No
99	Baton Rouge, LA	229493	227470	155	287	13.51	25.23	86.8%	+++	No
100	Memphis, TN	646889	633104	422	937	13.05	29.60	126.9%	+++	No
	All Top 100 US Cities	**59787162**	**65003996**	**20842**	**30164**	**6.97**	**9.28**	**33.1%**	**+++**	**17 cities**
	17 Vision Zero Cities	***25087774***	***26942332***	***6362***	***7881***	**5.07**	**5.85**	**15.3%**	***+++***	
	83 Other Cities	***34699388***	***38061664***	***14480***	***22283***	**8.35**	**11.71**	**40.3%**	***+++***	

	Top 100 US City	Population, 2010	Population, 2020	Fatalities, 2008-2012	Fatalities, 2018-2022	Fatalities per 100K, 2008-2012	Fatalities per 100K, 2018-2022	% change in fatalities per 100K, 08-12 to 18-22	Statistical Significance[1]	Established Vision Zero, 2012-2016
	Outside Top 100 Cities	*248958376*	*266445285*	*149724*	*167777*	*12.03*	*12.59*	*4.7%*	*+++*	
	US Total	*308745538*	*331449281*	*170566*	*197941*	*11.05*	*11.94*	*8.1%*	*+++*	

1) Result of a Z-test of proportions: Positive signs indicate that the fatality rate during 2018-2022 was significantly higher than in 2008-2012 (+++ indicates 99.9% confidence; ++ indicates 99%; + indicates 95%). Negative signs indicate that the fatality rate during 2018-2022 was significantly lower than in 2008-2012 (- - - indicates 99.9% confidence; - - indicates 99%; - indicates 95%). NS indicates not significant.