

TRANSPORT FINDINGS

Pedestrian Fatalities and Their Demographic Disparities in the US

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Findings

Using a Center for Disease Control and Prevention dataset, we analyzed how sex, age group, ethnicity, race, and urbanization level are linked to pedestrian fatality rates from 2011 to 2019. Outcomes in some subgroups had a higher death rate than other subgroups across sexes. For example, males who identify as American Indian or Alaska Native (OR = 1.98) as well as males who were 85 years and older (OR= 2.14) had the highest annualized death rates.

1. Questions

What are the current trends of pedestrian fatalities? How can understanding pedestrian fatalities inform targeted strategies?

We revisited previous analyses conducted by the Centers for Disease Control (CDC) from 2001 to 2010 to understand the state of this crisis (CDC 2013a). Past analyses highlighted disparities between males and females, citing a 2.5 times higher rate of pedestrian fatalities among men. Additionally, they noted the correlatory relationship between increasing age and pedestrian fatality rates among sexes, within the context of U.S. Census Bureau's projected aging of the U.S. population. These disparities were proven previously; for example, one study concluded that Black, African American, and American Indian and Alaskan Native populations are disproportionately affected, especially compared to White individuals (Roll and McNeil 2022). Previous studies have also found that pedestrian fatalities demonstrate uneven distributions across urbanization levels (Goodman et al. 2020).

Between 2011 and 2019, vehicular crashes were the second leading cause of death among unintentional injury causes, accounting for a total of 452,275 deaths across nine years (CDC 2019). Between 2009 and 2017, pedestrian travel, as a percentage of all trips, increased from 10.5% to 11.9% (NHTSA 2022b). Among crash deaths, pedestrians accounted for 14% of fatalities in 2011, while in 2019, this proportion rose to 17% (NHTSA 2022a). With this rise, it is critical to explore why this public health crisis occurs, to whom it most impacts, and understand mitigation methods.

Thus, this study aims to fill this gap by examining pedestrian fatalities among sex, age groups, race, ethnicity, and urbanization level.

Table 1. Urbanization Statuses Categorized via the 2013 National Center for Health Statistics Urban-Rural Classification Scheme for Counties

Urbanization Category	Description
Large Central Metropolitan	Population of at least one million persons, containing the largest proportion of the largest principal city or 250,000 persons within that city.
Large Fringe Metropolitan	Population of one million persons or more but not qualifying as a Large Central Metropolitan area.
Medium Metropolitan	Population between 250,000 and 999,999 persons.
Small Metropolitan	Population less than 250,000 persons.
Nonmetropolitan - Noncore/Micropolitan	Nonmetropolitan areas located within Micropolitan statistical areas or classified as Noncore.

2. Methods

These analyses draw from traffic-related pedestrian death rates by sex, age group, ethnicity, race, and urbanization level sourced from the CDC's National Vital Statistics System (NVSS), for years 2011 to 2019. Exclusion of 2020 was deemed necessary to avoid COVID-19's impact on travel patterns, which resulted in a 4.4% decrease in pedestrian fatalities (Krizsik and Pauer 2023). Analyses were conducted separately among race groups, further delineated between males and females: Black, American Indian and Alaska Native, Asian and Pacific Islander, and White individuals. We explored sex subgroups by ethnicity: Hispanic and non-Hispanic individuals. Urbanization statuses were categorized according to the 2013 National Center for Health Statistics urban-rural classification scheme (CDC 2013b). Each analysis was stratified by male and female sexes to understand rates by subgroup. It is noted that the CDC dataset did not have intersex data, which is a study limitation.

3. Findings

[Table 2](#) provides the total number of deaths stratified by sex as annualized death rates per 100,000 population. Confidence intervals for each of these calculations by their respective subgroups are also presented.

The annualized, traffic-related pedestrian death rate across males and females and subgroups was 0.22 per 100,000 population, accounting for 51,949 deaths over the nine years. Overall, the annualized death rate of males was 2.5 times that of females. Male pedestrians, compared to female pedestrians, account for 70% of total pedestrian fatalities over the period. Of subgroups, the highest annualized death rates were present among American Indian or Alaska Native (AI/AN) males (0.62) and males 85+ (0.67). AI/AN males have fatality odds 1.98 times those of non-AI/AN males. Similarly, 85+ males have odds of fatality 2.14 times higher than males 0-84. Analyzing urbanization levels, females (0.16; CI=0.13-0.19) and males (0.37; CI=0.32-0.42) residing in "Large Central Metropolitan" areas had the highest death rates, followed by those in "Medium Metropolitan" areas, at 0.13 (CI=0.10-0.17) and 0.33 (CI=(0.28-0.39) for females and males, respectively. These differences were statistically significant across sexes, as demonstrated

Table 2. Summary Statistics of 2011-2019 CDC's NVSS Traffic-Related Pedestrian Fatality Outcomes

Age Groups (Years)	Sex	
	Female	Male
	Annualized Death Rate (CI)	Annualized Death Rate (CI)
0-14	0.04‡† (0.00-0.08)	0.07‡† (0.02-0.11)
15-24	0.11*‡† (0.07-0.15)	0.26* (0.20-0.33)
25-34	0.13*‡ (0.09-0.18)	0.33*‡ (0.26-0.40)
35-44	0.14*‡ (0.09-0.18)	0.34*‡ (0.26-0.41)
45-54	0.16* (0.12-0.22)	0.42*‡† (0.35-0.51)
55-64	0.17* (0.11-0.22)	0.48*‡† (0.39-0.57)
65-74	0.17* (0.11-0.23)	0.41*‡ (0.30-0.51)
75-84	0.24* (0.14-0.35)	0.53*‡† (0.36-0.70)
85+	0.23‡ (0.09-0.36)	0.67‡ (0.34-0.99)
Race		
White	0.12*‡ (0.10-0.14)	0.29*‡ (0.26-0.32)
Black or African American	0.18* (0.13-0.23)	0.50*‡† (0.41-0.59)
Asian/Pacific Islander (A/PI)	0.13‡ (0.07-0.20)	0.19‡ (0.11-0.27)
American Indian or Alaska Native (AI/AN)	0.22 (0.04-0.41)	0.62‡ (0.32-0.93)
Ethnicity		
Hispanic or Latino	0.13*‡ (0.09-0.17)	0.37*‡ (0.30-0.43)
Not Hispanic or Latino	0.13*‡ (0.11-0.15)	0.31*‡ (0.28-0.34)
Urbanization		
Large Central Metro	0.16*‡ (0.13-0.19)	0.37*‡ (0.32-0.42)
Large Fringe Metro	0.11*‡ (0.08-0.15)	0.28*‡ (0.23-0.33)
Medium Metro	0.13*‡ (0.10-0.17)	0.33*‡ (0.28-0.39)
Micropolitan (Nonmetro)	0.11*‡ (0.06-0.17)	0.29* (0.20-0.37)
NonCore (Nonmetro)	0.11*‡ (0.04-0.17)	0.29* (0.19-0.39)
Small Metro	0.12*‡ (0.07-0.17)	0.29* (0.21-0.37)
Total	0.13*‡ (0.12-0.15)	0.32*‡ (0.29-0.35)

‡ denotes statistical significance between the value and the overall rate (0.22)

† denotes values that are statistically significant between that given value, and the female overall (0.13) or the male overall (0.32)

* denotes those values that are statistically significant between males and females for that same category

by their confidence intervals (Brahman 1991). Across age groups and sex, pedestrian death rates increased with age in almost every instance. Females within AI/AN populations (0.22) and Black or African American (0.18) populations displayed similarly high annualized death rates. Among females, the highest annualized death rates were present among those aged 75-84 (0.24), followed by those 85 and older (0.22). Among males, those identifying as Hispanic or Latino had a 1.2 times higher death rate than those not. Black or African American males displayed a similarly high statistically significant rate (0.5; CI=0.41-0.59).

Speculations for why these populations are at risk are supported by external research. According to the data, pedestrian fatality rates and age have a positive correlation, with the 75-84 age group being at heightened risk for females, and the age group of 85+ being at heightened risk for males. Previous

research found those aged 65+ may exhibit greater risk due to deterioration in functions such as vision, motion sensitivity, and ability to estimate time to contact (Wilmot and Purcell 2021).

AI/AN populations are at a greater risk towards pedestrian fatalities than any other racial or ethnic group and have exhibited increasingly high death rates even while the nationwide death rate was decreasing (Quick and Narváez 2018). Though not all AI/AN individuals reside on reservations, road quality and inadequate pedestrian facilities have been cited as areas of improvement for future safety measures and highlight concerns that AI/AN populations share (Quick and Narváez 2018). Pedestrian fatality statistics pose a far greater risk for males than for females for this group, establishing sex as a contributing risk factor for AI/AN populations.

Males are most cited for violating traffic regulations at railroad crossings and are at a greater risk for injury or death in poorly illuminated areas, where males have a higher chance of making nighttime walk trips (Hossain et al. 2024; Vellimana and Kockelman 2023). While specific areas such as Large Central Metro and Medium Metro shared the highest pedestrian fatality risks, it is notable that many crashes take place in lower-income neighborhoods that primarily house minority communities (Saha and Dumbaugh 2021). Overall, pedestrian fatality rates are concentrated among areas where pedestrian activity is frequent, occurring in urban areas (Al-Mahameed et al. 2019).

These findings point to inequitable outcomes for pedestrians among subgroups, underscoring potential target subgroups that must be further explored in research and practice. To comprehensively inform traffic safety measures, these death rates must be interpreted in the context of their impacts on these distinct and diverse population groups.

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