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Increased Rates of Death from Unintentional Injury among Non-Hispanic White, American Indian/Alaska Native, and Non-Metropolitan Communities

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Increased rates of death from unintentional injury among non-Hispanic White, American Indian/Alaska Native, and nonmetropolitan communities

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Overview of Key Findings

- Living in a nonmetropolitan area is associated with an increase in the age-adjusted death rate from unintentional injuries, from 46.2 in metropolitan areas to 59.2 in nonmetropolitan areas in 2018, with all races/ethnicity groups affected except for non-Hispanic Black.
- The ratio of unintentional injury deaths in nonmetropolitan areas, compared to metropolitan areas, was 1.28 overall, ranging from 1.05 to 1.56 depending on race and ethnicity.
- American Indians and Alaska Natives have the highest rate of living in nonmetropolitan areas (39.5%), and this group has the greatest increase in death from unintentional injury associated with living in a nonmetropolitan setting (from 67.7 to 105.3 per 100,000).
- There is no association between urbanization and race/ethnicity on the rate of emergency department visits for nonfatal unintentional injuries.

Introduction

Unintentional injuries, such as motor vehicle accidents, accidental poisonings, and falls,[i] collectively represent the third leading cause of death in the U.S., with an age-adjusted death rate of 48.0 per 100,000 in 2018.[1] This rate has increased over time, with metropolitan (metro) and rural[ii] areas experiencing increases in unintentional injury deaths from 2014 to 2017.[2] Rural residents are at particularly elevated risk of death from motor vehicle traffic accidents.[2–4] In 2017, for example, there were 19.7 deaths per 100,000 residents of rural areas,[2] compared to 12.8 deaths per 100,000 in small metro areas and 8.3 per 100,000 in large central metro areas.[2] A report on 2019 traffic fatalities, conducted by the National Highway Traffic Safety Administration, revealed that the rate of fatalities per vehicle miles traveled was 1.9 times higher in rural areas compared to urban areas.[4] People living in rural and/or nonmetropolitan (nonmetro) areas may not be at increased risk of death from all causes of unintentional injury death, however. Metro residents experienced a higher rate of drug overdose deaths in 2017, with 20.2 per 100,000 in small metro areas and 18.3 per 100,000 in large central metro areas, compared to 17.3 per 100,00 in rural areas.[2] For each of these types of unintentional injury deaths, it is unclear if the association between death rate and urbanization is due to differences in mortality following injury, or in the likelihood of experiencing an injury in the first place.

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[i] Unintentional, or accidental, injuries are distinct from those that are of undetermined intent and those that are intentional (e.g., suicides and homicides). Underlying cause-of-death (UCOD) codes: V01-X59 and Y85-Y86.[2]

[ii] When describing results in this paper, nonmetropolitan areas are defined using the core-based 2013 Office of Management and Budget[14] delineation of metropolitan statistical areas and the related county-based 2013 NCHS Urban-Rural classification scheme.[15] However, the papers cited throughout may refer to either nonmetropolitan or rural area designations and may be based on different classification schemes. For consistency, we adopt the terms used by each reference.

People living in rural and/or nonmetro areas may be at greater risk of death following traumatic injuries, such as motor vehicle accidents, due to disparities in access to trauma care. Delayed treatment may be associated with greater mortality from traumatic injuries[5] and, as of 2010, only 43.2% of rural areas were estimated to be within 60 minutes (driving or flying) of a trauma center, compared to 61.6% of suburban areas, 89.1% of minor city areas, and 99.7% of major city areas.[6] Among fatal traffic accidents in 2019, only 60.6% of victims of crashes in rural areas reached a hospital within 60 minutes of the crash (average time = 56 minutes), compared to 89.9% of victims in urban areas (average time = 37 minutes).[7] However, while the odds of death after severe traffic accident injury increase as the rurality of the crash location increases,[8] at least one study indicates that severe injuries may occur more frequently for rural residents as well as for people who are Black.[9]

There are known differences in the rate of death from unintentional injury related to race and ethnicity—for example, people who are American Indian or Alaska Native (AIAN) have a high rate of injury mortality relative to people who are White,[10] and the difference between AIAN and White injury death rates may be higher for those living in rural areas.[11] At present, there are few studies[9,12] that stratify by race when examining the association between urbanization and unintentional injury deaths. To build targeted prevention programs, it is important to understand how race/ethnicity and urbanization impact unintentional injury rates. The purpose of this policy brief is to examine the rate of fatal and nonfatal injuries in nonmetro and metro areas, with a focus on the association with race/ethnicity.

Methods

The National Hospital Ambulatory Medical Care Survey (NHAMCS) public use datafile for 2018 was used to generate estimates of nonfatal unintentional injury rates. This dataset sampled 20,291 visit records occurring in 2018 and used a weighting procedure to generate estimates of the total number of emergency department (ED) visits made in the U.S. Estimates were weighted according to Census information about the relative population size by sex, age, ethnicity, region, and metropolitan statistical area. The NHAMCS dataset was filtered to include only nonfatal injury encounters that were unintentional or of unknown intent (5,339 records representing 35,473,282 U.S. ED visits). To calculate rates, we use NHAMCS estimates as the numerator, and population estimates from the CDC Wide-ranging Online Data for Epidemiologic Research (WONDER) 2018 database as the denominator (Table 1).

Table 1. Population in metropolitan (metro) or nonmetropolitan (nonmetro) areas in 2018,[iii] stratified by race and ethnicity,[iv] from CDC WONDER database.

Race and Ethnicity	2018 U.S. Population	Population by Urbanization		% Nonmetro
		Metro	Nonmetro	
White*	201,068,278	164,698,271	36,370,007	18.1%
Black*	42,934,826	38,975,398	3,959,428	9.2%
Hispanic	59,871,746	55,811,138	4,060,608	6.8%
Asian (API)*	20,546,745	19,921,014	625,731	3.0%
Am. Indian (AIAN)*	2,745,839	1,661,389	1,084,450	39.5%
Total	**327,167,434**	**281,067,210**	**46,100,224**	**14.1%**

Non-Hispanic

Due to the limited sample size in the nonfatal injury dataset, the Asian and Pacific Islander (API) and AIAN categories were condensed into "non-Hispanic other" (Table 2). NHAMCS data weighted estimates use U.S. Census population estimates for 2018 from non-institutionalized populations, while the population estimates available through CDC's WONDER use all populations. The CDC estimates are 1% higher for Hispanic, 3% higher for White, and 8% higher for Black people.

[iii]Using the vintage 2018 bridged-race postcensal series: https://wonder.cdc.gov/wonder/help/ucd.html#Population%202018
[iv]For more details on race-bridged assignment, in the case of multiple races, and assignment of Hispanic origin, see: https://wonder.cdc.gov/wonder/help/CMF/Multiple_race_procedures_5-7-2004.pdf

The CDC's WONDER database was used to summarize Underlying Cause of Death data from 2014-2018. This dataset provides county-level national mortality data obtained from death certificates. It also contains population estimates obtained from U.S. Census Bureau race-bridged counts. A limitation of this dataset is that self-reports of race and ethnicity to the Census may differ from race or ethnicity assignment on death certificates.[13] To obtain estimates for all unintentional injury deaths, as well as deaths from unintentional drug overdoses and traffic accidents, we used definitions from a previous National Center for Health Statistics (NCHS) data brief.[2] Confidence intervals and age-adjusted death rates were generated by the CDC WONDER database and non-overlapping confidence intervals were considered significantly different. Age-adjusted death rates were used to calculate rate ratios comparing deaths in metro versus nonmetro areas (stratified by race/ethnicity) and within racial/ethnic groups (stratified by urbanization).

For the NHAMCS dataset, metro and nonmetro status was assigned using the 2013 Office of Management and Budget (OMB) delineations of metropolitan statistical areas.[14] The CDC WONDER dataset used the 2013 NCHS Urban-Rural classification scheme,[15] which is based on the 2013 OMB delineation but further divides individual counties in metro or nonmetro areas into a total of six levels of urbanization. To enable comparison to the NHAMCS data, we have condensed CDC WONDER data into metro[v] or nonmetro[vi] areas.

Findings

As seen in Table 1, in 2018 non-Hispanic White and American Indian and Alaska Native (AIAN) people were the most likely to live in a nonmetro area, with 18.1% and 39.5% of the White and AIAN populations living in nonmetro areas, respectively. The Asian and Pacific Islander (API) group had the lowest rates of nonmetro residency.

Table 2. Estimated rate of nonfatal unintentional injuries[vii] among people seeking treatment at hospitals in metropolitan (metro) or nonmetropolitan (nonmetro) areas in 2018, by race and ethnicity.

Urbanization	Race and Ethnicity	Estimated 2018 population	Sample count	Est. total # of ED visits in 2018			Est. rate of ED visits per 100,000 in 2018		
				Estimate	95% CI: lower	95% CI: upper	Rate estimate	95% CI: lower	95% CI: upper
Metro	White*	164,698,271	2,503	16,757,786	13,053,751	20,461,820	10,175	7,926	12,424
	Black*	38,975,398	1,139	7,692,903	5,878,866	9,506,940	19,738	15,084	24,392
	Hispanic	55,811,138	731	4,891,652	3,658,053	6,125,252	8,765	6,554	10,975
	Other*	21,582,403	222	1,304,390	909,433	1,699,348	6,044	4,214	7,874
	Total	*281,067,210*	*4,595*	*30,646,731*	*24,881,535*	*36,411,928*	*10,904*	*8,853*	*12,955*
Nonmetro	White*	36,370,007	632	3,806,682	1,768,581	5,844,782	10,467	4,863	16,070
	Black*	3,959,428	65	661,353	-	1,344,042	16,703	-	33,945
	Hispanic	4,060,608	38	269,750	56,305	483,194	6,643	1,387	11,900
	Other*	1,710,181	9	88,766	11,066	166,467	5,190	647	9,734
	Total	*46,100,224*	*744*	*4,826,551*	*2,080,093*	*7,573,008*	*10,470*	*4,512*	*16,427*

Non-Hispanic

Visits to the emergency department (ED) for unintentional injuries in 2018 (Table 2) were similar in metro and nonmetro areas. Overall, it was estimated that there were 30,646,731 ED visits for nonfatal unintentional injuries in metro areas and 4,826,551 in nonmetro areas. Using 2018 population estimates to calculate the rate per 100,000, we found that there were similar rates of ED visits within metro (10,904 per 100,000; CI: 8,853 - 12,955) and nonmetro

[v]Including decedents residing in metropolitan counties classified as 1) large central metro, 2) large fringe metro, 3) medium metro, and 4) small metro.
[vi]Including decedents residing in nonmetropolitan counties classified as 1) micropolitan and 2) noncore.
[vii]Data obtained from NHAMCS database. Population estimates used to calculate rate of ED visits per 100,000 were obtained from the CDC WONDER database and represent race-bridged postcensal population estimates.

(10,470 per 100,000; CI: 4,512 - 16,427) populations. In metro areas, there was a higher rate of ED visits for people who are non-Hispanic Black, compared to non-Hispanic White, Hispanic, and Other (API and AIAN) people. For nonmetro areas, however, there was no difference between any of the racial/ethnic groups. The lack of association in nonmetro areas may have been due to the low number of events sampled and wide confidence intervals for nonmetro strata, compared to metro strata, suggesting that there was less power to detect differences within nonmetro areas.
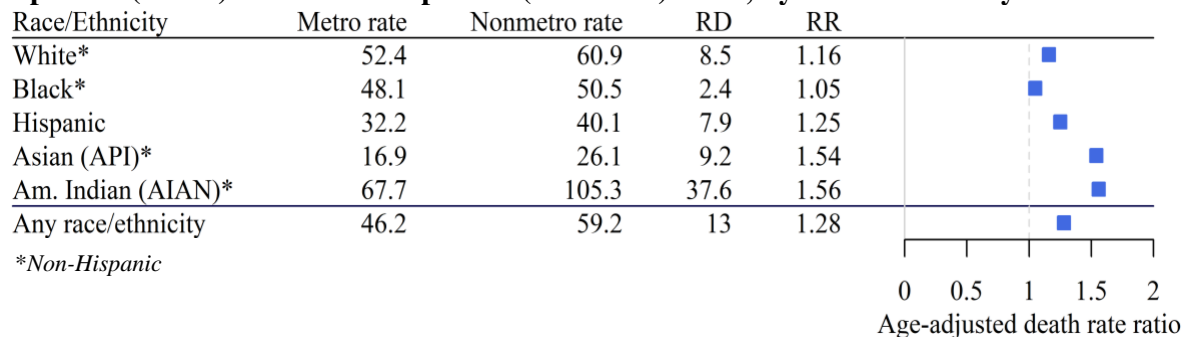
Table 3. Deaths from unintentional injuries[viii] among residents of metropolitan (metro) or nonmetropolitan (nonmetro) areas in 2018, by race and ethnicity.

Urbanization	Race and Ethnicity	Deaths	Age-adjusted death rate per 100,000			Comparison of age-adjusted death rate[ix]	
			Rate	95% CI: lower	95% CI: upper	vs White*	vs Metro
Metro	White*	98,150	52.4	52.0	52.7	ref	ref
	Black*	18,501	48.1	47.4	48.8	lower	ref
	Hispanic	15,824	32.2	31.7	32.7	lower	ref
	Asian (API)*	3,289	16.9	16.4	17.5	lower	ref
	Am. Indian (AIAN)*	1,096	67.7	63.6	71.8	higher	ref
	Any race/ethnicity	*137,446*	*46.2*	*45.9*	*46.4*	*-*	*ref*
Nonmetro	White*	25,001	60.9	60.1	61.7	ref	higher
	Black*	1,985	50.5	48.2	52.8	lower	non-sig
	Hispanic	1,415	40.1	37.9	42.3	lower	higher
	Asian (API)*	160	26.1	22.0	30.2	lower	higher
	Am. Indian (AIAN)*	1,057	105.3	98.8	111.8	higher	higher
	Any race/ethnicity	*29,681*	*59.2*	*58.5*	*59.9*	*-*	*higher*

Non-Hispanic

The rate of age-adjusted deaths from unintentional injuries in 2018 (Table 3) was significantly higher in nonmetro areas, compared to metro areas, for all racial/ethnic groups except non-Hispanic Black. Although people who are non-Hispanic Black had a higher age-adjusted death rate in nonmetro areas, the metro and nonmetro rates had overlapping confidence intervals and were therefore not significantly different.

Figure 1. Age-adjusted death rates per 100,000 for all causes of unintentional injury[viii] among residents of metropolitan (metro) and nonmetropolitan (nonmetro) areas, by race or ethnicity[x].

| Race/Ethnicity	Metro rate	Nonmetro rate	RD	RR
White*	52.4	60.9	8.5	1.16
Black*	48.1	50.5	2.4	1.05
Hispanic	32.2	40.1	7.9	1.25
Asian (API)*	16.9	26.1	9.2	1.54
Am. Indian (AIAN)*	67.7	105.3	37.6	1.56
Any race/ethnicity	46.2	59.2	13	1.28

Non-Hispanic

Age-adjusted death rate ratio

[viii]Data obtained from the CDC WONDER database.
[ix]We tested whether differences were significant (*P* < .05) by examining whether the confidence intervals were overlapping. If the two confidence intervals overlapped, then the difference was non-significant (non-sig). Otherwise, we indicated whether the rate was significantly higher or lower than the reference (ref) group.
[x]For each race/ethnicity, the rate difference (RD) and rate ratio (RR) were computed to compare metro and nonmetro areas.

The ratio of nonmetro versus metro death rates ranged from 1.05 to 1.56 (RR, Figure 1), with differences ranging from 2.4 to 37.6 deaths per 100,000, depending on racial/ethnic group. Living in a nonmetro area was associated with the largest increase in deaths for AIAN people. When death rates for each racial/ethnic group were compared to the group with the largest population, non-Hispanic White, a similar pattern emerged for residents of metro and nonmetro areas: non-Hispanic Black, Hispanic, and API people had lower relative rates of unintentional injury death, while AIAN people had a higher relative rate. Given that a large proportion of people who are AIAN live in nonmetro areas (39.5%), the burden of increased risk of death from unintentional injury associated with living in a nonmetro area may have the greatest impact on this group.

Figure 2. Change in age-adjusted death rates for all causes of unintentional injury from 2014-2018, among residents in metro or nonmetro areas, by race or ethnicity[xi].
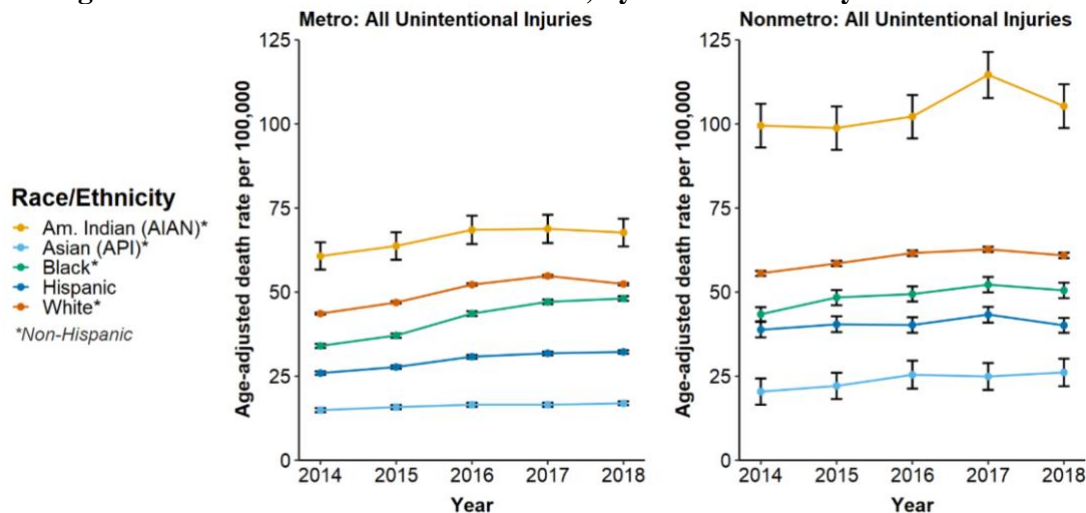
The rate of unintentional injury death from 2014-2018, as shown in Figure 2, demonstrates that the association between urbanization and race/ethnicity have been relatively constant over the most recent five years of data.

Figure 3. Deaths from unintentional injuries in 2018 among residents in nonmetropolitan (nonmetro) or metropolitan (metro) areas, from all causes (left), drug overdoses (center), or traffic accidents (right), by race or ethnicity[xii].
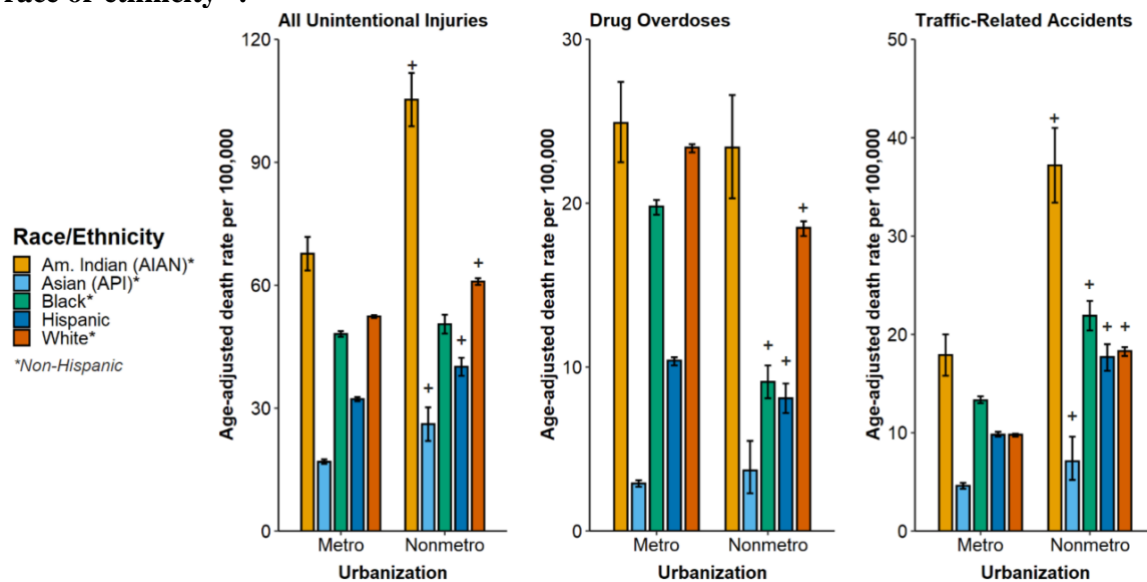
[xi]Data obtained from CDC WONDER database. Error bars represent bounds of 95% confidence interval for each year.
[xii]Data from CDC WONDER database. Error bars represent bounds of 95% confidence interval. +$P < .05$ vs metro rate.

Unintentional injury deaths from 2018 were further subdivided into drug overdose deaths (Figure 3, center) or traffic-related deaths (Figure 3, right). The association between urbanization and race/ethnicity appear to vary depending on the cause of death. For example, the decrease in drug overdose deaths associated with living in a nonmetro area seems to be greatest for people who are non-Hispanic Black. In contrast, for AIAN people living in nonmetro areas there is no difference in the rate of drug overdose deaths but there is a large increase in traffic-related deaths compared to AIAN people in metro areas.

Conclusion/Discussion

Previous publications have examined the relationship between unintentional injury death rates and urbanization[2] or race,[10,11] but the current study is the first to examine how both risk factors relate to the rate of fatal and nonfatal unintentional injuries. After stratifying by race/ethnicity, we found residents of nonmetro areas are more likely than those living in metro areas to suffer a fatal unintentional injury, regardless of racial/ethnic group. The absolute and relative increase in mortality associated with living in a nonmetro area was greatest for those who are AIAN and smallest for those who are non-Hispanic Black. These results are consistent with two previous studies demonstrating greater mortality rates for AIAN people,[10] particularly in rural areas.[11] However, this is the first study to demonstrate that there is no significant difference between metro and nonmetro areas for all cause unintentional injury mortality among people who are Black.

In contrast to the results for fatal injuries, the rate of nonfatal unintentional injuries requiring an emergency department visit was not associated with race/ethnicity or urbanization. The reason for the difference between fatal and nonfatal injury rates is unclear. It is possible that the NHAMCS survey is not powered to detect the impact of urbanization on the rate of emergency department visits for nonfatal injury, but another possibility is that the case fatality rate for unintentional injuries is higher in nonmetro areas. Further work is needed to determine what factors are driving the high rate of fatal unintentional injury in nonmetro areas found here, particularly for traffic accidents among AIAN people. Within both metro and nonmetro areas, those who are AIAN and those who are non-Hispanic White had the highest rates of death from unintentional injury. Further work is needed to determine which factors are contributing to high rates of death for these groups.

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