Race/ethnicity, urbanization, and unintentional injury death

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Background

Death from unintentional injury was the third leading cause of death in 2018,[1] following increases in the rate of death in metropolitan (metro) and nonmetropolitan (nonmetro) areas from 2014 to 2017[2]. Previous studies suggest that people who are American Indian or Alaska Native (AIAN) are at greater risk of injury death,[3] particularly in rural areas.[4] However, there are few studies that have examined potential interactions between race/ethnicity and urbanization. It is also unclear if disparities related to race and/or urbanization impact all causes of unintentional injury death. For example, rural residents have almost twice as many fatalities per mile driven[5] but the rate of death from drug poisoning (e.g., overdose) is lower in rural areas.[2]

Objective

To characterize potential interactions between two risk factors for unintentional injury death: race/ethnicity and nonmetro residency.

Data Source

The CDC's WONDER database was used to summarize Underlying Cause of Death data from 2018. This dataset provides county-level national mortality data obtained from death certificates. It also contains U.S. Census Bureau race-bridged population estimates.

Dependent Variables

Unintentional injury deaths were identified and, for three select causes, categorized using ICD-10 codes from a recent report.[2]

Independent Variables

The 2013 NCHS classification scheme for counties[6] was used to classify individuals as metro or nonmetro. Race/ethnicity was determined by combining information about Hispanic origin and bridged-race (Figure 1).

The final race/ethnicity variable consisted of American Indian or Alaska Native (AIAN)*, Asian/Pacific Islander (API)*, Black*, White*, and Hispanic.
*Non-Hispanic.

Figure 1. Race/Ethnicity
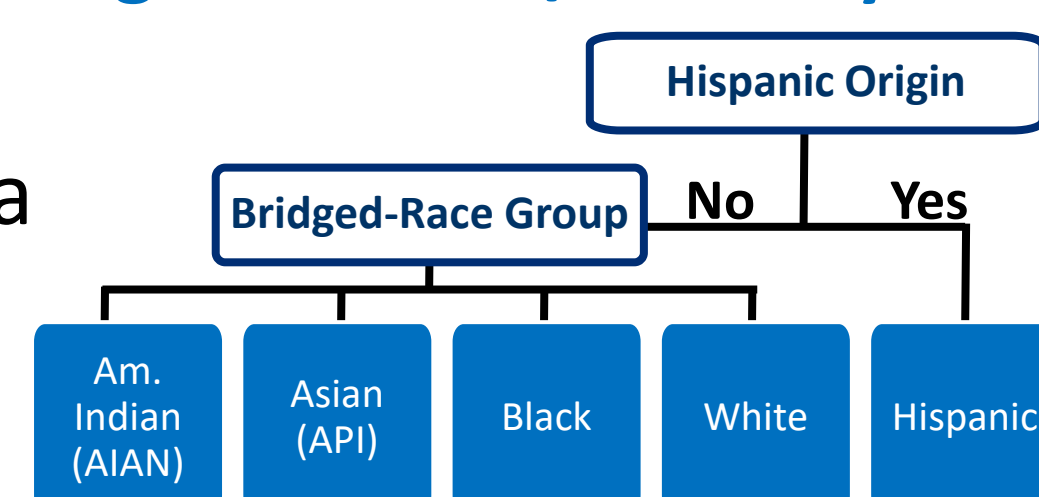
Analysis

Stratified rate ratios (RR) were calculated to examine the effect of race/ethnicity within metro and nonmetro residents and the effect of nonmetro residency within each racial/ethnic group. Combined RR and rate differences were calculated using a single reference group: non-Hispanic White Metro residents. Measures of additive and multiplicative effect measure modification (EMM)[8] were calculated for each race/ethnicity.

Descriptive Findings

Unintentional injury death rates varied by race/ethnicity and were higher for people living in nonmetro areas (Table 1). Compared to White people, AIAN people had a higher death rate while people in the other racial/ethnic groups had a lower death rate (Figure 2). Nonmetro death rates were higher than metro death rates for all groups, with the largest relative increases in AIAN and API people. The difference between rural and urban deaths was highest for traffic accidents (Figure 3).

Table 1. Unintentional injury deaths in 2018

Race and Ethnicity	Metro			Nonmetro		
	Population	Deaths	Age-Adjusted Rate (95% CI), per 100k	Population	Deaths	Age-Adjusted Rate (95% CI), per 100k
White*	164,698,271	98,150	52.4 (52 - 52.7)	36,370,007	25,001	60.9 (60.1 - 61.7)
Black*	38,975,398	18,501	48.1 (47.4 - 48.8)	3,959,428	1,985	50.5 (48.2 - 52.8)
Hispanic	55,811,138	15,824	32.2 (31.7 - 32.7)	4,060,608	1,415	40.1 (37.9 - 42.3)
Asian (API)*	19,921,014	3,289	16.9 (16.4 - 17.5)	625,731	160	26.1 (22 - 30.2)
Am. Indian (AIAN)*	1,661,389	1,096	67.7 (63.6 - 71.8)	1,084,450	1,057	105.3 (98.8 - 111.8)
Total	281,067,210	137,446	46.2 (45.9 - 46.4)	46,100,224	29,681	59.2 (58.5 - 59.9)

*Non-Hispanic

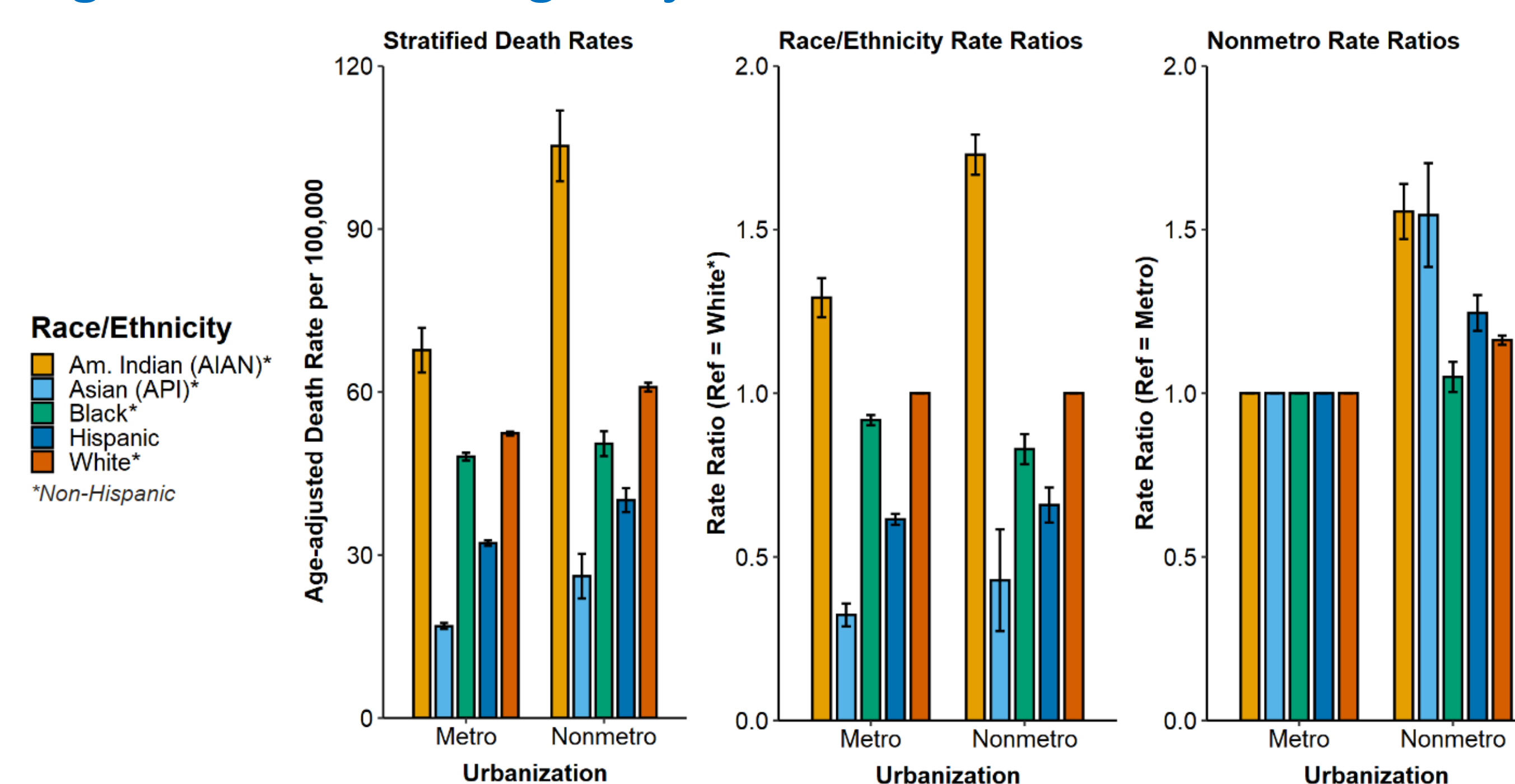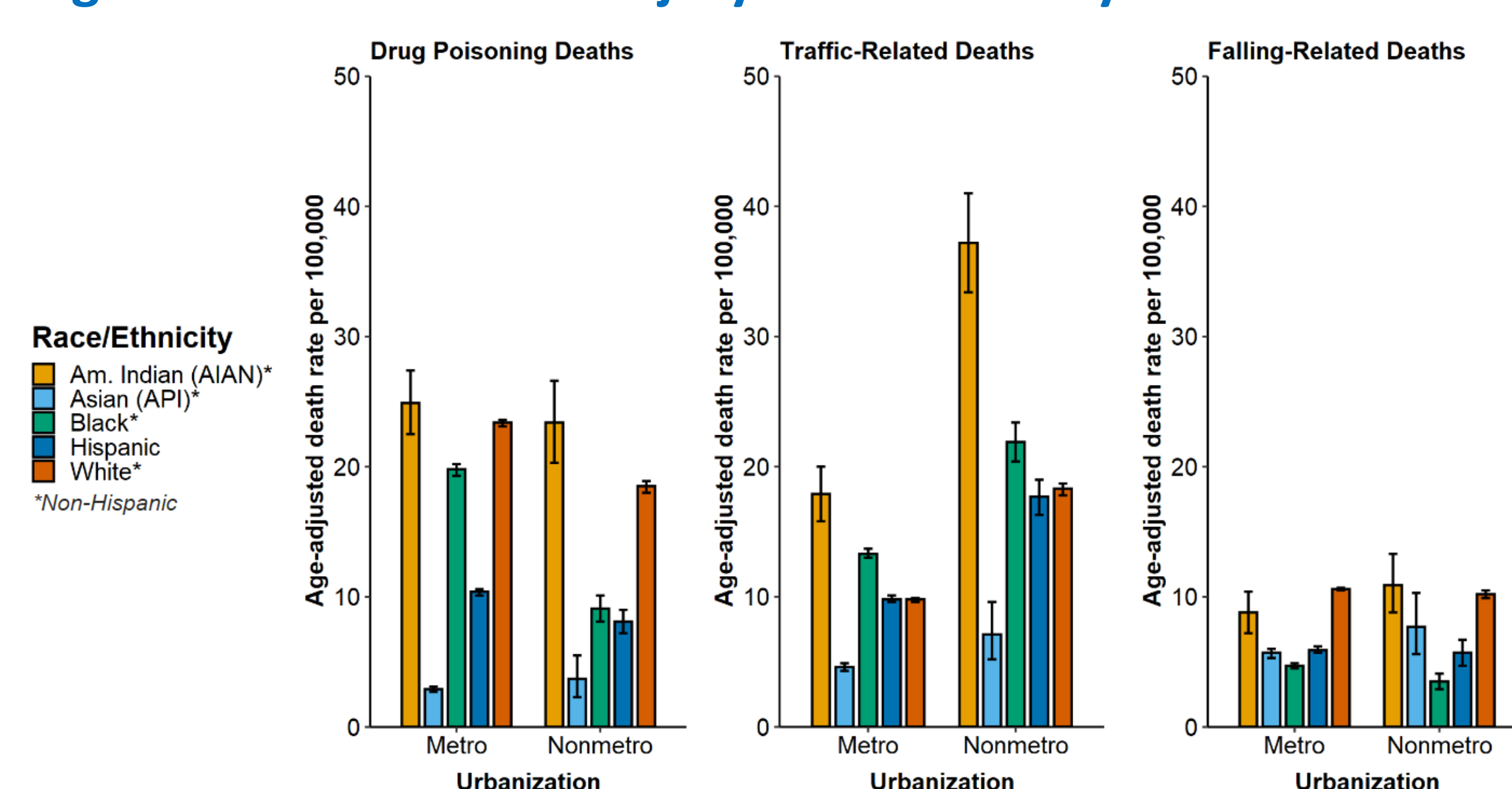### Figure 2. Stratified age-adjusted death rates and rate ratios

Figure 3. Unintentional injury death rates by cause

Effect Measure Modification (EMM) Findings

As shown in Table 2, we found evidence for positive EMM on the additive scale for people who are AIAN. Compared to people who are White, AIAN people accrue greater relative excess risk of death from unintentional injury when living in nonmetro areas. There was also evidence for positive EMM on the multiplicative scale for AIAN people and API people. This suggests that the combined effects of race/ethnicity and living in a nonmetro area are greater than the product of the separate effects of these two factors. For people who are Black, however, there may have been negative EMM on both the additive and multiplicative scales.

Table 2. Combined effects of race and urbanization

Race and Ethnicity	Rate ratio		Rate difference (per 100k)		Additive Scale EMM (0 = no EMM)	Multiplicative Scale EMM (1 = no EMM)
	Metro	Nonmetro	Metro	Nonmetro		
White*	ref	1.16	ref	9.3	n/a	n/a
Black*	0.92	0.96	-4.2	0.4	-0.12	0.90
Hispanic	0.61	0.77	-15	-10.1	-0.01	1.07
Asian (API)*	0.32	0.50	-30	-22.2	0.01	1.33
Am. Indian (AIAN)*	1.29	2.01	46.4	59.4	0.56	1.34

*Non-Hispanic

$$\text{Additive Scale EMM} = RR_{11} - RR_{10} - RR_{01} + 1 \qquad \text{Multiplicative Scale EMM} = \frac{RR_{11}}{RR_{10} * RR_{01}}$$

Conclusions and Implications

This study demonstrates that living in a nonmetro area may have the greatest effect on mortality among AIAN and API individuals, while the impact may be lessened for people who are Black. Deaths from traffic accidents were particularly impacted by living in a nonmetro area, whereas there was little impact on deaths from drug poisoning or falls. Taken together, these results suggest that public health measures to reduce traffic accidents in rural areas, and targeted programming for AIAN individuals, could help reduce disparities in accidental injury mortality rates.

Limitations

The race and ethnicity assignments obtained from death certificates may differ from Census bureau race/ethnicity assignments, which come from self-report[7]. In addition, the bridged-race approach used by CDC WONDER does not allow for identification of multiracial people.

References

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