

The Burden of Asthma in Travis County, Texas

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INTRODUCTION

- Understanding the regional epidemiology of asthma morbidity is important for:
 - Identifying potential regional causes of asthma morbidity
 - Planning and implementing interventions aimed at reducing the burden of asthma morbidity
- One area of the US that has received less attention in this regard is Travis County, TX, which has a large Latinx population and a unique environmental exposure profile, which may contribute to unique profiles of asthma morbidity.
- Unknowns:
 - Do certain neighborhoods have a greater burden of asthma morbidity than others?
 - What is the burden of morbidity among racial and ethnic groups and does it vary geographically among these groups?

OBJECTIVES

- Estimate population-based incidence rates (PBIR) for asthma-related emergency department (ED) visits and hospitalizations for Travis County residents by:
 - Age (adults vs. children)
 - Race/Ethnicity (Non-Latinx White, Black/African American, and Latinx)
 - Census tract for adults and children overall
- Map asthma-related ED visit and hospitalization PBIRs by race/ethnicity

METHODS

We used data from the Texas Health Care Information Collection (THCIC) from 2016 and 2017 and the American Community Survey (ACS) to calculate population-based incidence rates

- Population Based Incidence Rates:** PBIRs were calculated using combined 2016-2017 data. PBIRs are expressed per 10,000 person-years with corresponding 95% confidence intervals based on a Poisson distribution.
 - Health Care Encounter Data:** Texas Health Care Information Collection (THCIC) is an administrative claims dataset collected from hospital records Texas. Hospitals are required to report this information by Texas state law. The data contain variables such as ICD-10 diagnostic codes, the date of the emergency visits or hospitalization, demographic variables such as age, race, and ethnicity, and the patient's residence at the census tract level.
 - Population Data:** The denominator for the incidence rate estimation was obtained from the American Community Survey (ACS). Population estimates are provided down to the census tract level. The ACS data set provides population estimates for Travis County overall and by age and race/ethnicity for Non-Latinx White, African American (no ethnic distinction), and Latinx of any race.
 - Cases:** Asthma-related ED visits and hospitalizations were defined as an encounter with a primary diagnosis of asthma as indicated by an International Classification of Disease 10 (ICD-10) code of Asthma, J45.x
- Statistical Analysis:** All statistical analyses were performed using the software program R version 3.5.1. PBIRs and significance tests were performed using the “epitools” package. Choropleth maps were created with the “sf” and “tmap” packages. When possible, we tested our estimates against national point estimates (when no standard errors were available) or confidence intervals. Non-parametric Kendall's tau was use for testing correlations.
- Mapping:** Choropleth maps of Travis county were created by mapping census tract level PBIRs. Non-zero event counts less than ten are suppressed. We aggregated data over 2016-2017 to minimize the need for suppression.
- Race-Ethnicity Distinction:** We limited the analysis to Non-Latinx White, African American, and Latinx ethnic groups. Of those identified as African American, 8.3% were Latinx. Because of this small percentage and no tract level ACS estimates for African Americans by ethnicity, we aggregated all African American cases. We excluded Non-Latinx Asians and Non-Latinx Native Americans because they made up less than 1% of cases.

REFERENCES

- Asthma-Related Healthcare Use Data 2016 | CDC. <https://www.cdc.gov/asthma/healthcare-use/healthcare-use-2016.htm>. Page last reviewed: May 22, 2019.
- Akinbami LJ, Moorman JE, Simon AE, Schoendorf KC. Trends in racial disparities for asthma outcomes among children 0 to 17 years, 2001-2010. *J Allergy Clin Immunol*. 2014;134(3):547-553.e5.

RESULTS

Table 1. Overall population-based incidence rates for emergency department visits and hospitalizations for Travis County adults and children compared to national estimates (no SE reported for hospitalization)

Asthma-Related ED Visit and Hospitalization PBIRs by Age PBIR [95% CI]						
*p <.05, Travis County rate vs. National rate						
	Adults			Pediatrics		
	National ¹	2016	2017	National ¹	2016	2017
Emergency Department Visits	50.3 [37.2, 63.4]	28.3* [27.1, 29.4]	28.2* [27.0, 29.3]	74.3 [47.8, 100.8]	82.0 [78.42, 85.7]	81.39 [77.9, 85.1]
Hospital Inpatient Stays	4.4	3.4 [3.0, 3.8]	3.1 [2.7, 3.5]	10.7	19.2* [17.5, 21.1]	12.9* [11.5, 14.4]

Table 2. Population-based incidence rates for emergency department visits and hospital inpatient stays over 2016-2017 for Travis County children (<18 years) by race-ethnicity compared to national estimates where available.

Asthma-Related ED Visit and Hospitalization PBIRS for Children (<18 yrs), by Race & Ethnicity PBIR [95% CI]					
*p <.05, Travis County rate vs. National rate					
	Non-Latinx White	National ² Non-Latinx White	African American	National ² African American	Latinx
Emergency Department Visits	83.1 [79.0, 87.3]	77.9 [68.3, 87.5]	268.43 [253.7, 282.8]	254.4, [216.0, 292.8]	46.0 [43.4, 48.7]
Hospital Inpatient Stays	22.97* [20.9, 25.2]	10.1 [3.4, 16.8]	44.3 [38.5, 50.8]	33.3 [8.0, 58.6]	5.6 [4.7, 6.6]

Table 3. Population-based incidence rates for emergency department visits and hospital inpatient stays for Travis County adults by race and ethnicity. National estimates for adults by race-ethnicity not available.

Asthma-Related ED Visit and Hospitalization PBIRs for Adults, by Race and Ethnicity PBIR [95% CI]			
	Non-Latinx White	African American	Latinx
Emergency Department Visits	15.1 [14.4, 15.9]	106.2 [101.0, 111.7]	30.3 [28.9, 31.8]
Hospital Inpatient Stays	2.0 [1.7, 2.3]	8.81 [7.4, 10.5]	3.88 [3.4, 4.4]

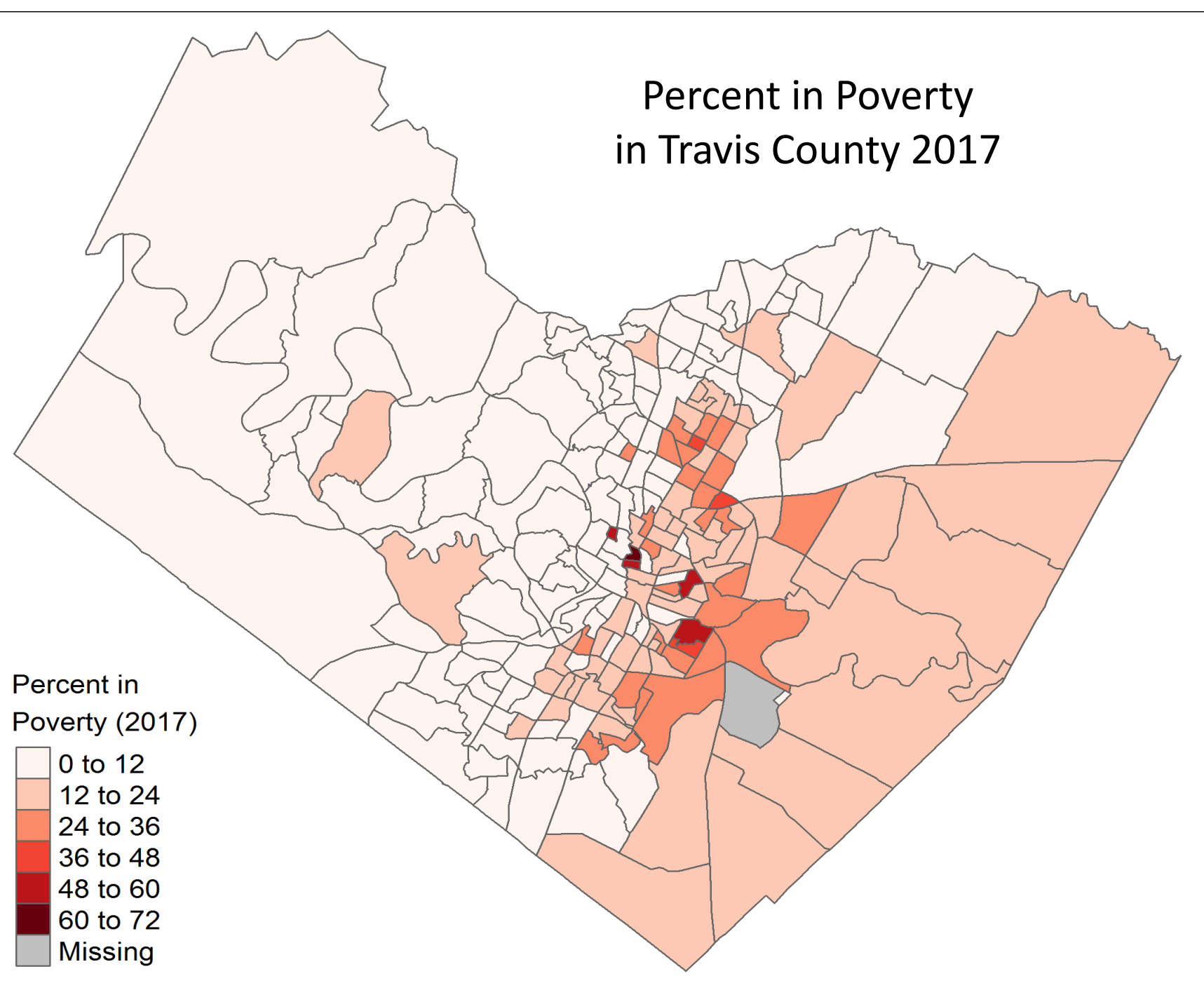
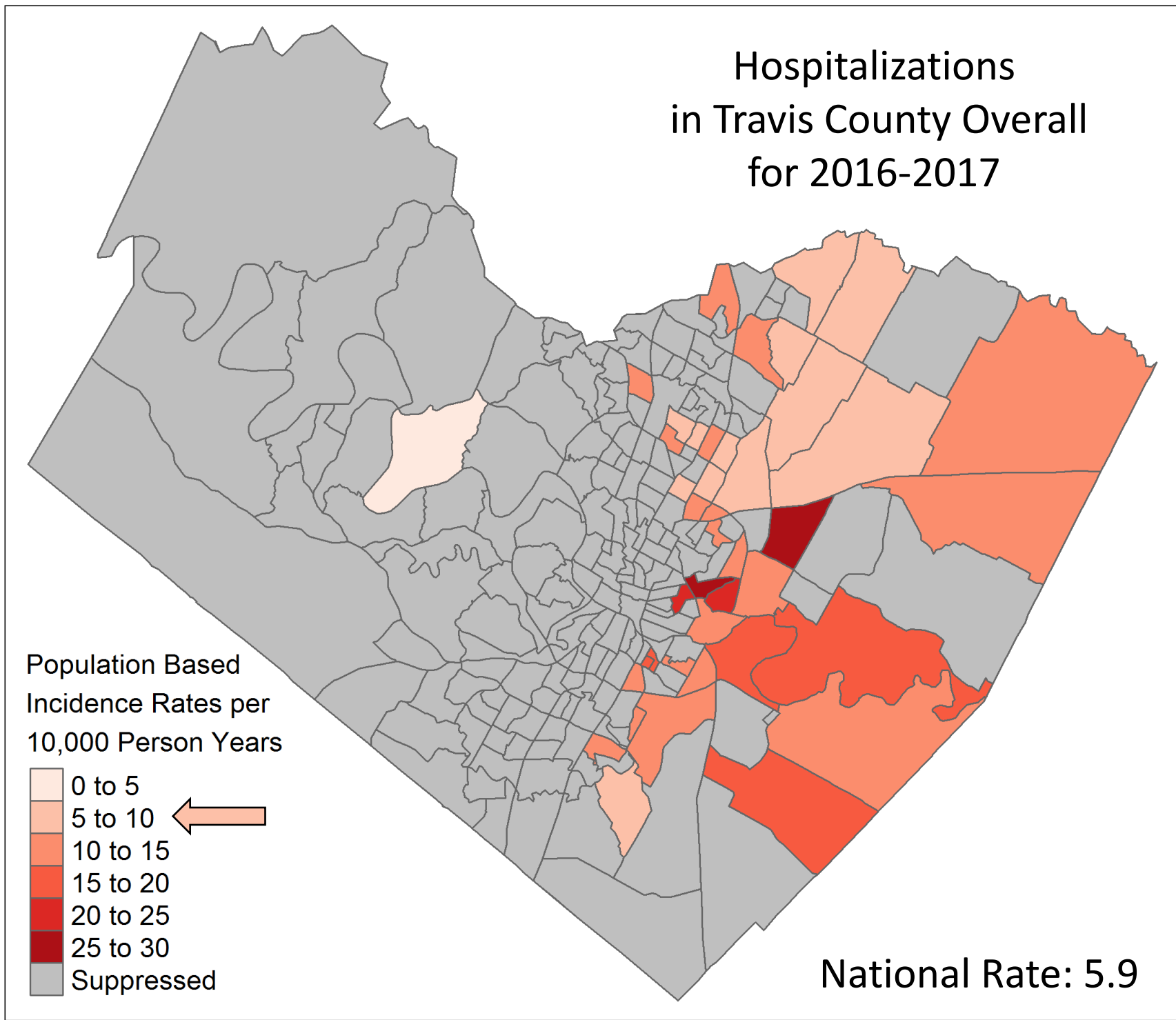
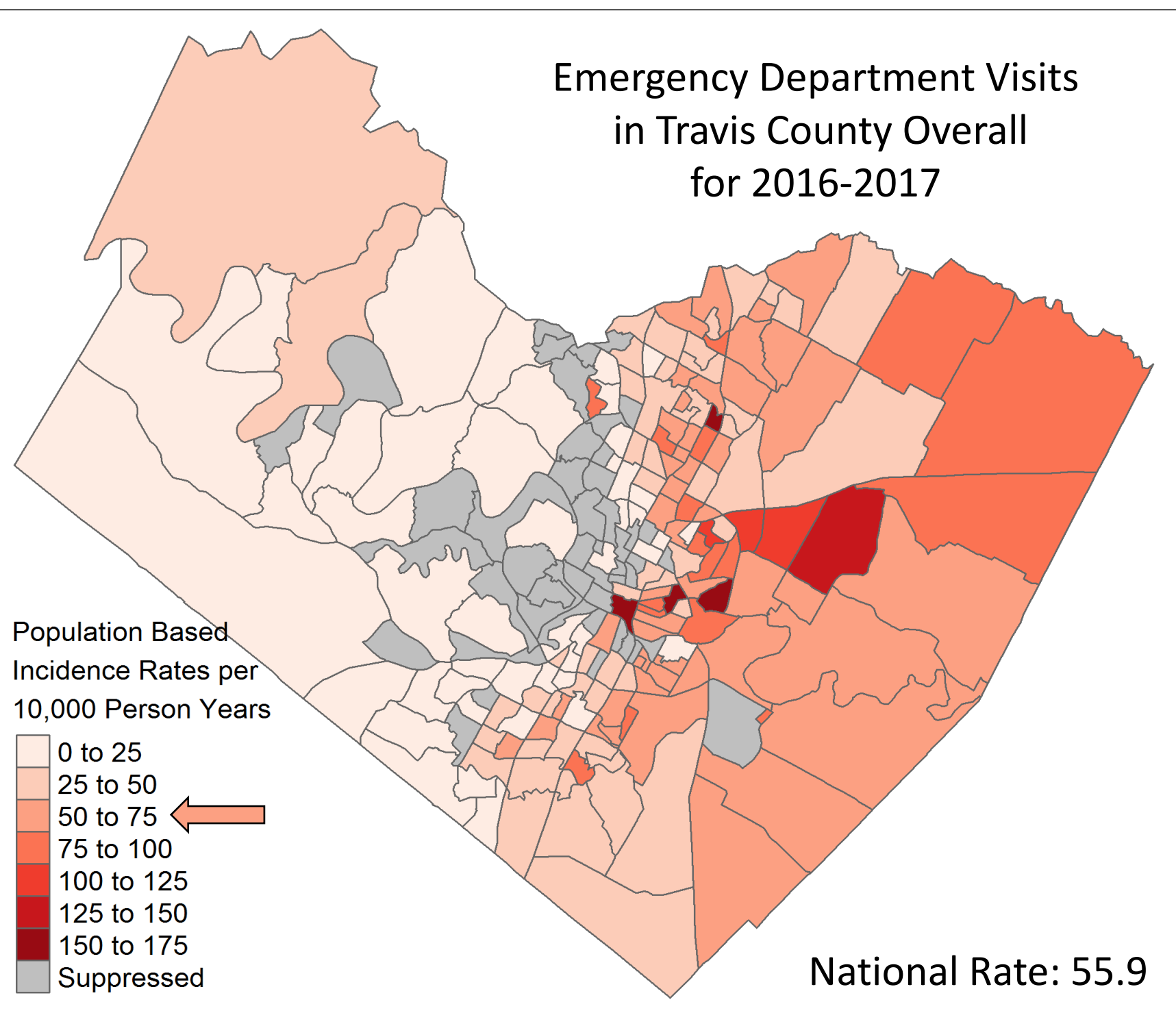


Figure 1. **Spatial Distribution of Asthma Related Events and Poverty in Travis County.** Choropleth maps depicting the estimated population-based incidence for emergency department visits (top left) and hospitalizations (top right) for all Travis County residents for 2016 and 2017 combined over all age groups. Overall national rate for ED visits in 2016 was 55.9 (SE= 6.4), hospitalization rate 5.9. National rates indicated with arrows for comparison. Choropleth map depicting the percent of Travis County residents below the federal poverty line for 2017 (bottom left). Elevated ED and hospitalizations are predominantly located in the eastern part of the county, broadly consistent with 2017 spatial distribution of poverty. Poverty correlates with ED visits and hospitalizations at $\tau=.39$, $p < .0001$ and $\tau=.32$, $p < .0001$, respectively. (Census tracts with fewer than ten cases are suppressed.)

RESULTS

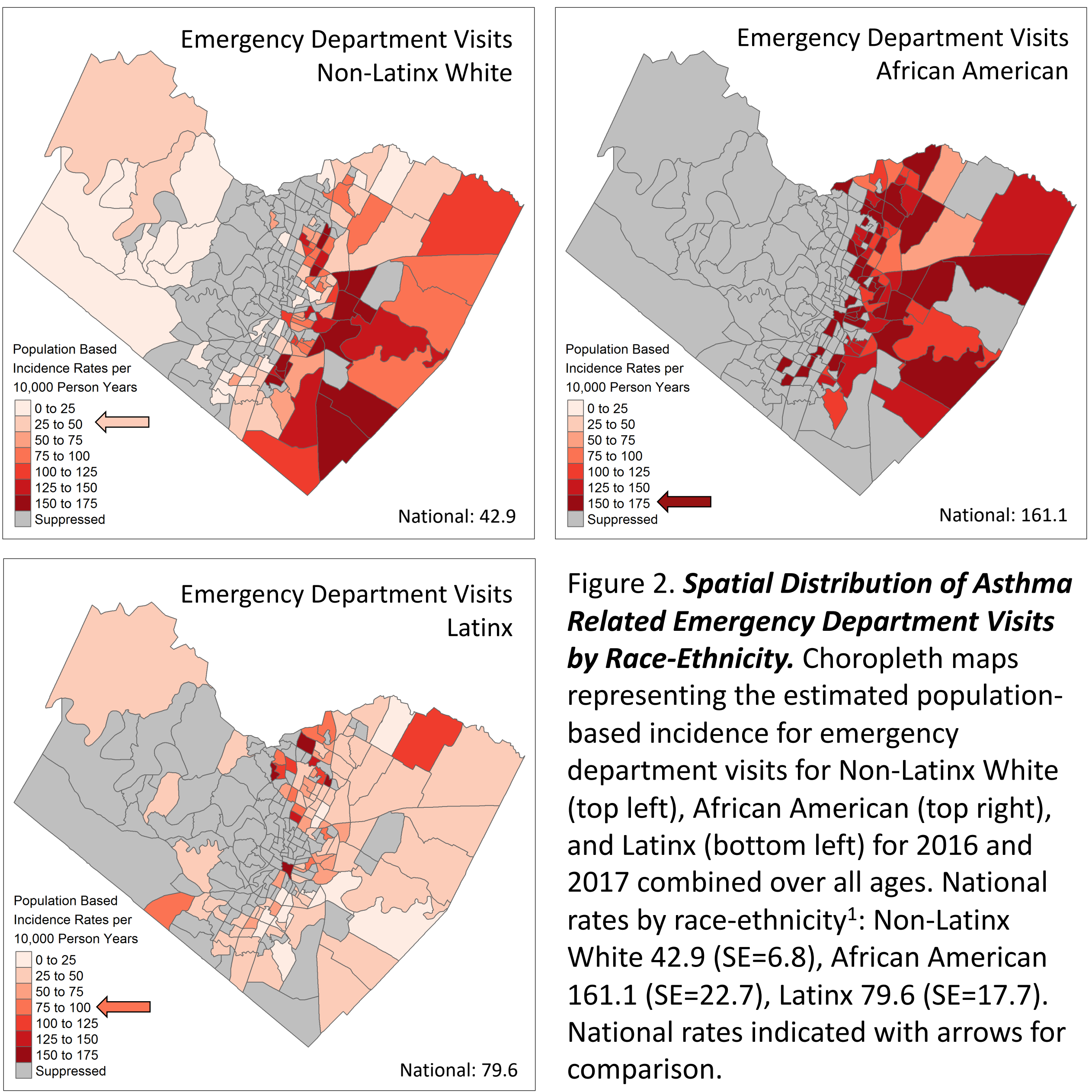


Figure 2. **Spatial Distribution of Asthma Related Emergency Department Visits by Race-Ethnicity.** Choropleth maps representing the estimated population-based incidence for emergency department visits for Non-Latinx White (top left), African American (top right), and Latinx (bottom left) for 2016 and 2017 combined over all ages. National rates by race-ethnicity¹: Non-Latinx White 42.9 (SE=6.8), African American 161.1 (SE=22.7), Latinx 79.6 (SE=17.7). National rates indicated with arrows for comparison.

CONCLUSIONS

- Travis County Residents Overall:**
 - Asthma related ED visits and hospitalization rates are similar or less than national incidence rates except for hospitalizations among children
- Asthma-related ED and hospitalization rates among the Travis County:**
 - Non-Latinx White population are similar or less than rates among the US Non-Latinx White population, except for hospitalization rates among white children, which were higher than rates among US Non-Latinx White children.
 - African American population are similar to rates among the US African American population
 - Latinx population are less than rates among the US Latinx population
- Spatial Distribution:**
 - The highest asthma-related ED visit and hospitalization rates are observed in eastern Travis County, where tracts with higher poverty rates are clustered
 - The spatial distribution of asthma-related ED visits is similar across all racial and ethnic groups

IMPLICATIONS

- Travis County Children**
 - Travis County children have a higher hospitalization rate than US children
 - Potential explanations:
 - Different criteria for admission? More severe exacerbations?
- Racial & Ethnic Disparities**
 - Disparities between African American and White populations in Travis County are similar to national disparities
 - The Travis County Latinx population seems to be at lower risk than US Latinx
- Spatial Distribution**
 - The spatial distribution of asthma morbidity is similar among racial and ethnic groups, suggesting that asthma morbidity could be due to spatial factors such as poverty and/or poverty-related factors such as environmental exposures
- Public health interventions**
 - Public health interventions should focus on children, minority populations, and areas with disproportionate morbidity in Eastern Travis County