Illinois Childhood Asthma Surveillance Report, 2011-2014

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SUMMARY

In general, the rates of childhood asthma inpatient hospitalizations and emergency department visits in Illinois were highest among young NH Black children. There were significantly higher rates of hospitalizations in geographic areas of high concentrated disadvantage, likely the result of neighborhood factors including environment triggers and socio-structural determinants of health. These include substandard housing and lower income neighborhood characteristics such as dust mites, higher levels of pollution, and increased violence and stress. Within Chicago, Suburban Cook County, Madison County, and St. Clair County, childhood asthma inpatient hospitalization and ED visit rates align closely with census tracts of high concentrated disadvantage, disproportionately affecting NH Black children.

INTRODUCTION

Asthma is a chronic inflammatory disorder of the airways that leads to episodes of reversible breathing problems due to airway narrowing and blockage. These episodes can range in severity from mild to life threatening. Symptoms of asthma include wheezing, coughing, chest tightness, and shortness of breath. Daily prophylactic treatment can prevent symptoms and attacks, and enable individuals with asthma to lead active lives. Respiratory diseases burden individuals and their families, but also schools, workplaces, neighborhoods, cities, and states.

Inpatient hospitalizations and emergency department visits for asthma often indicate poor control of asthma or that the patient lacks a primary care physician. Analysis of inpatient hospitalizations and ED visits can provide insight into access to routine health care services, quality of care, and existing community health programs focusing on asthma.

Asthma-Related Healthy People 2020 (HP2020) Objectives[†]

RD-2.1: Reduce hospitalizations for asthma among children under age 5 years
Target: 18.2 per 10,000

RD-2.2: Reduce hospitalizations for asthma among children and adults aged 5- to 64 years
Target: 8.7 per 10,000

RD-3.1: Reduce emergency department (ED) visits for asthma among children under age 5 years
Target: 95.7 per 10,000

RD-3.2: Reduce emergency department (ED) visits for asthma among children and adults aged 5 to 64 years
Target: 49.6 per 10,000

[†] Office of Disease Prevention and Health Promotion. 2020 Topics & Objectives: Respiratory Diseases. https://www.healthypeople.gov/2020/topics-objectives/topic/respiratory-diseases/objectives. Accessed May 2016.

DATA SOURCES AND METHODS

Data Source for Childhood Asthma Prevalence

The asthma prevalence of Illinois children (ages 0-17) was determined using the 2011-2012 National Survey of Children's Health (NSCH). The NSCH is a telephone survey for parents of non-institutionalized children ages 0-17 sponsored by the federal Maternal and Child Health Bureau (MCHB). The 2011-2012 NSCH is the most recent version of this survey at the date of this report publication.

Data Source for Illinois Childhood Asthma Hospitalizations and ED Visits

Records of inpatient hospitalization and ED visit records were obtained from the IDPH Division of Patient Safety and Quality. Cases included in this analysis were Illinois residents, ages 0-19, discharged between during 2011-2014, with a principal International Classification of Disease version 9 (ICD-9) diagnosis code of '493.xx'. Patients who presented at the ED and were subsequently admitted to the hospital were included as inpatient hospitalizations, not ED visits.

Additional childhood asthma hospitalizations and ED visits for Illinois resident children were provided by the bordering states of Indiana, Iowa, Missouri, and Wisconsin. Cases were identified as Illinois residents, ages 0-19, discharged between 01/01/2011 and 12/31/2014 with a principal ICD-9 diagnosis code of '493.XX'. These cases are included in all the findings except Figures 4 and 6 (multi-factor stratified analyses not available for out of state cases).

Calculation of Hospitalization and ED Visit Rates

Rates at the state and county level were calculated by dividing the number of childhood asthma hospitalizations and ED visits by the 2011-2014 post-censal population estimates for each subpopulation of interest. Rates at the zip code level were calculated by dividing the number of hospitalizations and ED visits by the 2010-2014 5-Year American Community Survey (ACS) population estimates for each subpopulation of interest.

All Healthy People 2020 comparisons in the analysis (with the exception of rates displayed specifically for children ages 0-4) were set in reference to the *HP2020* objectives for children and adults ages 5-64, as there is no single *HP2020* objective for ages 0-19. In addition, all map classes were set in reference to the *HP2020* objectives for children and adults ages 5-64.

Rate Ratios (RR) and 95% confidence intervals were calculated via log-binomial regression using the Genmod Procedure in SAS v9.4. Rate Differences (RD) were calculated by subtracting the smaller rate from the larger rate. For the RDs, 95% confidence intervals were calculated using the following formula:

$$95\%\ Confidence\ Interval = \ RD\ \pm\sqrt{(\frac{Hospital\ Count_1}{Population\ Estimate_1}+\frac{Hospital\ Count_2}{Population\ Estimate_2})}$$

Geographic Area of Patient Residence[‡]

Illinois region is assigned using the stratification employed by the Illinois Behavioral Risk Factor Surveillance System (BRFSS):

Chicago: Residents of the city of Chicago.

Suburban Cook County: Illinois residents residing within Cook County but outside Chicago.

Collar Counties: Illinois residents residing in counties contiguous with Cook County, including DuPage, Kane, Lake, McHenry, and Will.

Other Urban Counties: Illinois residents residing in: Champaign, DeKalb, Kankakee, Kendall, McLean, Macon, Madison, Peoria, Rock Island, Sangamon, St. Clair, Tazewell, and Winnebago counties.

Rural Counties: Illinois residents residing in: Adams, Alexander, Bond, Boone, Brown, Bureau, Calhoun, Carrol, Cass, Christian, Clark, Clay, Clinton, Coles, Crawford, Cumberland, DeWitt, Douglas, Edgar, Edwards, Effingham, Fayette, Ford, Franklin, Fulton, Gallatin, Greene, Grundy, Hamilton, Hancock, Hardin, Henderson, Henry, Iroquois, Jackson, Jasper, Jefferson, Jersey, JoDaviess, Johnson, Knox, LaSalle, Lawrence, Lee, Livingston, Logan, McDonough, Macoupin, Marion, Marshall, Mason, Massac, Menard, Mercer, Monroe, Montgomery, Morgan, Moultrie, Ogle, Perry, Piatt, Pike, Pope, Pulaski, Putnam, Randolph, Richland, Saline, Schuyler, Scott, Shelby, Stark, Stephenson, Union, Vermillion, Wabash, Warren, Washington, Wayne, White, Whiteside, Williamson, and Woodford counties.

Calculation of Concentrated Disadvantage Indicator[§]

Concentrated disadvantage is a standardized measure of the economic strength of a community. While it is similar to measuring poverty, it encompasses more than just income level to assess a community's economic standing. It acknowledges that some communities experience a concentration of economic disadvantages that adversely affect residents.

Concentrated disadvantage is calculated based on five variables:

- % of families under the poverty line
- % of persons living in households receiving public assistance
- % of individuals 16 and older in the labor force who are unemployed
- % of households headed by single females
- % of persons under 18 years of age

For this analysis, 2010 Census and 2008-2012 ACS data were used to calculate concentrated disadvantage at the county and census tract levels. Z-scores were computed to compare the county/tract values to the state average and the z-scores were then classified into quartiles to divide communities into four levels of concentrated disadvantage. Communities with z-scores in the 4th quartile (highest 25%) were classified as experiencing high concentrated disadvantage.

[‡] Illinois Department of Public Health. Illinois Behavioral Risk Factor Surveillance System (BRFSS) Stratification for Data Analysis. http://app.idph.state.il.us/brfss/stratamap.asp. Accessed July 2016.

[§] AMCHP 2014, "Life Course Indicator: Concentrated Disadvantage". Retrieved from: http://www.amchp.org/programsandtopics/data-assessment/LifeCourseIndicatorDocuments/LC-06_ConcentratedDisad_Final-4-24-2014.pdf

RESULTS

Figure 1 shows that 9% of Illinois children ages 0-17 had asthma during 2011-2012. Non-Hispanic (NH) Black children had the highest prevalence of childhood asthma (19%), more than three times that of NH White (6%) and Hispanic (6%) children. Asthma prevalence was highest among children 12-17 years of age (11%), followed by children 6-11 years of age (9%). There was no significant difference in asthma prevalence between male and female children. Of children in poor or near poor households (less than 200% of the federal poverty line), asthma prevalence was 10%, nearly twice as high as among higher income children (6%).

Figure 1. Percent of IL Children with Current Asthma, 2011-2012 NSCH

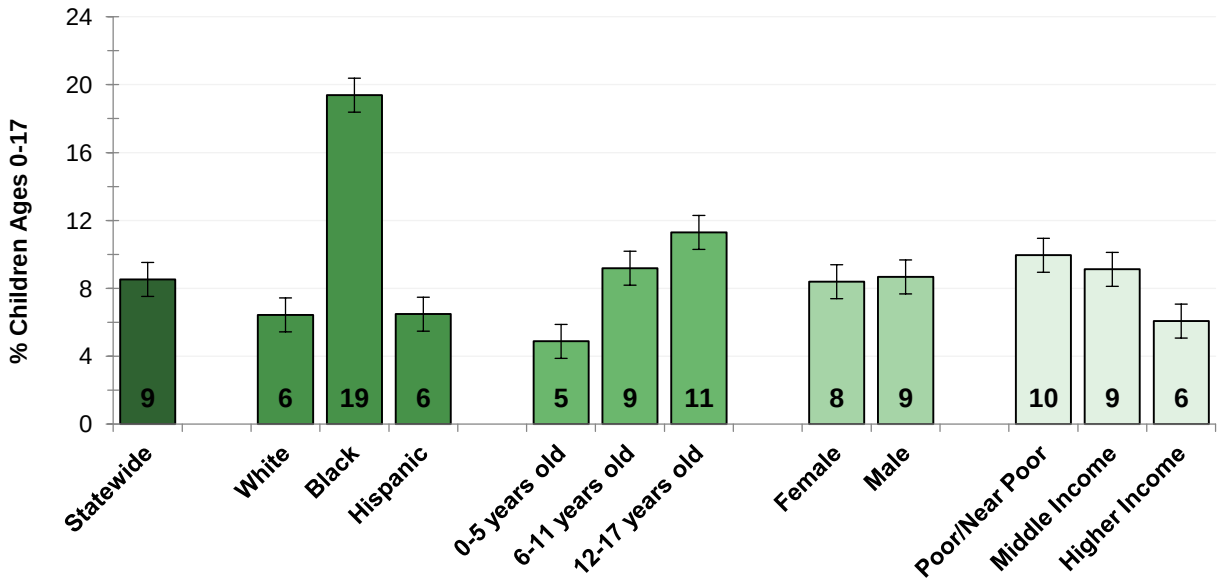


Table 1 describes the 20,808 hospitalizations and 121,986 ED visits related to asthma for Illinois children during 2011-2014. Asthma hospitalizations and ED visits were most common among young children, with 46.8% of hospitalizations and 32.8% of ED visits occurring among children under five years of age. Males also had a higher burden of asthma hospitalizations and ED visits, as boys accounted for 61.5% of hospitalizations and 60.0% of ED visits. Despite the fact that African-American children make up only 17.2% of the population, they accounted for 41.8% of hospitalizations and 48.6% of ED visits for childhood asthma. The majority of childhood asthma hospitalizations and ED visits occurred to children residing in the Chicago metropolitan area. Nearly 40% of Illinois children reside in Cook County, but these children accounted for over 50% of asthma hospitalizations and ED visits. If you also include the five Collar counties, two-thirds of Illinois children reside in the Chicago metropolitan area; these Chicago area children accounted for 75.6% of inpatient hospitalizations and 68.2% of ED visits for childhood asthma.

Table 1. Number and Percent of Illinois Child Asthma Inpatient Hospitalizations and ED Visits (ages 0-19), By Child Characteristics, 2011-2014

	Child Population Estimate Annual Average		Inpatient Hospitalizations		ED Visits	
	N	%	N	(%)	N	(%)
TOTAL	3,394,118	100.0%	20,808	100.0%	121,986	100.0%
Admission Year						
2011	863,401	25.4%	5,273	25.3%	30,597	25.1%
2012	853,624	25.2%	5,335	25.6%	31,235	25.6%
2013	843,900	24.9%	4,993	24.0%	29,006	23.8%
2014	833,294	24.6%	5,207	25.0%	31,148	25.5%
Age						
0-4	805,825	23.7%	9,729	46.8%	40,069	32.8%
5-9	842,148	24.8%	6,191	29.8%	37,023	30.4%
10-14	861,761	25.4%	3,345	16.1%	24,620	20.2%
15-19	884,385	26.1%	1,543	7.4%	20,274	16.6%
Sex						
Female	1,662,098	49.0%	8,002	38.5%	48,791	40.0%
Male	1,734,812	51.1%	12,806	61.5%	73,188	60.0%
Race/Ethnicity						
NH White	1,834,745	54.1%	6,150	29.6%	32,900	27.0%
NH Black	582,839	17.2%	8,695	41.8%	59,327	48.6%
Hispanic	800,201	23.6%	3,898	18.7%	20,132	16.5%
Asian/Pacific Islander	178,125	5.2%	534	2.6%	1,531	1.3%
Other/Unknown	*	*	1,531	7.4%	8,096	6.6%
Geography of Patient Residence						
Chicago	754,100	22.2%	6,799	32.7%	38,883	31.9%
Suburban Cook County	585,242	17.2%	4,389	21.1%	22,707	18.6%
Collar Counties	905,740	26.7%	4,549	21.9%	21,603	17.7%
Other Urban Counties	615,104	18.1%	3,397	16.3%	24,350	20.0%
Rural Counties	533,931	15.7%	1,674	8.0%	14,442	11.8%

*Not applicable or no estimate available.
**Population distribution estimated using 2010-2014 ACS 5-Year estimate for children ages 0-17.

The rate of asthma hospitalization in 2014 among children ages 0-19 was 15.6 per 10,000 children. The 2014 asthma ED visit rate for children ages 0-19 was 92.0 per 10,000 children. The rates of Illinois childhood asthma hospitalizations and ED visits did not change meaningfully during 2011-2014 (see Figure 2).

Figure 2. Rate of Childhood Asthma Hospitalizations and ED Visits, Illinois 2011-2014

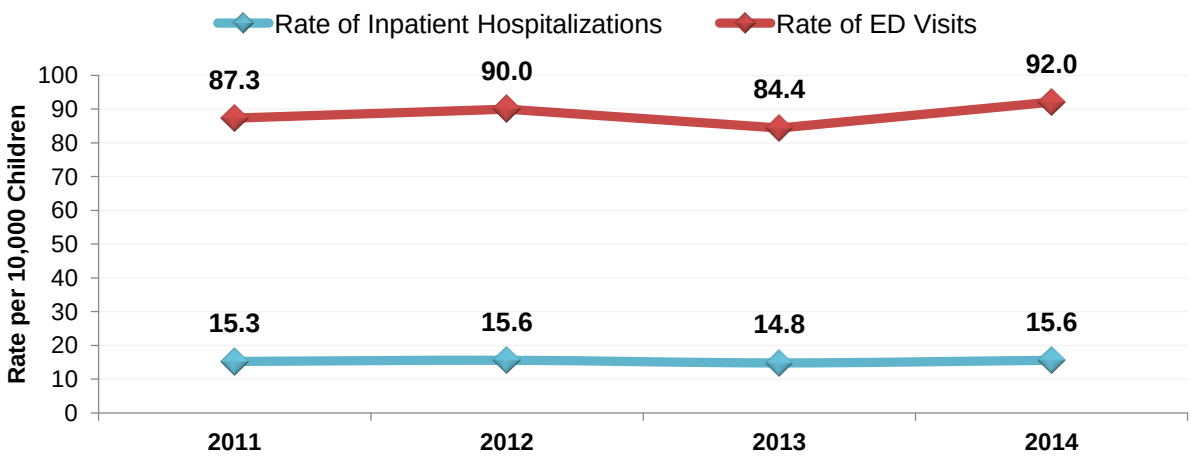


Figure 3 shows the childhood asthma hospitalization rate broken down the race/ethnicity, age, sex, and location of residence for the child. The rate of childhood asthma hospitalizations for all Illinois children during 2014 was 15.3 hospitalizations per 10,000 children ages 0-19. This rate was 1.8 times the *Healthy People 2020* objective of 8.7 hospitalizations per 10,000.

The 2014 Illinois childhood asthma hospitalization rates were highest among Non-Hispanic (NH) Black children, at a rate of 38.1 hospitalizations per 10,000 children. This was more than 4.5 times as high as the rate for NH White children, and was 4.4 times the *Healthy People 2020* objective of 8.7 hospitalizations per 10,000.

The 2014 rate of Illinois childhood asthma hospitalizations was highest among young children, with children 0-4 years and 5-9 years having respective rates of 29.5 hospitalizations per 10,000 and 20.2 hospitalizations per 10,000. The hospitalizations rates for children ages 0-4 and 5-9 are 1.6 and 2.3 times the respective *Healthy People 2020* objectives for each age group [18.2 hospitalizations per 10,000 children ages 0-4; 8.7 hospitalizations per 10,000 children and adults ages 5-64]. The asthma hospitalization rate for children ages 10-14 in 2014 (9.5 per 10,000) was marginally higher than the *Healthy People 2020* objective, while the rate for children ages 15-19 (4.5 per 10,000) met the *Healthy People 2020* objective.

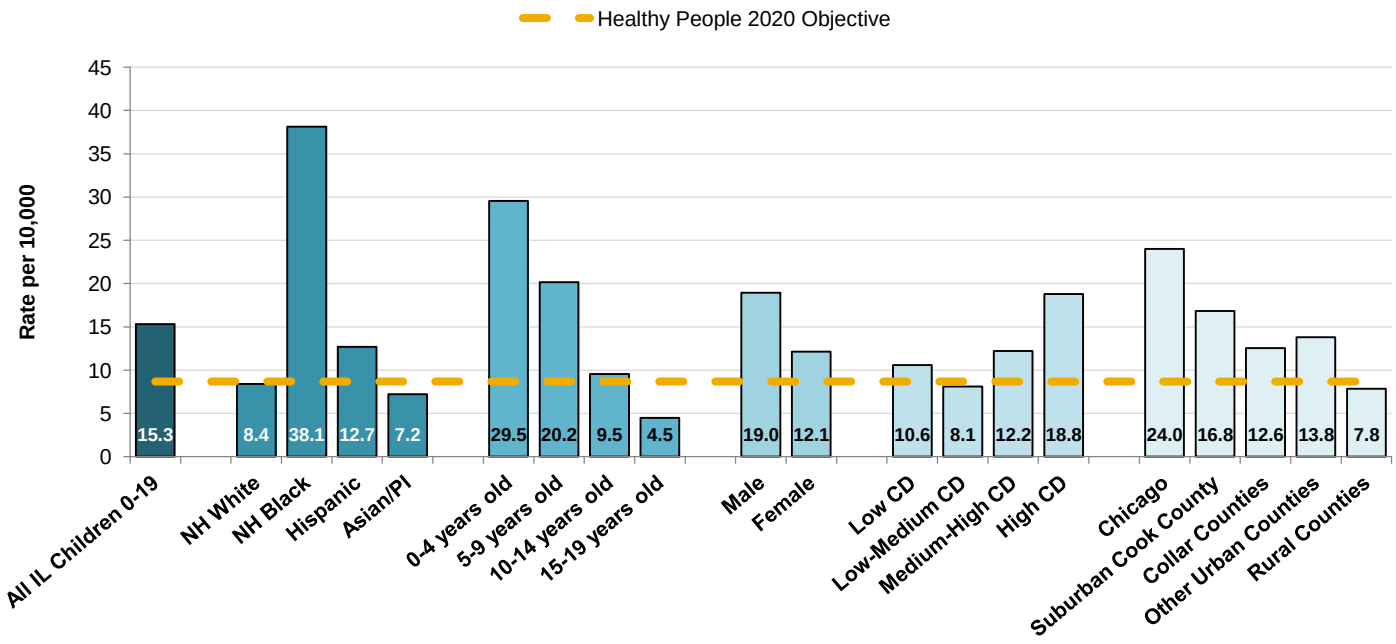
Childhood asthma hospitalizations were more common among Illinois boys than girls. In 2014, the asthma hospitalization rate for male children was 19.0 per 10,000, while the hospitalization rate for female children was 12.1 per 10,000. The rate of hospitalizations for asthma was 57% higher among male compared to female children. The rate of hospitalizations for males and females were 2.2 times and 1.4 times the *Healthy People 2020* objective, respectively.

The relative level of concentrated disadvantage for the county of residence was related to the rate of childhood asthma hospitalizations. In 2014, children residing in with the highest level of concentrated disadvantage had the highest childhood asthma hospitalization rates (18.8 per

10,000). The high concentrated disadvantage category was strongly skewed towards the rate in Cook County because the larger population there, but even when Cook County was not included, the remaining high concentrated disadvantage counties continued to exhibit the highest childhood asthma hospitalization rate (13.8 per 10,000). The rate of childhood asthma hospitalizations in counties of high concentrated disadvantage was 2.2 times the *Healthy People 2020* objective. In contrast, counties with low or low-medium levels of concentrated disadvantage had asthma hospitalization rates of 10.6 per 10,000 and 8.5 per 10,000, respectively.

When the place of residence was classified based on geography and level of urbanicity, children residing in the city of Chicago had the highest rate of childhood asthma hospitalizations (24.0 per 10,000), while children residing in rural counties had the lowest hospitalization rate (7.8 per 10,000). The hospitalization rate in Chicago was 2.8 times the *Healthy People 2020* objective.

Figure 3. Rate of Childhood Asthma Hospitalizations, By Demographics, Illinois 2014



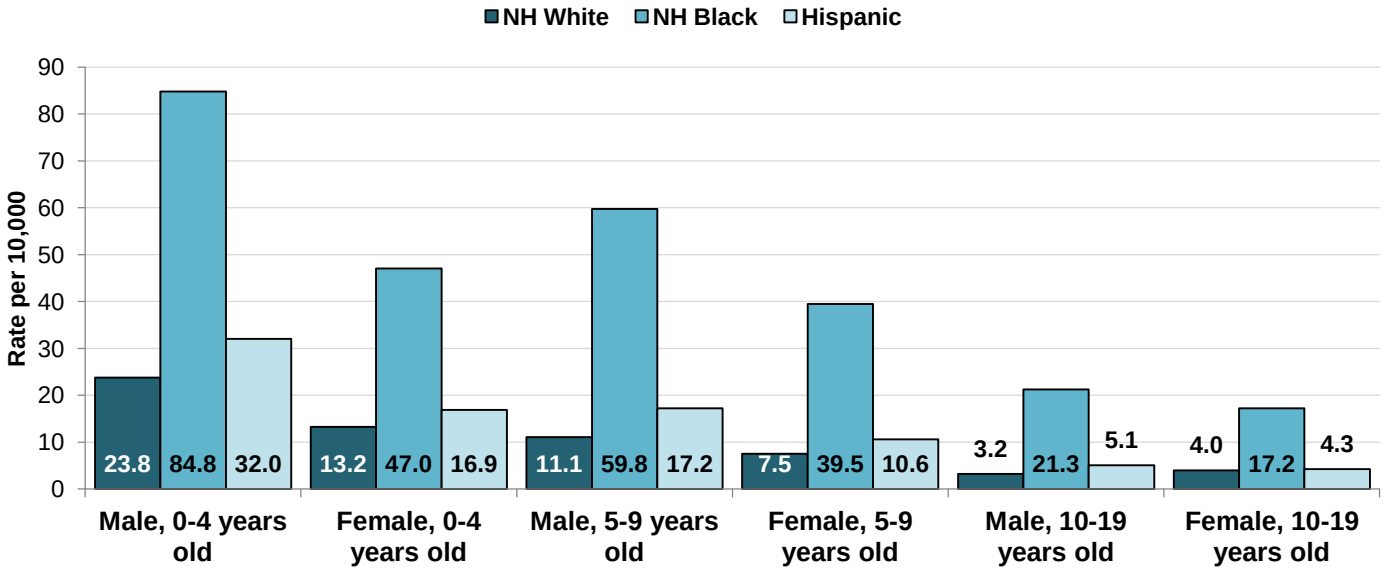
Looking at single-factor characteristics of children, however, does not provide a complete picture of how these risk markers combine synergistically to affect childhood asthma. Figure 4 shows the rate of childhood asthma hospitalizations according to the various combinations of child sex, age, and race/ethnicity. Four years of data were combined for this chart to produce sufficient sample sizes for the estimates.

The highest rates of Illinois childhood asthma hospitalizations occur among 0-4 year old NH Black males (84.8 per 10,000), 5-9 year old NH Black males (59.8 per 10,000), 0-4 year old NH Black females (47.0 per 10,000), and 5-9 year old NH Black females (39.5 per 10,000). These

subpopulations are 4.7 times, 6.9 times, 2.6 times, and 4.5 times the respective Healthy People 2020 objectives [18.2 hospitalizations per 10,000 in ages 0-4; 8.7 hospitalizations per 10,000 in ages 5-64].

Rate differences (RDs) and rate ratios (RRs) comparing each sub-population to their NH White counterparts were calculated and are displayed in appendix table A-2. These RDs and RRs highlight the racial/ethnic disparities in asthma hospitalizations. The largest rate differences and rate ratios were present for the same two groups: between NH Black and NH White male children, ages 0-4 and NH Black and NH White male children, ages 5-9.

Figure 4. Rate of Childhood Asthma Hospitalizations, By Child Sex, Age, and Race/Ethnicity, Illinois* 2011-2014

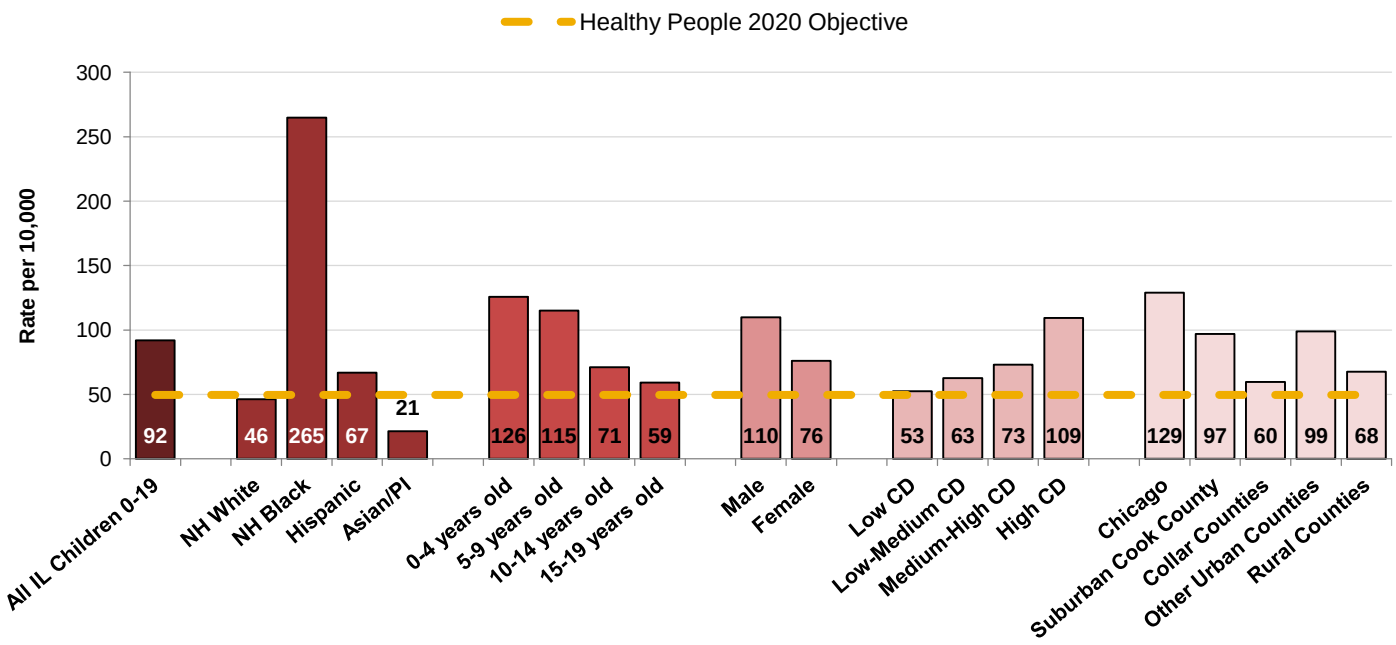


** out of state occurrences to Illinois residents not included in this Figure*

Figure 5 shows the childhood asthma ED visit rate broken down the race/ethnicity, age, sex, and location of residence for the child. The rate of childhood asthma ED visits for all Illinois children during 2014 was 92 ED visits per 10,000 children ages 0-19. This rate was 1.9 times the *Healthy People 2020* objective of 49.6 ED visits per 10,000.

The 2014 Illinois childhood asthma ED visit rates by race/ethnicity were highest among NH Black children, with 265 ED visits per 10,000 children. The rate of ED visits among NH Black children was 5.3 times the *Healthy People 2020* objective. The rate of asthma ED visits for NH Black children asthma was more than 5.5 times as high as that for NH White children.

Figure 5. Rate of Childhood Asthma ED Visits, By Demographics, Illinois 2014



The 2014 Illinois childhood asthma ED visit rates by race/ethnicity were highest among NH Black children, with 265 ED visits per 10,000 children. The rate of ED visits among NH Black children was 5.3 times the *Healthy People 2020* objective. The rate of asthma ED visits for NH Black children asthma was more than 5.5 times as high as that for NH White children.

The rate of Illinois asthma ED visits in 2014 was highest among young children, with children 0-4 years and 5-9 years having respective ED visit rates of 126 per 10,000 and 115 per 10,000. Older children had lower rates of childhood asthma-related ED visits, with 71 ED visits per 10,000 children ages 10-14 and 59 ED visits per 10,000 children ages 15-19. In contrast, the *Healthy People 2020* objectives for asthma ED visits are 95.7 visits per 10,000 children ages 0-4 and 49.6 visits per 10,000 children and adults ages 5-64. All age groups of Illinois children exceeded the respective *Healthy People 2020* objectives for childhood asthma ED visits.

ED visits for childhood asthma are more common for Illinois boys than girls. The Illinois 2014 childhood asthma ED visit rates for males and females were 110 per 10,000 and 76 per 10,000, respectively. The childhood asthma ED visit rates for males and females were 2.2 times and 1.5 times the *Healthy People 2020* objective, respectively.

The relative level of concentrated disadvantage for the county of residence was related to the rate of childhood asthma ED visits. Children residing in counties with the highest level of concentrated disadvantage had the highest childhood asthma ED visit rates (109 visits per 10,000 children ages 0-19). The high disadvantage category was more heavily influenced by Cook County because of its large population, but when Cook County was not included, the remaining high concentrated disadvantage counties continued to have the highest ED visit rate

(96 visits per 10,000 children). The rate of childhood asthma ED visits in counties of high concentrated disadvantage was 2.2 times the *Healthy People 2020* objective. In contrast, counties with low concentrated disadvantage had an asthma ED visit rate of 53 visits per 10,000 children.

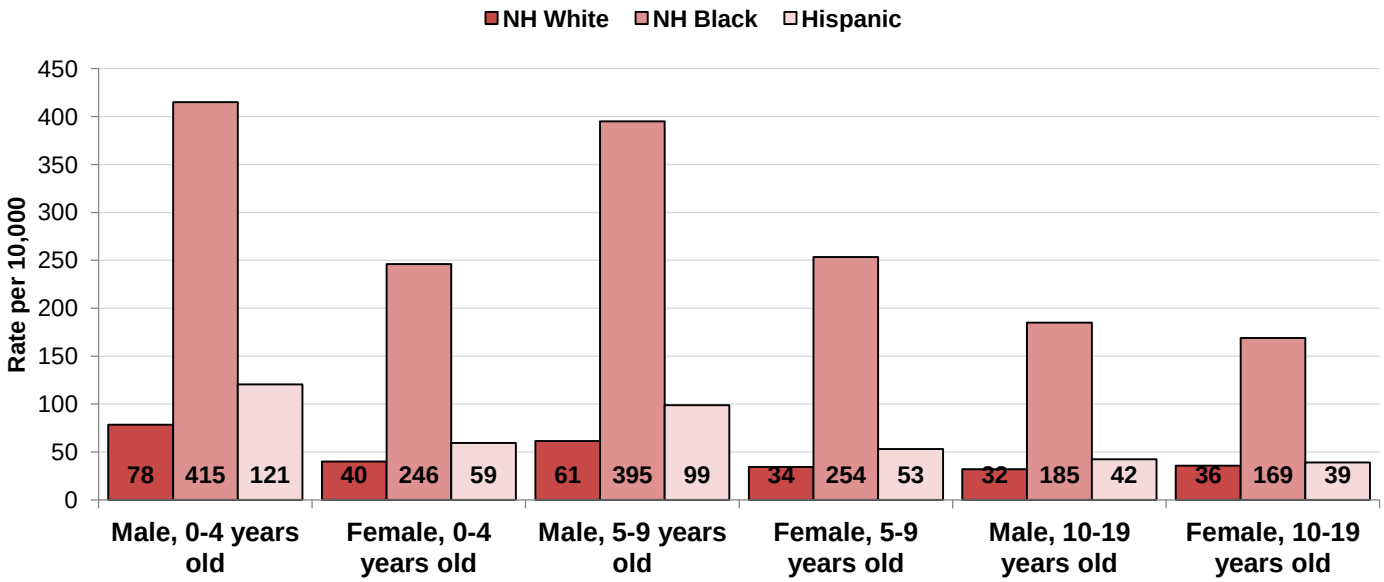
When the place of residence was classified based on geography and level of urbanicity, children residing in the city of Chicago had the highest rate of childhood asthma ED visits (120 per 10,000), while children residing in rural counties had the lowest asthma ED visit rate (60 per 10,000). The hospitalization rate in Chicago was 2.6 times the *Healthy People 2020* objective.

As discussed with the hospitalization data, looking at individual characteristics of children does not provide a complete picture of how these risk markers combine to affect childhood asthma. Figure 6 shows the rate of childhood asthma ED visits according to the various combinations of child sex, age, and race/ethnicity.

The highest rates of childhood asthma ED visits were among NH Black males ages 0-4 (415 per 10,000), NH Black males ages 5-9 (395 per 10,000), NH Black females ages 5-9 (254 per 10,000), and NH Black females ages 0-4 (246 per 10,000). Respectively, these groups were 4.3, 8.0, 2.7 and 5.0 times their related *Healthy People 2020* objectives [95.7 ED visits per 10,000 children ages 0-4; 49.6 ED visits per 10,000 children and adults ages 5-64].

RDs and RRs comparing each sub-population to their NH White counterparts were calculated and are displayed in appendix table A-3. These RDs and RRs highlight the absolute and relative racial/ethnic disparities in asthma hospitalizations. The largest RDs were between NH Black and NH White male children ages 0-4 and ages 5-9. The largest RRs were between NH Black and NH White children ages 5-9, both males and females.

Figure 6. Rate of Childhood Asthma ED Visits,
By Child Sex, Age, and Race/Ethnicity, Illinois* 2011-2014



** out of state occurrences to Illinois residents not included in this Figure*

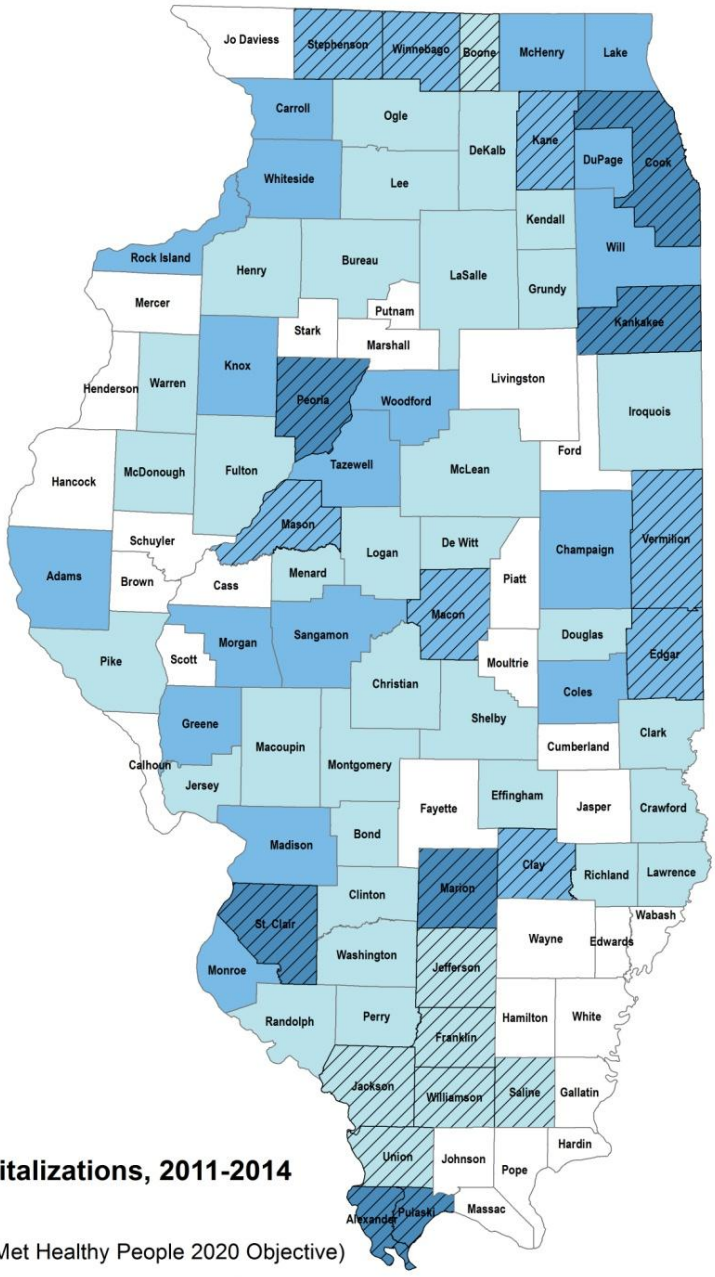
Maps of Childhood Asthma Hospitalizations and ED Visits: STATEWIDE

Figures 7 and 8 display the 2011-2014 Illinois childhood asthma hospitalization and ED visit rates for all children ages 0-19 by county. Counties are shaded according to their comparison to the *Healthy People 2020* objective: light shaded counties met the objective, while the medium and darker shadings represent 1-2 times and more than 2 times the *Healthy People 2020* objective. Counties with too few cases to report (<10 hospitalizations) during 2011- 2014 are represented in white. Counties with high concentrated disadvantage are marked with a diagonal pattern.

Seven Illinois counties had a childhood asthma hospitalization rate more than two times the *Healthy People 2020* objective. All seven counties are of high concentrated disadvantage, suggesting that social determinants of health have a strong relationship with childhood asthma hospitalizations in Illinois. The five counties with the highest rates of hospitalizations in 2011-2014 were: Marion (29.0 hospitalizations per 10,000), Kankakee (22.9 per 10,000), Alexander (22.2 per 10,000), Cook (20.9 per 10,000), and Saline (19.9 per 10,000).

Fifteen counties had childhood asthma ED visit rates more than two times the *Healthy People 2020* objective. In addition, ten of these fifteen counties are of high concentrated disadvantage, again reaffirming the connection of social determinants of health with asthma ED visits. The five counties with the highest childhood asthma ED visit rates during 2011-2014 were: Hardin (316 per 10,000), St. Clair (174 per 10,000), Alexander (158 per 10,000), Stephenson (137 per 10,000), and Mason (129 per 10,000).

Figure 7. Rate of Childhood Asthma Inpatient Hospitalizations, Illinois 2011-2014



Rate of Asthma Hospitalizations, 2011-2014

Ages 0-19

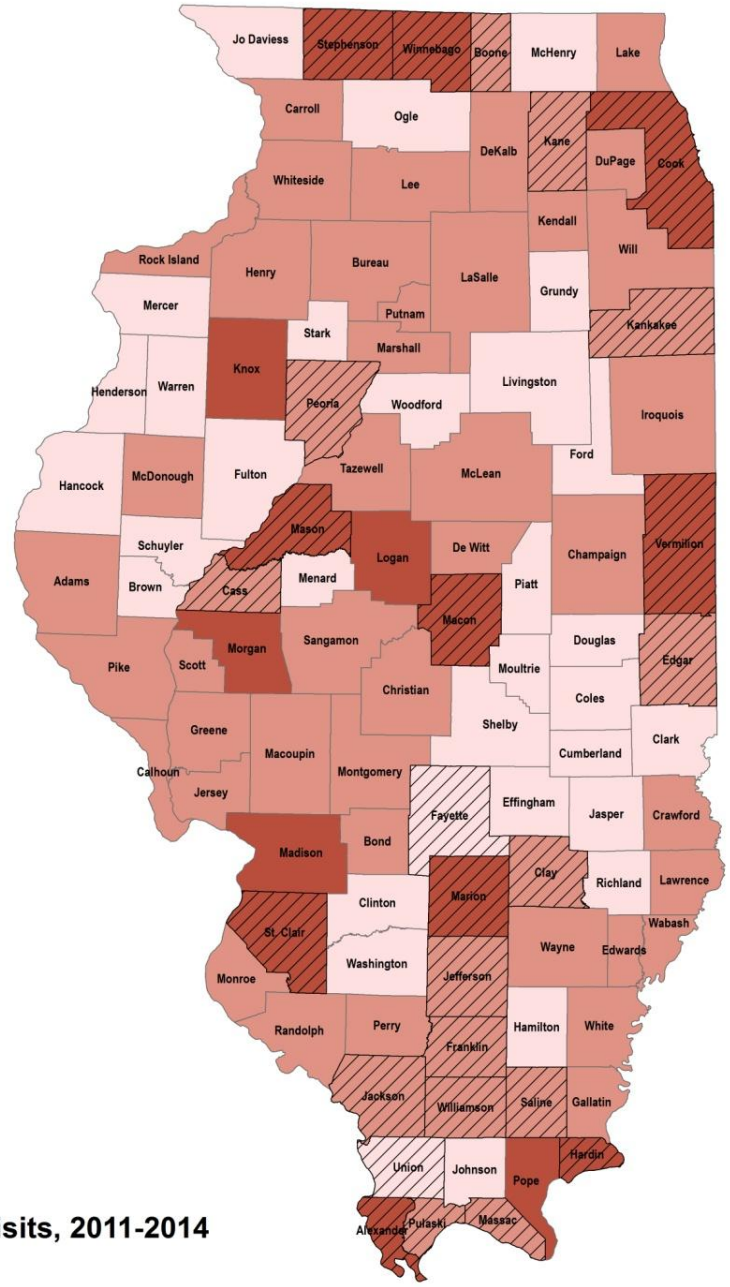
- 0.0 - 8.7 per 10,000 (Met Healthy People 2020 Objective)
- 8.8 - 17.4 per 10,000 (Up to 2x Healthy People 2020 Objective)
- > 17.4 per 10,000 (>2x Healthy People 2020 Objective)
- Too Few Cases to Report
- County with High Concentrated Disadvantage

Data Sources: Illinois Dept. of Public Health, State of Missouri Dept. of Health and Senior Services, Wisconsin Division of Health, Indiana State Dept. of Health, Iowa Hospital Association, National Center for Health Statistics, U.S. Bureau of the Census

N

0 20 40 80 Miles

Figure 8. Rate of Childhood Asthma ED Visits, Illinois 2011-2014



Rate of Asthma ED Visits, 2011-2014

Ages 0-19

- 0.0 - 49.6 per 10,000 (Met Healthy People 2020 Objective)
- 49.7 - 99.2 per 10,000 (Up to 2x Healthy People 2020 Objective)
- > 99.2 per 10,000 (>2x Healthy People 2020 Objective)
- County with High Concentrated Disadvantage

Data Sources: Illinois Dept. of Public Health, State of Missouri Dept. of Health and Senior Services, Wisconsin Division of Health, Indiana State Dept. of Health, Iowa Hospital Association, National Center for Health Statistics, U.S. Bureau of the Census

N

0 20 40 80 Miles

Maps of Childhood Asthma Hospitalizations and ED Visits: COOK COUNTY

Figures 9 and 10 display the 2011-2014 Illinois childhood asthma hospitalization and ED visit rates for all children ages 0-19 in zip codes within Cook County. Zip codes are shaded according to their comparison to the *Healthy People 2020* objective: light shaded zip codes met the objective, while the medium and darker shadings represented 1-2 times, 2-3 times, and more than 3 times the *Healthy People 2020* objective. Zip codes with too few cases to report (<10 hospitalizations) during 2011- 2014 are represented in white. Census tracts with high concentrated disadvantage are marked with a diagonal pattern. The boundaries for the city of Chicago are outlined in bold black lines.

The highest rates of childhood asthma hospitalizations occur in the western and southern regions of Chicago and Chicago suburban regions of Cook County. Within Cook County, zip codes with a high percentage of NH Blacks making up the population are disproportionately burdened by both high concentrated disadvantage and high asthma hospitalization rates. Hospitalization rates by Cook County zip code reach as high as 65.8 hospitalizations per 10,000, which is 7.5 times the *Healthy People 2020* objective.

Overall, there is a similar geographic pattern for childhood asthma ED visits as was observed for hospitalizations. The highest rates of childhood asthma ED visits occur in the western and southern Chicago and Chicago suburban regions and often align with census tract areas of high concentrated disadvantage. ED visit rates by Cook County zip code reach as high as 332 per 10,000, which is 6.7 times the *Healthy People 2020* objective.

Figure 9. Rate of Childhood Asthma Inpatient Hospitalizations, Cook County, Illinois 2011-2014

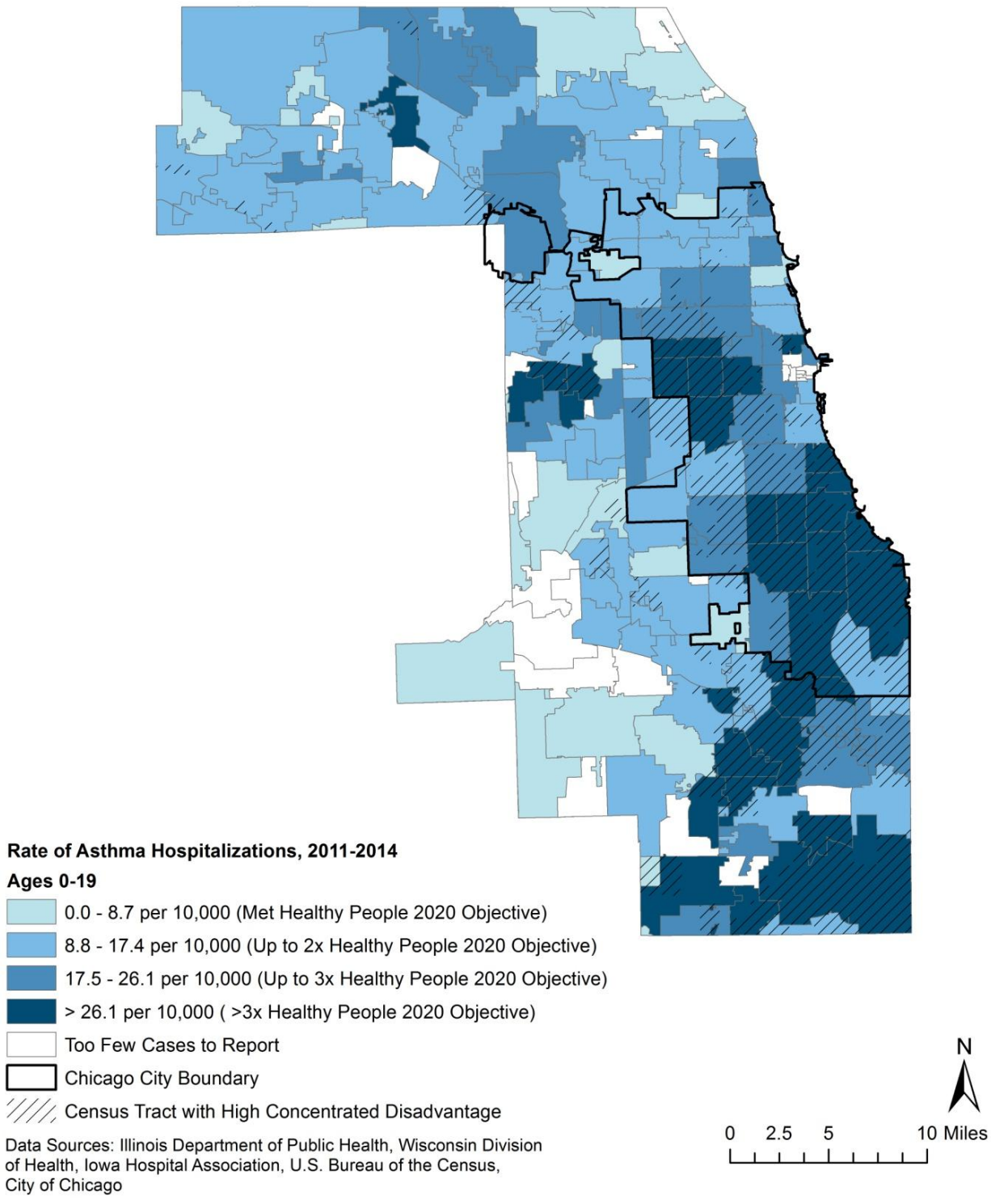
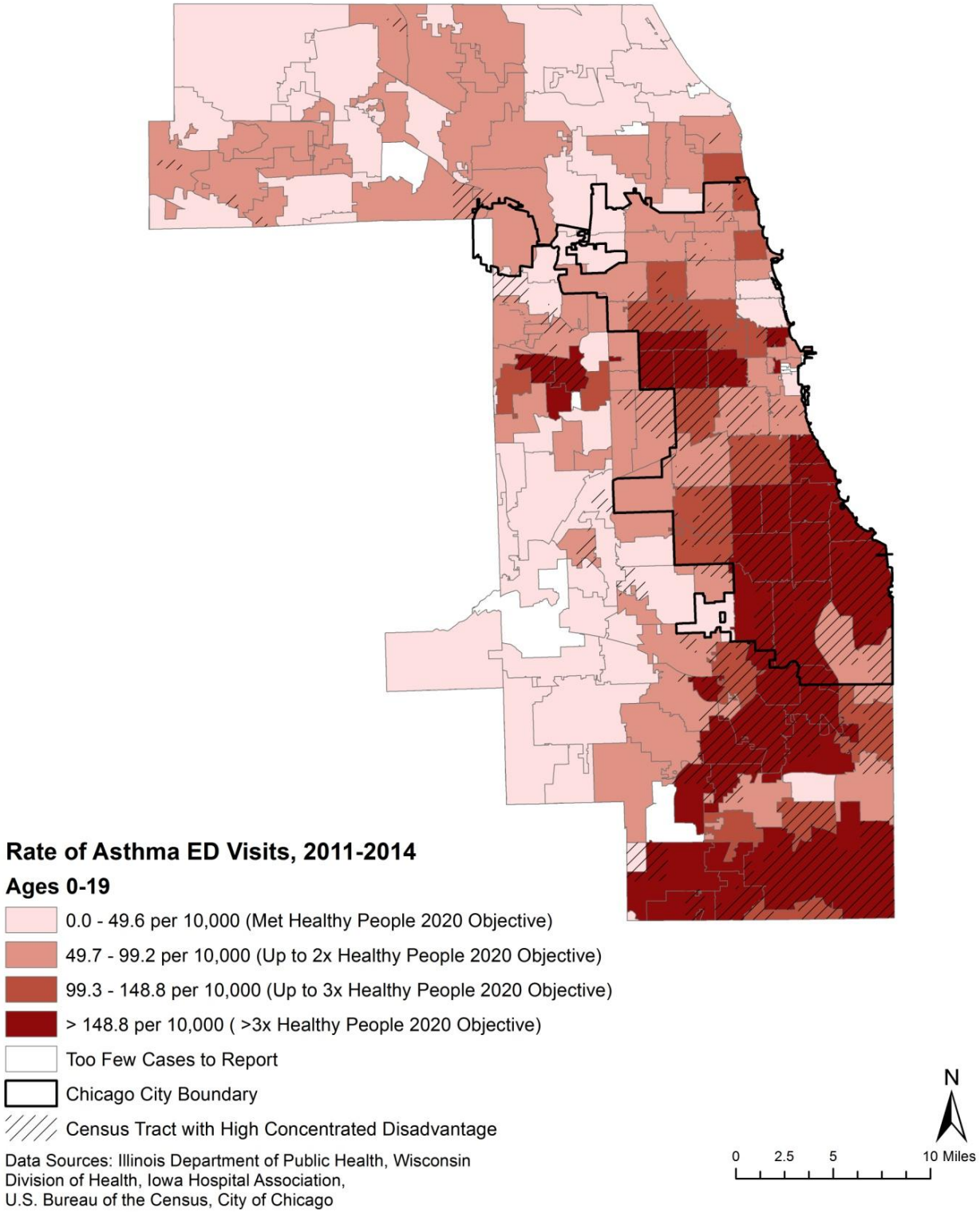


Figure 10. Rate of Childhood Asthma ED Visits, Cook County, Illinois 2011-2014



Maps of Childhood Asthma Hospitalizations and ED Visits: CHICAGO

Figures 11 and 12 display the 2011-2014 Illinois childhood asthma hospitalization and ED visit rates for all children ages 0-19 in zip codes within the city of Chicago. Zip codes are shaded according to their comparison to the *Healthy People 2020* objective: light shaded zip codes met the objective, while the medium and darker shadings represented 1-2 times, 2-3 times, and more than 3 times the *Healthy People 2020* objective. Zip codes with too few cases to report (<10 hospitalizations) during 2011- 2014 are represented in white. The boundaries for the 77 community areas of Chicago are overlaid on the map – Table 2 provides a codebook for the community areas.

Both the highest childhood asthma hospitalization and ED visit rates occurred in the western and southern Chicago community areas. The zip codes with the highest rates of childhood asthma hospitalizations were located in: Englewood (48.0 per 10,000), West and East Garfield Park (47.0 per 10,000), and West Englewood (46.4 per 10,000). The zip codes with the highest rates of childhood asthma ED visits were located in: Austin (323 per 10,000), West Englewood (323 per 10,000), and Englewood (302 per 10,000). All of these community areas are of high concentrated disadvantage, as seen in figures 9 and 10.

Chicago Community Area Codes					
1	Rogers Park	**27**	East Garfield Park	**53**	West Pullman
2	West Ridge	**28**	Near West Side	**54**	Riverdale
3	Uptown	**29**	North Lawndale	**55**	Hegewisch
4	Lincoln Square	**30**	South Lawndale	**56**	Garfield Ridge
5	North Center	**31**	Lower West Side	**57**	Archer Heights
6	Lake View	**32**	The Loop	**58**	Brighton Park
7	Lincoln Park	**33**	Near West Side	**59**	McKinley Park
8	Near North Side	**34**	Armour Square	**60**	Bridgeport
9	Edison Park	**35**	Douglas	**61**	New City
10	Norwood Park	**36**	Oakland	**62**	West Elsdon
11	Jefferson Park	**37**	Fuller Park	**63**	Gage Park
12	Forest Glen	**38**	Grand Boulevard	**64**	Clearing
13	North Park	**39**	Kenwood	**65**	West Lawn
14	Albany Park	**40**	Washington Park	**66**	Chicago Lawn
15	Portage Park	**41**	Hyde Park	**67**	West Englewood
16	Irving Park	**42**	Woodlawn	**68**	Englewood
17	Dunning	**43**	South Shore	**69**	Greater Grand Crossing
18	Montclare	**44**	Chatham	**70**	Ashburn
19	Belmont Cragin	**45**	Avalon Park	**71**	Auburn Gresham
20	Hermosa	**46**	South Chicago	**72**	Beverly
21	Avondale	**47**	Burnside	**73**	Washington Heights
22	Logan Square	**48**	Calumet Heights	**74**	Mount Greenwood
23	Humboldt Park	**49**	Roseland	**75**	Morgan Park
24	West Town	**50**	Pullman	**76**	O'Hare
25	Austin	**51**	South Deering	**77**	Edgewater
26	W. Garfield Park	**52**	East Side		

Figure 11. Rate of Childhood Asthma Inpatient Hospitalizations, Chicago, Illinois 2011-2014

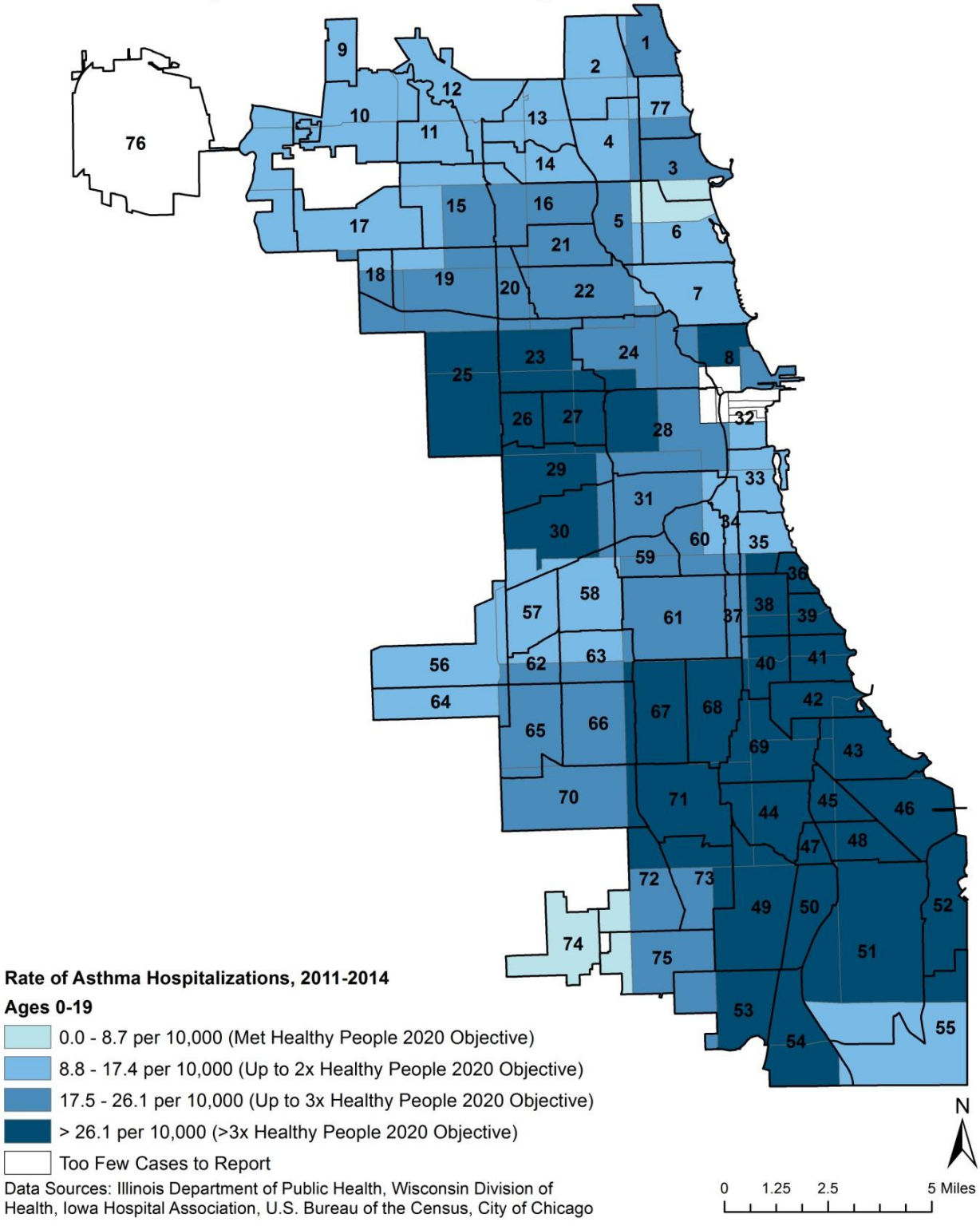
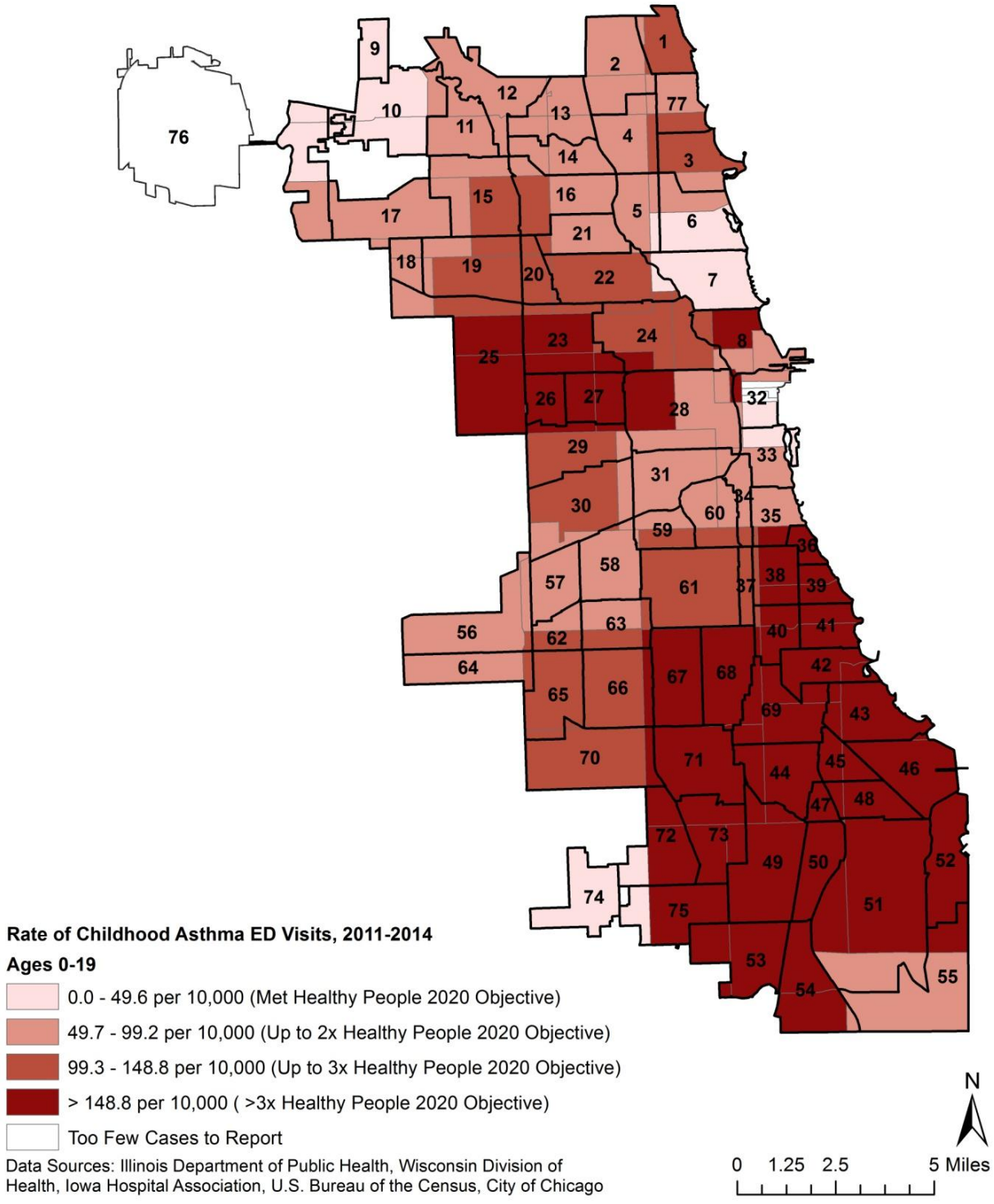


Figure 12. Rate of Childhood Asthma ED Visits, Chicago, Illinois 2011-2014



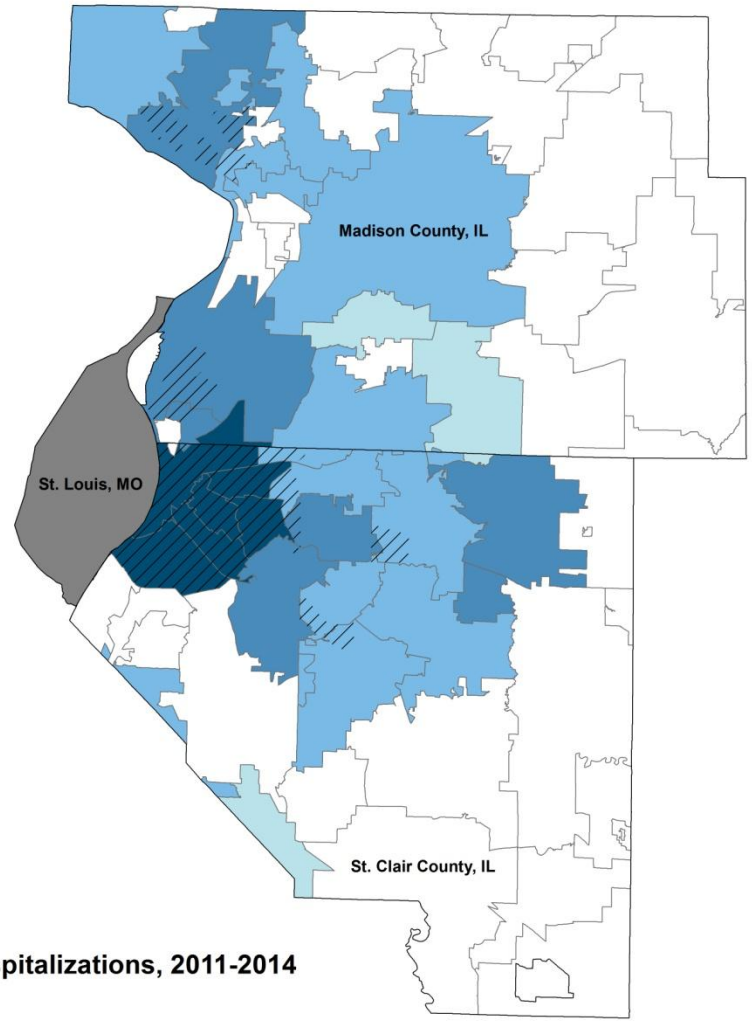
Maps of Childhood Asthma Hospitalizations and ED Visits: MADISON AND ST. CLAIR COUNTIES

Figures 12 and 13 display the 2011-2014 Illinois childhood asthma hospitalization and ED visit rates for all children ages 0-19 in zip codes within Madison and St. Clair Counties. Zip codes are shaded according to their comparison to the *Healthy People 2020* objective: light shaded zip codes met the objective, while the medium and darker shadings represented 1-2 times, 2-3 times, and more than 3 times the *Healthy People 2020* objective. Zip codes with too few cases to report (<10 hospitalizations) during 2011- 2014 are represented in white. Census tracts with high concentrated disadvantage are marked with a diagonal pattern.

The highest childhood asthma hospitalization rates occur in zip codes contiguous to the city of St. Louis, Missouri. Geographic areas with the highest rates of hospitalizations align with census tracts of high concentrated disadvantage. Hospitalization rates reach as high as 65.5 hospitalizations per 10,000 children ages 0-19 in Madison and St. Clair counties, which is 7.5 times the *Healthy People 2020* objective.

The highest childhood asthma ED visit rates also occur in zip codes contiguous to the city of St. Louis, Missouri and the Missouri bordering zip codes in Madison County. Geographic areas with the highest rates of ED visits align with census tracts of high concentrated disadvantage. ED visit rates reach as high as 392 ED visits per 10,000 children ages 0-19 in Madison and St. Clair counties, which is 7.9 times the *Healthy People 2020* objective.

Figure 13. Rate of Childhood Asthma Inpatient Hospitalizations, Madison County and St. Clair County, Illinois 2011-2014



Rate of Asthma Hospitalizations, 2011-2014

Ages 0-19

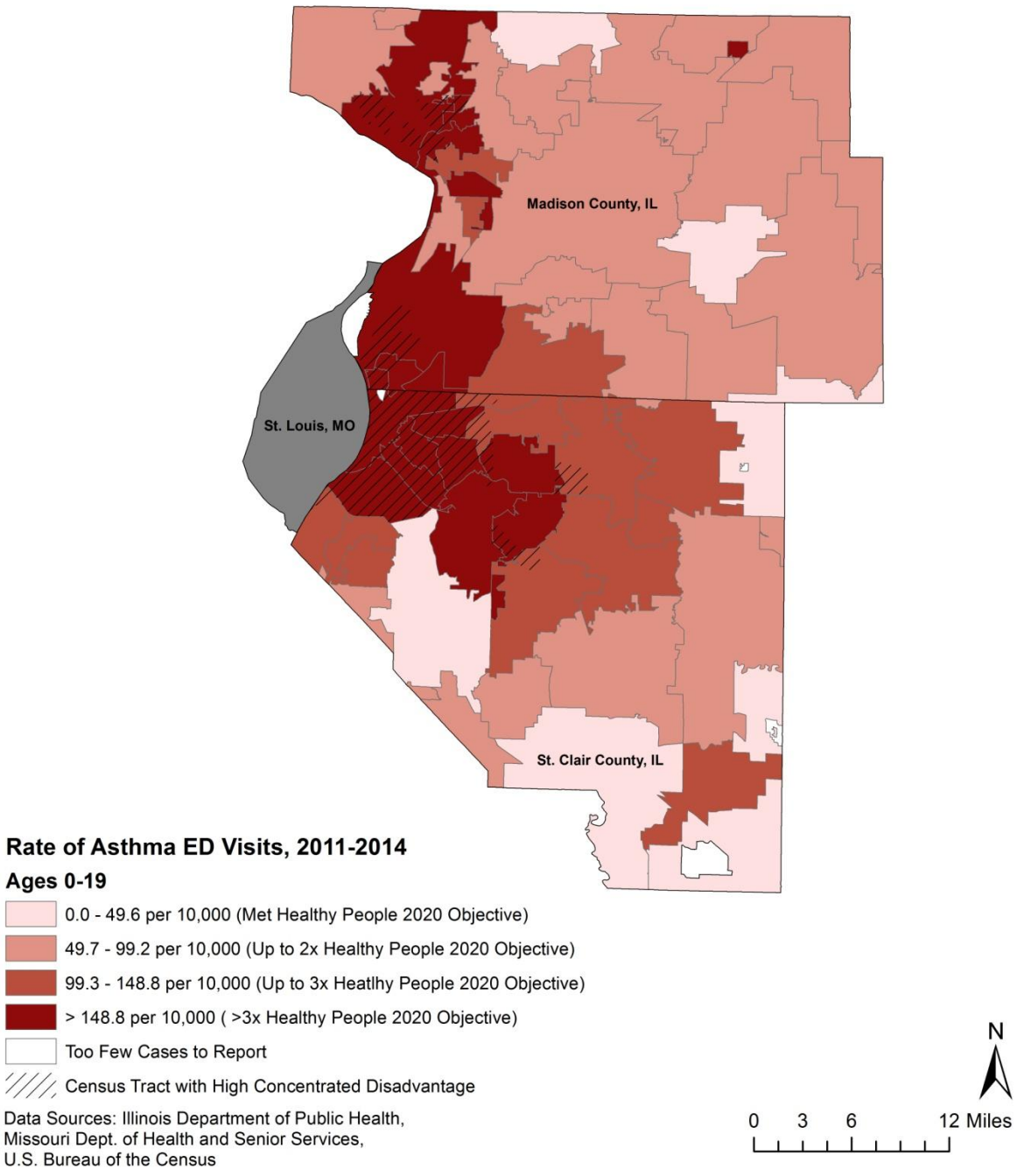
- 0.0 - 8.7 per 10,000 (Met Healthy People 2020 Objective)
- 8.8 - 17.4 per 10,000 (Up to 2x Healthy People 2020 Objective)
- 17.5 - 26.1 per 10,000 (Up to 3x Healthy People 2020 Objective)
- > 26.1 per 10,000 (>3x Healthy People 2020 Objective)
- Too Few Cases to Report
- Census Tract with High Concentrated Disadvantage

Data Sources: Illinois Department of Public Health,
State of Missouri Dept. of Health and Senior Services,
U.S. Bureau of the Census

N

0 3 6 12 Miles

Figure 14. Rate of Childhood Asthma ED Visits, Madison County and St. Clair County, Illinois 2011-2014



CONCLUSIONS AND IMPLICATIONS

This surveillance analysis highlights geographic areas of high childhood asthma hospitalization and ED visit rates that would benefit from additional resources and programmatic initiatives focusing on childhood asthma. In addition, this analysis demonstrates the need to consider environmental triggers and socio-structural determinants of health with respect to childhood asthma hospital use in Illinois.

The Community Preventive Services Task Force (June 2008) currently recommends the use of home-based, multi-trigger, multi-component environmental interventions. These interventions utilize a combination of home assessments, reduction of indoor exposures to asthma triggers, education about the home environment, asthma self-management education, asthma caregiver education, and coordinated care for the asthma patient.

Many private and public programs are currently focusing on childhood asthma in Illinois and utilize the Task Force recommendations. However, these programs indicate that there is limited funding to implement the recommendations. This report may be utilized to demonstrate the need for increased programming, to secure sustainable funding sources for these program initiatives, as well as providing a framework for decision-making related to program targeting and expansion.

The Community Preventative Services Task Force. Asthma Control: Task Force Recommendations and Findings (June 2008). http://www.thecommunityguide.org/asthma/index.html. Accessed August 2016.

Data Appendix

Table A-1. Counts and Rates of Childhood Asthma Hospitalizations and ED Visits, By Illinois County, 2011-2014

IL County	Hospitalizations		ED Visits		IL County	Hospitalizations		ED Visits	
	Count	Rate per 10,000	Count	Rate per 10,000		Count	Rate per 10,000	Count	Rate per 10,000
Adams	77	11.4	486	72.0	**Lee**	24	7.4	202	62.6
Alexander	17	22.2	121	158.0	**Livingston**	*	*	103	27.7
Bond	11	6.9	155	96.8	**Logan**	17	6.2	300	109.6
Boone	51	7.9	338	52.3	**Macon**	14	4.6	213	70.3
Brown	*	*	18	37.5	**Macoupin**	322	9.2	1,294	37.0
Bureau	19	5.7	320	95.4	**Madison**	122	6.5	990	52.4
Calhoun	*	*	27	58.2	**Marion**	156	14.1	1,331	120.4
Carroll	12	9.3	71	54.8	**Marshall**	35	7.6	300	65.5
Cass	*	*	84	57.9	**Mason**	344	13.0	3,330	125.8
Champaign	217	10.2	1,895	88.8	**Massac**	114	29.0	458	116.5
Christian	12	3.7	190	58.2	**McDonough**	*	*	61	54.0
Clark	11	6.8	59	36.3	**McHenry**	12	8.9	157	116.9
Clay	12	8.9	94	69.3	**Mclean**	*	*	97	66.5
Clinton	14	3.8	133	36.3	**Menard**	11	8.7	55	43.5
Coles	49	9.5	255	49.6	**Mercer**	*	*	55	35.2
Cook	11,188	20.9	61,590	115.0	**Monroe**	33	9.6	196	57.0
Crawford	11	6.3	98	56.3	**Montgomery**	14	5.1	151	55.4
Cumberland	*	*	42	38.1	**Morgan**	30	9.0	341	102.5
DeKalb	92	8.0	678	58.7	**Moultrie**	*	*	41	25.5
De Witt	10	6.3	103	64.8	**Ogle**	41	7.5	265	48.3
Douglas	14	6.3	106	48.1	**Peoria**	395	19.7	1,934	96.5
DuPage	1,321	13.4	5,400	54.7	**Perry**	10	5.1	146	74.0
Edgar	21	12.4	123	72.3	**Piatt**	*	*	64	38.7
Edwards	*	*	44	66.1	**Pike**	10	6.3	92	58.0
Effingham	20	5.5	151	41.7	**Pope**	*	*	41	114.1
Fayette	*	*	103	48.1	**Pulaski**	11	19.0	40	68.9
Ford	*	*	66	47.1	**Putnam**	*	*	31	58.8
Franklin	16	4.1	232	59.6	**Randolph**	21	7.4	275	96.8
Fulton	22	6.7	134	40.6	**Richland**	10	6.4	76	49.0
Gallatin	*	*	34	71.2	**Rock Island**	148	10.1	1,300	89.1
Greene	13	9.7	103	77.2	**Saline**	577	19.9	5,047	174.1
Grundy	50	8.7	237	41.1	**Sangamon**	12	4.9	155	63.7
Hamilton	*	*	33	40.0	**Schuyler**	324	15.9	1,917	94.3
Hancock	*	*	83	47.9	**Scott**	*	*	29	43.1
Hardin	*	*	117	315.6	**Shelby**	*	*	41	78.5
Henderson	*	*	22	37.1	**St. Clair**	15	7.1	102	48.0
Henry	42	8.3	313	61.6	**Stark**	*	*	26	46.6
Iroquois	22	7.5	285	97.4	**Stephenson**	56	12.3	624	137.0
Jackson	40	7.1	522	92.9	**Tazewell**	132	9.6	775	56.3
Jasper	*	*	25	26.0	**Union**	12	7.4	35	21.6
Jefferson	30	8.0	306	82.1	**Vermilion**	115	13.4	1,073	125.4
Jersey	10	4.4	149	66.1	**Wabash**	*	*	91	80.7
Jo Daviess	*	*	64	33.0	**Warren**	15	8.0	89	47.5
Johnson	*	*	43	40.3	**Washington**	10	7.4	66	48.9
Kane	624	9.8	4,152	65.3	**Wayne**	*	*	89	54.5
Kankakee	284	22.9	1,057	85.1	**White**	*	*	75	55.0
Kendall	113	7.3	976	62.6	**Whiteside**	53	9.2	452	78.3
Knox	72	15.0	479	99.5	**Will**	1,119	13.5	5,776	69.9
La Salle	1,163	14.1	4,981	60.4	**Williamson**	45	7.0	348	54.4
Lake	60	5.4	741	66.7	**Winnebago**	493	15.9	3,120	100.7
Lawrence	12	8.5	107	75.7	**Woodford**	41	9.5	171	39.7

*Too few cases to report.

Table A-2. Racial Disparities: Rate Difference and Rate Ratio of Childhood Asthma Hospitalizations, 2011-2014

	Rate Difference *(compared to NH White of same sex & age)*	95% CI	Rate Ratio *(compared to NH White of same sex & age)*	95% CI
NH Black, Male ages 0-4	61.0	(60.8, 61.2)	3.6	(3.4, 3.8)
NH Black, Female ages 0-4	33.8	(33.6, 33.9)	3.6	(3.3, 3.9)
NH Black, Male ages 5-9	48.7	(48.5, 48.9)	5.4	(5.0, 5.8)
NH Black, Female ages 5-9	32.0	(31.8, 32.1)	5.3	(4.8, 5.8)
NH Black, Male ages 10-19	18.0	(17.9, 18.1)	6.6	(6.0, 7.3)
NH Black, Female ages 10-19	13.3	(13.2, 13.3)	4.3	(3.9, 4.8)
Hispanic, Male ages 0-4	8.3	(8.1, 8.4)	1.3	(1.3, 1.4)
Hispanic, Female ages 0-4	3.6	(3.5, 3.7)	1.3	(1.2, 1.4)
Hispanic, Male ages 5-9	6.1	(6.0, 6.2)	1.6	(1.4, 1.7)
Hispanic, Female ages 5-9	3.1	(3.0, 3.2)	1.4	(1.3, 1.6)
Hispanic, Male ages 10-19	1.9	(1.8, 1.9)	1.6	(1.4, 1.8)
Hispanic, Female ages 10-19	0.3	(0.2, 0.3)	1.1*	(0.9, 1.2)

*Not statistically significant

Table A-3. Racial Disparities: Rate Difference and Rate Ratio of Childhood Asthma ED Visits, 2011-2014

	Rate Difference *(compared to NH White of same sex & age)*	95% CI	Rate Ratio *(compared to NH White of same sex & age)*	95% CI
NH Black, Male ages 0-4	347.2	(346.8, 347.7)	5.2	(5.0, 5.3)
NH Black, Female ages 0-4	212.7	(212.4, 213.0)	6.0	(5.8, 6.3)
NH Black, Male ages 5-9	344.3	(343.8, 344.7)	6.4	(6.2, 6.6)
NH Black, Female ages 5-9	224.1	(223.7, 224.4)	7.3	(7.0, 7.6)
NH Black, Male ages 10-19	1555.8	(155.5, 156.1)	5.8	(5.6, 5.9)
NH Black, Female ages 10-19	135.2	(134.9, 135.4)	4.7	(4.6, 4.9)
Hispanic, Male ages 0-4	37.9	(37.6, 38.2)	1.5	(1.4, 1.5)
Hispanic, Female ages 0-4	17.4	(17.2, 17.6)	1.4	(1.3, 1.5)
Hispanic, Male ages 5-9	34.8	(34.5, 35.0)	1.5	(1.5, 1.6)
Hispanic, Female ages 5-9	17.2	(17.1, 17.4)	1.5	(1.4, 1.6)
Hispanic, Male ages 10-19	9.9	(9.7, 10.0)	1.3	(1.3, 1.4)
Hispanic, Female ages 10-19	2.7	(2.6, 2.9)	1.1	(1.0, 1.1)