

# Northeast CACE Hub

Community Asthma Care & Education



## ASTHMA IN MISSOURI

### ABSTRACT

Asthma is a prevalent health condition that can be controlled through a combination of care. The Northeast Community Asthma Care and Education (CACE) Hub comprises a nine county region. This report describes the prevalence, interventions, and health impacts of pediatric asthma in this area.

**Asthma  
Ready  
Communities**

## Abstract

- ❖ Asthma is a chronic condition affecting children and adults. Nationwide, an estimated 25 million people currently have asthma. In Missouri, it is estimated that one-half million people, ~91,000 being children are living with asthma. Compared to the U.S. prevalence, Missouri children with current asthma (7.1%) is 9.2% higher than the U.S (6.5%) and similar among adults (9.7% v 9.4%), respectively.
- ❖ The Northeast Community Asthma Care & Education (CACE) Hub area of Missouri, comprised of nine (9) counties (Adair, Linn, Macon, Marion, Monroe, Pike, Ralls, Randolph, and Shelby), has the lowest prevalence of children with asthma among the Behavioral Risk Factor Surveillance System regions.
- ❖ Children with asthma, aged 0 to 17 years, residing in the Northeast CACE Hub have had consistently lower asthma emergency department (ED) visit and hospitalization rates than the state.
- ❖ To inform and guide geographic distribution of interventions, analysis of Medicaid administrative claims data indicated among the children with persistent asthma in the Northeast CACE Hub, more than one in five (23%) have uncontrolled asthma.
- ❖ Hospitalization data for children and teens in Missouri has a seasonal pattern. Combining 2011-2015 indicate two peak periods: 1) May and 2) October. For the Northeast CACE Hub, the inpatient hospital admission rate for children and teens increases in April, elevates again in August and peaks in October.
- ❖ In Missouri, among children and teens aged 0 to 17 with asthma as the primary diagnosis, hospital charges totaled \$20.8 million and children / teens from the Northeast CACE Hub accounted for about 1.6% (\$329 thousand) of these charges (2015). Medicaid accounted for the largest pay source cited.
- ❖ The proportion of outpatient and preventive visits to total care encounters (POPte) score of 81% indicates that 8 in 10 asthma care encounters are occurring as outpatient and preventive visits in the Northeast region.
- ❖ The Northeast Hub has 34 public school districts with more than 21,000 total students, representing approximately 2.4% of the current enrollment in public schools in Missouri.
- ❖ Interventions implemented in the Northeast CACE Hub have included Asthma ECHOs; Asthma Ready® trainings for clinics, hospitals, and clinicians; Becoming an Asthma Educator & Care Manager (BAECM), school interventions such as Teaming Up for Asthma Control (TUAC), presentations, partner meetings, and early childhood trainings for asthma.
- ❖ The health care system in the Northeast CACE Hub includes primary care providers, hospitals, clinics, community health centers, public and mental health services, and environmental and school services, There are many additional community resources also available.

**Asthma Ready® Communities**

**University of Missouri**

**Columbia**

August 2024



# Table of Contents

<b>Abstract</b>	<b>i</b>
<b>Northeast CACE Hub Counties</b>	<b>1</b>
<b>Asthma</b>	<b>2</b>
<b>Programs</b>	<b>7</b>
<b>Health Systems</b>	<b>10</b>
<b>Community Resources</b>	<b>11</b>
• <b>Schools</b>	
• <b>Faith-based</b>	
	<b>13</b>
<b>Acknowledgement</b>	
<b>References</b>	<b>13</b>

## Tables

1. Characteristics and select indicators for the Northeast Community Asthma Care and Education (CACE) Hub Counties and Missouri, 2021
2. Number of Zip Codes, Most Populous, and Percent of County Population for listed Zip Code, Northeast CACE Hub, Missouri
3. Key interventions to reduce pediatric asthma risk and improve control, Northeast CACE Hub area, Missouri, March 2007 - February 2023
4. Northeast CACE Hub School Districts by Number of Students, Missouri

## Figures

1. Northeast Community Asthma Care and Education (CACE) Hub counties, Missouri, 2024
2. Prevalence of Current Asthma among Children  $\leq 17$  years of age, United States, 2018-2020
3. Prevalence of Current Asthma among Children aged 0 to 17 years by BRFSS Region, Missouri, 2021
4. Asthma Emergency Visit Rates among Children aged 0-17 years, Northeast CACE Hub and Missouri, 2001 - 2015
5. Asthma Hospitalization Rates among Children aged 0-17 years, Northeast CACE Hub and Missouri, 2001 - 2015
6. Asthma Inpatient Hospitalizations under Age 18, Missouri, 2016 – 2019
7. Asthma Inpatient Hospital Admission Rates for Children aged 0 to 19 years by month, Northeast CACE Hub and Missouri, 2011-2015
8. Missouri County Zip Codes, 2022
9. Asthma Risk Panel Report, Northeast CACE Hub Regional Dashboard, 2019
10. Children with Medicaid coverage and persistent asthma by county, Missouri, 2014-2015
11. Hospitals, Federally Qualified Health Centers, and Rural Clinics, Northeast CACE Hub counties, Missouri
12. Primary Care Health Homes, Missouri
13. Northeast CACE Hub School Districts and County, Missouri

Funding for this report was provided in part by the Missouri Foundation for Health and the US Centers for Disease Control and Prevention cooperative agreement number N01CE001393. Its contents are solely the responsibility of the authors and do not necessarily represent the official views of the Centers for Disease Control and Prevention or the Department of Health and Human Services.

Cover photo:  
Mark Twain Memorial Lighthouse, Hannibal, Missouri  
Courtesy of Backyard Production from iStock

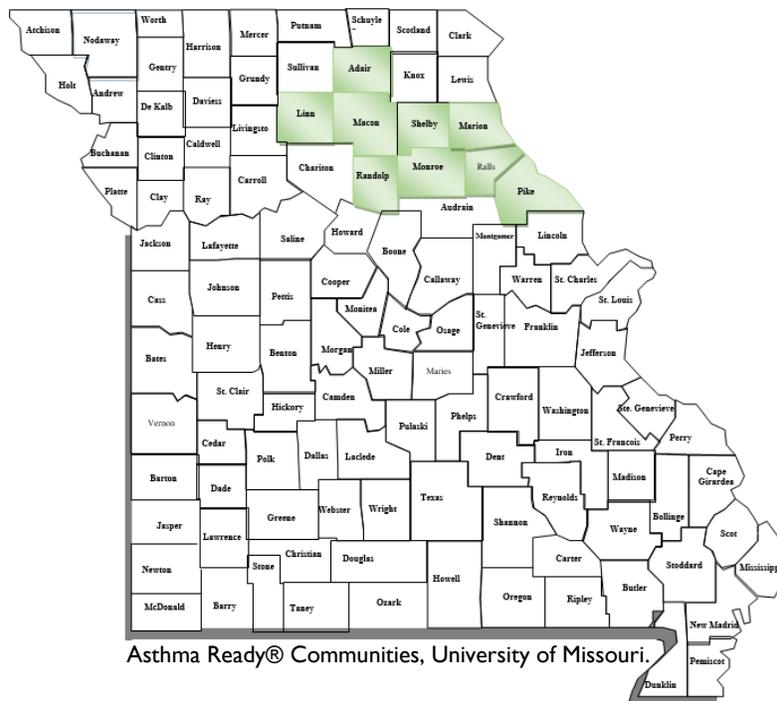


## Northeast Hub

Childhood asthma is a common health condition faced by families, school nurses, and health clinicians. Nationwide, an estimated 25 million people are living with asthma of which 4.7 million are younger than age 18 (2021).<sup>1</sup> Children and teens with asthma are especially vulnerable to persistent symptoms or uncontrolled asthma affecting learning, wellness, and overall quality of life.<sup>2,3</sup> Community Asthma Care and Education (CACE) Hubs are designated, contiguous multi-county regions identified through Medicaid claims data as having disparate rates of uncontrolled pediatric asthma (i.e., high acute care utilization and medications). These Hubs establish partnerships and implement interventions to improve pediatric asthma control. The Northeast CACE Hub includes 9-counties (Figure 1).

**Figure 1**

*Northeast Community Asthma Care and Education (CACE) Hub counties, Missouri, 2024*



Marion County is the most populous county in the Northeast CACE Hub region followed by Adair and Randolph (Table 1).<sup>4</sup> Children aged 0 to 17 years account for approximately 1 in 5 people in each county which is similar to the State percent. African-Americans and Hispanics comprise small proportions in each county. Kirksville, located in Adair county, is home to Truman State University and Randolph County comprises the Moberly Micropolitan Statistical Area. Pike County, the most diverse, has the largest African-American population (7.8%) and Linn County has the largest Hispanic/Latino population (2.8%). Bowling Green, located in Pike County near the Mississippi River, also has a sizable Amish community close to the town. Persons younger than age 65 without health insurance ranges from a low in Marion and Ralls counties (11%) to Adair County (15%). Hannibal located in Ralls County is the home of author Mark Twain. Three counties (Macon, Linn, and Monroe) have more than 16% of households without a computer.

**Table 1**

*Characteristics and Select Indicators for Northeast Community Asthma Care and Education (CACE) Hub Counties and Missouri, 2021*

County	Population	Age			Race <sup>a</sup> / Ethnicity			No Health Insurance	Persons in Poverty	Households without computer <sup>b</sup>
		0-17 Percent	18-64 Percent	≥ 65 Percent	White Percent	Black Percent	Hispanic Percent	Age ≤ 65 years Percent	Percent	Percent
<b>Adair</b>	25,185	17.9	67.0	15.1	91.5	3.4	2.6	15.4	17.9	10.0
<b>Linn</b>	11,843	23.3	55.3	21.4	96.6	0.9	2.8	13.4	14.7	16.6
<b>Macon</b>	15,183	23.0	54.2	22.8	94.6	2.5	1.8	14.6	13.0	16.7
<b>Marion</b>	28,518	23.1	58.6	18.3	91.5	5.0	1.9	11.1	14.3	11.1
<b>Monroe</b>	8,712	21.6	54.4	24.0	93.9	2.9	1.7	13.5	13.0	16.5
<b>Pike</b>	17,761	21.7	60.5	17.8	90.0	7.8	2.3	13.1	14.9	14.3
<b>Ralls</b>	10,361	21.1	56.7	22.2	96.4	1.4	1.3	11.3	11.4	13.9
<b>Randolph</b>	24,760	21.6	61.2	17.2	90.5	5.6	2.2	12.7	12.1	13.8
<b>Shelby</b>	5,976	24.1	54.1	21.8	97.0	0.9	2.2	14.7	14.6	13.3
<b>Missouri</b>	<b>6,168,187</b>	<b>22.3</b>	<b>60.4</b>	<b>17.3</b>	<b>82.9</b>	<b>11.8</b>	<b>4.4</b>	<b>12.0</b>	<b>12.1</b>	<b>9.3</b>

U.S. Census Bureau.

<sup>a</sup> Others not shown.

<sup>b</sup> 2016-2020

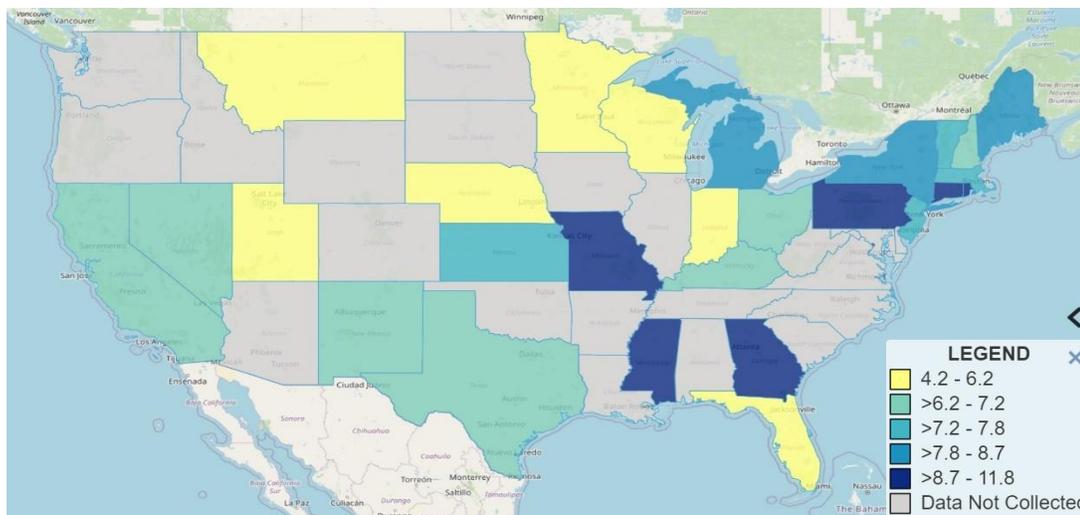
## Asthma

### Prevalence

The Behavioral Risk Factor Surveillance System (BRFSS) collects asthma prevalence information for children and adults.<sup>5</sup> According to the 2021 data, the prevalence of adults living with asthma in Missouri is 9.4%, which is similar to the U.S. (9.7%).<sup>6</sup> For children, the prevalence of current asthma in Missouri (7.1%) is 9.2% higher than the U.S. (6.5%) (2021). Missouri is among the states in the highest tier for the prevalence of childhood asthma (Figure 2).

**Figure 2**

*Prevalence of Current Asthma among Children ≤ 17 years of age, United States, 2018-2020*

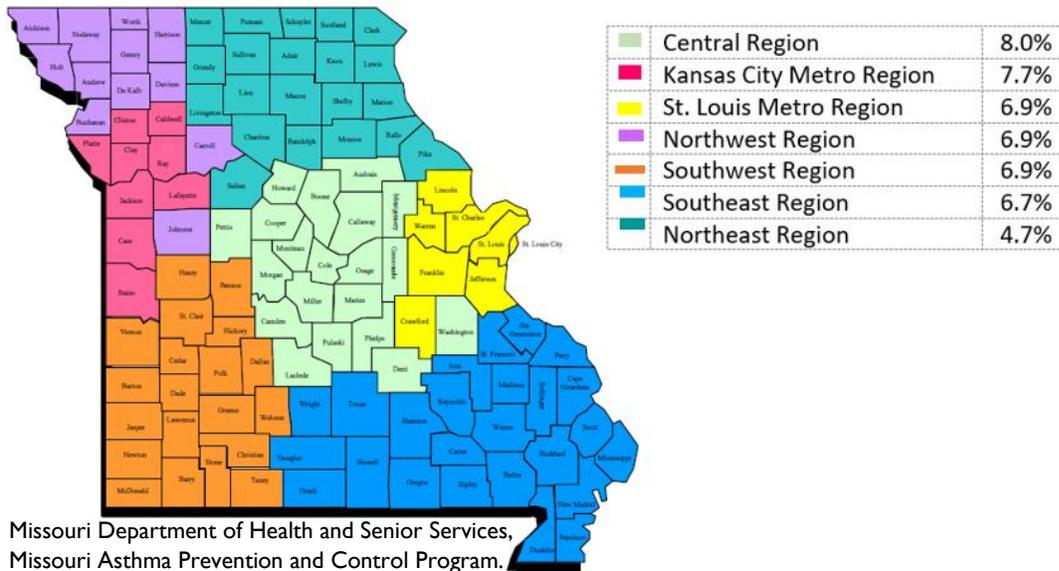


Centers for Disease Control and Prevention. Environmental Public Health Tracking Network. Asthma Prevalence among Children.

The Northeast CACE Hub counties are all located in the Northeast Missouri BRFSS region. The Northeast BRFSS region ranked the lowest in the prevalence of children with asthma compared to the other regions.

**Figure 3**

*Prevalence of Current Asthma among Children aged 0 to 17 years by BRFSS Region, Missouri, 2021*



### Control

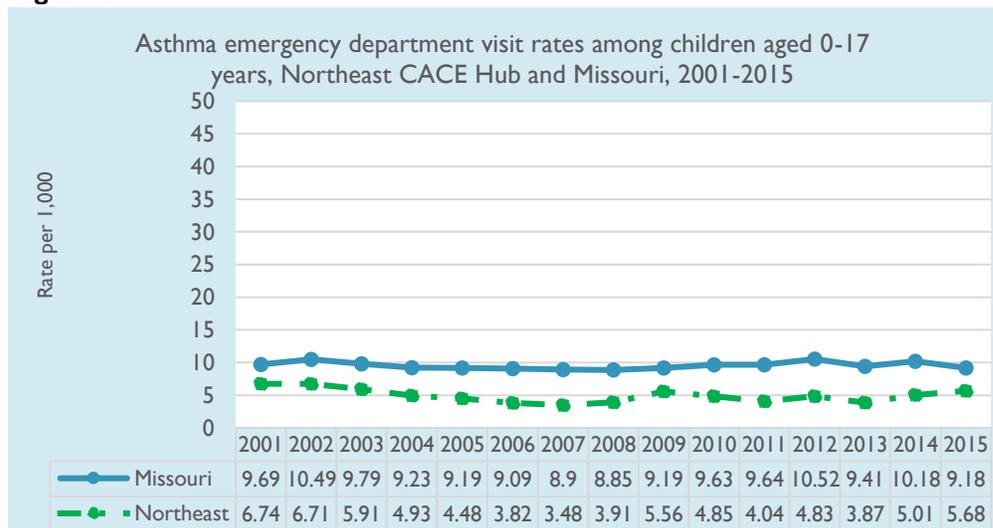
In Missouri, more than one-half million people currently have asthma with an estimated 91,000 being children (2021).<sup>6</sup> While asthma occurs among all population groups, it is particularly a health issue among children and teens and is more common among African-Americans and in households with lower incomes and education. While asthma cannot be cured, the goal is optimal control. Well-controlled asthma results in increased productivity and low morbidity and overall health costs. Approximately 47.9% of children with asthma in Missouri are uncontrolled (2018-2020).<sup>2</sup> This leads to frequent symptoms and impairment (e.g., interference with sleep and normal activity), absenteeism from school, and a disproportionate share of emergency department (ED) visits and hospitalizations.

### Emergency Department Visits and Hospitalizations

The emergency department visit rates for children with a primary diagnosis of asthma in the Northeast CACE Hub have consistently been significantly lower than the state rates (Figure 4).

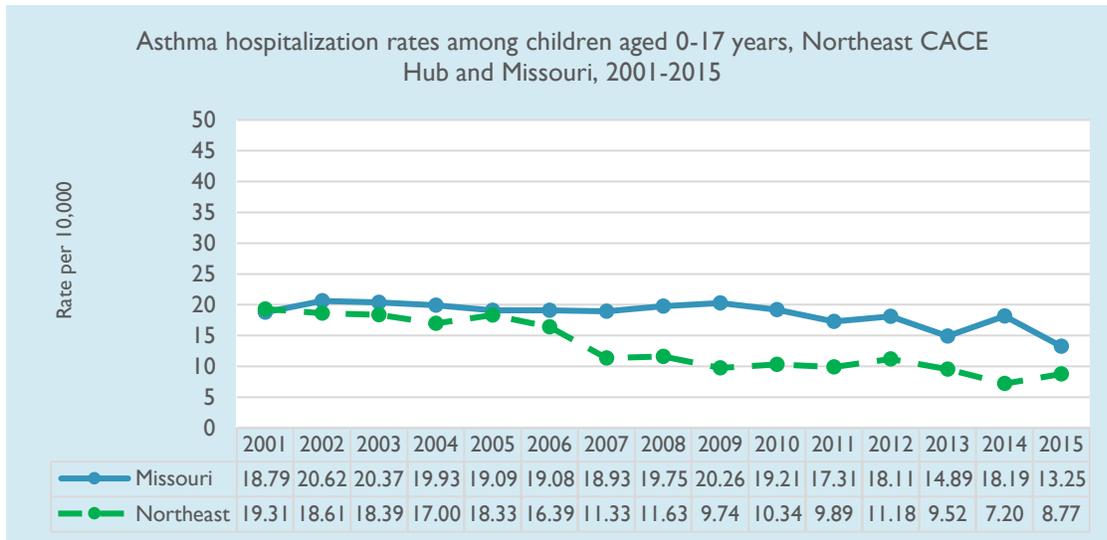
Missouri Department of Health and Senior Services. Missouri Public Health Information Management System (MOPHIMS), Inpatient Hospitalizations, Missouri Information for Community Assessment (MICA).

**Figure 4**



The rates of asthma hospitalizations for children living in the Northeast CACE Hub were similar to the state rates from 2001- 2006 (Figure 5). In 2007, the asthma hospitalization rate for children in the Northeast CACE Hub was significantly lower than the state rate and continued to be significantly lower through 2015. In the Northeast CACE Hub comparing the childhood asthma hospitalization rates for 2007 (11.3%) to 2015 (8.8%), the rate declined by 22.6%. The Missouri asthma hospitalization rates for children also showed a decline of 30% comparing 2007 to 2015.

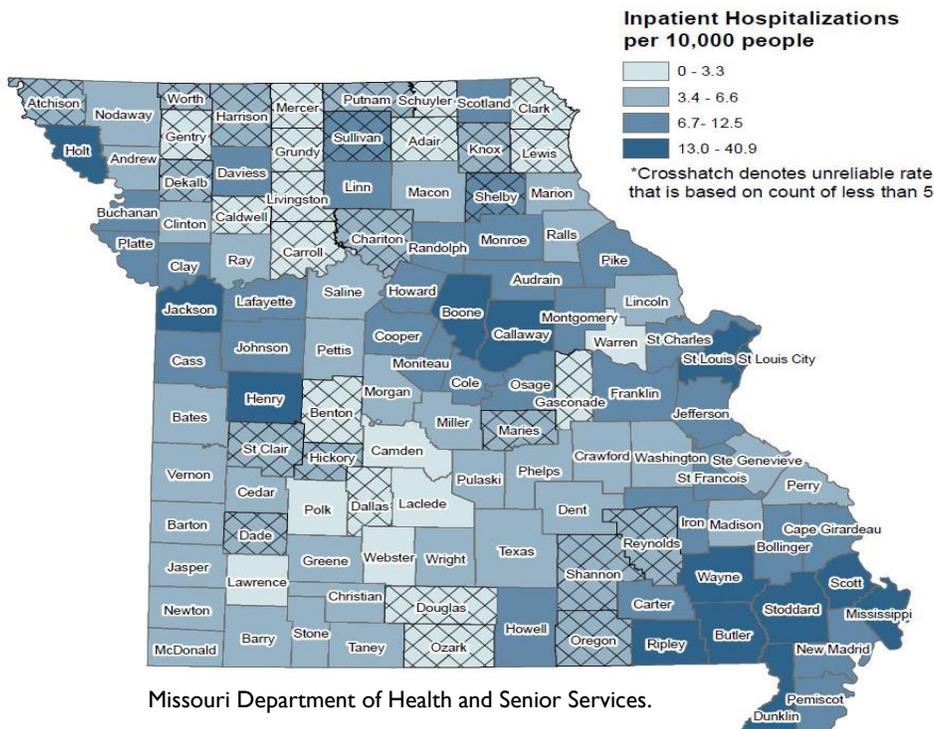
**Figure 5**



More recent hospitalization data continue to show low asthma hospitalization rates for the Northeast CACE Hub counties (Figure 6). These counties are in the lower two tiers for the rate of hospitalizations among children younger than age 18.

**Figure 6**

*Asthma Inpatient Hospitalizations under Age 18, Missouri, 2016 – 2019*



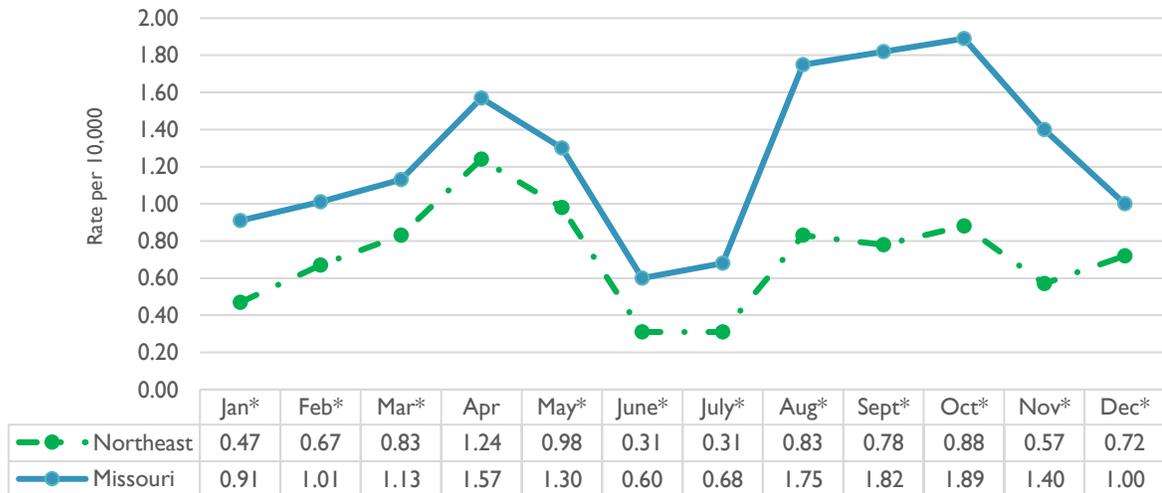
In Missouri, among children and teens aged 0 to 17 with asthma as the primary diagnosis, hospital charges totaled \$20.8 million and children / teens from the Northeast CACE Hub 9-county area accounted for about 1.6% (\$329 thousand) of these charges (2015).<sup>7</sup> Medicaid accounted for the largest source cited (55.9%) followed by commercial insurance (37.5%) for asthma hospital charges among children in the Northeast Hub area. Self-pay or no charges accounted for approximately 6.6% of the asthma hospitalization charges among children in the Northeast CACE Hub. As these data indicate, asthma continues to be a heavy financial weight on children and families enrolled in Medicaid.

### Seasonality

Asthma ED visits and hospitalizations have seasonal patterns. For children and teens aged 0 to 19, the asthma hospital admissions rates by month for Missouri show a bimodal distribution indicating two peak periods, April and October (Figure 7).<sup>5</sup> For the Northeast CACE Hub, the inpatient hospital admission rate for children increases in April, elevates again in August and peaks in October. Both Missouri and the Northeast Hub show substantial lower rates in asthma hospital admissions for children and teens June-July.

**Figure 7**

Asthma inpatient hospital admission rates for children aged 0 to 19 years by month, Northeast CACE Hub and Missouri, 2011-2015



\*Rate is unreliable; numerator less than 20

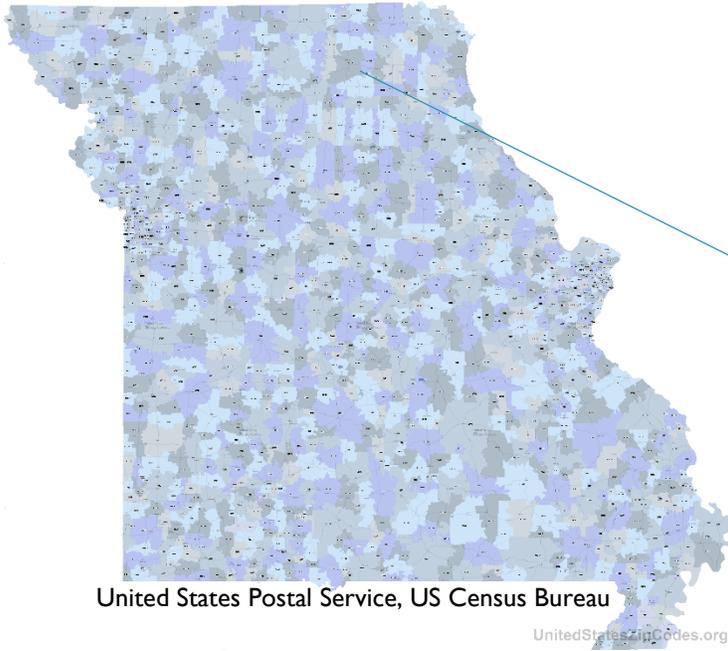
Source: Missouri Department of Health and Senior Services. Missouri Public Health Information Management System (MOPHIMS). Environmental Public Health Tracking



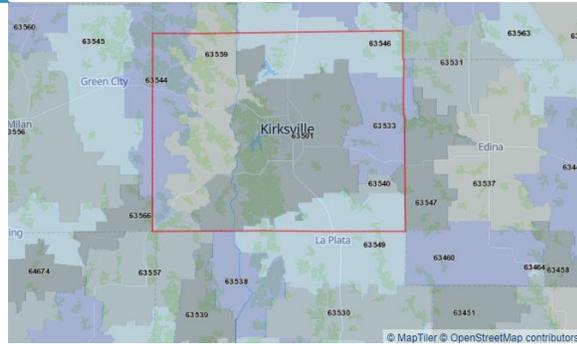
## Zip Codes

**Figure 8.**

Missouri County Zip Codes, 2022



The Missouri Zip Codes Map (Figure 8), uses the ZIP Code Tabulation Areas (ZCTAs) as specified by the United States Census Bureau and approximate the area covered by a ZIP code.<sup>8</sup> The Northeast 9-county area has more than 100 ZIP codes with the majority residential (98.1%) and only two are PO boxes with low or no residential populations (Table 2).



County	Number of Residential Zip Codes	PO Boxes	Most Populous Zip Code	Percent of County Population %
Adair	9	0	63501	84%
Linn	13	0	64628	47%
Macon	14	0	63552	51%
Marion	10	0	63401	68%
Monroe	16	0	65275	29%
Pike	12	0	63334	46%
Ralls	9	*	63459	40%
Randolph	10	*	65270	69%
Shelby	9	0	63468	37%
<b>Total</b>	<b>102</b>	<b>2</b>	<b>--</b>	<b>--</b>

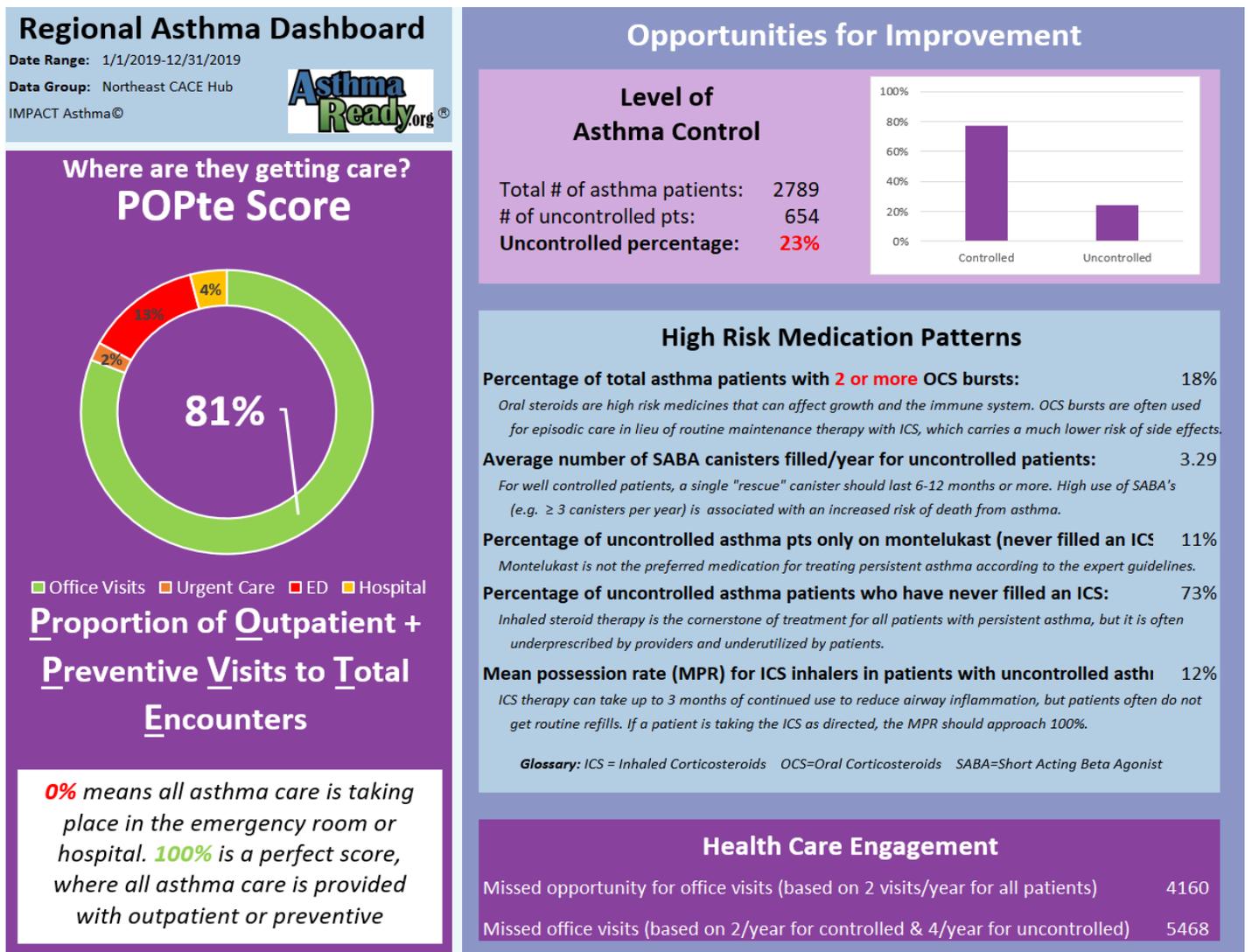
\* 2 or less; --not applicable.

**Table 2**  
*Number of Zip Codes, Most Populous, and Percent of County Population for listed Zip Code, Northeast CACE Hub, Missouri*

# Programs

To focus programs in areas of greatest need, Medicaid administrative claims data are used to generate de-identified population-based asthma risk panel reports (ARPRs) and maps to identify children with uncontrolled asthma in Missouri. Risk indicators such as frequent asthma acute care visits (i.e., emergency visits and hospitalizations) and medication overuse (i.e., short acting beta agonists or systemic oral steroids) or underuse (low control medication use) are used. This information is translated for clinicians, school nurses, and care managers as an asthma risk population panel report. These reports inform care management and practices. The baseline asthma risk panel report dashboard for children, teens and young adults (< 21 years) with asthma in the Northeast CACE Hub for 2019 indicates 23.0% had uncontrolled asthma and a proportion sought care through the emergency room (13%) (Figure 9). Only 2% had been hospitalized for asthma. The proportion of outpatient and preventive visits to total care encounters (POPte) score of 81% indicates that 8 in 10 asthma care encounters are occurring as outpatient and preventive visits.

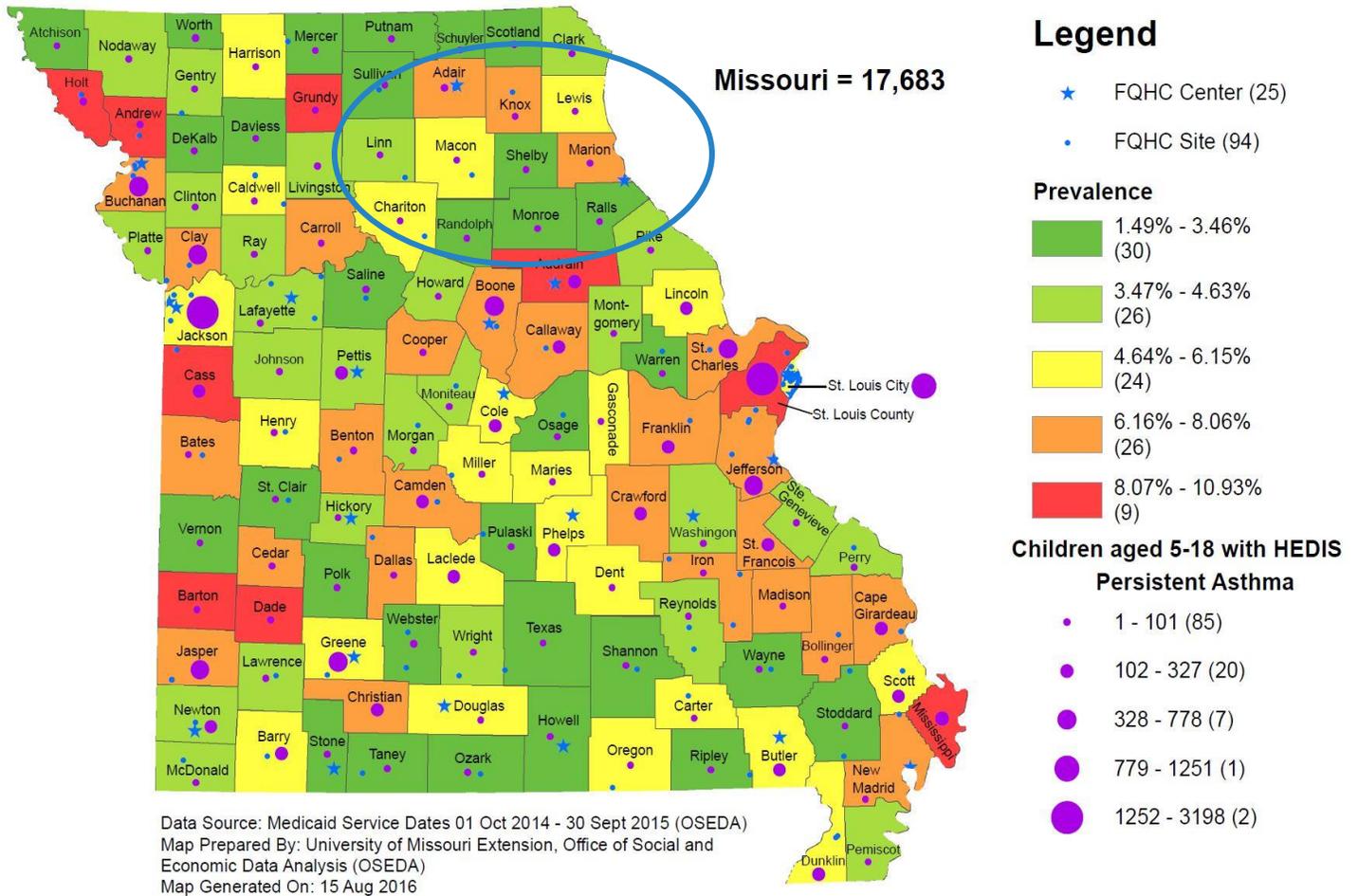
Figure 9



A map shows children throughout the Northeast CACE Hub with persistent asthma (Figure 10). Persistent asthma was defined by the legacy Healthcare Effectiveness Data and Information Set (HEDIS) criteria: One asthma inpatient admission; or ED visit, or four asthma medication dispensing events, or four outpatient asthma visits and at least 2 asthma medication dispensing events. This criterion was applied for children with a primary or second diagnosis of asthma. Children in Adair, Marion, and Knox (an adjacent county) have a moderately high prevalence of children with persistent asthma in the Northeast CACE Hub.

**Figure 10**

*Children with Medicaid with Persistent Asthma by County, Missouri, 2014-2015*



The Asthma Ready® Communities (ARC) database contained 198 activity records for the Northeast CACE Hub (Table 3). The activity records spanned March 2007 – March 2023. Interventions such as, Asthma ECHOs; Asthma Ready® trainings for clinics, hospitals, and clinicians; and Becoming an Asthma Educator & Care Manager (BAECM) are the leading interventions that have been implemented in the Northeast CACE Hub counties. Other activities and interventions have included school interventions (TUAC), presentations, partner meetings, and early childhood training initiatives.

**Table 3**

*Key interventions to reduce pediatric asthma risk and improve control, Northeast CACE Hub area, Missouri, March 2007 - March 2023*

<b>Intervention</b>	<b>Activity Records Number</b>	<b>Percent of participation records %</b>
<b>All</b>	<b>198</b>	<b>100.0</b>
<b>Extension for Community Healthcare Outcomes (ECHO)</b>	80	40.4
<ul style="list-style-type: none"> <li>• <i>Impact Asthma – Essentials (66)</i></li> </ul>	--	--
<ul style="list-style-type: none"> <li>• <i>Asthma Care Accelerator – Quality Improvement / Maintenance of Certification (QIMOC) (6)</i></li> </ul>		
<ul style="list-style-type: none"> <li>• <i>Asthma Care &amp; Education – Community (8)</i></li> </ul>		
<b>Asthma Ready Clinic Training (ARCT) and Hospitals, Physicians Asthma Care Education (PACE), Intro to AR Clinics, Asthma Update, and CHW training</b>	41	20.7
<b>Becoming an Asthma Educator &amp; Care Manager (BAECM)</b>	30	15.2
<b>Teaming Up for Asthma Control, introduction, evaluation, school nurse training and school activities</b>	21	10.6
<b>Presentations / Professional Organizations / Partner / Administrative Meetings, Conferences, Workshops</b>	18	9.1
<b>Courses – Acting on Behalf of My Child (ABC) and Asthma Control Everyday (ACE)</b>	7	3.5
<b>Asthma Academy / Asthma Day</b>	1	0.5

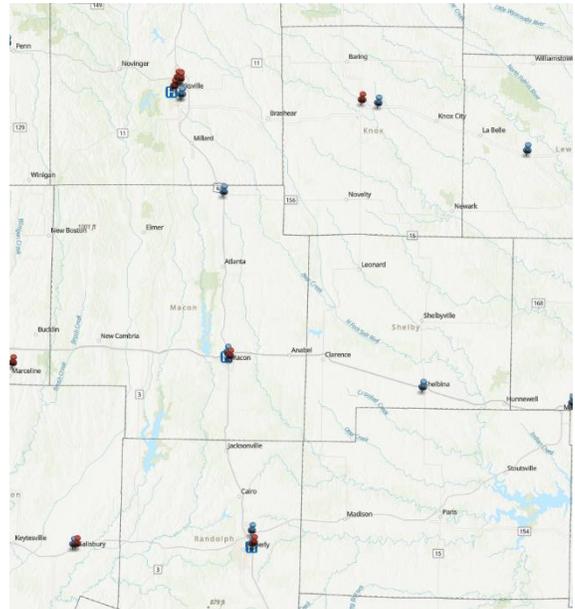
University of Missouri, Asthma Ready Communities (ARC). Northeast CACE Hub activity records.

# Health Systems

The Northeast CACE Hub health care system is comprised of primary care providers, hospitals, clinics, community health centers, public health, mental health services, school nurses, Medicaid and care management services, and community partners. In addition, there are primary, dental, and mental health care facilities designated as being in Health Professional Shortage Areas (HPSAs) in the Northeast CACE Hub including federally qualified health centers and rural health clinics.<sup>9</sup> The Northeast CACE Hub area has health care systems that participate in asthma interventions and activities including Clarity Healthcare, Compass Health Network, and others. Locations of the Northeast hospitals, federally qualified health centers, and rural clinics are shown in Figure 11.

**Figure 11**

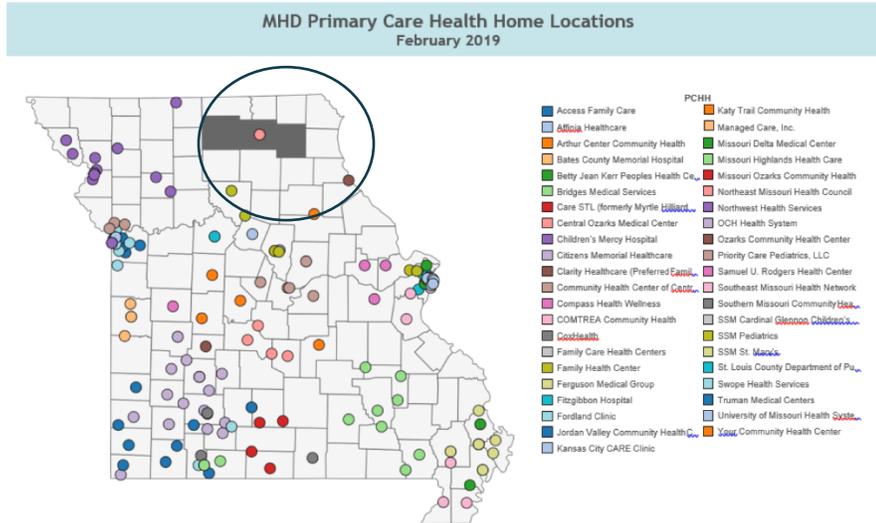
Hospitals, Federally Qualified Health Centers, and Rural Clinics, Northeast CACE Hub counties, Missouri



Missouri Department of Health and Senior Services, Rural Health

There are Primary Care Health Home providers in the Northeast CACE Hub Area (Figure 12). Local Public Health Agencies are also located throughout the Northeast CACE Hub.

**Figure 12**

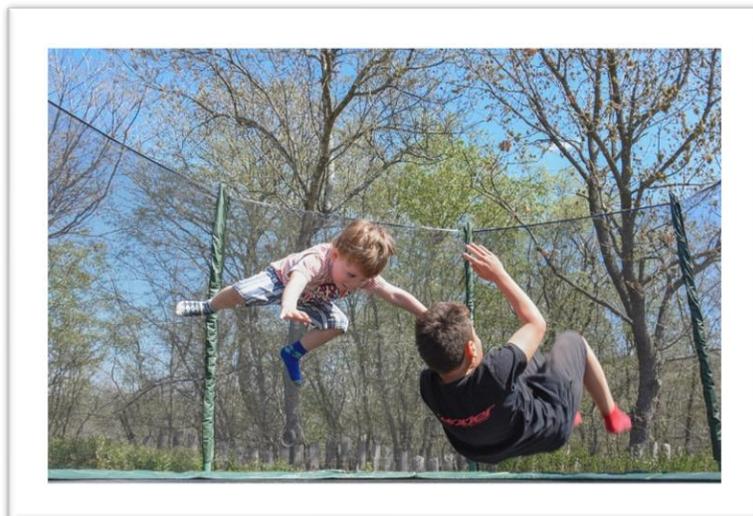


Missouri Department of Social Services. Missouri Primary Care Health Home Initiative. 2019.

## Community Resources

There are community resources available in the Northeast CACE Hub and neighboring areas to assist children with asthma and their families. Resources include public health systems, social services, and assistance programs, The following provides a sample of available resources:

- NEMO Resources, Community Support, links to county health departments, food banks and pantries, transportation services, Red Cross, housing, Community Action Partnership, United Way, and many other resources. <https://www.nemoresources.org/community-support/>
- Adair County Health Department, Referral & Health Resource <https://adair.lphamo.org/clinics/referral-health-resource/>
- Linn County Profile and Resource Guide 2023 <https://www.downtownmarceline.org/about/lcresourceguide/>
- Linn County Health Department <https://www.linncohealth.org/>
- Macon County Resource Guide <https://www.maconmohealth.org/macon-county-resource-guide/>
- Macon County Health Department <https://www.maconmohealth.org/>
- Community Resources for Macon, MO <https://resources.finalsite.net/images/v1671030687/maconk12mous/mk3frvt11qgtfixij4b/CommunityResources-Update.pdf>
- Marion County Health Department <https://www.marioncountyhd.org/>
- United Way of The Mark Twain Area, Community Resources <https://unitedwaymta.org/community-resources>
- Monroe County Health Department Resources <http://monroecountyhealth.com/resources/>
- Pike County Health Department, <https://pikecountyhealth.org/>
- Pike County Community Resource Guide <https://pikecountyhealth.org/resources/community-resource-guide-2/>
- Randolph County Clerk, Community Links and Resources <https://www.randolphcountyclerkmo.com/community-links-and-resources>
- Randolph Caring Community Partnership <https://randolphcaringcommunity.org/>
- Northeast Community Action Corporation Randolph County Service Center <https://uwgkc.myresourcedirectory.com/index.php/component/cpx/?task=resource.view&id=2958904>
- Health Department of Randolph County <https://randolphcountyhealth.org/>
- Shelby County Health Department <https://shelbycountyhealth.com/> and Resources Directory <https://shelbycountyhealth.com/resources-directory/>
- Missouri Resource Guide <https://dss.mo.gov/fsd/pdf/missouri-resource-guide-3steps.pdf>

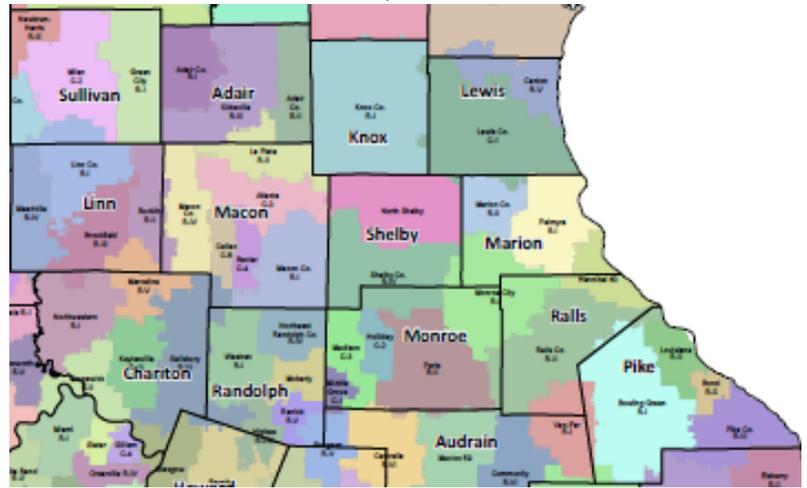


## Schools

There are 34 school districts in the Northeast CACE Hub 9-county area (Figure 13).<sup>10</sup> These students are in elementary, middle and high schools as well as early learning, career, and technical centers. Combined, the Northeast CACE Hub has more than 21,000 total students (Table 4), representing approximately 2.4% of the current enrollment in public schools in Missouri.<sup>11</sup>

**Figure 13**

Northeast CACE Hub school districts, Missouri



**Table 4**

Northeast CACE Hub School Districts by Number of Students, Missouri

Districts		Number	Percent of Total
<b>County</b>	<b>9-County Area</b>	<b>21,067</b>	<b>100.0</b>
Marion	Hannibal 60	3,511	16.7
Adair	Kirksville R-III	2,445	11.6
Randolph	Moberly	2,221	10.5
Pike	Bowling Green R-1	1,369	6.5
Macon	Macon Co R-1	1,244	5.9
Marion	Palmyra R-1	1,137	5.4
Linn	Brookfield R-III	928	4.4
Ralls	Ralls Co R-II	756	3.6
Monroe	Monroe City R-I	724	3.4
Pike	Louisiana R-II	724	3.4
Shelby	Shelby Co R-IV	706	3.4
Linn	Marceline R-V	637	3.0
Randolph	Westran R-I	579	2.7
Pike	Pike Co. R-III	434	2.1
Monroe	Paris R-II	404	1.9
Randolph	Northeast Randolph Co. R-IV	363	1.7
Macon	La Plata R-II	322	1.5
Shelby	North Shelby	277	1.3
Linn	Meadville R-IV	230	1.1
Adair	Adair Co. R-1	225	1.1
Randolph	Higbee R-VIII	204	1.0
Marion	Marion Co. R-II	203	1.0
	All Others	1,424	6.8

14 school districts have 81% of the total Northeast Hub public school student population

Missouri Department of Elementary and Secondary Education. School Directory April 22, 2022.

## Faith-Based Systems

There many denominations and non-denominational churches in the Northeast CACE Hub Area. Denominations include Episcopal, Catholic, Baptist, Christian, Methodist, Lutheran, and many others. The location of many of the churches may be found through online search portals such as [Church Finder](#). Faith-based asthma control initiatives and partnerships have the potential for a broad health impact, ranging from the individual to the community and have shown promise in improving asthma control.

## Acknowledgment

This report was made possible through a collaboration of the University of Missouri – Department of Child Health and Center for Health Policy; Missouri Department of Social Services, MO HealthNet Division; Missouri Department of Health and Senior Services, Missouri Asthma Prevention and Control Program; and many partners. The following individuals made important contributions:

Sherri Homan, PhD, RN, FNP, Public Health Epidemiologist, Asthma Ready® Communities, University of Missouri: Principal, SuRE Writing LLC

Ben Francisco, PhD, PNP-BC, AE-C, Director Asthma Ready® Communities, Pediatric Nurse Practitioner, Certified Asthma Educator

Paul Foreman, PhD, MS, MA, Project Director, Asthma Ready® Communities

Tammy Rood, DNP, CPNP-PC, AE-C, Pediatric Nurse Practitioner, Certified Asthma Educator, Asthma Ready® Communities, University of Missouri

Rebecca Brown, MPA, AE-C, RRT, Community Asthma Coordinator, Asthma Ready® Communities, University of Missouri

Michelle Dickens, RN, FNP-C, AE-C, Family Nurse Practitioner and Certified Asthma Educator

Julie Patterson, BA, Asthma Ready Communities, University of Missouri

Eric S. Armbrrecht, PhD, Lead Evaluator, Missouri Asthma Prevention and Control Program; Principal, Open Health LLC

Peggy Gaddy, RRT, MBA, Missouri Asthma Prevention and Control Program Manager, Missouri Department of Health and Senior Services

## References

<sup>1</sup> Centers for Disease Control and Prevention (CDC). Most Recent National Asthma Data. Current Asthma Prevalence by Select Sociodemographic Characteristics (2021). National Health Interview Survey (NHIS). Retrieved July 25, 2024, from [https://www.cdc.gov/asthma/most\\_recent\\_national\\_asthma\\_data.htm](https://www.cdc.gov/asthma/most_recent_national_asthma_data.htm)

<sup>2</sup> CDC. Uncontrolled asthma among children with current asthma, 2018-2020. Behavioral Risk Factor Surveillance System (BRFSS)—Child Asthma Call-back Survey Data, 2018-2020. Retrieved January 11, 2024, from [https://www.cdc.gov/asthma/asthma\\_stats/uncontrolled-asthma-children-2018-2020.htm](https://www.cdc.gov/asthma/asthma_stats/uncontrolled-asthma-children-2018-2020.htm)

<sup>3</sup> Pate CA, Zahran HS, Qin X, Johnson C, Hummelman E, Malilay J. Asthma Surveillance – United States, 2006-2018. Morbidity and Mortality Weekly Report (MMWR). 2021;70(5): 1-32. [https://www.cdc.gov/mmwr/volumes/70/ss/ss7005a1.htm?s\\_cid=ss7005a1\\_w](https://www.cdc.gov/mmwr/volumes/70/ss/ss7005a1.htm?s_cid=ss7005a1_w)

<sup>4</sup> US Census Bureau. Population and demographic estimates. Retrieved January 10, 2023, from <https://www.census.gov/data.html>

<sup>5</sup> Centers for Disease Control and Prevention (CDC). Behavioral Risk Factor Surveillance System. <https://www.cdc.gov/brfss/>

<sup>6</sup> CDC. Behavioral Risk Factor Surveillance System, 2021. Retrieved January 11, 2024, from <https://www.cdc.gov/asthma/brfss/default.htm>

<sup>7</sup> DHSS. Missouri Public Health Information Management System (MOPHIMS), Missouri Information for Community Assessment (MICA) - Inpatient Hospitalizations, and Environmental Public Health Tracking. January 12, 2024, from <https://healthapps.dhss.mo.gov/MoPhims/MOPHIMSHome>

<sup>8</sup> United States Zip Codes.org. Zip Code Maps by State. December 10, 2023, from <https://www.unitedstateszipcodes.org/printable-zip-code-maps/>

<sup>9</sup> Health Resources & Services Administration. Primary Care HPSA: Health Professional Shortage Area. Retrieved March 10, 2024 from <https://data.hrsa.gov/tools/shortage-area/hpsa-find>

<sup>10</sup> Missouri Department of Elementary and Secondary Education. Missouri School Directory, 2022. Retrieved March 10, 2024 from <https://dese.mo.gov/directory>

<sup>11</sup> Missouri Department of Elementary and Secondary Education. 2022-2023 Statistics of Missouri Public Schools. Retrieved January 12, 2024, from <https://dese.mo.gov/media/pdf/mo-school-statistics>

Photos: Courtesy of Pixabay and iStock.

