

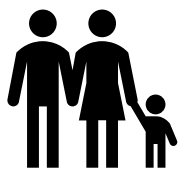
Asthma in Missouri

SOUTHEAST COMMUNITY ASTHMA CARE & EDUCATION



Asthma Ready® Communities
University of Missouri
Columbia, Missouri
AsthmaReady.org/
July 2021

Abstract



Asthma is a chronic condition affecting children and adults in Missouri and nationwide. It is estimated that more than 25 million children and adults currently have asthma. The Southeast Region of Missouri is no exception. According to the Behavioral Risk Factor System data for the Southeast Region, comprising 25 Missouri counties, the estimated prevalence of current asthma among children is 9.8%, which was 12.6% higher than the state prevalence (8.7%). The prevalence of adults with current asthma in the southeast was also 6.2% higher than the state.



The Southeast CACE Hub 11-county area has a statistically significantly higher asthma hospitalization rate among children age 0 to 17 years than the state (23.12 v. 16.03, respectively). To inform and guide geographic distribution of interventions, analysis of Medicaid administrative claims data indicated areas in southeast Missouri where children are experiencing persistent asthma and indicated a substantial proportion have uncontrolled asthma. Interventions directed in those areas are showing improved outcomes with pediatric asthma hospitalizations declines 2011 to 2013 and again between 2014 and 2015.



Seasonality asthma hospitalization data for children and teens indicate two peak periods (2011-2015): 1) April and 2) August through October. The peaks are higher for the Southeast Hub than the state of Missouri.



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 Southeast 11-county area accounted for about 6.25% (\$1.3 million) of these charges (2015). Medicaid accounted for the largest pay source cited.



The Southeast 11-county area has 51 public school districts. Combined, this area has more than 48,000 total students representing approximately 5.5% of the enrollment in public schools in Missouri (2019-2020). The most populous school districts in the 11-county area were Jackson R-II (5,436 students, Cape Girardeau County), followed by Popular Bluff R-I (5,254 students, Butler County) and Cape Girardeau 63 (4,391 students, Cape Girardeau County).



The health care system in the Southeast Hub area includes primary care providers, hospitals, clinics, urgent care, community health centers, public health, mental health services, schools, Medicaid and care management services, and community partners. There are many community resources also available.

Table of Contents

Abstract.....	i
Southeast Hub Counties.....	1
Asthma.....	2
• Prevalence	
• Control	
• Emergency Room Visits	
• Hospitalizations	
• Seasonality	
Programs.....	7
Community Agencies.....	10
Health Systems.....	10
Schools.....	12
Churches.....	13
Acknowledgement.....	13
References.....	14

Tables

1. Characteristics and select indicators for the Community Asthma Care and Education (CACE) Southeast Hub Counties and Missouri, 2019
2. Prevalence of current asthma among children aged 0-17 and adults aged ≥ 18 years, BRFSS Southeast Region and Missouri, 2015
3. Asthma emergency department and hospitalization rates and select indicators among children aged 0 to 17 years, CACE Southeast Counties, Missouri
4. Key interventions to reduce pediatric asthma risk and improve control, Southeast Hub area, Missouri 2006-2021
5. Southeast CACE Hub School Districts by Number of Students, Missouri

Figures

1. Community Asthma Care and Education (CACE) Southeast Hub counties, Missouri, 2021
2. Asthma hospitalizations rates among children aged 0-17 years, Southeast CACE Hub and Missouri, 2011 - 2015
3. Asthma Inpatient Hospitalizations under Age 18, Missouri, 2016 – 2019
4. Asthma inpatient hospital admission rates for children aged 0 to 19 years by month, Southeast CACE Hub and Missouri, 2011-2015
5. Missouri Zip Codes, 2021
6. Asthma Risk Panel Report, Southeast Hub Dashboard, 2019
7. Children with persistent asthma by school district, Missouri, 2014-2015
8. Hospitals, Federally Qualified Health Centers, and Rural Clinics, Southeast Missouri
9. Primary Care Health Homes, Missouri
10. Southeast School Districts by County, Missouri

Funding for this report was provided in part by the Leda J Sears Trust Fund 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: Statue on farm in southeast Missouri
Courtesy of: #199279859 © Diane Chilton | Dreamstime.com

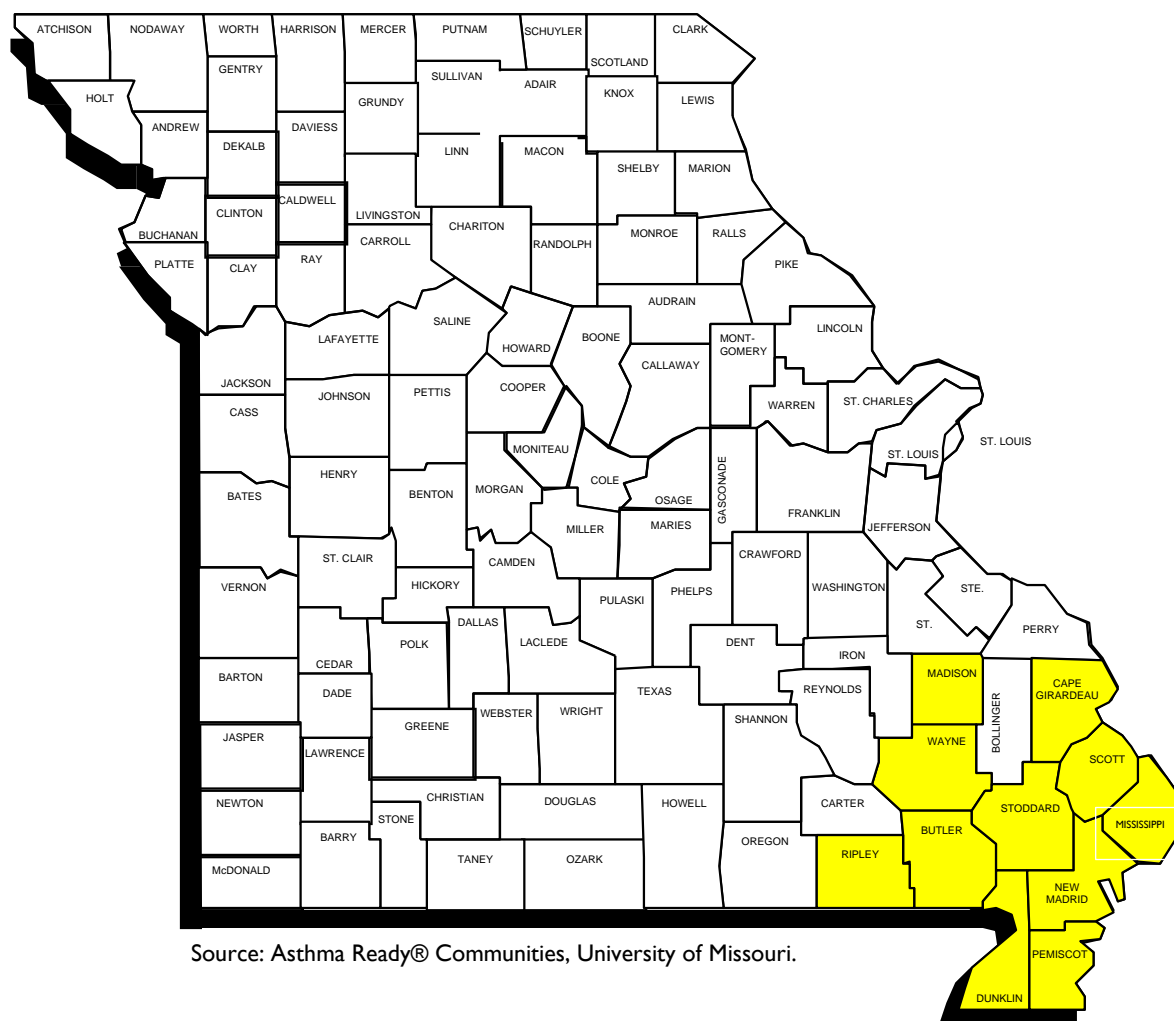


Asthma Southeast Hub Counties

Childhood asthma is one of the most prevalent conditions faced by families, schools, and health clinicians. Children and teens with asthma are especially vulnerable to persistent symptoms or uncontrolled asthma affecting learning, wellness, and overall quality of life. Community Asthma Care and Education (CACE) Hubs are designated, contiguous multi-county regions identified through Medicaid claims data 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 southeast CACE Hub includes 11-counties (Figure 1).

Figure 1.

Community Asthma Care and Education (CACE) Southeast Hub counties, Missouri, 2021



Source: Asthma Ready® Communities, University of Missouri.

Butler County is the most populous county in the southeast hub region followed by Cape Girardeau and Scott counties (Table 1).¹ The populations in Dunklin and Pemiscot counties have the largest proportions (1 in 4) of children and teens, ages 0 to 17 years. African-Americans comprise almost one-fourth of the populations in Mississippi and Pemiscot counties. The population of African-Americans also exceed the state proportion in New Madrid, Cape Girardeau, and Scott counties. Among persons younger than age 65 without health insurance ranges from a low in Cape Girardeau County (11.2%) to Ripley County (17.2%). A majority of the counties (63.6%) have more than one in five persons (> 20%) living in poverty. Many households in the Southeast Hub area do not have a computer.

Table 1.

Characteristics and select indicators for the Community Asthma Care and Education (CACE) Southeast Hub Counties and Missouri, 2019

County	Population	Age			Race ^a / Ethnicity			No Health Insurance	Persons in Poverty	Households without computer ^b
		0-17 Percent	18-64 Percent	≥ 65 Percent	White Percent	Black Percent	Hispanic Percent	Age ≤ 65 years Percent	Percent	Percent
Butler	42,478	23.3	57.5	19.2	88.4	5.6	2.2	15.0	22.5	16.5
Cape Girardeau	40,559	18.9	64.8	16.3	78.8	12.8	3.1	11.2	23.0	10.5
Dunklin	29,131	25.5	55.7	18.8	79.5	10.6	7.0	16.1	26.7	18.9
Madison	12,088	23.0	57.4	19.6	94.6	0.6	2.3	13.5	16.7	19.4
Mississippi	13,180	20.8	61.0	18.2	71.0	24.8	2.5	14.5	27.7	23.6
New Madrid	17,076	23.2	57.3	19.5	79.6	15.9	2.1	13.9	22.5	18.6
Pemiscot	15,805	25.5	56.9	17.6	68.5	26.1	2.8	13.7	26.9	20.6
Ripley	13,288	22.8	56.4	20.8	94.9	0.6	1.6	17.2	19.7	19.9
Scott	38,280	24.0	57.4	18.6	83.1	12.1	2.4	13.6	17.9	16.4
Stoddard	29,025	21.8	57.9	20.3	95.2	1.3	1.8	14.9	18.4	15.5
Wayne	12,873	20.3	55.4	24.3	94.5	0.9	1.8	16.9	20.6	23.9
Missouri	6,137,428	22.3	60.4	17.3	79.1	11.8	4.4	12.0	12.9	11.0

Source: U.S. Census Bureau.

^a Others not shown.

^b 2015-2019

Asthma

Prevalence

According to the Behavioral Risk Factor Surveillance System's (BRFSS) expanded Southeast Region data, comprising 25 Missouri counties, the estimated prevalence of current asthma among children is 9.8%, which is 12.6% higher than the state (8.7%) (Table 2).² The prevalence of adults with current asthma in the southeast is also 6.2% higher than the state.

Table 2.

Prevalence of current asthma among children aged 0-17 and adults aged ≥ 18 years, BRFSS Southeast Region and Missouri, 2015

	Adult %	Child %
	95% Confidence Interval	95% Confidence Interval
<i>Southeast Region</i>	10.2	9.8
	7.8 - 12.7	3.6 - 16.1
<i>Missouri</i>	9.6	8.7
	8.6 - 10.6	6.7 - 10.6

Source: Missouri Department of Health and Senior Services.
Behavioral Risk Factor Surveillance System.

Control

Asthma currently affects an estimated 25 million people in the United States (8.0% adults and 7.0% of children) (2019).³ 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 55% of children with asthma in Missouri are uncontrolled.⁴ This leads to frequent symptoms and urgent asthma attacks resulting in 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 Southeast CACE 11-county area hub has a statistically significantly higher asthma hospitalization rate among children age 0 to 17 years than the state (Table 3). One county, Madison, has a statistically significantly higher rate of child asthma ED visits than the state. The Southeast CACE Hub counties include more than 3,000 children with asthma as a primary diagnosis enrolled in MO HealthNet. These counties are designated as primary care health professional shortage areas (see Health Systems). The Southeast Hub 11-county area includes 51 school districts (see Schools).

Table 3.

Asthma emergency department and hospitalization rates and select indicators among children aged 0 to 17 years, CACE Southeast Counties, Missouri

County	Emergency Department Rate* Age 0-17 2011-2015	ED State Rank	Hospitalization Rate* Age 0-17 2011-2015	Sig Higher Hospital Rate than State	Asthma Counts 2019 MHN	HRSA Primary Care HPSA ^o	Number of School Districts
Butler	4.63	65	31.64	SH	493	X	3
Cape Girardeau	5.41	50	11.79		479	X	5
Dunklin	9.46	6	26.28	SH	452	X	7
Madison	12.35 [^]	4	13.10		152	X	2
Mississippi	8.98	8	44.89	SH	225	X	2
New Madrid	5.65	42	22.96	SH	181	X	4
Pemiscot	9.90	5	29.41	SH	252	X	8
Ripley	5.77	40	23.59	SH	123	X	4
Scott	9.36	7	31.20	SH	596	X	7
Stoddard	4.20	78	15.10		220	X	7
Wayne	4.09	79	17.24		117	X	2
11 counties	6.87	--	23.12	SH	3,290		51
Missouri	9.79	--	16.05	--	53,019	--	

Sources: Missouri Department of Health and Senior Services, Missouri Public Health Information Management System (MOPHIMS) emergency department and hospitalization data; Missouri Department of Social Services, MHN: MO HealthNet Division; HRSA: Health Resources & Services Administration, Primary Care HPSA: Health Professional Shortage Area; and Missouri Department of Elementary and Secondary Education.

*ED visit rate per 1,000 population; Hospitalization rate per 10,000 population.

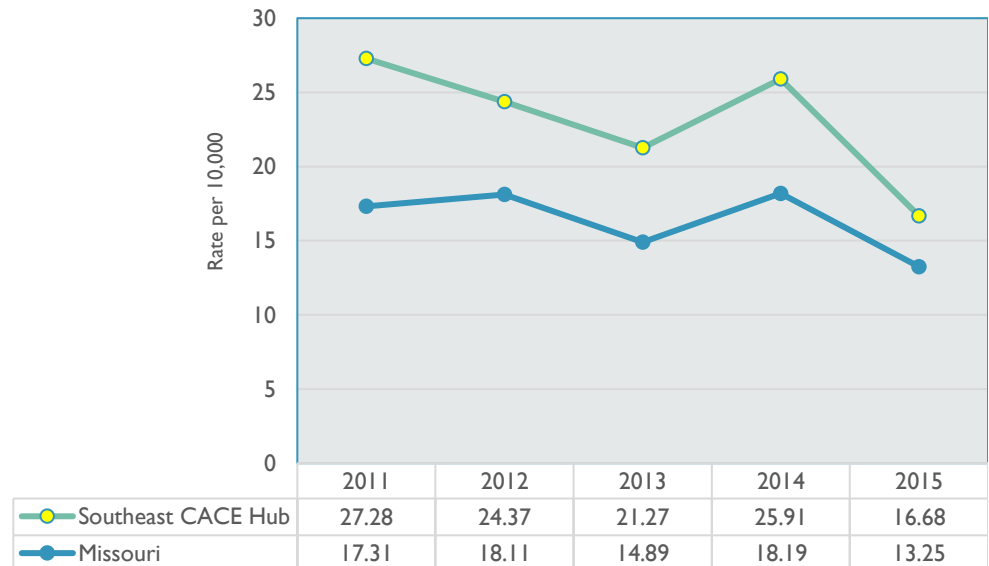
[^]Statistically significantly higher asthma ED visit rate than the state.

SH: Statistically significantly higher asthma hospitalization rate than the state.

While asthma hospitalizations among children in the Southeast CACE Hub have consistently been above the state, there were declines, 2011 to 2013 and again between 2014 and 2015 (Figure 2). However, recent data continue to show a majority of the Southeast CACE Hub counties in the highest quartile for child asthma hospitalizations (Figure 3).

Figure 2.

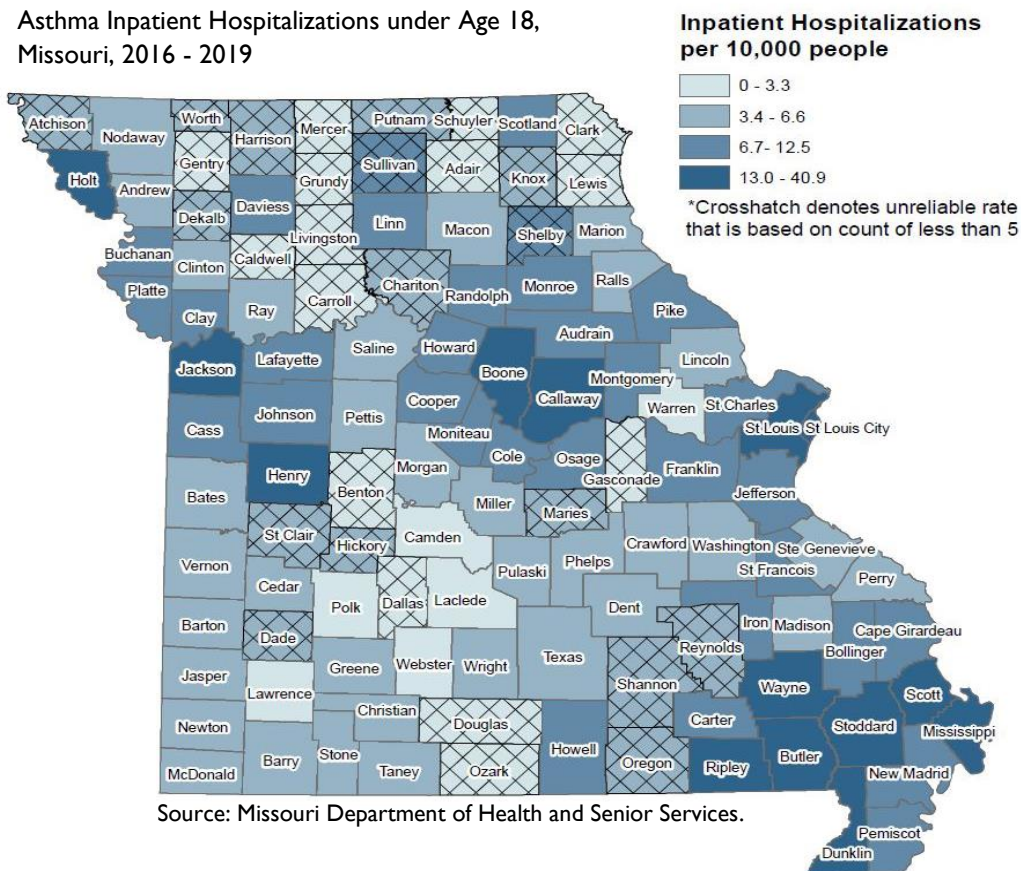
Asthma hospitalizations rates among children aged 0-17 years, Southeast CACE Hub and Missouri, 2011 - 2015



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

Figure 3.

Asthma Inpatient Hospitalizations under Age 18, Missouri, 2016 - 2019



Source: Missouri Department of Health and Senior Services.

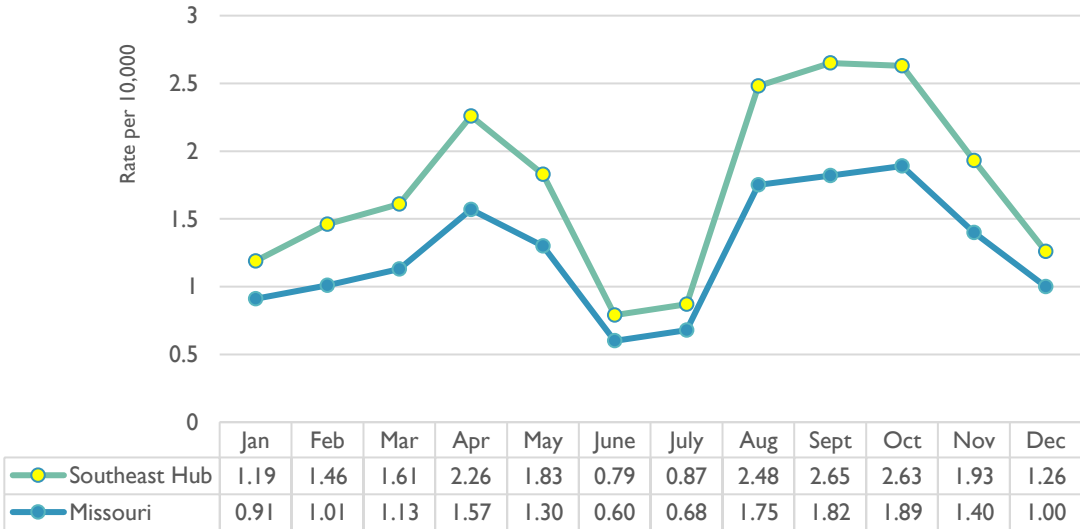
In Missouri, among children and teens aged 0 to 17 with asthma as the primary diagnosis, hospital charges totaled \$20.8 million and children / teens from the Southeast 11-county area accounted for about 6.25% (\$1.3 million) of these charges (2015).⁵ In the Southeast area for asthma hospital charges among children, Medicaid accounted for the largest pay source cited (86.7%) followed by commercial insurance (7.6%). As these data indicate, asthma is a heavy financial weight on children and families enrolled in Medicaid.

Seasonality

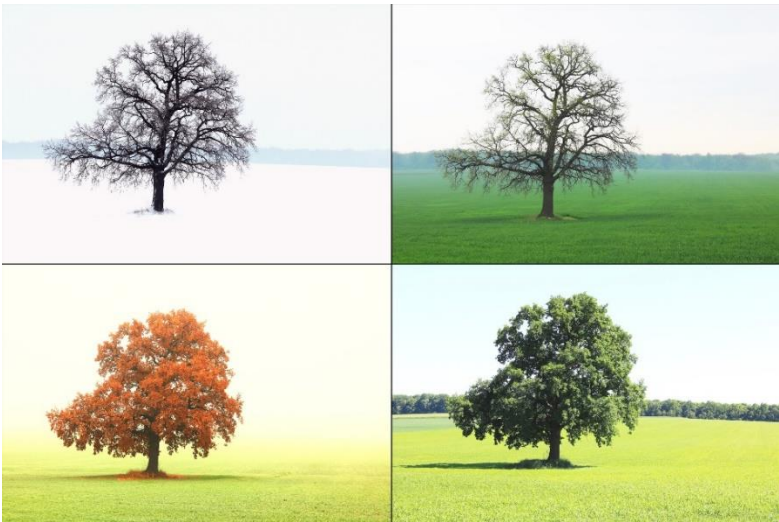
Asthma ED visits and hospitalizations have seasonal patterns. For children and teens aged 0 to 19, the asthma hospital admissions rates by month for the Southeast 11-county area and Missouri show a bimodal distribution indicating two peak periods (Figure 4).⁵ The peak months are April and August-October. Also shown are the substantial low rates in asthma hospital admissions for children and teens June-July in the Southeast area and Missouri.

Figure 4.

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



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



Zip Codes

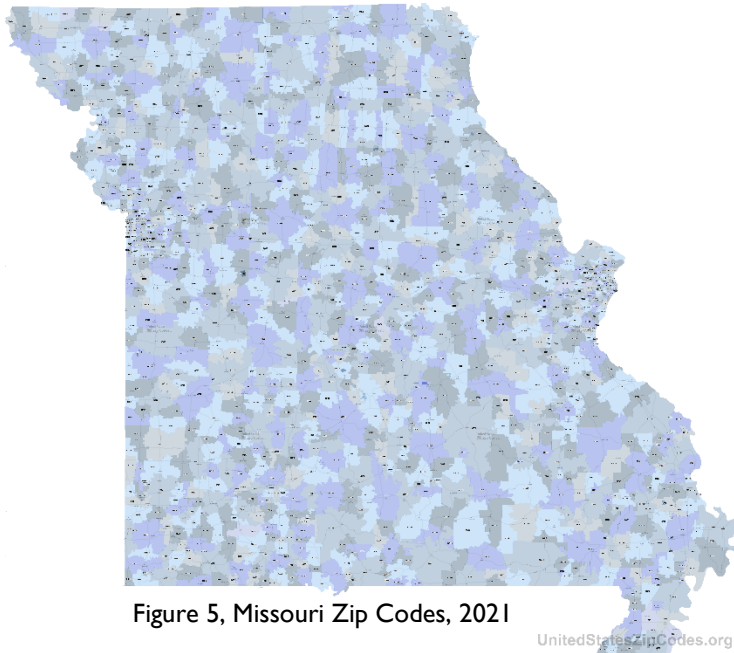
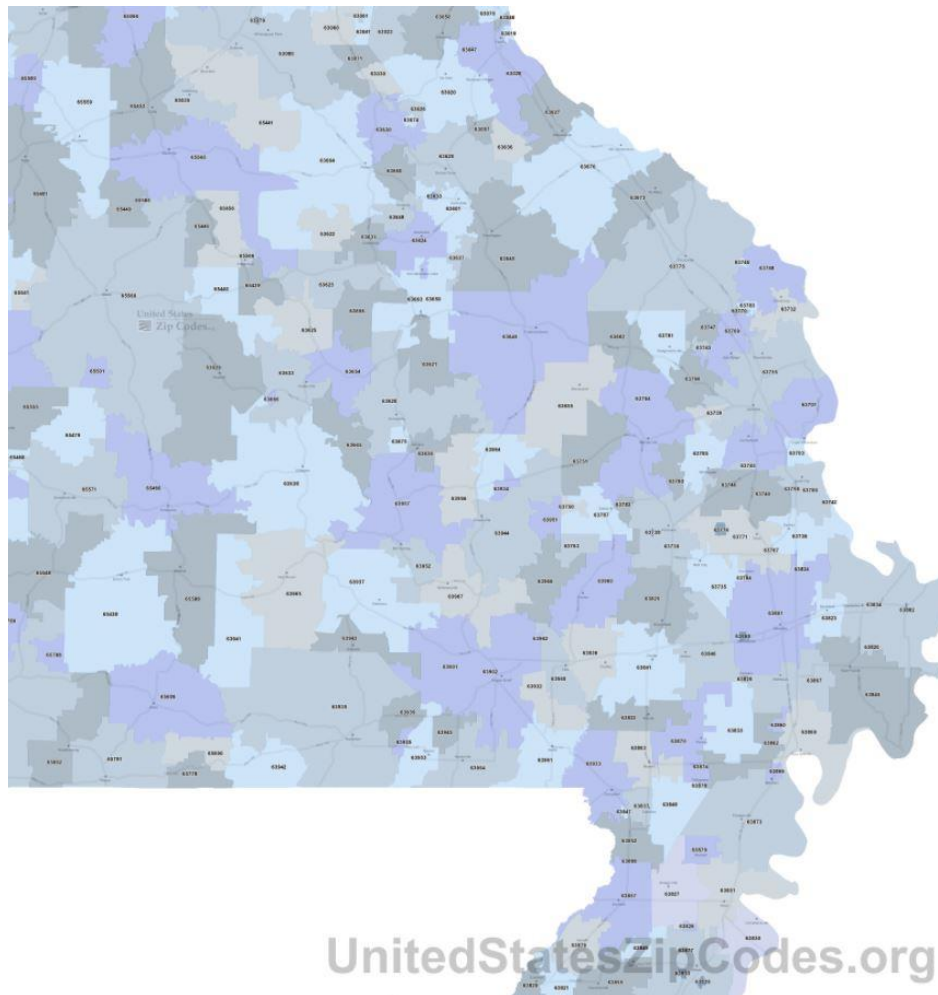


Figure 5, Missouri Zip Codes, 2021

UnitedStatesZipCodes.org

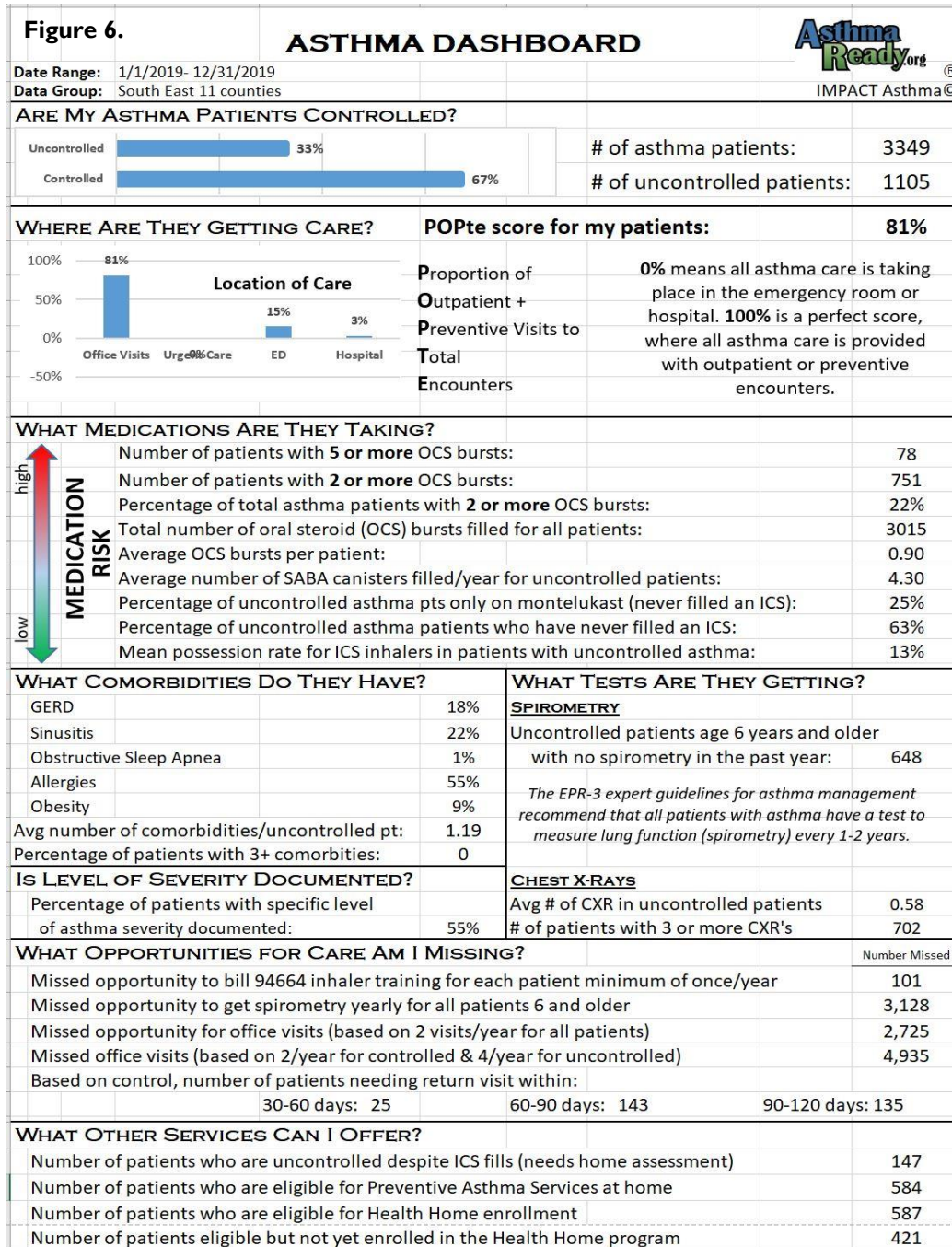
Source: United States Postal Service, US Census Bureau

The Missouri Zip Codes Map (Figure 5), using the ZIP Code Tabulation Areas (ZCTAs) as specified by the United States Census Bureau, approximate the area covered by a ZIP code.⁶ The southeast 11-county area has about 131 ZIP codes. Most are residential, but a small number (23 or 17.6%) are PO boxes with low or no residential populations.



Programs

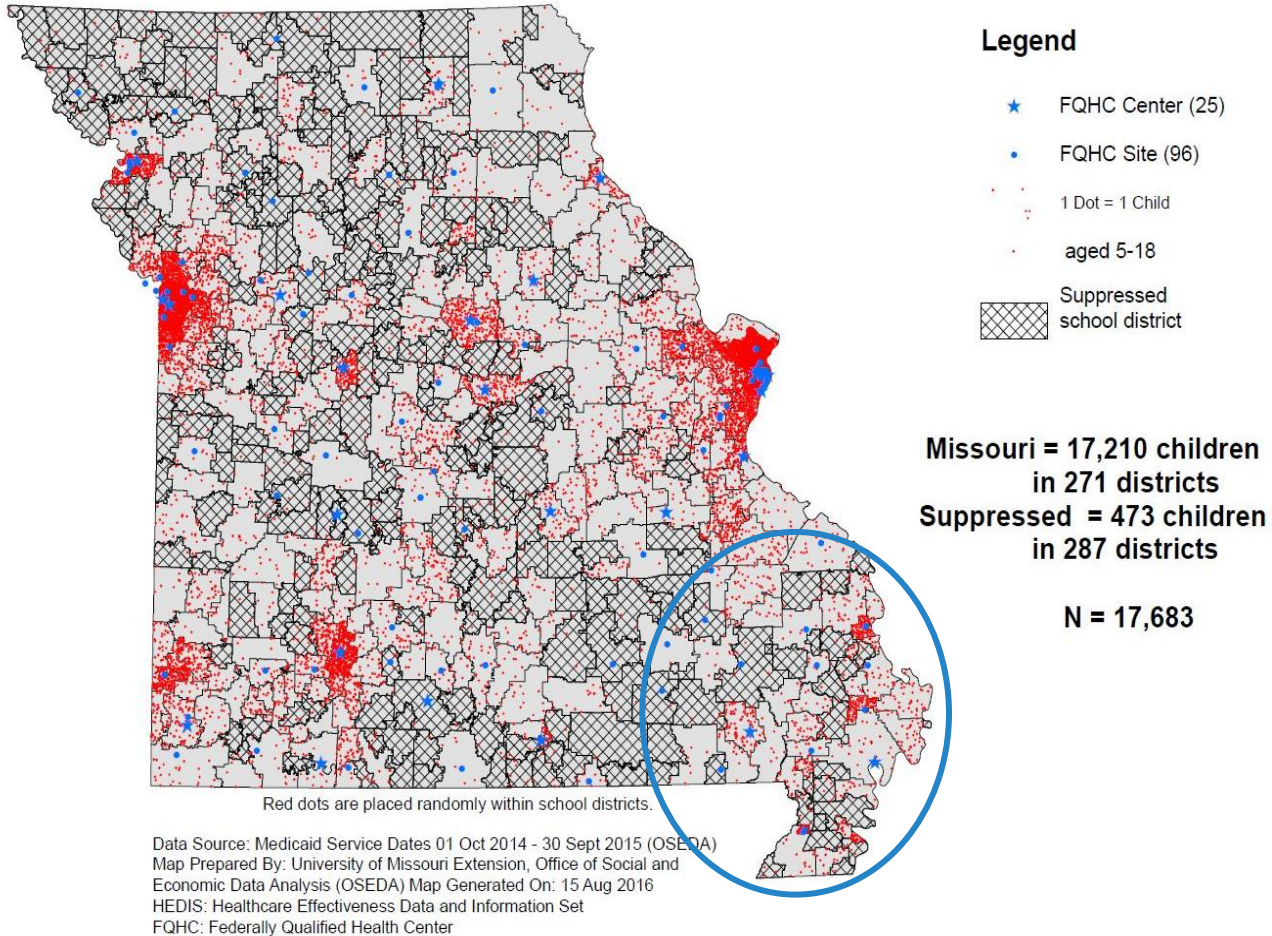
To focus programs in areas of greatest need, Medicaid administrative claims data are used to generate de-identified population-based asthma risk panel reports and maps to identify children with uncontrolled asthma in Missouri. Risk indicators such as frequent asthma acute care visits (i.e., emergency 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 asthma risk panel report dashboard for children, teens and young adults (< 21 years) with asthma in the Southeast CACE Hub for 2019 indicates that one-third (33.0%) had uncontrolled asthma and a proportion sought care through the emergency room (15%) (Figure 6). However, the proportion of outpatient and preventive visits to total care encounters (POPte) score of 81% indicates that almost 8 in 10 care encounters are occurring in outpatient and preventive visits.



A map shows children throughout the Southeast Hub with persistent asthma (Figure 7). Persistent asthma was defined by the Healthcare Effectiveness Data and Information Set (HEDIS).

Figure 7,

Children with persistent asthma by school district, Missouri,
2014-2015



PERSISTENT ASTHMA

- 1 ASTHMA INPATIENT ADMISSION OR EMERGENCY DEPARTMENT VISIT
OR
- 4 ASTHMA MEDICATION DISPENSING EVENTS
OR
- 4 OUTPATIENT ASTHMA VISITS AND AT LEAST 2 ASTHMA MEDICATION DISPENSING EVENTS

Applying the data and implementing evidence-based practices and community-wide interventions in the Southeast Hub area are showing results of improved self-care measures and overall symptom control among children and teens. Legacy interventions such as Childhood Asthma Linkages in Missouri, Teaming Up for Asthma Control, early childhood initiatives, and asthma care professional development combined with current interventions (e.g., collaborative learning combined with health system, primary care, and community initiatives, particularly schools), are contributing to advances in asthma control. Collaborative learning participants include MD/DOs, RN/NPs, RTs, LPNs, MAs, CHWs, PhDs, students, and others. The Asthma Ready® Communities (ARC) data contained 1,335 activity records for the Southeast Hub area (Table 4). Other interventions and initiatives such as primary care health homes and home environmental assessments further support and contribute to improving asthma outcomes and reducing costs.

Table 4.

Key interventions to reduce pediatric asthma risk and improve control, Southeast Hub area, Missouri 2006-2021

Intervention	Percent of participation records
Extension for Community Healthcare Outcomes (ECHO)	56.8
<ul style="list-style-type: none"> Impact Asthma – <i>Essentials</i> (39.6%) Asthma Care Accelerator – (5.4%) <i>Quality Improvement / Maintenance of Certification (QI/MOC)</i> Asthma Care & Education – <i>Community</i> (11.8%) 	
Asthma Ready Clinic Training, Hospital, School, PACE, and Pharmacist Asthma Encounter Management	18.2
Becoming an Asthma Educator & Care Manager	13.5
Teaming Up for Asthma Control	4.3
Presentations / Workshops / Professional Organizations	2.2
Asthma Academy / Asthma Day	1.9
Childhood Asthma Linkages in Missouri 2	1.9
Programs – <i>Acting on Behalf of My Child</i> and <i>Asthma Care Everyday</i>	1.2

Source: University of Missouri, Asthma Ready Communities (ARC). Southeast activity records = 1,335.

Community Agencies

There are community resources available in the Southeast Hub Area to assist children with asthma and their families. The following provides a sample of resources:

Community Resources, Southeast Missouri State University

Community Partnership of Southeast Missouri, United Way 2-1-1

[Helpful Region / County Resources](#), Missouri Department of Health and Senior Services

Community Action Agencies: East Missouri Action Agency, South Central Missouri Community Action Agency, and Delta Area Economic Opportunity Corporation

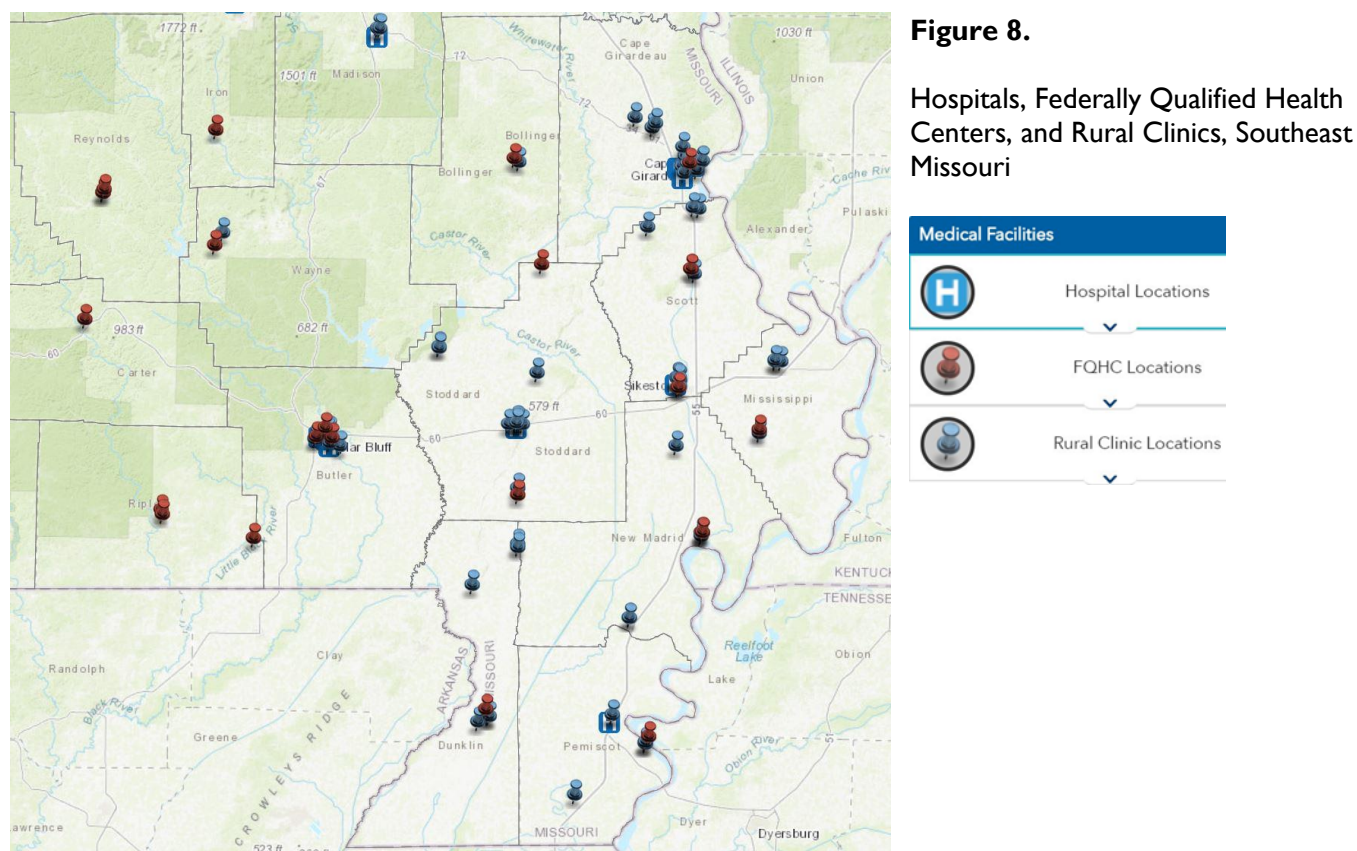
Environmental Health Assessments: Southeast Missouri State University, Institute for Environmental Health Assessment and Patient Centered Outcomes request through [Asthma Bridge](#)

Local Weatherization Programs, Missouri Department of Natural Resources

SMTS Anyone Can Ride, serves 6 of the Southeast Hub Counties: Butler, Madison, New Madrid, Pemiscot, Stoddard, and Wayne

Health Systems

The health care system is comprised of primary care providers, hospitals, clinics, urgent care, community health centers, public health, mental health services, school nurses, Medicaid and care management services, and community partners. Yet, all the Southeast Hub counties are designated as primary care professional shortage areas.⁷ The Southeast Hub area has several health care systems that participate in asthma interventions and activities including SEMO Health Network, Popular Bluff Pediatric Association, Ferguson Medical Group, and Missouri Delta Medical Center. The southeast hospitals, federally qualified health centers, and rural clinics are shown in Figure 8.

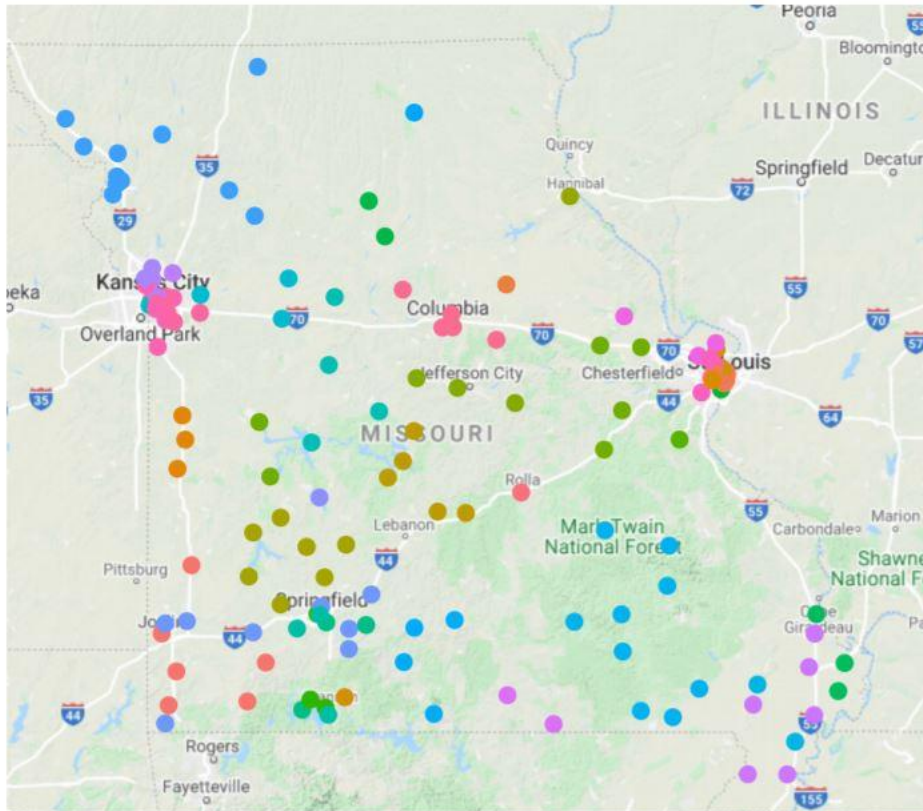


Source: Missouri Department of Health and Senior Services, Rural Health

There are Primary Care Health Home providers in the Southeast Hub Area and throughout Missouri (Figure 9). Local Public Health Agencies are also located throughout the Southeast Hub.

Figure 9.

Primary Care Health Homes, Missouri



<ul style="list-style-type: none"> Access Family Care Affinia Healthcare Author Center Bates County Memorial Hospital Betty Jean Kerr Peoples Health Centers Bridges Medical Services Care StL Central Ozarks Medical Center Childrens Mercy Hospital Citizens Memorial Healthcare Clarity Healthcare Preferred Family Health Community Health Center of Central Missouri Compass Health Wellness Contera Community Health Cox Health Family Care Health Centers 	<ul style="list-style-type: none"> Family Health Center of Boone County Ferguson Medical Group St. Francis Medical Center Fitzgibbon Hospital Fordland Clinic Great Mines Health Center Jordan Valley Community Health Center Katy Trail Community Health KC Care Clinic Livewell Community Health Managed Care Inc. Missouri Delta Medical Center Missouri Highlands Health Care Missouri Ozarks Community Health Northeast Missouri Health Council Northwest Health Services OCH Health System 	<ul style="list-style-type: none"> Ozarks Community Health Center Priority Care Pediatrics LLC Samuel U Rogers Health Center Southeast Missouri Health Network Southern Missouri Community Health Center SSM Cardinal Glennon Danis Pediatrics SSM Cardinal Glennon Pediatrics SSM Internal Medicine SSM Pediatrics St. Louis County Department of Public Health Swope Health Services Truman Medical Centers University of Missouri Health System Your Community Health Center
--	--	---

Source: Missouri Primary Care Association, MO HealthNet, and Missouri Institute of Mental Health. Primary Care Health Home Progress Report 2018-2019.

Schools

There are 51 school districts in the Southeast Hub 11-county area (Figure 10).⁸ These students are located in elementary, middle/Jr high schools, high schools as well as preschools, technical career centers, diagnostic and learning centers. Combined, the Southeast Hub has more than 48,000 total students (Table 5) representing approximately 5.5% of the enrollment in public schools in Missouri.⁹

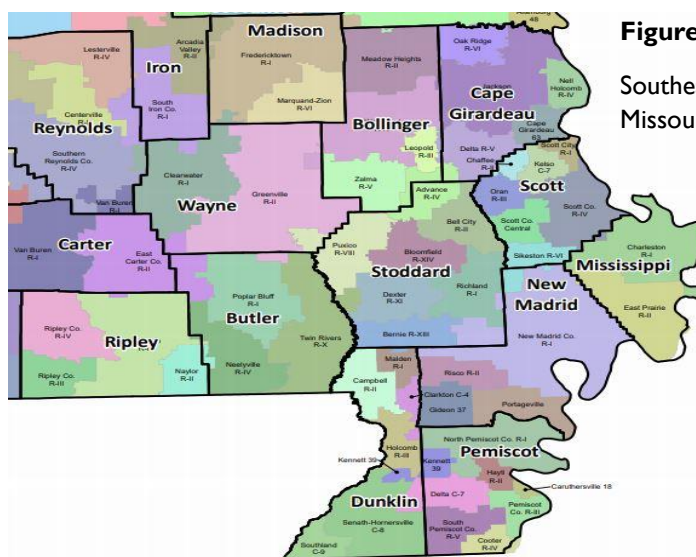


Figure 10.
Southeast school districts,
Missouri



Table 5.

Southeast CACE Hub School Districts by Number of Students, Missouri

Southeast School Districts		Number	Percent of Total
County	I I-County Area	48,339	100
Cape Girardeau	Jackson R-II	5,436	11.2
Butler	Poplar Bluff R-I	5,254	10.9
Cape Girardeau	Cape Girardeau 63	4,391	9.1
Scott	Sikeston R-6	3,448	7.1
Stoddard	Dexter R-XI	2,090	4.3
Madison	Fredericktown R-I	2,002	4.1
Dunklin	Kennett 39	1,948	4.0
Ripley	Doniphan R-I	1,645	3.4
New Madrid	New Madrid Co. R-I	1,363	2.8
Mississippi	East Prairie R-II	1,095	2.3
Pemiscot	Caruthersville 18	1,012	2.1
Scott	Scott Co. R-IV	977	2.0
Dunklin	Malden R-1	970	2.0
Wayne	Clearwater R-I	955	2.0
Butler	Twin Rivers R-X	915	1.9
Mississippi	Charleston R-I	881	1.8
Scott	Scott City R-I	863	1.8
Stoddard	Puxico R-VIII	788	1.6
Dunklin	Senath-Hornersville C-8	757	1.6
Wayne	Greenville R-II	737	1.5
New Madrid	Portageville	730	1.5
Scott	Chaffee R-II	672	1.4
Stoddard	Bloomfield R-XIV	659	1.4
Butler	Neelyville R-IV	639	1.3
Pemiscot	Hayti R-III	636	1.3
Pemiscot	South Pemiscot Co. R-V	635	1.3
Dunklin	Campbell R-II	562	1.2
Stoddard	Bernie R-XIII	547	1.1
	All Others	5,732	11.9

22 school districts have
80.5% of the total
Southeast Hub public
school student population

Source: Missouri Department of Elementary and Secondary Education. School Directory
June 2021.

Churches

There is an abundance of churches in the Southeast Area including Presbyterian, Baptist, 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.

The combined impact of simultaneously supporting clinicians, school nurses, and care managers while implementing effective interventions and linking with community resources (i.e., schools, churches, pharmacies, etc.) in areas with known asthma burden will likely have substantial impact and significantly improve population-level 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, Cox Health, Ferrell Duncan Allergy Clinic

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

- ¹ US Census Bureau. Population and demographic estimates. Retrieved July 9, 2021, from <https://www.census.gov/data.html>
- ² Missouri Department of Health and Senior Services (DHSS). Behavioral Risk Factor Surveillance System 2015 Data Report. Retrieved July 26, 2021, from <https://health.mo.gov/data/brfss/2015datareport.pdf>
- ³ Centers for Disease Control and Prevention (CDC). National Health Interview Survey Data. Atlanta, GA: National Center for Environmental Health, Asthma and Community Health Branch. Retrieved July 9, 2021, from <https://www.cdc.gov/nchs/fastats/asthma.htm>
- ⁴ CDC. Uncontrolled asthma among children, 2012-2014. Behavioral Risk Factor Surveillance System (BRFSS)—Child Asthma Call-back Survey Data, 2012-2014. Retrieved November 15, 2019, from https://www.cdc.gov/asthma/asthma_stats/uncontrolled-asthma-children.htm
- ⁵ DHSS. Missouri Public Health Information Management System (MOPHIMS), Missouri Information for Community Assessment (MICA) - Inpatient Hospitalizations, and Environmental Public Health Tracking,. Retrieved July 26, 2021, from <https://healthapps.dhss.mo.gov/MoPhims/MOPHIMSHome>
- ⁶ United States Zip Codes.org. Zip Code Maps by State. Retrieved July 30, 2021, from <https://www.unitedstateszipcodes.org/printable-zip-code-maps/>
- ⁷ Health Resources & Services Administration. Primary Care HPSA: Health Professional Shortage Area. Retrieved July 26, 2021, from <https://data.hrsa.gov/tools/shortage-area/hpsa-find>
- ⁸ Missouri Department of Elementary and Secondary Education. Missouri School Directory, 2021. Retrieved August 18, 2021, from <https://dese.mo.gov/directory>
- ⁹ Missouri Department of Elementary and Secondary Education. 2019-2020 Statistics of Missouri Public Schools. Retrieved August 24, 2019, from <https://dese.mo.gov/media/pdf/mo-school-statistics>

