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Asthma-Related Emergency Room Visits by Children Under Age 18

Asthma is a chronic respiratory disease. Various triggers lead to coughing, wheezing and shortness of breath. Some of the triggers “include allergens, infections, exercise, abrupt changes in the weather, or exposure to airway irritants, such as tobacco smoke.”¹ Asthma is one of the nation’s most common and costly diseases.² Better asthma management could reverse the increasing numbers of emergency room visits and hospitalizations due to asthma.³

Asthma emergency room (ER) visits are expensive and may be considered preventable. Many of these ER visits could be avoided with better access to primary care physicians, preventive medicine, and health education.⁴ In Missouri, children, compared to other age groups, tend to have the highest rates of emergency room use for asthma. This article provides an analysis of patterns of asthma-related emergency room visits for children under age 18.

The data source for the analysis is the Patient Abstract System (PAS), a state-mandated hospital data reporting system. The PAS contains a record for every patient treated in the emergency department of a hospital in Missouri. Reporting is mandated for all licensed hospitals except federal hospitals and state mental hospitals. Data for Missouri residents receiving care in some hospitals located in contiguous states are also included in the PAS. Data for this study are for Missouri residents treated and released from hospital emergency rooms during 2003.

ER Rates by Age and Gender

Table 1 displays the number and rate (based on 2003 population estimates⁵) of ER visits for asthma (where asthma was listed as the principal diagnosis) by sex and age group. The highest rates for asthma are found in children, 1-4 years

Table 1						
Asthma Emergency Room Visits: Rates by Age and Sex						
Missouri Residents, 2003						
Age of Patient	Male		Female		Both	
	Number	Rate	Number	Rate	Number	Rate
Under 1	535	13.6	244	6.5	779	10.1
1 - 4	3,066	20.2	1,650	11.4	4,716	16.0
5 - 9	2,313	12.0	1,412	7.7	3,725	9.9
10 - 14	1,780	8.5	1,314	6.5	3,094	7.5
15 - 17	733	5.8	879	7.3	1,612	6.5
18 - 19	492	5.8	722	8.9	1,214	7.3
20 - 24	991	4.8	1,787	8.8	2,778	6.7
25 - 44	2,702	3.4	5,668	7.1	8,370	5.3
45 - 64	1,093	1.6	2,566	3.6	3,659	2.7
65 and Over	307	1.0	716	1.6	1,023	1.3
All Ages	14,012	5.0	16,958	6.1	30,970	5.6

Note: Rates are per 1,000 population by age and sex.

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old. As children get older, they are less likely to be treated in emergency rooms for asthma. Rates continue to decrease after age 19 in both men and women. Male children have much higher rates of asthma ER visits than female children in the younger age categories (under 1 year, 1-4 years old and 5-9 years old). By the late teen years (age 15-19), females are slightly more likely to be treated for asthma than males. Overall, the age-adjusted ER treatment rate for females is greater than that for males (6.1 versus 5.0, respectively, $p < .05$).

ER Rates by Pay Source

National data⁶ indicate that more children with asthma are covered by commercial insurance than are covered by Medicaid. The MICA⁷ data show that Medicaid covered about 520,000 (37 percent) of 1,400,000 Missouri children under 18 years of age in 2003. It is estimated⁸ that about 48,000 (3.4 percent) of children under age 18 were uninsured, while about 60,000 (4.3 percent) were covered by other public insurance. This results in an estimated 772,000 children under age 18 being covered by commercial insurance in 2003, or about 48 percent more than were covered by Medicaid. Table 2 shows

that despite this, in 2003, Medicaid covered significantly (94 percent) more ER visits for asthma than commercial insurance for children under age 18 (8654 versus 4457, respectively).

Table 2 also displays the number and rate of ER visits for asthma by age group and pay source. ER visit rates for asthma are higher for Medicaid than for commercial insurance up to age 18, with the overall rate being almost three times higher for Medicaid than for commercial insurance. The rate for 1-4 year olds is high relative to the rest of the children covered by Medicaid, but children covered by commercial insurance do not show this pattern.

To develop rates for asthmatic children, asthmatic children were estimated to make up seven percent of the population⁹. Rates based on the population of asthmatic children (Table 2a), are much higher—about 14 times higher—than the rates in Table 2. The population of asthmatic children was estimated over five years ago and may be an underestimate of the current population if asthma has been on the increase. This would tend to make the rates of 237.7 and 82.5 somewhat high, but still a better estimate of the rates of

Table 2 Asthma Emergency Room Visits: Rates by Age and Pay Source Missouri Residents under Age 18, 2003						
Age of Patient	Medicaid		Commercial		All	
	Number	Rate	Number	Rate	Number	Rate
Under 1	589	16.7	152	2.9	779	10.1
1 - 4	3,115	23.2	1,377	6.5	4,716	16.0
5 - 9	2,204	15.2	1,308	6.0	3,725	9.9
10 - 14	1,857	13.4	1,026	5.0	3,094	7.5
15 - 17	889	13.1	594	5.9	1,612	6.5
Total	8,654	16.6	4,457	5.8	13,926	9.9

Note: Rates are per 1,000 population by age and pay source (estimated).

Table 2a Asthma Emergency Room Visits: Rates by Age and Pay Source Missouri Residents under Age 18, 2003						
	Medicaid		Commercial		All	
	Number	Rate	Number	Rate	Number	Rate
Total	8,654	237.7	4,457	82.5	13,926	142.1

Note: Rate calculation method:
 Rates per 1,000 estimated asthma population by pay source
 Asthma population estimated at 7% of total population under age 18
 Medicaid Estimate: $(8654 \times 1000) / (520,000 \times 0.07) = 237.7$.
 Commercial Estimate: $(4457 \times 1000) / (772,000 \times 0.07) = 82.5$.
 Total Estimate: $(13926 \times 1000) / (1,400,000 \times 0.07) = 142.1$.

Table 3

Asthma Emergency Room Visits: Charges by Age and Pay Source
Missouri Residents under Age 18, 2003

Age of Patient	Medicaid		Commercial		All	
	Amount	Average	Amount	Average	Amount	Average
Under 1	\$ 402,833	\$ 11.43	\$ 108,472	\$ 2.07	\$ 537,605	\$ 5.66
1 - 4	\$ 2,088,522	\$ 15.62	\$ 1,065,357	\$ 5.04	\$ 3,319,507	\$ 9.22
5 - 9	\$ 1,511,192	\$ 10.42	\$ 916,865	\$ 4.26	\$ 2,584,012	\$ 6.62
10 - 14	\$ 1,326,923	\$ 9.58	\$ 741,004	\$ 3.60	\$ 2,196,365	\$ 5.89
15 - 17	\$ 638,461	\$ 9.47	\$ 419,847	\$ 4.49	\$ 1,144,045	\$ 6.30
Total	\$ 5,967,931	\$ 11.48	\$ 3,251,545	\$ 4.21	\$ 9,781,534	\$ 6.99

Note: Average charge is based on estimated population covered by pay source.

ER visits for asthmatic children than the rates in Table 2. (On the other hand, whether the percent of children with asthma is higher or lower than that used for these estimates, it is not likely to be exactly the same for children on Medicaid and children with commercial insurance, so these rates should be viewed with caution.) The rates indicate that the ER visits could represent nearly a fourth (23.7 percent) of the Medicaid population under age 18 with asthma. Since some children may visit the ER more than once during the year, the number of asthmatic children covered by Medicaid who actually visit the ER is probably somewhat less than 23.7 percent of the population.

The larger number of asthma ER visits for children with Medicaid, combined with the smaller population of children with Medicaid, results in an average number of asthma ER visits per child covered that is substantially higher for Medicaid than for commercial insurance (0.24 visits per child per year versus 0.08, respectively). The high visit rate may be a reflection of several issues, including problems with access to primary health care in the Medicaid population, due to providers opting out of Medicaid participation. This may result in inappropriate use of the ER for non-emergency care.

ER Charges by Pay Source

National data¹⁰ indicate that per capita medical costs for asthma-related treatment of children under age 18 (including the children with asthma who had no ER visits) are higher for Medicaid than for commercial insurance. The national data indicate that per capita costs of asthma-related ER visits for children could be more than twice as high with Medicaid as with commercial insurance. Missouri's PAS data show that total charges for asthma-related ER visits for children under age 18 were about 84 percent higher for Medicaid than for commercial insurance in 2003 (\$5,967,931 versus \$3,251,545, see Table 3). When averaged over the estimated population of children under age 18 with Medicaid, charges for asthma-related visits were about 2.7 times as much as those for children with commercial insurance. The average charge was highest for 1-4 year olds in both groups: \$15.62 for the Medicaid group and \$5.04 for the commercial group. The greatest difference between the Medicaid and commercial groups is for those under age 1: the average Medicaid charge of \$11.43 is over five times the commercial charge of \$2.07.

Using seven percent of the population of children as the estimated asthma population, the average ER charge per

Table 3a

Asthma Emergency Room Visits: Charges by Age and Pay Source
Missouri Residents under Age 18 in 2003

	Medicaid		Commercial		All	
	Amount	Average	Amount	Average	Amount	Average
Total	\$ 5,967,931	\$ 163.95	\$ 3,251,545	\$ 60.17	\$ 9,781,534	\$ 99.81

Note: Average charge calculation method:

Average charge based on estimated asthma population covered by pay source

Asthma population estimated at 7% of total population for children under age 18

Medicaid Estimate: $\$5,967,931 / (520,000 \times 0.07) = \163.95 .

Commercial Estimate: $\$3,251,545 / (772,000 \times 0.07) = \60.17 .

Total Estimate: $\$9,781,534 / (1,400,000 \times 0.07) = \99.81 .

Table 4
Asthma Emergency Room Visits: Rates by Age, Sex and Race
Missouri Residents, 2003

Age of Patient	White						African American					
	Male		Female		Both		Male		Female		Both	
	Number	Rate	Number	Rate	Number	Rate	Number	Rate	Number	Rate	Number	Rate
Under 1	277	8.5	100	3.2	377	5.9	227	40.4	129	23.9	356	32.3
1 - 4	1,538	12.4	757	6.4	2,295	9.5	1,395	57.5	822	35.1	2,217	46.5
5 - 9	1,121	7.1	654	4.3	1,775	5.7	1,119	37.6	711	24.4	1,830	31.1
10 - 14	763	4.4	591	3.6	1,354	4.0	968	28.5	703	21.4	1,671	25.0
15 - 17	343	3.2	497	5.0	840	4.1	269	30.6	259	30.3	732	20.3
18 - 19	240	3.4	478	7.0	718	5.1	231	19.7	233	20.9	464	20.3
20 - 24	569	3.2	1,204	7.0	1,773	5.1	397	14.7	549	19.8	946	17.3
25 - 44	1,574	2.3	3,911	5.8	5,485	4.1	1,049	11.8	1,642	15.8	2,691	13.9
45 - 64	646	1.1	1,701	2.7	2,347	1.9	422	7.2	808	11.2	1,230	9.4
65 and Over	245	0.8	517	1.3	762	1.1	52	2.5	175	5.0	227	4.1
All Ages	7,316	3.1	10,410	4.4	17,726	3.8	6,232	16.4	6,132	16.2	12,364	16.4

Note: Rates are per 1,000 population by age, sex and race.

asthmatic child by pay source is shown in Table 3a--about \$164 for children covered by Medicaid and \$60 for children covered by commercial insurance. Again, these are about 14 times higher than the average charges in Table 3.

Medicaid pays about 61 percent of all asthma-related ER charges for children under age 18, while commercial insurance pays about 33 percent of these charges (Table 3). All insurance sources combined pay over 96 percent of all asthma-related ER charges for children under age 18. The remaining four percent in Table 3 are primarily self-pay.

Race and Gender

Because Native Americans, Hispanics, and Asians make up a small percentage of the asthma patients, comparisons in this report are made only between African Americans and Whites.

Asthma emergency room visits demonstrate dramatically the differences between the two populations. Table 4 shows the number and rate of asthma emergency room visits by age group, sex and race. The rate for African Americans is over four times higher than the rate for Whites (16.4 vs. 3.8). The highest rate (57.5) is for African-American males ages 1-4.

Regardless of sex, African Americans have higher rates of emergency room visits than Whites in each age group. The largest discrepancy is for 10-14 year olds, where African Americans have over six times the white rate. For just males, the rate for African-American males in this age group is 6.5 times the white male rate. African Americans also have higher rates of ER visits than Whites by pay source (Table 5). The African-American rate for Medicaid is over six times higher than the white rate (8.8 vs. 1.3), and the African-American rate for commercial insurance is 2.6 times higher

than the white rate (3.9 vs. 1.5). (These rates are based on population by race and age group, not by pay source.)

County of Residence

Rates of asthma-related ER visits vary by geographic location in the state (see Figure 1). During the period studied, there were significantly higher rates ($p < .05$) of asthma ER visits for children under age 15 who reside in the urban areas of St. Louis City (30.2), St. Louis County (14.8), and Jackson County (14.7), than for the state overall (10.6). Residents of two rural counties also had rates that were significantly higher than the state rate. These were Washington County (18.4) and Pemiscot County (16.5). When these two are combined with Jackson, St. Louis City and St. Louis County, they comprise 53 percent of the asthma-related ER visits in 2003.

Sixty-four counties had a significantly lower rate than the state rate. For the remaining 46 counties, rates were not significantly different from the overall state rate, or rates were not statistically reliable enough for comparison.

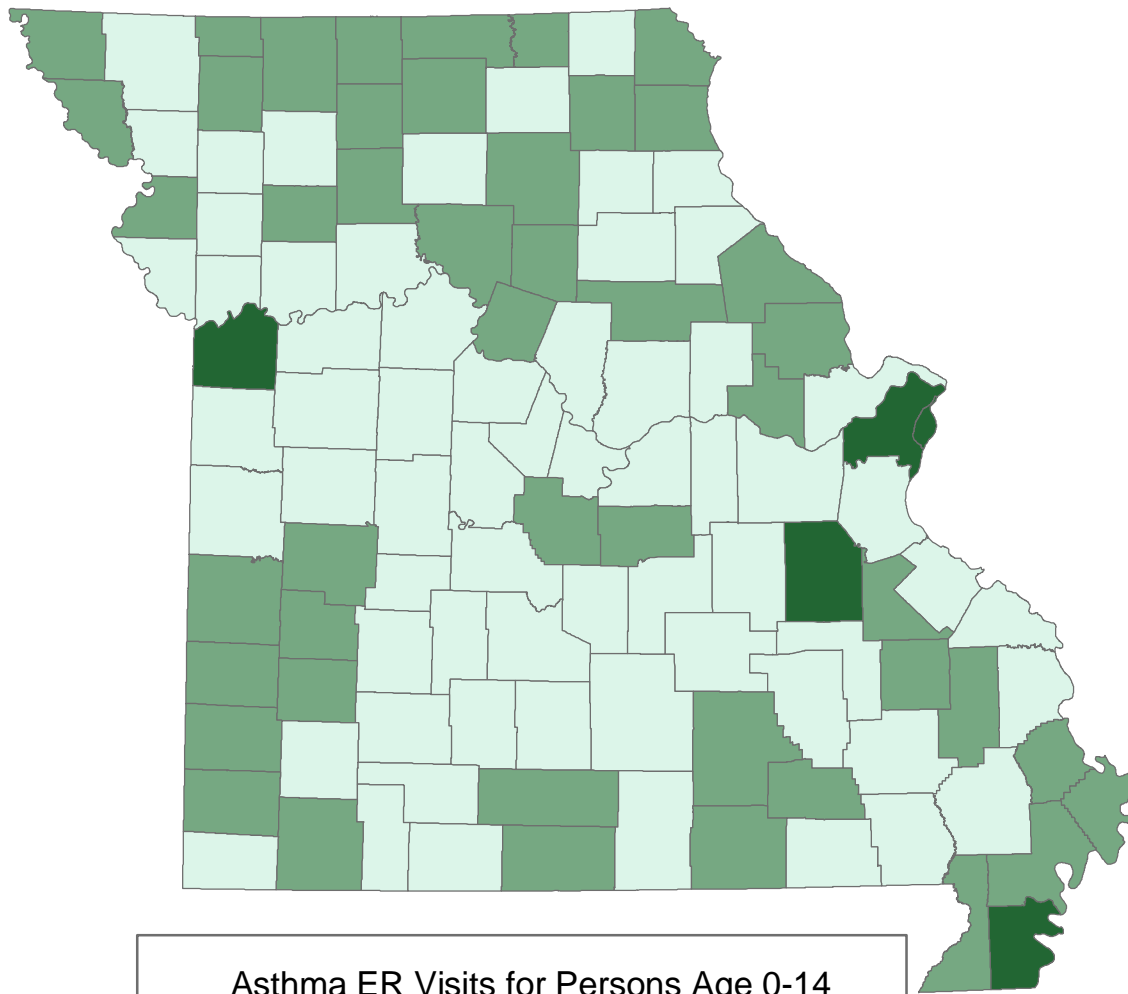
From this study, generalizations cannot be drawn about asthma-related ER visits as an urban or rural problem. Most of the rural counties have rates that are lower or not significantly different than the state rate. In Greene County, which includes Springfield, the third largest metropolitan area in the state, the rate (5.1) is significantly lower than the state rate.

Conclusions

The U.S. Department of Health and Human Services in Tracking Healthy People 2010¹¹ sets the baseline rate of asthma emergency room visits at 15.0 per 1,000 in 1995-1997 for children under age 5. For Missouri, the rate of asthma emergency room visits for this age group in 2003 was 14.8,

Figure 1

ER Visit Rates for Asthma by County Children Age 0-14, 2003



Asthma ER Visits for Persons Age 0-14

Missouri State Rate = 10.6 per 1,000

- Significantly higher than state rate
- Significantly lower than state rate
- Not Significantly different than state rate

Sources: Patient Abstract Data 2003, 2000 US Census Bureau

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Table 5

**Asthma Emergency Room Visits: Rates by Age, Race and Pay Source
Missouri Residents, 2003**

Age of Patient	White						African American					
	Medicaid		Commercial		All		Medicaid		Commercial		All	
	Number	Rate	Number	Rate	Number	Rate	Number	Rate	Number	Rate	Number	Rate
Under 1	241	3.8	115	1.8	377	5.9	308	28.0	32	2.9	356	32.3
1 - 4	1,187	4.9	968	4.0	2,295	9.5	1,793	37.6	353	7.4	2,217	46.5
5 - 9	763	2.5	893	2.9	1,775	5.7	1,367	23.2	379	6.4	1,830	31.1
10 - 14	572	1.7	651	1.9	1,354	4.0	1,234	18.5	361	5.4	1,671	25.0
15 - 17	382	1.9	386	1.9	840	4.1	488	13.5	191	5.3	732	20.3
18 - 19	254	1.8	306	2.2	718	5.1	196	8.6	145	6.4	464	20.3
20 - 24	578	1.7	573	1.7	1,773	5.1	331	6.1	255	4.7	946	17.3
25 - 44	1,749	1.3	2,069	1.5	5,485	4.1	929	4.8	758	3.9	2,691	13.9
45 - 64	457	0.4	1,119	0.9	2,347	1.9	405	3.1	366	2.8	1,230	9.4
65 and Over	8	0.0	80	0.1	762	1.1	4	0.0	31	0.6	227	4.1
All Ages	6,191	1.3	7,160	1.5	17,726	3.8	7,055	8.8	2,871	3.9	12,364	16.4

Note: Rates are per 1,000 population by age and race.

below this baseline. However, for Missouri children under age 5 studied here, rates varied widely from 5.7 for white females to 54.3 for African-American males. African Americans have much higher rates of ER visits than Whites for all age groups studied, indicating a possible problem with asthma management.

ER visit rates for children with asthma were much higher for Medicaid than for commercial insurance, even though more children were covered by commercial insurance than by Medicaid. The total charges for these visits were also much higher for Medicaid than for commercial insurance. When these charges were averaged over the estimated respective populations covered by Medicaid and commercial insurance, the average charges were about 2.7 times as much for Medicaid as for commercial insurance. The rate of ER visits for asthma is nearly three times as high for the Medicaid population as for the children with commercial insurance.

The higher ER visit rates for children with asthma that are covered by Medicaid, and the corresponding higher total ER charges, are putting a burden on the Medicaid program and the health care system that we should be able to reduce. Other studies¹² have indicated that regular preventive care can reduce acute episodes of asthma. Children covered by Medicaid should be receiving EPSDT (Early Periodic Screening, Diagnosis and Treatment) for early detection and preventive care. Ensuring that these children are receiving care as outlined in the National Heart Lung and Blood Institute's 'Guidelines for the Diagnosis and Management of Asthma' may improve their health status and reduce their visits to the ER.

A number of interesting patterns were revealed in this report. Despite the fact that most children were covered with some type of insurance and theoretically had access to preventive care, children on Medicaid were visiting the ER at higher rates and had higher charges than children covered by

commercial insurance. Also, African American children had higher rates of asthma-related visits than white children regardless of whether they were covered by Medicaid or commercial insurance. These disparities should be investigated in future studies.

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