



HIDI HealthStats

Statistics and Analysis From the Hospital Industry Data Institute

AUGUST 2015 ■ INNOVATIVE CARE DELIVERY MODELS FOR CHILDREN WITH ASTHMA IN MISSOURI



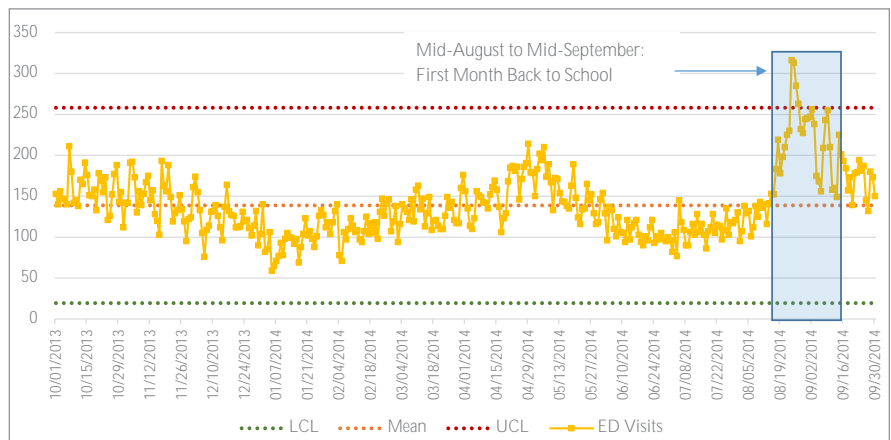
Background

The June issue of *HIDI HealthStats* focused on hospital utilization for asthma by children in Missouri. The findings revealed that asthma is the most commonly diagnosed chronic condition for Missouri children; the number and rate of emergency department visits for children with asthma increased significantly during the 10-year study period; low-income Missouri children face a disproportionate burden from asthma; and more than 1 in 10 children who visit an ED for asthma experience a return visit within 90 days.

This month's issue focuses on innovations designed to improve the health outcomes and quality of life for children with asthma in Missouri from the hospital, provider, education, law-making and public health communities in the state. This month, nearly 900,000 students will return to Missouri's public primary and secondary school systems.ⁱ During the 2014 to 2015 school year, 10 percent of these students were reported to be using medication to control asthma at home or at school.ⁱⁱ With more than 10 million school days missed in the U.S. every year because of the disease, asthma is one of the major drivers of absenteeism for students.ⁱⁱⁱ

Last year, the number of Missouri children visiting a hospital ED for asthma spiked above the upper statistical process control^{iv} during the first month of the school year (Figure 1).^v Between Aug. 15 and Sept. 16, 2014, the average number of daily asthma-related ED visits for children in Missouri increased more than 55 percent, from 139 per day to 216. While there is an apparent dearth of

Figure 1: SPC Chart for Daily Pediatric Asthma ED Visits in Missouri



literature to help explain this observed relationship, asthma in children is more likely to be triggered by cooler ambient temperatures.^{vi} Missouri’s 1,621 school nurses — a statewide ratio of one nurse per 533 students^{vii} — are commonly placed on the front lines of asthma control and management for children with the condition.

School nurses in Missouri work with hospitals, universities, the Missouri Asthma Prevention and Control Program, policymakers and community stakeholders to develop innovative approaches to improve health outcomes and safety for Missouri school children with asthma.

Case Study 1: A Kennett Public School, District- Led Pediatric Asthma Intervention in Dunklin County

In 2006, Dunklin County had the highest rate of pediatric hospitalizations for asthma in the state.^{viii} About 40 percent of the county’s children live in poverty and Dunklin County consistently ranks among the highest in the state for environmental health hazards, including the fourth-highest rate of air particulate matter which can trigger asthma attacks.

^{ix} Kennett Public Schools, the largest public school district in the county, has an estimated prevalence of asthma of 18 percent, which is twice the current state childhood asthma prevalence of 7.9 percent.^x Working through a community coalition model, KPS school nurses developed

a multipronged intervention that involved self-management education, proactive assessment of asthma severity by school nurses, home environment assessments, a specialist referral clinic, health care provider training and linkages to caregivers at Twin Rivers Regional Medical Center and local primary care physician offices. The KPS interventional design was adapted from the Missouri Asthma Prevention and Control Program’s Framework for Community-Based Approaches to Improving Asthma Care for Children.^{xi} A grant from the Missouri Foundation for Health provided funding in Dunklin County for additional resources which made full implementation, data collection and evaluation possible. During the course of the project, the hospital and two local physician offices earned the Asthma Ready® distinction, a Missouri-based program that recognizes health care providers for implementing processes aligned with the National Institutes of Health Expert Panel Report-3 guidelines.^{xii}

Between 2006 and 2011, the pediatric asthma hospitalization rate in Dunklin County fell from 77.8 to 39.9 per 10,000 children — a

49 percent decline during the five-year period. Evaluation of more recent Hospital Industry Data Institute data suggests this trend has been sustained with the rate of inpatient hospitalizations for children with a primary diagnosis of asthma in Dunklin County decreasing 77 percent from a high of 128 per 10,000 population under age 18 in 2002, to 29 stays per 10,000 in 2014 (Figure 2).^{xiii} Through a partnership with the Centers for Disease Control and Prevention and MAPCP, the KPS model was assessed by evaluation experts that examined health status improvement of KPS students with asthma (n=299) in comparison to a control school district (n=157) located about 30 miles away.^{xiv} Results of the study showed KPS students had, on average, fewer asthma symptoms, as measured by the asthma control questionnaire. After controlling for race, grade, gender and age, the odds of having well-controlled asthma were 55 percent higher for KPS students compared to students attending the control schools (OR=1.548; 95% CI 1.017-2.358). KPS parents consistently offered positive feedback regarding their interactions with the asthma management program. They expressed confidence

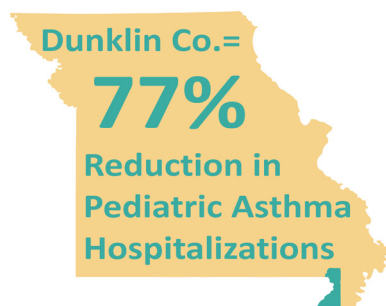
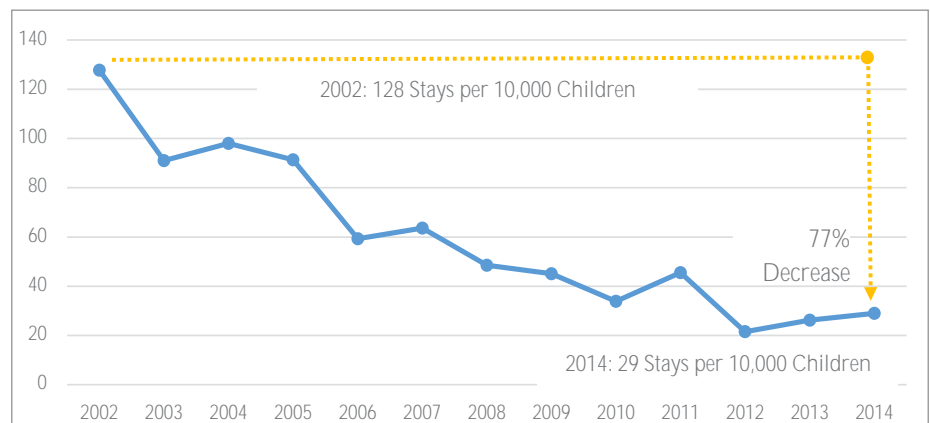


Figure 2: Pediatric Asthma Hospitalization Rate per 10,000 in Dunklin County, Missouri (2002 to 2014)



Barton County Memorial Hospital's Childhood Asthma Resource Education Program

The CARE program offers a free service to all children in Barton, Cedar and Dade counties with asthma and other chronic respiratory illnesses. Two certified asthma educators implement the CARE program. It is their goal to raise asthma awareness to patients, their families, health professionals and the public. Asthma is a serious chronic illness and certain risks can be avoided with education. They work in conjunction with the child's doctor and school nurse to ensure proper medication techniques and asthma self-management skills along with in-home environmental checks to help identify triggers for children with asthma. To date, the CARE program has worked with more than 300 children, their families and health care providers. The program also has worked directly with 11 schools to develop approximately 1,000 asthma assessments and action plans.

that their children were well cared for at school and reported learning how to better manage asthma. The leading factors KPS school nurses identified as contributors to the program's success were as follows.

- Sharing data, such as symptoms and forced expiratory volume in one second measurements, regularly with local health care providers.
- Prompting providers to adjust medications.
- Helping parents understand the importance of asthma management.
- Focusing school nurse effort on

monitoring adherence to asthma controller medications.

- Improving asthma self-management behaviors of students such as inhalation technique and trigger avoidance.

Case Study 2: Using Legislation to Remove Barriers to School Safety for Students With Asthma

The June issue of *HIDI HealthStats* highlighted recent legislation sponsored by Rep. Sue Allen (R-Town and Country) to fund and facilitate home-based environmental assessments for Medicaid children with asthma in Missouri — an evidence-based best practice with returns of \$5.30 to \$14 for every dollar invested.^{xv} Rep. Allen also sponsored House Bill 1188 that was enacted in August 2012.^{xvi} The legislation permits school districts in Missouri to maintain a stock supply of asthma-related rescue medications for use in the care of any student who is having a life-threatening asthma episode. Prior to HB 1188, Missouri pharmacy laws prohibited the dispensation of stock asthma-related rescue medications to schools. Now, school districts can maintain a stock of low-cost, nebulizer-administered rescue albuterol under a global prescription dispensed directly to the school in place of securing individual prescriptions for each student with asthma. The law also allows a school nurse or other trained employee to administer the rescue medication to a student experiencing a life-threatening asthma attack.

Eighteen months after the law was passed, an estimated 37 percent of public school districts had adopted the policy, making stock rescue medication available for children with asthma in crisis. Among participating districts, 56 percent reported that at least one student had been given stock

rescue medication to treat an asthma episode during the 2013-2014 school year.

According to State School Nurse Consultant Marjorie Cole, MSN, R.N., the rescue medication legislation has been highly successful at school districts that have chosen its implementation. "School nurses from participating districts across the state have repeatedly commented that having rescue medications available has prevented a severe asthma attack from escalating to one that would warrant a 911 call," Cole said. "So many of our kids do not have medications at school for a variety of reasons, so having a backup supply at arm's length and the legal authorization to use it when needed is absolutely critical."

The MAPCP offers technical assistance to any school nurse, administrator, board member or parent who wants to make their school safer by stocking asthma rescue medications. Hospitals experiencing high rates of asthma visits from local students also can contact MAPCP at 573/522-2876 for additional information and linkages to nurses in surrounding school districts.

Case Study 3: Addressing Childhood Asthma at Children's Hospitals

Prioritizing the Health of Children With Asthma Through a Collaborative Community Health Needs Assessment

Because of the overlapping missions of St. Louis Children's Hospital and Cardinal Glennon Children's Medical Center — to improve the health of children in St. Louis City — the two hospitals took a collaborative approach to evaluating the health needs of children in St. Louis. After evaluating primary and secondary data sources and the feedback of community health groups and parents,

childhood asthma was identified as one of the top three priorities in each hospital’s CHNA in terms of the underlying opportunity to improve the health and quality of life for children in St. Louis City.^{xvii}

The hospitals found that compared to the rest of the state, both the rates and racial disparities in hospital utilization for childhood asthma in St. Louis City were significantly higher and deserving of prioritized intervention in the implementation portion of the CHNA plans. At 47.9 percent of the total population (317,419 in 2014), African Americans comprise the racial majority in the city of St. Louis.^{xviii} Through their collaborative CHNA process, the hospitals found that African American children in St. Louis experienced 8.2 times the rate of ED visits for asthma as white children, and 8.5 times the rate of inpatient hospitalizations for asthma (Table 1).

Figure 3 shows the geographic distribution of pediatric asthma ED visits as a rate per 1,000 children through age 17 and the poverty rate for families with children in St. Louis City and St. Louis County during 2014.^{xix} The observed relationship between childhood asthma ED utilization rates and the childhood poverty rate reveals the highest concentrations of each occurring in North St. Louis County and in North and Southeast St. Louis City (Figure 3, top panel).

The Pearson’s correlation coefficient suggests a strong positive association ($r=0.74$) between the calculated rates of childhood asthma ED utilization and childhood poverty in the region. Univariate regression suggests an increase of 1.92 in the childhood asthma ED utilization rate for every one point increase in the childhood poverty rate in the region ($n=277$; $R^2=0.54$). Controlling for geographically-related clustering of childhood poverty and ED utilization for asthma produces hotspot maps very similar in appearance (Figure 3, bottom panel).^{xx} The Z-scores used to determine hot and cold spots for each map shared a strong positive association ($r=0.88$). Supporting the data used in the St. Louis Children’s and Cardinal Glennon CHNAs, nearly all of the hotspots for childhood asthma ED utilization in the region occur in the low-income and predominantly African American communities of North St. Louis City and North St. Louis County.

Implementing the Community Health Needs Assessment

In areas of North St. Louis City and North St. Louis County, 1 in 5 children suffer from asthma — double the national rate.^{xxi} To help these children and their families, caregivers and educators learn how to manage the disease, St. Louis Children’s Hospital developed the free Healthy Kids Express-Asthma program, which



is regarded nationally as an evidence-based best practice for improving health outcomes for children with asthma. The HKEA program is a multidisciplinary partnership between the hospital, local physicians and school districts located in ZIP codes with high rates of childhood asthma ED utilization. Each year, HKEA works with approximately 600 school-age children to improve knowledge and techniques to manage their asthma. Paired sample t-tests have shown HKEA kids miss fewer days of school, have 10.4 percent fewer hospital visits, and have significant improvements in both knowledge and self-management techniques.^{xxii}

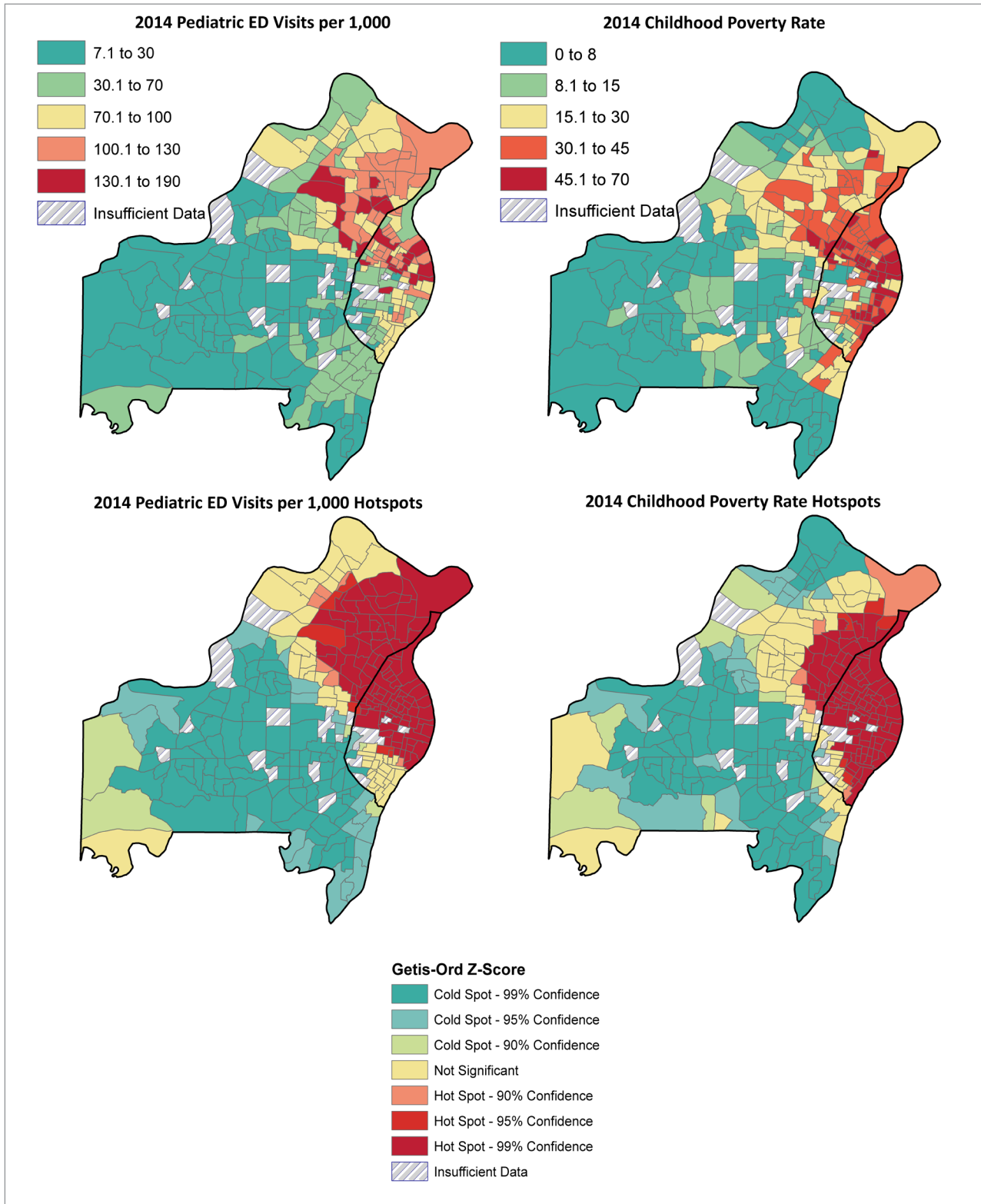
According to HKEA Program Director, Lisa Meadows, PNP, “So many of these children are walking around very sick, but don’t realize that feeling that bad is not normal and it can be prevented. Many of these children have severe obstruction, and when they have to stop running and playing in gym class or at recess they assume that’s part of life because

Table 1: Pediatric Asthma Hospital Utilization by Race for St. Louis City and Missouri

	St. Louis City			Missouri		
	White	African American	Total	White	African American	Total
ED Visits per 1,000	5.2	42.4	28.1	5.1	32.7	9.9
Hospitalizations per 10,000	9.7	82.9	55.7	13.4	67.3	22.9
Magnitude of Disparity						
ED Visits per 1,000	8.2 to 1			6.4 to 1		
Hospitalizations per 10,000	8.5 to 1			5.0 to 1		

Source: Adopted from the SSM Cardinal Glennon Children’s Medical Center Community Health Needs Assessment 2012. Ages 1-14, 2008-2009.

Figure 3: 2014 Rates and Hotspots for Childhood Asthma ED Visits and Poverty in the St. Louis Area



Washington County Memorial Hospital's Camp Catch-Ya-Breath Program

WCMH has been targeting services to improve outcomes for children with asthma since 2008. The hospital works with school nurses, primary care physicians, asthmatic children and their parents in a six-county area. As part of this interventional framework, it co-sponsors Camp Catch-Ya-Breath with the YMCA in Potosi. This free weekend camp helps children learn about their asthma and how to control it. Camp staff, including respiratory therapists, physicians and nurses, incorporate asthma education, trigger avoidance and medication techniques with swimming, hiking and crafts. Through education and mentoring, the camp provides children with the tools necessary to manage asthma symptoms and improve their quality of life. In addition, the hospital recently received a \$500,000 Health Resources and Services Administration grant to provide much needed services such as medication assistance for children in the hospital's service area.

they've never had well-controlled asthma. Our goal is to show them it doesn't have to be so difficult."

The Asthma Friendly Home Partnership Program at Children's Mercy Kansas City Takes a Look at Where Kids Live in Kansas City

The AFHP is a comprehensive pediatric asthma case management system centered at Children's Mercy and involves numerous community stakeholders and partnerships. The

AFHP uses asthma health utilization data and risk characterization to more carefully identify the needs of asthma patients and their caregivers in improving asthma management and reducing potential exposure to environmental triggers in the home. For some families, the AFHP works with local community housing partners to collaborate on home assessments and interventions for environmental management and remediation.

Asthma patients and their caregivers can be referred to the AFHP through any inpatient department, outpatient clinic, community health provider or safety net clinic. Once referred, AFHP uses a predictive Total Asthma Risk Index that was developed by the program using combined data from past utilization based on asthma acute care visits, results of an administered asthma control test, and an environmental risk assessment. Using this risk index, patients are stratified into low, medium or high risk for future health utilization. The acute care visit-specific part of this predictive index has been validated by CMKC and shown to be highly predictive of the likelihood of future acute care visits for asthma. CMKC uses this predictive utilization model as part of the high-risk asthma protocol that includes an automatic referral to the AFHP for environmental consultation at the child's home. For the AFHP, the higher a child's asthma risk, the more intensive the level of case management and interventions that are offered to the family. All AFHP families receive healthy home education, a healthy home resource manual and an asthma friendly home kit at no cost. With grant funding, the AFHP provides services for high-risk families to specifically identify and repair any asthma-related home hazards.

A recent review of the total acute care visits and Asthma Control Test

scores of recent AFHP participants revealed that the 71 families who received a home assessment and basic interventions experienced 77 percent fewer acute care visits six months after participation in the program ($p < 0.05$), and the 44 children that completed an ACT after participation increased their scores by an average of 18.7 percent ($p < 0.05$), indicating a significant improvement in asthma control for these children over time.^{xxiii} AFHP is currently collecting data in the REDCap™ case management system which allows program managers and case workers to track the costs of home assessments, environmental interventions and acute care utilization for each case. As data mature, this will allow AFHP to evaluate the full cost-benefit impact for individual participants and the larger population. These data will highlight the program's return on investment in three domains highly aligned with the Triple Aim of health care: improved care, better outcomes and health care savings for these children and their families.

Kevin Kennedy, MPH, CIEC, directs the Center for Environmental Health at Children's Mercy. He says, "Effective asthma management includes teaching patients and their caregivers about the role home environmental control plays in managing this challenging disease. There are many actions families can take to minimize the exposure to asthma triggers and reduce their child's symptoms. There are other times when there are issues in homes that families need help to address. One of the goals of the AFHP is to develop a sustainable network of community partners that can provide services and resources to families to help them manage their homes, which can be a tremendous part of improving asthma management outcomes and the quality of life for patients and their

families. Asthma management has to move outside of clinics and hospitals and connect health care providers with community organizations that assist families as part of a comprehensive community partnership for asthma care.”

Case Study 4: Building Capacity for School Nurses Across Missouri to Support Children With Asthma and Reduce Total Cost of Care – University of Missouri Asthma Ready Communities

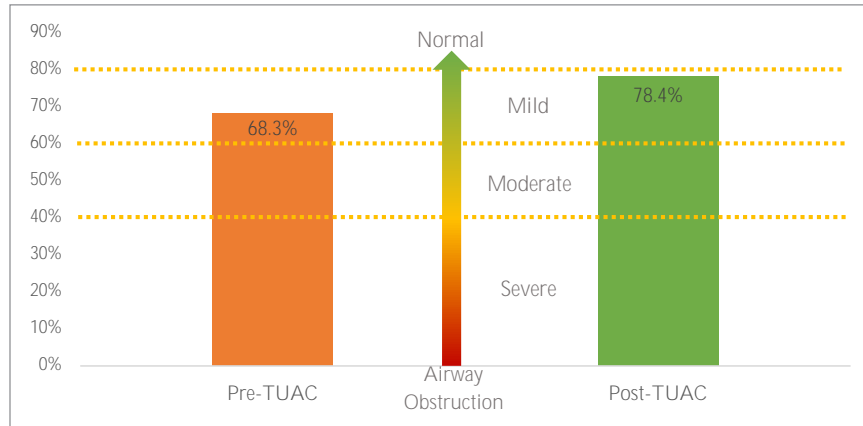
In 2010, a long-time partnership between the MAPCP and University of Missouri Asthma Ready Communities created “Teaming Up for Asthma Control,” a mentor-driven training strategy to achieve school nurse competency in the following three key areas.

- assessing asthma severity per NIH EPR-3^{xiii} guidelines
- evaluating student self-care behaviors
- educating students with persistent asthma and their families

TUAC trained and equipped more than 500 school nurses to be proactive in their involvement with students who have persistent asthma. Fifty-four school nurses participating in an evaluation of TUAC checked asthma control through forced expiratory volume in one second monitoring and impairment score about every two weeks. They also assessed environmental tobacco smoke exposure, student-reported weekly doses of inhaled corticosteroid medication and students’ inhalation technique. Mean predicted FEV1 for 63 TUAC students with poorly-controlled asthma increased from 68.3 to 78.4 percent after the program ($p < .01$).

At the heart of the TUAC program is a school nurse who functions as

Figure 4: Mean Predicted FEV1 for TUAC Students With Poorly-Controlled Asthma (n=63)



Source: TUAC Program and http://asthma.about.com/od/glossary/g/def_fev1.htm

an alert system, notifying parents/guardians and primary care providers when assessments show significant lack of control, per EPR-3 guidelines. Notably, the total cost of care for 62 TUAC participants enrolled in Medicaid was approximately \$1,400 less per year than controls matched by a risk-propensity scoring method. The independent analysis of claims data was conducted by the University of Missouri Office of Social and Economic Data Analysis. The cost-savings were attributable to fewer illnesses with lower medication costs, lower ED utilization and fewer hospitalizations for TUAC participants.^{xxiv}

Today, school nurses across Missouri can obtain no-cost training, materials and supplies to implement TUAC for their students by contacting MAPCP at 573/522-2876 or Missouri Asthma Ready Communities at 573/884-8629.

Measuring the Severity of Airway Obstruction in Children With Asthma

Forced expiratory volume in one second, or FEV1, is a technique to measure a patient’s maximum amount of air forcefully exhaled in one second as a percent of the predicted level based on height, weight and race.

“Most people understand that health and academic success are related. For the past five years, identifying students with asthma that is not well-controlled has been a mission at Webster Groves School District. Educating the staff at school about asthma has increased positive outcomes for our students. As a school nurse, you don’t always know how all of the children in your building are doing if they never come to the clinic. Some children at the middle school level think their asthma is just fine, when it may not be. The staff in our building are my extra eyes and ears. When the teachers or other staff see a child using their inhaler outside of the clinic or experiencing a change in their general well-being or attention level, they contact me so I can begin the nursing process. The concept of the Whole Child, Whole School, Whole Community is starting to take hold in our school district and as a school nurse I see this as a win-win. Helping students and their families to better understand their asthma, the importance of using their medications correctly and avoiding their asthma triggers when possible has improved individual student attendance and allowed their teachers to focus on educating their minds.” - Linda Neumann, R.N., Webster Groves School District

Conclusion

The Annie E. Casey Foundation recently released the 2015 KIDS COUNT Data Book, ranking every state on child well-being measured in four domains. This year, Missouri ranked 26th overall, but 33rd in health, the lowest of the four domains evaluated for the state, which also include family and community, education and economic well-being.^{xxv} Research shows that health challenges for children are barriers to learning, and that uncontrolled childhood asthma is a key driver of school absenteeism. Research also shows that education is the best indicator of future economic opportunity, security and overall well-being, suggesting that innovative and effective interventional approaches to managing childhood asthma not only improve the child's short-term health outcomes, but also their long-term economic stability and quality of life.

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ⁱ Missouri Department of Elementary and Secondary Education. *2013-2014 statistics of Missouri public schools*. Retrieved from <http://mcds.dese.mo.gov/quickfacts/District%20and%20School%20Information/Statistics%20of%20Public%20Schools.pdf>

ⁱⁱ Missouri Department of Health & Senior Services. *Inventory of students with special health care needs 2013 and 2015 comparisons*.

ⁱⁱⁱ American Lung Association. *Asthma in schools*. Retrieved from <http://www.lung.org/lung-disease/asthma/creating-asthma-friendly-environments/asthma-in-schools/>

^{iv} Note: The SPCs were calculated as the mean number of daily pediatric ED visits for fiscal year 2014 plus or minus three standard deviations.

^v Source: Fiscal year 2014 Hospital Industry Data Institute Inpatient and Outpatient Databases.

^{vi} American College of Allergy, Asthma & Immunology. Retrieved from <http://acaai.org/asthma/symptoms/asthma-attack>

^{vii} Note: Of Missouri's 518 school districts, the ratio of school nurses per student ranges from 0 (approximately 40 districts do not have a nurse) to 1 nurse per 250 students.

^{viii} Missouri Department of Health & Senior Services.

^{ix} University of Wisconsin Population Health Institute. *2015 county health rankings and roadmaps*. Retrieved from www.countyhealthrankings.org

^x Missouri Department of Health & Senior Services. *Inventory of students with special health care needs 2013 and 2015 comparisons*.

^{xi} Missouri Department of Health & Senior Services, Missouri Asthma Prevention and Control Program (2008, January). *Framework for community-based approaches to improving asthma care for children. Core components to building a comprehensive and coordinated strategy*. Retrieved from <http://health.mo.gov/living/healthcondiseases/chronic/asthma/publications.php>

^{xiii} National Institutes of Health. (2007). *National asthma education and prevention program expert panel report 3. Guidelines for the diagnosis and management of asthma*. Retrieved from: <http://www.nhlbi.nih.gov/files/docs/guidelines/asthsumm.pdf>

- ^{xiii} Sources and Notes: FY 2002-FY 2014 Hospital Industry Data Institute Inpatient Databases for residents of Dunklin County, Mo., up through age 17 with primary diagnoses 493.00-493.92. Pediatric asthma discharges were standardized with the Dunklin County, Mo., population up through age 17 data from 2002-2014 Nielsen-Claritas PopFacts Premier databases.
- ^{xiv} Rasberry, C., Cheung, K., Buckley, R., Dunville, R., Daniels, B., Cook, D., Robin, L., & Dean, B. (2014). Indicators of Asthma in a Rural, School-Based Asthma Management Program. *J Asthma*, 51(8), 876-885. doi: 10.3109/02770903.2014.913620.
- ^{xv} Guide to Community Preventive Services. (2008, June). *Asthma control: Home-based multi-trigger, multicomponent interventions*. Retrieved from <http://www.thecommunityguide.org/asthma/multicomponent.html>
- ^{xvi} Section 167.635.1, RSMo
- ^{xvii} SSM Cardinal Glennon Children's Medical Center Community Health Needs Assessment 2012. Retrieved from <http://www.cardinalglennon.com/aboutus/Documents/2012%20CGCMC%20Community%20Health%20Needs%20Assessment.pdf>
St. Louis Children's Hospital Community Health Needs Assessment Report and Implementation Plan. Retrieved from http://www.stlouischildrens.org/sites/default/files/about_us/files/Childrens_FINAL_CHNA.pdf
- ^{xviii} U.S. Census Bureau, State & County QuickFacts, St. Louis City, Missouri. Retrieved from <http://quickfacts.census.gov/qfd/states/29/29510.html>
- ^{xix} Sources and Notes: FY 2014 Hospital Industry Data Institute Inpatient and Outpatient Databases for residents of St. Louis City and St. Louis County, Mo., through age 17 with an ED visit where asthma was a contributing factor. Pediatric asthma discharges were standardized with the St. Louis City and St. Louis County, Mo., population through age 17 using census tract level data from the 2014 Nielsen-Claritas PopFacts Premier database. Poverty rate data also were calculated using the census tract level data from the 2014 Nielsen-Claritas PopFacts Premier database. Statistically significant clusters were identified using Getis-Ord z-scores in ArcMap 10.2 which are designed to detect hotspots through the autocorrelated spatial association of common attributes in neighboring geographic areas.
- ^{xx} Ord, J. & Getis, A. (1995, October). Local spatial autocorrelation statistics: Distributional issues and an application. *Geographical Analysis*, 27(4). Retrieved from http://www.researchgate.net/profile/Keith_Ord/publication/229529958_Local_Spatial_Autocorrelation_Statistics_Distributional_Issues_and_an_Application/links/5433f9c70cf294006f733591.pdf
- ^{xxi} Munz, M. St. Louis Post Dispatch. (2012, December). *One in five kids in parts of St. Louis area struggles with asthma*. Retrieved from http://www.stltoday.com/lifestyles/health-med-fit/one-in-five-kids-in-parts-of-st-louis-area/article_ca6dfbd1-f207-5cf3-8e05-58ef28dff9ff.html
- ^{xxii} *Healthy Sonoma, healthy kids express-asthma program, an evidence-based practice*. Retrieved from <http://www.healthysonoma.org/index.php?controller=index&module=PromisePractice&action=view&pid=30050>
- ^{xxiii} Children's Mercy, AFHP independent evaluation.
- ^{xxiv} The evaluation of "Teaming Up for Asthma Control" was funded by the Centers for Disease Control and Prevention, Cooperative Agreement #5U59EH000510-05 in cooperation with the MOHealth Net Data Project.
- ^{xxv} 2015 KIDS COUNT data book, state trends in child well-being. (2014). The Annie E. Casey Foundation, 701 St. Paul St. Baltimore, MD 21202. Available at <http://www.aecf.org/resources/the-2015-kids-count-data-book/>
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