Pediatric Asthma Surveillance System (PASS) in Dallas County

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Asthma is a significant pediatric health concern in Dallas County, with notable disparities affecting low-income and minority children, particularly in the southern sector of the county. The Dallas County Pediatric Asthma Surveillance System (PASS) was developed and launched in December 2022 and serves as a critical tool to primarily address the significant pediatric asthma disparities identified in the 2019 and 2022 Dallas County Community Health Needs Assessments (CHNAs).

The "What"

Children in the southern sector of Dallas County are disproportionately exposed to environmental triggers and substandard housing, which contribute to increased asthma prevalence and severity. Limited access to healthcare and socioeconomic barriers further exacerbate poor asthma control, leading to higher rates of emergency visits and hospitalizations. To address these disparities, a comprehensive approach is necessary, focusing on early detection of asthma attack risks, improved management, and long-term care for children most vulnerable to the disease.

The 2019 and 2022 Dallas County Community Health Needs Assessment (CHNA) identified pediatric asthma as a key driver of pediatric morbidity and mortality. Following this, various strategies were identified for implementation to address pediatric asthma, including enhanced asthma surveillance and monitoring. This led to the development of the Pediatric Asthma Surveillance System (PASS), which is a collaborative initiative between Dallas County Health and Human Services (DCHHS), Parkland Health, and the Parkland Center for Clinical Innovation. The development of PASS was primarily driven by the necessity for regular, precise, timely, and actionable data insights at the micro- geography level to address the substantial variation in asthma prevalence across Dallas County and facilitate coordinated cross-system collaborations. Hence, PASS was designed to track asthma vulnerability, identify high-risk areas, and tailor interventions to improve asthma outcomes.

PASS was constructed with input from clinical providers, public health specialists, and community health advocates to ensure relevance, accuracy, and usability. Community representatives provided critical feedback on dashboard design and model outputs, ensuring alignment with local experience and priorities.

The development of PASS began with the collection of diverse clinical, environmental, and social data from multiple sources, including Parkland's electronic health records, claims data from the Dallas-Fort Worth Hospital Council Foundation (DFWHCF), U.S. Centers for Disease Control and Prevention (CDC), U.S. Census Bureau's American Community Survey, Center for Neighborhood Technology, and OpenWeather. An initial set of 117 candidate variables known to influence asthma risk was refined to 67 variables after multicollinearity analysis. LASSO regression was then applied to narrow the set further to 10 key predictors covering clinical, social, and environmental domains.

The final PASS tool includes two major components: (1) a vulnerability index capturing pediatric asthma risk based on clinical, environmental, and social drivers, and (2) an AI-driven, community-facing interactive dashboard that identifies areas at highest risk for poor asthma outcomes at the zip-code and census-tract level visualized through color-coded maps and impact scores.

The modeling process utilized historical data from 2018–2022 to predict census-tract–level pediatric asthma emergency department visits and hospitalizations within 90 days. The model's performance, with an adjusted R-squared (R^2) of 55.5%, demonstrated strong predictive capacity for a public health tool of this type. The resulting Pediatric Asthma Vulnerability Index ranks census tracts and zip codes into quintiles (Very High to Very Low risk), allowing direct comparison of asthma vulnerability across geographic areas.

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PASS was finally deployed as a community-facing dashboard via Power BI featuring color-coded maps, risk predictors, community demographic profiles, and impact scores for each variable on the DCHHS website. Following deployment, various promotional activities including community training were conducted. Accordingly, individuals from more than 15 organizations including schools, healthcare providers, social service agencies, and environmental advocates were trained. A train-the-trainer model was emphasized to promote sustained use. Dissemination efforts through social and traditional media generated over 12,000 impressions and 4,530 website views within the first year. The platform also incorporates a feedback mechanism for ongoing community input and system improvement. PASS is currently being used for data-driven interventions, advocacy, and collaboration to reduce asthma disparities across Dallas County.

The "So What"

Since its deployment, PASS has significantly improved the county's capacity to monitor and address pediatric asthma. One of the most impactful outcomes has been the identification of neighborhoods with the highest burden of pediatric asthma. By leveraging real-time data, PASS has enabled public health officials, healthcare providers, and policymakers to pinpoint geographic areas where asthma prevalence and hospitalizations are disproportionately high. This granular understanding allows for more effective targeting of resources and interventions to the communities that need them the most.

PASS has also been instrumental in informing targeted outreach and clinical care improvements. Health systems and community organizations now have the data necessary to prioritize home visits, educational sessions, and tailored case management for families living in high-risk neighborhoods. Clinicians can adjust treatment strategies based on trends and triggers identified in specific communities, ultimately improving asthma management and reducing emergency department visits and hospitalizations among children.

Another critical impact of PASS is its role in supporting asthma-friendly school policies. DCHHS and Parkland Health have used PASS for identifying schools in areas with high asthma rates. This has prompted collaborations with school districts in adopting evidence-based practices such as reducing environmental triggers, training school nurses and staff on asthma management, and ensuring that students have access to medications and action plans. These efforts have contributed to healthier school environments and better academic outcomes for children with asthma.

Moreover, PASS has been a catalyst for fostering cross-sector partnerships. By bringing together stakeholders from public health, healthcare, education, housing, and community organizations, PASS facilitates a coordinated response to pediatric asthma. These collaborations have led to innovative interventions that address both clinical and social determinants of asthma, such as improving indoor air quality through an asthma home visit program and access to healthcare through linkage to care.

In addition, the data generated by PASS has strengthened grant applications, giving agencies and organizations access to up-to-date, local evidence that demonstrates community needs and supports proposed interventions. This has resulted in increased funding opportunities for asthma prevention and management initiatives.

Finally, PASS has enabled optimal resource utilization by guiding public health and community organizations to focus limited resources where they can have the greatest impact. Whether it's deploying mobile clinics, distributing asthma education materials, or implementing home-based interventions, PASS ensures that these efforts are data-driven and strategically aligned with the areas of greatest need, maximizing their effectiveness and efficiency.

Since its initial launch in 2022, PASS has served as a critical tool for guiding data-driven interventions, informing advocacy efforts, and strengthening cross-sector partnerships to address pediatric asthma disparities in Dallas County. By leveraging real-time data and surveillance insights, PASS has enabled the DCHHS and partners to better understand the distribution and burden of asthma among children, particularly in underserved communities. This system has helped shape a coordinated approach to pediatric asthma management, ensuring that resources and interventions are strategically targeted to areas and populations with the greatest need.

Guided by PASS, the Virtual Asthma Home Visit Program has enrolled 396 participants and conducted 1,286 virtual visits. 28% of participants have achieved asthma control.

Additionally, PASS supports targeted asthma education efforts that are vital for empowering families to control asthma effectively. By identifying high-risk populations and geographic hotspots, PASS informs the development of culturally appropriate education programs that teach families how to manage asthma, recognize warning signs, and avoid triggers. This targeted education, combined with system-wide collaboration and policy efforts such as tobacco-free campus and housing policies, leads to healthier environments and reduced asthma-related hospitalizations and emergency visits. Ultimately, PASS improves public health by advancing asthma control, reducing health disparities, and creating stronger systems of care for children with asthma.

One practical example of public health improvement resulting from the use of PASS is the success of DCHHS' Virtual Asthma Home Visit (AHV) Program. This program is designed to help individuals and families manage asthma through self-management education and environmental assessments, with a primary focus on children with poorly controlled asthma. Key goals of the AHV program include improving asthma control, reducing emergency visits and hospitalizations, empowering families with tools like an Asthma Action Plan, and creating healthier home environments to minimize asthma triggers.

Guided by PASS and supported by Parkland Health, the program has enrolled 396 participants and conducted 1,286 virtual visits to date. As a result, the percentage of participants achieving asthma control—measured by an Asthma Control Test (ACT/C-ACT) score of 20 or higher—improved by 28%. Similarly, 17% improvement was observed in the use of Asthma Action Plans among participants.

The "Now What"

To add to the success of PASS project, DCHHS is focusing on expanding its reach and impact in several key ways. First, they aim to promote broader adoption and use of the surveillance system among more healthcare providers, clinics, and health systems within our jurisdiction. By engaging additional healthcare partners and demonstrating the value of PASS population-level monitoring, they hope to increase data sharing and improve the overall quality of local public health decisions and interventions. Furthermore, the department plans to advocate for and facilitate the expansion of PASS beyond their current jurisdiction to neighboring regions and possibly at a much wider geographic level.

The ongoing need for PASS is access to timely, local-level data, particularly at the micro-geography level (e.g., neighborhood or census tract). This level of data is essential for identifying and addressing disparities, targeting interventions, and informing community-specific strategies to reduce asthma-related morbidity. In addition, continued and expanded collaboration with stakeholders who can share data will be critical to maintaining and enhancing the effectiveness of PASS in supporting local public health actions.

DCHHS is actively working to apply the innovative approach developed through PASS to other chronic diseases. Recognizing the potential of automated surveillance to improve chronic disease outcomes, they are currently designing dedicated surveillance systems for diabetes and hypertension. These new systems will leverage lessons learned from PASS, utilizing similar methods for data collection and analysis to generate actionable insights for healthcare providers and public health officials. The ultimate goal is to build a suite of surveillance systems that address the rising burden of chronic conditions in communities, strengthen public health infrastructure, foster cross-sector collaboration, and improve population health outcomes.

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