Louisiana Morbidity Report

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Childhood Asthma: East Baton Rouge Parish Louisiana, 2010-2015

Section of Environmental Epidemiology and Toxicology (SEET)

Report Summary

Asthma is a lung disorder associated with the narrowing of the airways, leading to breathing difficulties, coughing, wheezing, and chest tightness. Starting most often in childhood, asthma can result in the increased absence of children from the classroom as well as the playground.

In July 2018, a Baton Rouge physician contacted Louisiana Department of Health (LDH), Office of Public Health's (OPH) Section of Environmental Epidemiology and Toxicology (SEET) with concerns regarding childhood asthma in an industrialized area of East Baton Rouge (EBR) Parish. In response, SEET conducted a preliminary sub-parish (sub-county) analysis of the Emergency Department (ED) visits and hospitalizations for asthma among children residing there. The results were then assessed within the framework of the statewide childhood asthma burden as well as the socioeconomic and environmental factors within EBR Parish.

At the parish-level, EBR ranked tenth in the state in terms of ED visits and 19th in terms of the hospitalization rate for childhood asthma. Both rates for EBR Parish were statistically significantly higher than the state rates. Sub-county analyses of EBR Parish revealed three ZIP Code Tabulation Areas (ZCTAs) of special concern: 70802, 70805 and 70812.

While no direct causal associations could be drawn from this report, the data suggest a complex intermingling of several factors at these locations. These include poverty, race and potential environmental exposures, though many other factors that could not be examined here likely also play a role. Contributions from indoor environmental quality, such as in the home or in schools where children spend much of their time, are touched upon briefly in this issue, using available SEET data from the Indoor Environmental Quality Education Service (IEQES). Overall, the results highlight the demographic inequities in health outcomes in EBR Parish and the resulting burden of asthma from a healthcare as well as cost perspective. SEET has subsequently sparked outreach efforts in the areas of concern with the aim to promote better management of childhood asthma and thereby advance the cause of health equity in Louisiana.

Sub-county Analysis of Pediatric Asthma Identifies Areas that May Benefit from Comprehensive Interventions: East Baton Rouge Parish

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Asthma is a chronic lung disorder characterized by the constriction of airways, resulting in wheezing, breathlessness, coughing and chest tightness. People of all ages can have asthma, but it most often starts in childhood [1]. The Centers for Disease Control and Prevention's (CDC) 2015 Behavioral Risk Factor Surveillance System (BRFSS) estimates that about 14% of children in Louisiana have been diagnosed with asthma, with about 8.8% currently suffering from the symptoms of the condition [2]. A major component of asthma management involves identifying personal asthma triggers and avoiding exposure to them. Common asthma triggers include outdoor air pollutants (such as ozone and fine particulate matter) as well as indoor air pollutants (tobacco smoke, dust mites, animal dander, mold, etc.) [3].

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In July 2018, a pediatrician practicing in Baton Rouge, Louisiana contacted SEET with concerns regarding high rates of asthma-related ED visits among children from an industrialized area in western EBR Parish. In response, the Environmental Public Health Tracking ('Tracking') and Occupational Health programs collaborated to provide a preliminary sub-county analysis of asthma in EBR Parish.

Methods

Childhood asthma ED visits and hospitalization events (for population younger than 18 years of age), where asthma was a primary diagnosis, were extracted by ZIP code for 2010 to 2015. Asthma cases from 2010 to 2015, quarters one to three (Q1-Q3) were identified using the International Classification of Diseases, ninth edition (ICD-9) code 493.XX. In the fourth quarter of 2015, the U.S. switched to the ICD-10 system. Thus, nearly all cases from 2015 Q4 were identfied using ICD-10 codes for asthma, J45.XX and J46.XX. Due to the small population size at the ZIP code-level, crude rates (as opposed to age-adjusted rates) were calculated using the estimated population of the corresponding ZCTA for that time period.* ZCTAs are generalized representations of the U.S. Postal Service ZIP code service areas and are the best available population estimate for a ZIP code.** Rates derived from fewer than 20 cases are considered unstable and should be interpreted with caution. The calculated rates, along with socioeconomic factors known to affect asthma prevalence (race/ethnicity, poverty and health insurance coverage) [4] and Medicaid usage, were mapped by ZCTA. Crude rate ratios and 95% confidence intervals (C.I.) were calculated to estimate whether the rate of ED/hospital visits for asthma was higher in a particular ZCTA than for the parish overall. The percentage by which the ZCTA rate was higher than the parish rate was calculated by subtracting one (1) from the rate ratio (x 100).***

Results and Discussion

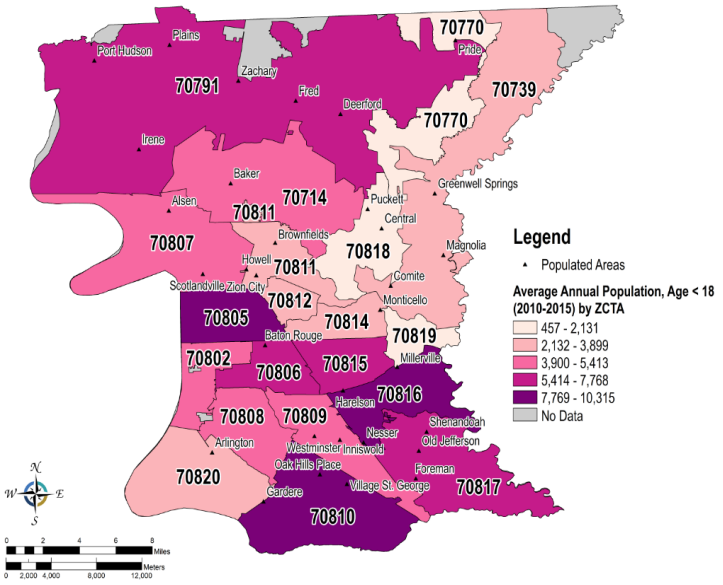
A demographic profile of residents younger than 18 years of age in EBR Parish is presented in Figure 1. In terms of the general population, from 2010 to 2015, the highest number of children resided in ZCTAs 70805, 70810 and 70816.

** Data and procedural limitations are noted in the 'Data Limitations' section.*

*** For discussion on ZCTA vs. ZIP code see (i) in the 'Further Reading' section.*

**** Details on the methodology are in the complete report by LDH Tracking - see (i) in the 'Further Reading' section.*

Figure 1: Average Population Younger than 18 Years of Age by ZCTA - EBR Parish, 2010-2015. Data Source: U.S. Census Bureau.



Sub-county analysis of childhood asthma meanwhile revealed a pattern of high ED visits and hospitalization events for pediatric asthma in ZCTAs 70802, 70805 and 70812 between 2010 and 2015. It is notable these three ZIP codes were also of special concern to the doctor who initially approached SEET. The ED visit rates for asthma in these ZCTAs were statistically significantly higher than the parish rate (by 69% to 86%); hospitalization rates for childhood asthma were also significantly higher, ranging from 1.59-times to twice the parish rate (Figure 2, Figure 3 and Table 1).

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Figure 2: Average Annual Crude Rate of Childhood Asthma ED Visits per 1,000 Residents Younger than 18 Years of Age by ZCTA - EBR Parish, 2010-2015. ED Visits Data Source: LDH.

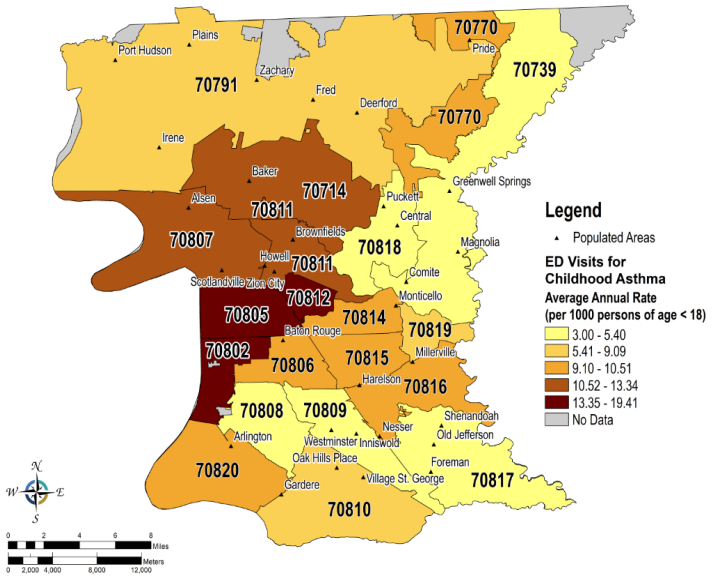


Figure 3: Average Annual Crude Rate of Childhood Asthma Hospitalizations per 1,000 Residents Younger than 18 Years of Age by ZCTA - EBR Parish, 2010-2015. Rates Based on Fewer than 20 Cases Are Marked "Unstable." Hospitalization Data Source: LDH.

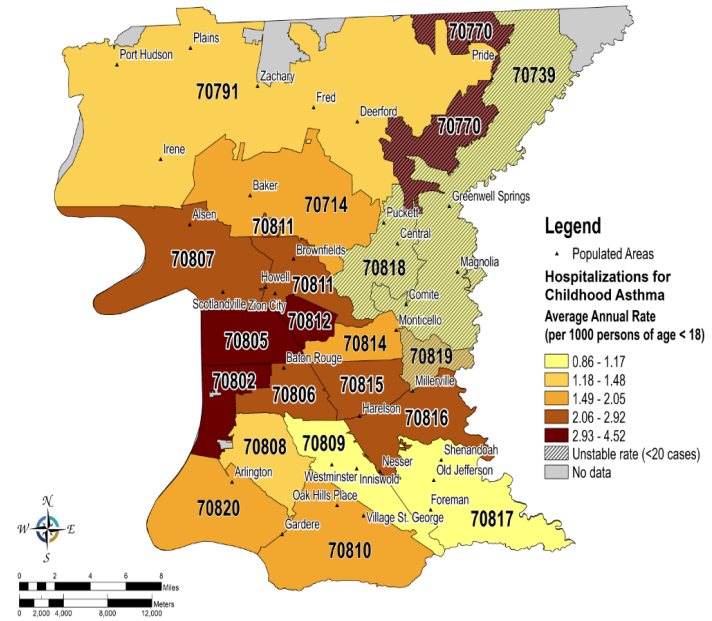
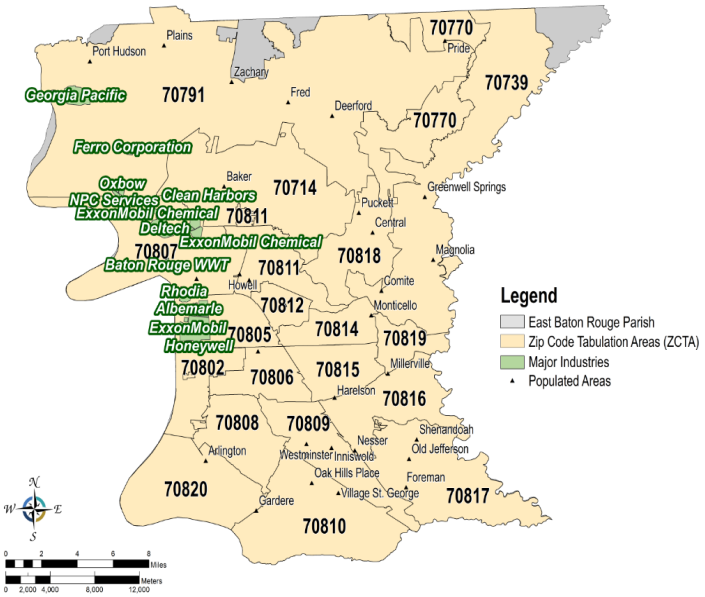


Table 1: Top Three ZCTAs with the Highest Crude Rates for Childhood Asthma ED Visit and Hospitalization - EBR Parish, 2010-2015. A Rate Ratio of Greater than 1.0, Where the 95% C.I. Does Not Include the Value of 1.0, Indicates that the ZCTA Rate Is Statistically Significantly Higher than the EBR Parish Rate.

Location	ED Visits		Hospitalizations	
	Rate (per 1,000 children, age < 18)	Rate Ratio *compared to EBR* (95% C.I.)	Rate (per 1,000 children, age < 18)	Rate Ratio *compared to EBR* (95% C.I.)
EBR	10.45	*Reference*	2.26	*Reference*
70802	19.18	1.83 (1.69, 1.99)	3.60	1.59 (1.32, 1.93)
70805	19.41	1.86 (1.74, 1.98)	4.52	2.00 (1.75, 2.30)
70812	17.71	1.69 (1.52, 1.89)	4.21	1.86 (1.49, 2.34)

SEET found that ZCTA 70805, which had the highest asthma-related ED visit rate, also had the highest concentration of industrial facilities in the parish (Figure 4). However, this observation alone should not be used to make any assumptions regarding causal associations (see Data Limitations).

Figure 4: Major Industrial Sites - EBR Parish, 2018. Data Source: Internal LDH. Polygons (Green) Were Compiled from Various Sources for General Reference Only and Are Not Intended to be an Exhaustive List. Ongoing Changes to Plant Ownership, Status and Extent Often Occur, and Sites may be Incorrect or Missing from this List. This Map Alone Should Not Be Used to Make Any Causal Assumptions (see Data Limitations)



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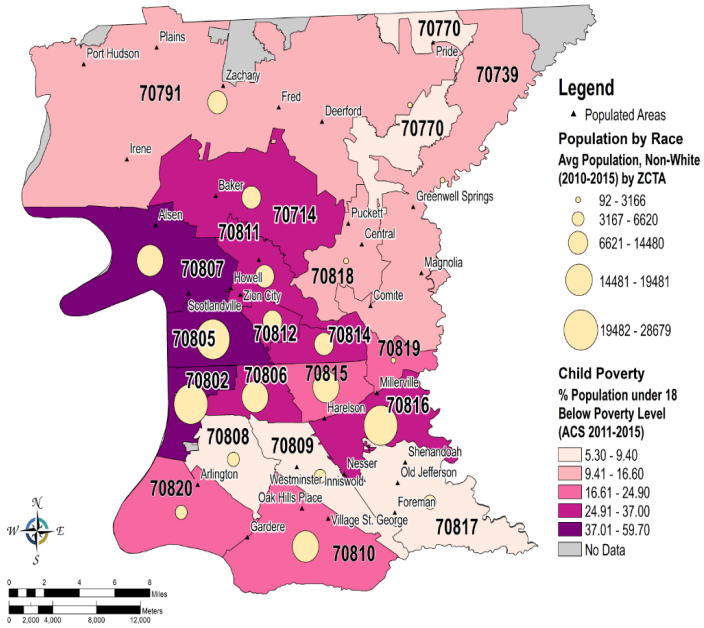
Statistics for several socioeconomic factors were also notable for ZCTAs 70802, 70805 and 70812, where the childhood asthma ED visit/hospitalization rates were the highest. In terms of demographics, non-white populations comprised much of these three ZCTAs during 2010 to 2015. As a fraction of their total population, ZCTAs 70805 and 70812 were comprised of ~ 95% to 97% non-white residents. In terms of total number, ZCTA 70802 and 70805 were among the top three ZCTAs with the largest average population of non-white residents. Poverty among children in ZCTAs 70802 and 70805 was among the highest in the parish (~ 52% to 60% of residents younger than 18 years of age), (Figure 5). Medicaid was listed as a payer for nearly 90% of the ED visits and over 40% of the hospitalization events for asthma among children in these three ZCTAs.* Of note, payer information was available for only about half of the hospitalization cases; therefore, the percentage of hospitalization cases paid for by Medicaid may be greater than the current estimate. Overall, these data serve to highlight the demographic inequities in health outcomes in EBR Parish, and the resulting burden of asthma from both a healthcare as well as a cost perspective.

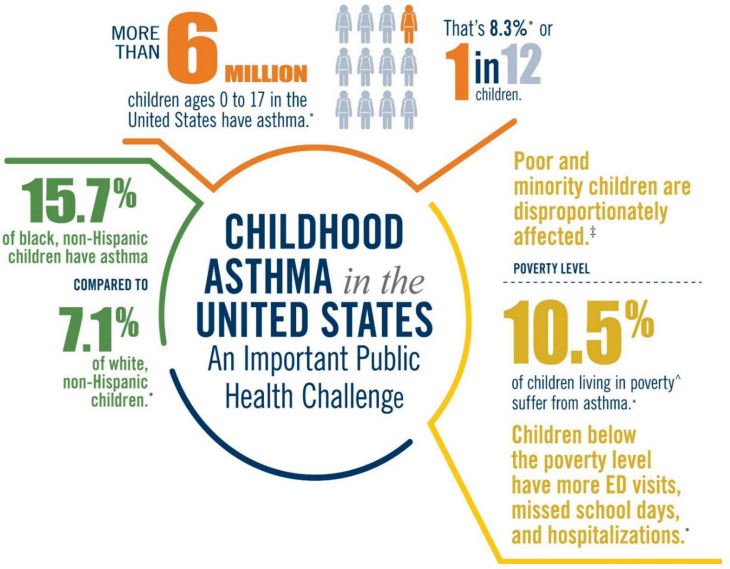
Figure 5: Demographic Profile by Race and Poverty by ZCTA - EBR Parish. Shading on the Map Shows Percent Population Younger than 18 Years of Age with a Past 12-Month Income Below the Poverty Level (Data Source: U.S. Census Bureau American Community Survey, 2011-2015). Size of the Circles Indicate the Average Number of Residents Who Did Not Identify Their Race as "White" During the Years 2010 to 2015 (Data Source: U.S. Census Bureau).



** For Medicaid usage and health insurance coverage maps, see (i) in the 'Further Reading' section.*

Racial minorities and individuals of lower socioeconomic status are disproportionately affected by health disparities, which are often further compounded by inherently unequal environmental burdens [5-6]. This is particularly notable in the case of respiratory diseases such as asthma, which can be aggravated by environmental triggers in both indoor and outdoor air. Indeed, demographic inequities in childhood asthma is recognized by the Environmental Protection Agency (EPA) and CDC as a national issue (Figure 6), which will likely require a concerted effort at the local level to overcome.

Figure 6: Childhood Asthma - United States, 2016 [Image Source: EPA; Data Source: 2016 National Health Interview Survey Data (CDC)]



‡ *Coordinated Federal Action Plan to Reduce Racial and Ethnic Asthma Disparities.* https://www.epa.gov/sites/production/files/2014-08/documents/federal_asthma_disparities_action_plan.pdf

^ *Defined as Living At or Below 100% of the Federal Poverty Level*

* *CDC Vital Signs Asthma in the U.S.2018.* https://www.cdc.gov/vitalsigns/childhood-asthma/

Spurred by the preliminary associations described here, SEET is now developing outreach strategies to increase awareness of environmental asthma triggers and to minimize exposure at area homes and schools. Possible health interventions include collating and promoting asthma management resources available to Medicaid recipients through Managed Care Organizations. Guided by this sub-county analysis, SEET's goal is to promote better asthma management among children, and thereby advance the cause of health equity in Louisiana.

Data Limitations

These data and maps are provided to assist in answering questions related to the environment and possible impacts on human health. Direct connections are difficult to support with

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preliminary analyses and include only a small fraction of the available data needed to conduct a thorough investigation or study. In this specific example, factors such as asthma management, smoking and second-hand smoke exposure, other environmental asthma triggers and access to health care are just a few examples of additional considerations that could not be addressed here. These data are intended to spur research and should be used only as a starting point to understanding how the environment and other contributing factors may be connected to disease.

Data limitations should be noted if conducting exploratory ecological studies with these data. Limitations may include data gaps, reporting errors and discrepancies (for example, a disruption of reporting or instrument recording following hurricanes), and insufficient data on all potentially confounding factors. There are numerous additional factors which may contribute to disease onset. These include genetics, access to health care, existing health conditions, medicines, other chemical substances we come into contact with or ingest, nutrition, route and duration of exposure, level of activity, level of stress, and many others.

Crude rates were compared in this sub-county analysis because the small number of cases at the ZIP code level did not allow for reliable stratification by age necessary for age-adjustment. One major limitation of this analysis, therefore, is that it cannot take into account whether any observed differences may be due to differences in the underlying structure of the population younger than 18 years of age in these geographies.

Responsible use of this data, therefore, requires exercising caution when drawing conclusions based solely on views of the limited available data. Any perceived relationship, trend, or pattern apparent in the data should not be interpreted to imply causation; it may, in fact, be unrelated and should be regarded as preliminary and potentially erroneous until more in-depth study and, if applicable, statistical evaluation can be applied. The LDH Bureau of Health Informatics, Environmental Public Health Tracking Program and the LDH Office of Public Health cannot guarantee the completeness of the information contained in these datasets.

Note that this is a preliminary review of data and maps, and this work can be added to or refined in future reports. Cite all sources when sharing or referencing these data and maps.

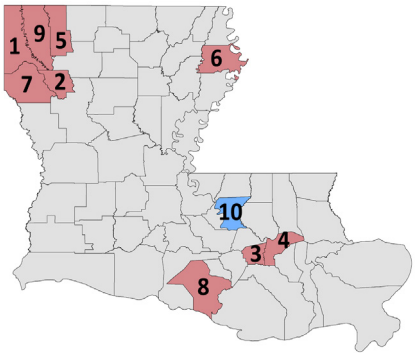
Data in Context: Tracking EBR Parish Asthma Relative to the Statewide Childhood Asthma Burden

The Environmental Public Health Tracking program tracks ED visit and hospitalization events for asthma and other health outcomes across the State of Louisiana. These data, along with the corresponding metadata, are updated biannually and made publicly available via the LDH Health Data Portal (*https://healthdata.ldh.la.gov/*). Tracking data from this query system were analyzed to provide context to the sub-county analysis by presenting the EBR Parish asthma data within the wider landscape of the statewide childhood asthma burden.

Based on 2010 to 2015 ED data, EBR Parish had the tenth highest age-adjusted rate of ED visits for childhood asthma of the 64 parishes in the state (Table 2).

Table 2: Top Ten Parishes with the Highest Age-Adjusted Rate of ED Visits for Childhood Asthma in Louisiana. The Age-Adjusted Rate for Louisiana Is Also Shown for Reference. The Map on the Right Shows the Location of the Parishes Listed in the Table; Parish Numbers on the Map Correspond to the Rank in the Table.

Rank	Parish	Age-adjusted Rate, per 1,000 Children (ED Visits; 2010-2015)
1	Caddo	24.67
2	Red River	20.35
3	St. James	19.63
4	St. John the Baptist	17.77
5	Webster	16.12
6	Madison	15.71
7	De Soto	13.50
8	St. Mary	13.34
9	Bossier	12.77
10	**East Baton Rouge**	**12.42**
-	*Louisiana*	*9.89*



During the same time, EBR Parish ranked 19th in the state in terms of the age-adjusted rate of hospitalization events for childhood asthma (Table 3).

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