Preliminary Asthma Data Review in East Baton Rouge Parish (2010-2015)

Louisiana Department of Health

A Report Prepared by the

Environmental Public Health Tracking Program

and the Occupational Health And Injury Surveillance Program

of the

Section for Environmental Epidemiology and Toxicology

Office of Public Health

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LOUISIANA
DEPARTMENT OF HEALTH

Report Summary

This report provides health and environmental quality data available through the Section of Environmental Epidemiology and Toxicology (SEET) programs, in particular the Environmental Public Health Tracking program (EPHT). It is being provided in response to concerns raised by a physician related to pediatric asthma in East Baton Rouge Parish in an area in close proximity to industry. Several factors may contribute to asthma, and not all could be addressed here. SEET and the Louisiana Department of Health (LDH) Office of Public Health look forward to further discussion and review of these data, as well as collaborative steps forward in the generation of activities towards improved public health. SEET is including with this review an article which was recently published related to the management of asthma in schools in Louisiana (Nuss *et al*, 2016).

Funding for the LDH Tracking Program is provided through a Cooperative Agreement with the US Centers for Disease Control and Prevention. Please note that these are a preliminary review of data and maps, and this work can be added to or refined in future reports. Please cite all sources when sharing or referencing these data and maps.

Disclaimer

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 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 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. Moreover, crude rates were compared in this report, instead of age-adjusted rates, 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 under 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; 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 LDH Office of Public Health cannot guarantee the completeness of the information contained in these datasets and expressly disclaim liability for errors and omissions in their content.

ASTHMA IN EAST BATON ROUGE PARISH

Demographic Profile

Figure 1. Average population of East Baton Rouge Parish, 2010-2015, by ZIP Code Tabulation Area (ZCTA[1]). Areas 70801 and 70803 are provided for reference but cover public buildings and do not have a residential population (not shaded). Data source: U.S. Census Bureau.
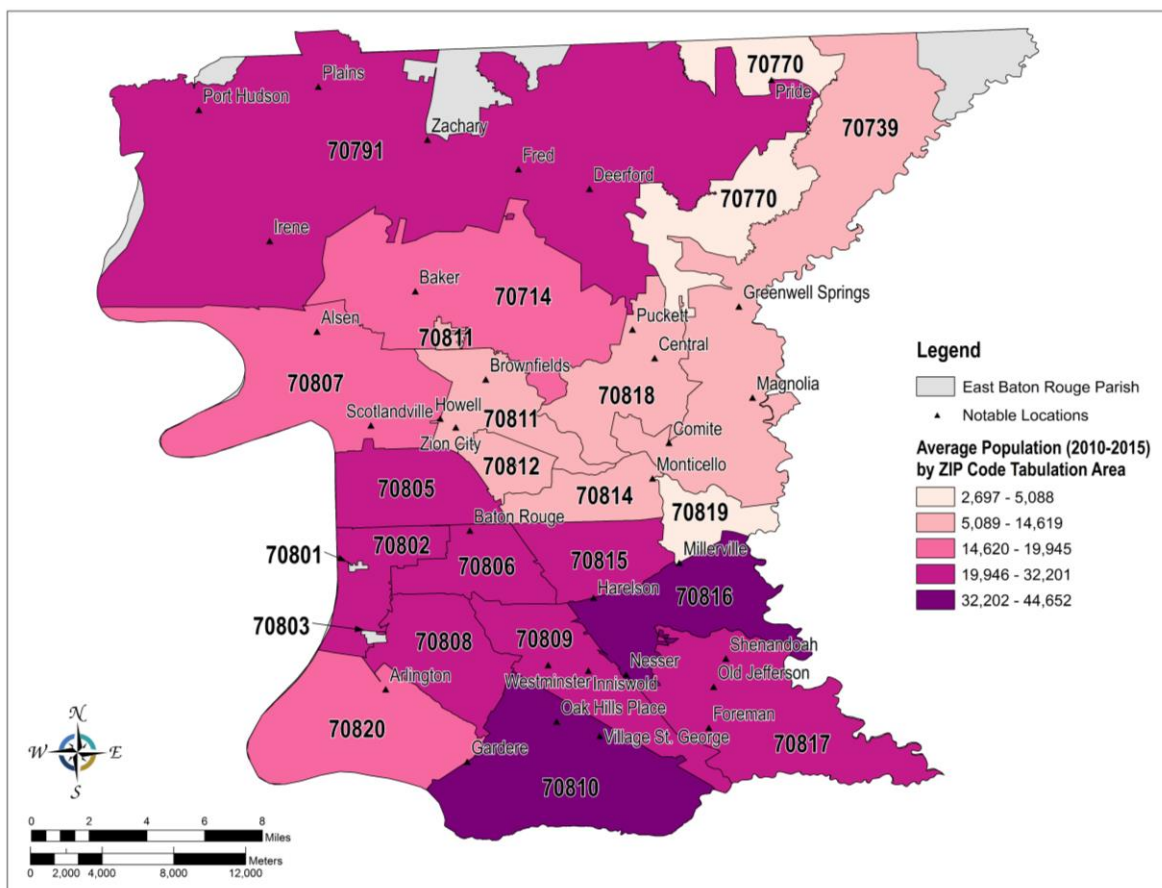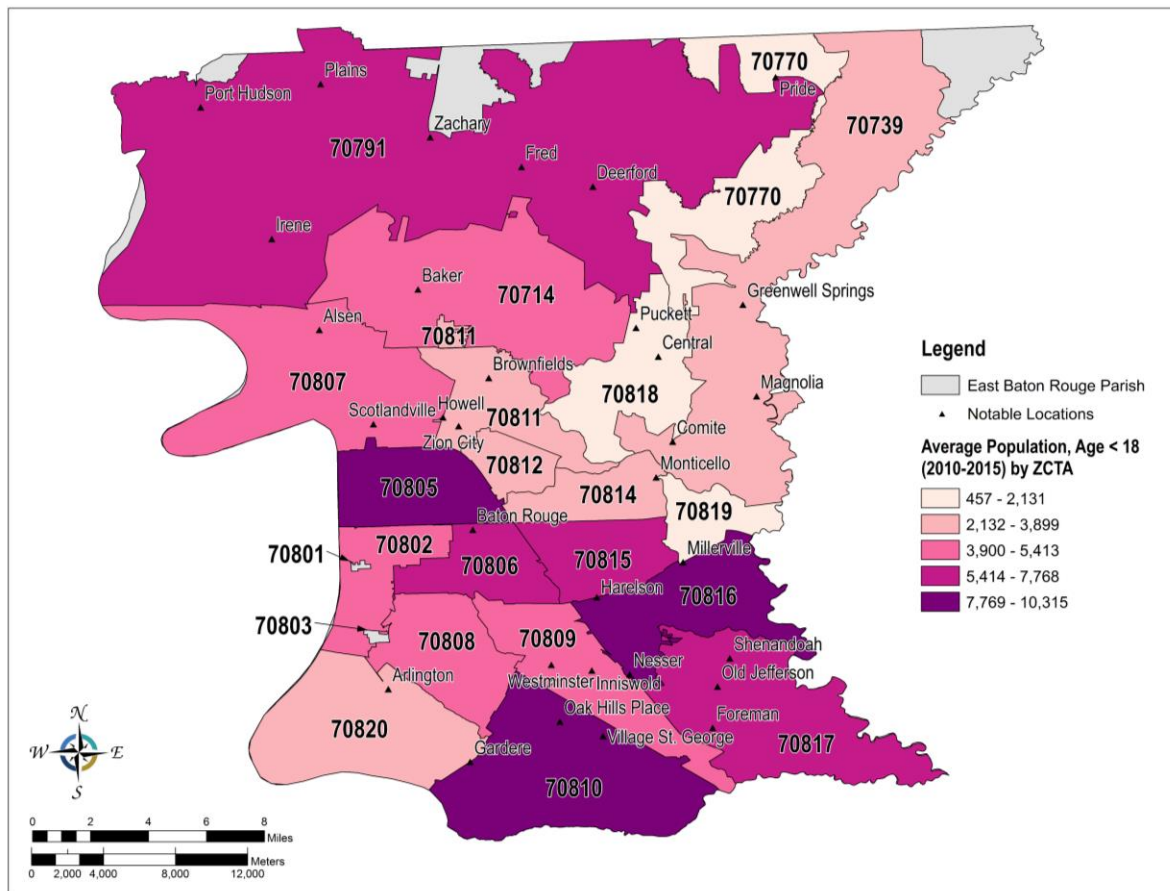

Map prepared August 8, 2018 by the Louisiana Department of Health (LDH), Office of Public Health, Section of Environmental Epidemiology and Toxicology (SEET). LDH SEET cannot guarantee the accuracy of the information contained on this map and expressly disclaims liability for errors and omissions in its contents.

ZCTAs **70810** and **70816** were the most highly populated areas in East Baton Rouge Parish during 2010-2015.

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[1] ZCTAs are generalized representations of ZIP codes, provided by the U.S. Census Bureau. No census data is available for ZIP codes, which were implemented by the United States Postal Service to facilitate efficient mail delivery, and are not meant to represent specific geography. Thus, ZCTAs are the closest approximation of the geographic boundaries covered by ZIP codes, albeit with certain limitations (for more information see Methodological Notes, Section 2.1 in Appendix).

Figure 2. Average population of East Baton Rouge Parish under the age of 18 by ZCTA (2010-2015). Population data unavailable for 70801 and 70803 (not shaded). Data source: U.S. Census Bureau.
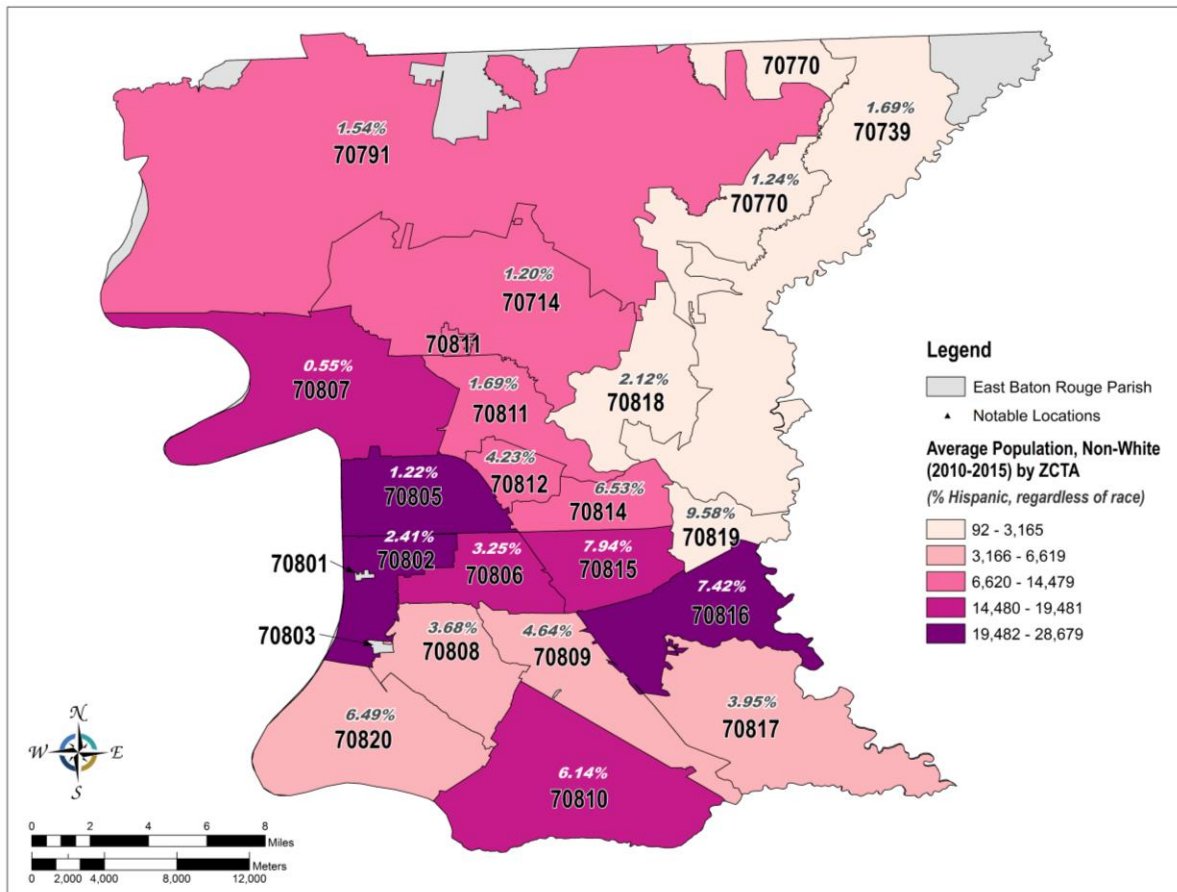

Map prepared August 8, 2018 by the Louisiana Department of Health (LDH), Office of Public Health, Section of Environmental Epidemiology and Toxicology (SEET). LDH SEET cannot guarantee the accuracy of the information contained on this map and expressly disclaims liability for errors and omissions in its contents.

ZCTAs **70805**, **70810**, and **70816** had the greatest number of children (residents under the age of 18), on average, during 2010-2015, in East Baton Rouge Parish.

For a detailed description of how demographic data were derived, see Methodological Notes, Section 2 in Appendix.

Figure 3. Average population of East Baton Rouge Parish by race and ZCTA (2010-2015).
Map shows the average number of residents who did not identify their race as "white" during
2010-2015. *Percentage above ZCTA* indicates the average percent Hispanic residents by ZCTA
(regardless of race) during this time. Demographic data unavailable for areas 70801 and 70803
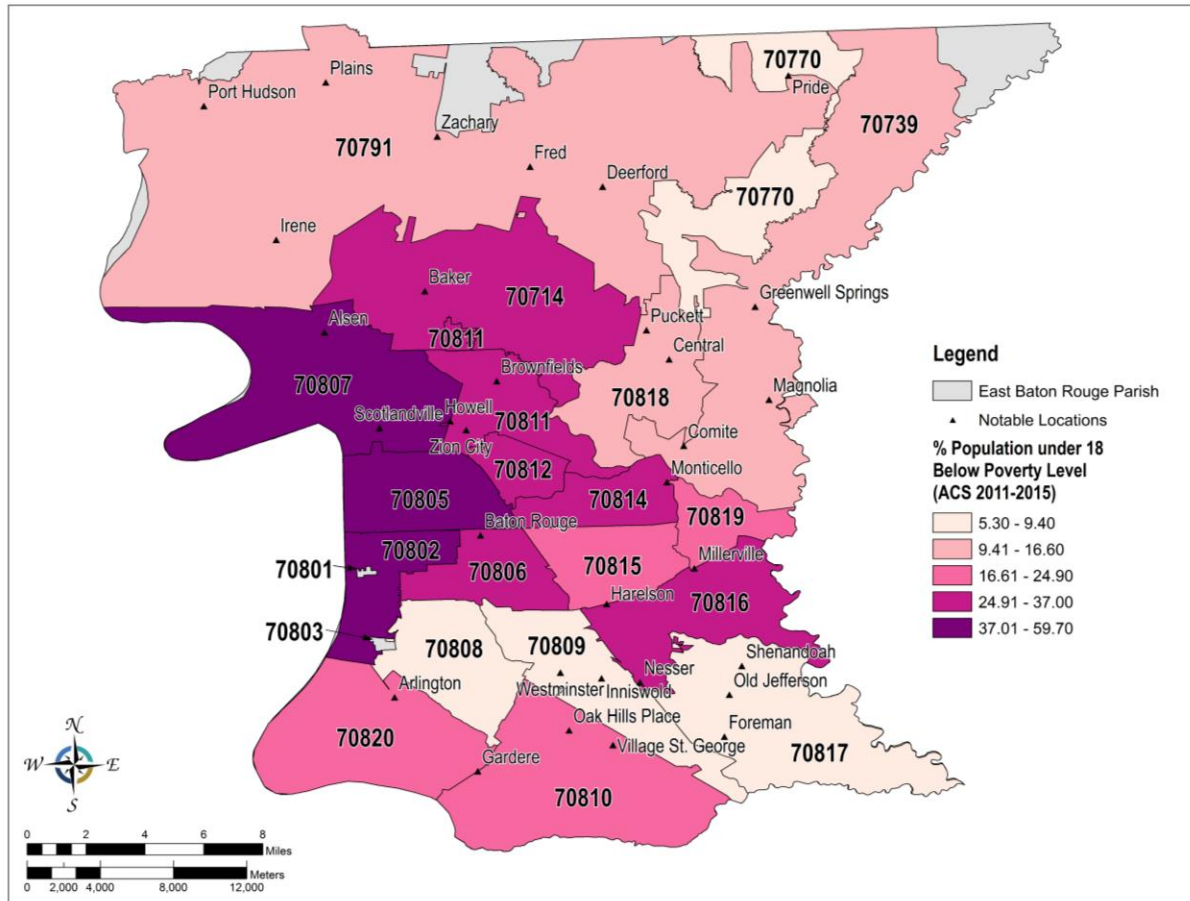(not shaded). Data source: U.S. Census Bureau.

Map prepared August 8, 2018 by the Louisiana Department of Health (LDH), Office of Public Health, Section of
Environmental Epidemiology and Toxicology (SEET). LDH SEET cannot guarantee the accuracy of the
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ZCTAs **70802**, **70805** and **70816** had the highest number of residents, on average, who did not
identify their race as "white". About 2.41%, 1.22% and 7.42% of all residents in these ZCTAs,
respectively, identified their ethnicity as "Hispanic" (regardless of race).

ZCTA **70815** had the highest proportion of Hispanic residents of any race (7.94%) during 2010-
2015.

Figure 4. Poverty among children in East Baton Rouge Parish by ZCTA (2011-2015). Map shows percent population under 18 with a past 12-month income below the poverty level. Income information unavailable for areas 70801 and 70803 (not shaded). Data source: U.S. Census Bureau American Community Survey (ACS) 2011-2015.

Map prepared August 8, 2018 by the Louisiana Department of Health (LDH), Office of Public Health, Section of Environmental Epidemiology and Toxicology (SEET). LDH SEET cannot guarantee the accuracy of the information contained on this map and expressly disclaims liability for errors and omissions in its contents.

ACS estimates show that ZCTAs **70802**, **70805** and **70807** had greatest percentage of children living in poverty, 2011-2015, in East Baton Rouge Parish.

For details regarding how ACS data were accessed, see Methodological Notes, Section 4 in Appendix.

Industrial Profile

Figure 1. Major industrial sites in East Baton Rouge Parish (2018). Data source: internal Louisiana Department of Health (LDH) polygons were compiled from various sources and are not intended to be an exhaustive list. Ongoing changes to plant ownership, status and extent often change, and sites may be incorrect or missing from this list. The most recent update is provided here for general reference only.
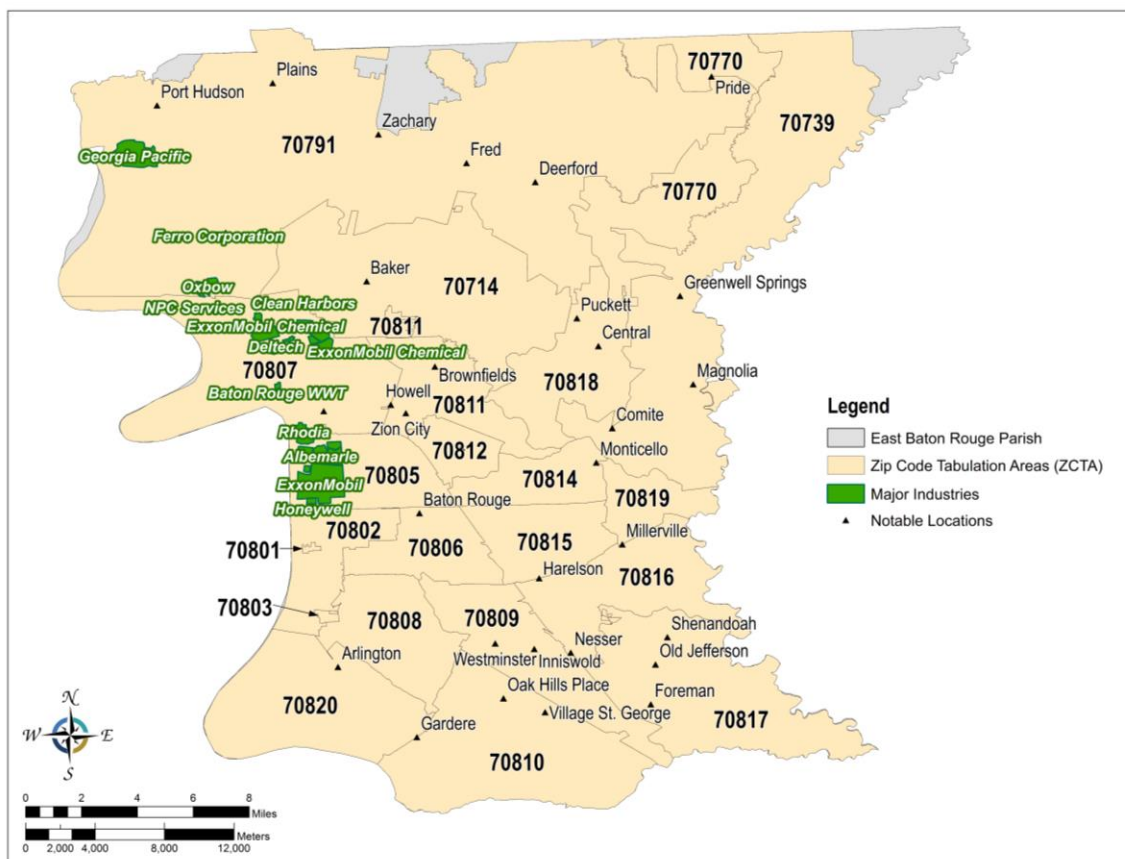
Map prepared August 8, 2018 by the Louisiana Department of Health (LDH), Office of Public Health, Section of Environmental Epidemiology and Toxicology (SEET). LDH SEET cannot guarantee the accuracy of the information contained on this map and expressly disclaims liability for errors and omissions in its contents.

Based on the general approximation of site locations, major industrial sites appear to cluster around ZCTAs **70805** and **70807** in East Baton Rouge Parish.

Health Insurance Coverage Profile

Figure 1. Health insurance coverage among children in East Baton Rouge Parish by ZCTA (2011-2015). Map shows the percentage of non-institutionalized civilian population, under the age of 18, who have no health insurance coverage. Data unavailable for ZCTAs 70801 and 70803 (not shaded). Data source: U.S. Census Bureau American Community Survey (ACS) 2011-2015.
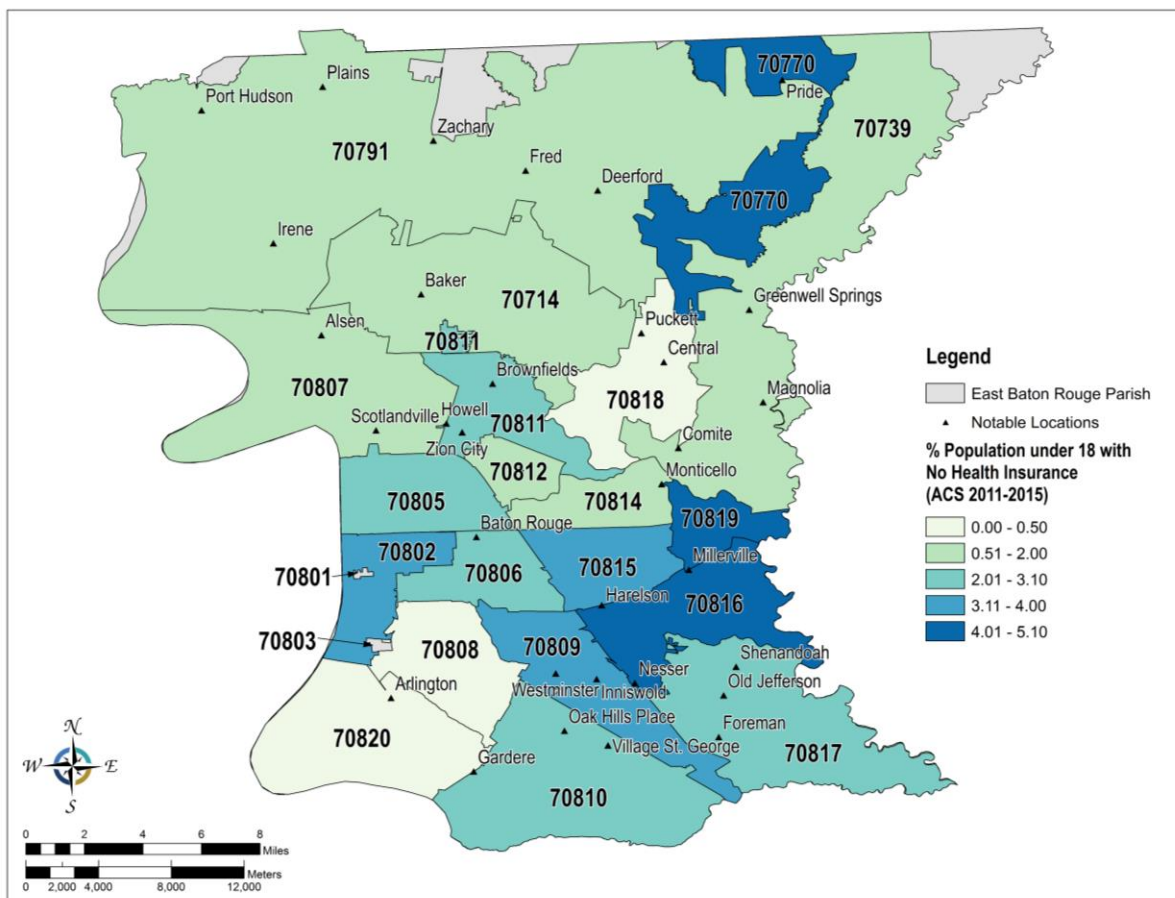

Map prepared August 8, 2018 by the Louisiana Department of Health (LDH), Office of Public Health, Section of Environmental Epidemiology and Toxicology (SEET). LDH SEET cannot guarantee the accuracy of the information contained on this map and expressly disclaims liability for errors and omissions in its contents.

Per ACS estimates, ZCTAs **70816**, **70819** and **70770** had the greatest percentage of children with no health insurance coverage during 2011-2015, in East Baton Rouge Parish.

For details regarding how ACS data were accessed, see Methodological Notes, Section 4 in Appendix

Childhood Asthma Profile: ED

Childhood Asthma as Primary Diagnosis during Emergency Department (ED) Visits

Figure 1. Average annual rate of ED visits for childhood asthma in East Baton Rouge Parish by ZCTA (2010-2015; per 1,000 residents under age 18). Rates for 70801 and 70803 could not be calculated due to lack of population data (not shaded). ED visits data source: LDH.
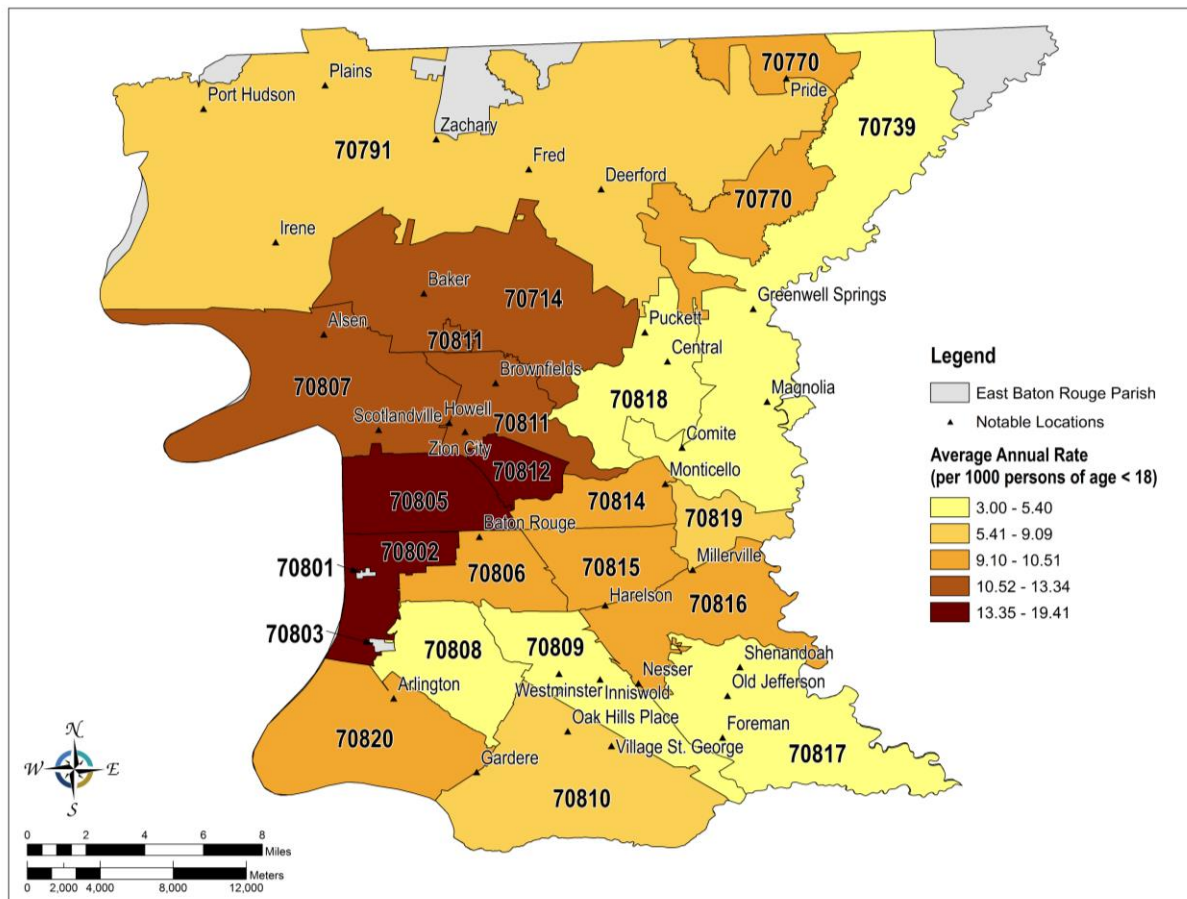
Map prepared August 8, 2018 by the Louisiana Department of Health (LDH), Office of Public Health, Section of Environmental Epidemiology and Toxicology (SEET). LDH SEET cannot guarantee the accuracy of the information contained on this map and expressly disclaims liability for errors and omissions in its contents.

ZCTAs **70802** and **70805** had the highest rate of ED visits for children, where asthma was a primary diagnosis, during 2010-2015. The next highest rate was observed for ZCTA **70812**, during this time.

For detailed methodological descriptions, see the corresponding sections in Methodological Notes in Appendix, case identification: section 1, and rate calculation: section 2.

Figure 2. Childhood asthma as a primary diagnosis (2010-2015): Comparison of the rate of ED visits in ZCTA to the rate of ED visits in East Baton Rouge Parish (EBR). Rate ratios unavailable for areas 70801 and 70803 (not shaded). ED visits data source: LDH.
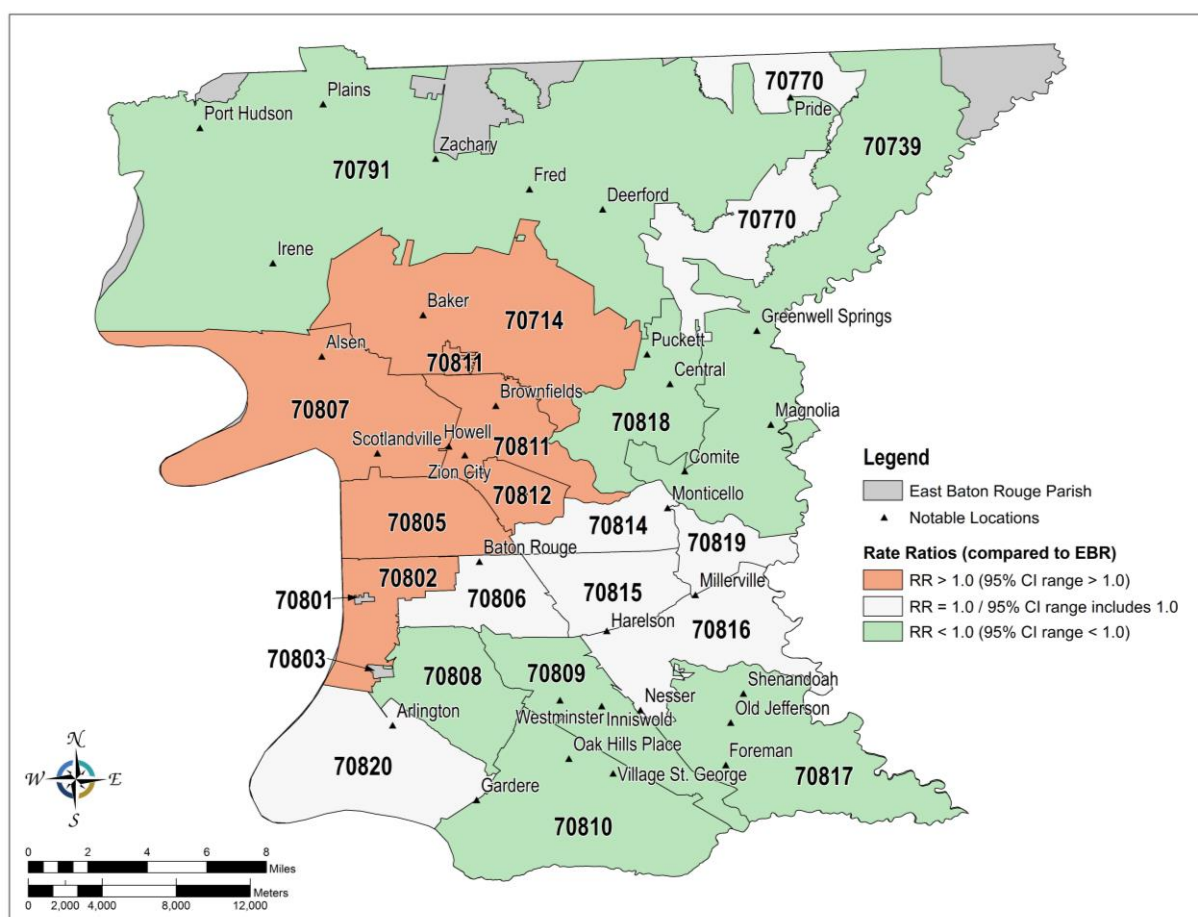

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Orange areas on the map indicate ZCTAs where the rates of ED visits for childhood asthma were statistically significantly higher[†] than the rate for the parish overall. Green areas on the map indicate ZCTAs where the rates of ED visits were statistically significantly lower[†] than the parish rate. White indicates ZCTAs where no statistically significant[†] differences were observed. The actual rates, rate ratios and confidence intervals for each ZCTA are provided in Table 1.

For a detailed description of how rate ratios are calculated and interpreted, see Methodological Notes, Section 3 of the Appendix.

[†]Rate ratios are considered statistically significant if the confidence interval (CI) range does not include 1.0. Rate ratios greater than (>) 1.0 indicate that the ZCTA rate is higher than the parish rate, and rate ratios less than (<) 1.0 indicate that the ZCTA rate is lower than the parish rate

Table 1. Childhood asthma as a primary diagnosis (2010-2015): Rate comparison of ED visits for childhood asthma in East Baton Rouge Parish ZCTAs to the Parish rate. ZCTA rates that are significantly higher and lower than the parish rate are highlighted in orange and green, respectively.

ZCTA	Rate (per 1,000 persons, age < 18)	Rate Ratio	95% CI* (lower)	95% CI* (upper)
Louisiana	8.50	*N/A*		
East Baton Rouge	10.45	*Reference*		
70714	**11.76**	**1.12**	**1.01**	**1.25**
70739	**3.00**	**0.28**	**0.22**	**0.37**
70770	10.22	0.98	0.68	1.41
70791	**7.79**	**0.74**	**0.67**	**0.83**
70802	**19.18**	**1.84**	**1.69**	**1.99**
70805	**19.41**	**1.86**	**1.74**	**1.98**
70806	10.48	1.00	0.91	1.11
70807	**13.34**	**1.28**	**1.15**	**1.42**
70808	**5.07**	**0.49**	**0.41**	**0.57**
70809	**5.08**	**0.49**	**0.41**	**0.57**
70810	**8.20**	**0.78**	**0.71**	**0.86**
70811	**12.75**	**1.22**	**1.08**	**1.37**
70812	**17.71**	**1.69**	**1.52**	**1.89**
70814	10.34	0.99	0.87	1.12
70815	10.11	0.97	0.88	1.06
70816	9.86	0.94	0.87	1.02
70817	**3.46**	**0.33**	**0.28**	**0.39**
70818	**5.40**	**0.52**	**0.41**	**0.65**
70819	9.09	0.87	0.70	1.08
70820	10.51	1.01	0.86	1.18

* 95% CI (lower/upper) refer to the lower and upper bounds of the 95% confidence interval calculated for the rate ratios. Rate ratios are considered statistically significant if the confidence interval range does not include 1.0. Rate ratios greater than 1.0 indicate that the ZCTA rate is higher than the parish rate, and vice versa.

Note: The rate ratio for ED visits for childhood asthma in East Baton Rouge Parish compared to Louisiana State was 1.23 (95% CI: 1.20, 1.26). Thus, the EBR rate was *higher* than the state rate by 23%.

1. The rates of ED visits for childhood asthma were higher by **~85%** in ZCTAs **70802** and **70805** compared to the parish rate.

2. The rate of ED visits in ZCTA **70812** was **~69%** higher than the parish rate.

Figure 3. Average annual rate of ED visits for childhood asthma in East Baton Rouge Parish by ZCTA (2010-2015; per 1,000 residents under age 18). Rates unavailable for 70801 and 70803 (not shaded). ED visits data source: LDH.
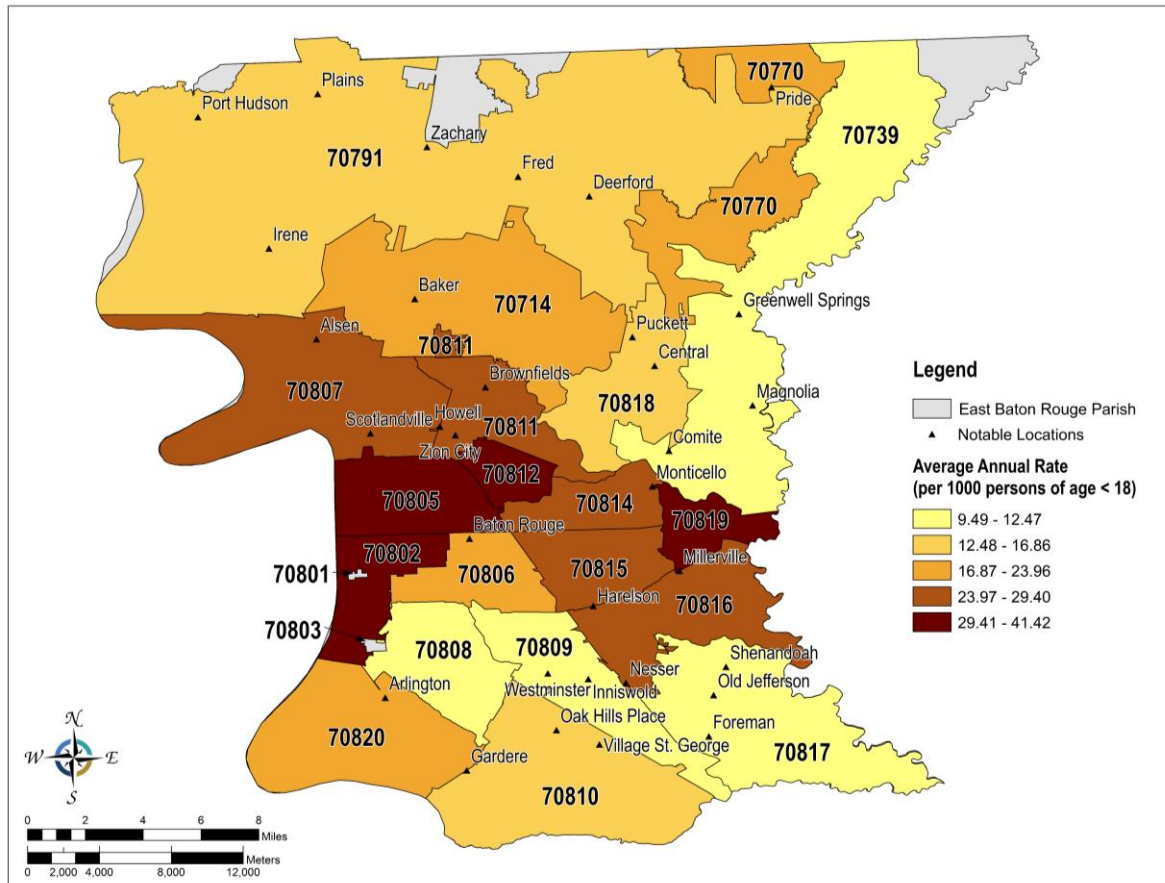
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Four ZCTAs, **70802**, **70805**, **70812**, and **70819**, were identified as having the highest rate of ED visits for children, where asthma was a diagnosis, during 2010-2015.

Figure 4. Childhood asthma as primary or secondary diagnosis (2010-2015): Comparison of the rate of ED visits in ZCTA to the rate of ED visits in East Baton Rouge Parish (EBR). Rate ratios unavailable for areas 70801 and 70803 (not shaded). ED visits data source: LDH.

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Orange areas on the map indicate ZCTAs where the rate of ED visits was statistically significantly higher[†] than the parish rate. Green areas on the map indicate ZCTAs where the rate of ED visits was statistically significantly lower[†] than the parish rate. White marks ZCTAs where no statistically significant[†] changes were observed. The actual rates, rate ratios and confidence intervals for each ZCTA can be found in Table 2.

[†]Rate ratios are considered statistically significant if the confidence interval range does not include 1.0. Rate ratios greater than 1.0 indicate that the ZCTA rate is higher than the parish rate, and rate ratios less than 1.0 indicate that the ZCTA rate is lower than the parish rate

Table 2. Childhood asthma as primary or secondary diagnosis (2010-2015): Rate comparison of ED visits in East Baton Rouge Parish ZCTAs to the Parish rate. ZCTA rates that are significantly higher and lower than the parish rate are highlighted in orange and green, respectively.

ZCTA	Rate (per 1,000 persons, age < 18)	Rate Ratio	95% CI* (lower)	95% CI* (upper)
Louisiana	24.06	*N/A*		
East Baton Rouge	24.12	*Reference*		
70714	23.96	0.99	0.93	1.07
70739	**9.49**	**0.39**	**0.34**	**0.46**
70770	20.81	0.86	0.67	1.12
70791	**15.60**	**0.65**	**0.60**	**0.70**
70802	**41.42**	**1.72**	**1.63**	**1.81**
70805	**39.30**	**1.63**	**1.56**	**1.70**
70806	**22.37**	**0.93**	**0.87**	**0.99**
70807	**29.40**	**1.22**	**1.14**	**1.30**
70808	**11.12**	**0.46**	**0.41**	**0.51**
70809	**12.47**	**0.52**	**0.47**	**0.57**
70810	**16.86**	**0.70**	**0.66**	**0.75**
70811	**28.74**	**1.19**	**1.10**	**1.29**
70812	**36.16**	**1.50**	**1.39**	**1.61**
70814	**27.01**	**1.12**	**1.04**	**1.21**
70815	**25.53**	**1.06**	**1.00**	**1.12**
70816	**27.71**	**1.15**	**1.10**	**1.20**
70817	**10.97**	**0.45**	**0.42**	**0.50**
70818	**16.42**	**0.68**	**0.60**	**0.78**
70819	**39.53**	**1.64**	**1.48**	**1.82**
70820	23.36	0.97	0.87	1.07

* 95% CI (lower/upper) refer to the lower and upper bounds of the 95% confidence interval calculated for the rate ratios. Rate ratios are considered statistically significant if the confidence interval range does not include 1.0. Rate ratios greater than 1.0 indicate that the ZCTA rate is higher than the parish rate, and rate ratios less than 1.0 indicate that the ZCTA rate is lower than the parish rate.

Note: The rate ratio for ED visits in East Baton Rouge Parish, where childhood asthma was either a primary or secondary diagnosis, compared to Louisiana State, was 1.00 (95% CI: 0.98, 1.01). Thus, the EBR rate would be considered comparable to the state rate.

1. The rate of ED visits in ZCTA **70802**, where childhood asthma was one of the diagnoses, was **~72%** higher than the parish rate.

2. The rates of ED visits were higher by **~63 - 64%** in ZCTAs **70805** and **70819**, and by **~50%** in ZCTA **70812**, compared to the parish rate.

Childhood Asthma Profile: Hospitalization

Childhood Asthma as Primary Diagnosis during Hospitalization

Figure 1. Average annual rate of hospitalizations for childhood asthma in East Baton Rouge Parish by ZCTA (2010-2015; per 1,000 residents under age 18). Rates for 70801 and 70803 could not be calculated due to lack of population data (not shaded). Rates based on less than 20 cases are marked "unstable." Hospitalization data source: LDH.
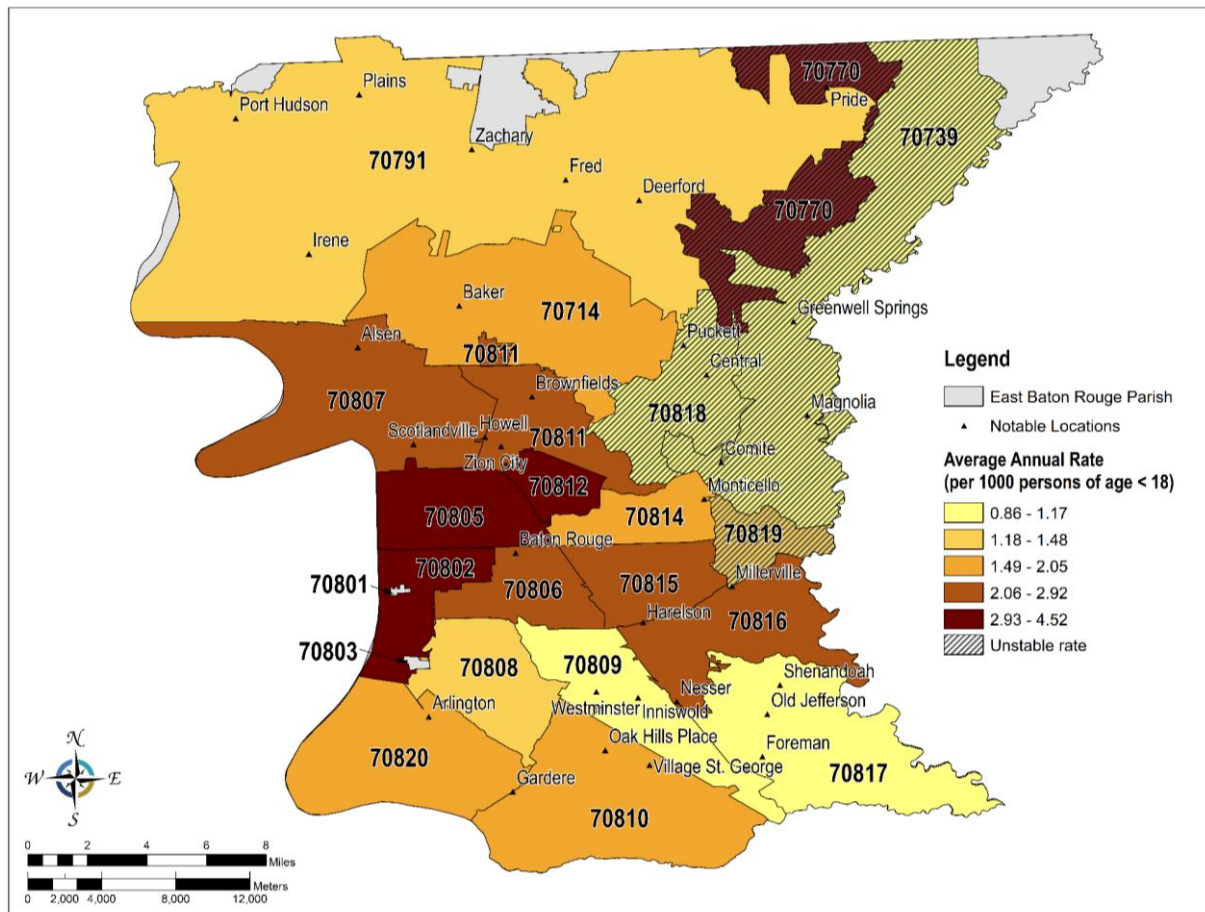
Map prepared December 10, 2018 by the Louisiana Department of Health (LDH), Office of Public Health, Section of Environmental Epidemiology and Toxicology (SEET). LDH SEET cannot guarantee the accuracy of the information contained on this map and expressly disclaims liability for errors and omissions in its contents.

ZCTAs **70802** and **70805** had the highest rate of hospitalization events among children, where asthma was a primary diagnosis, during 2010-2015. The next highest rate was observed for ZCTA **70812**, during this time.

The fourth-highest rate was observed for ZCTA **70770**; however, this rate was based less than 20 cases and is considered unstable (subject to change due to small fluctuations in case counts).

Figure 2. Childhood asthma as a primary diagnosis (2010-2015): Comparison of the rate of hospitalizations in ZCTA to the rate of hospitalizations in East Baton Rouge Parish (EBR). Rate ratios unavailable for areas 70801 and 70803 (not shaded). Hospitalization data source: LDH.
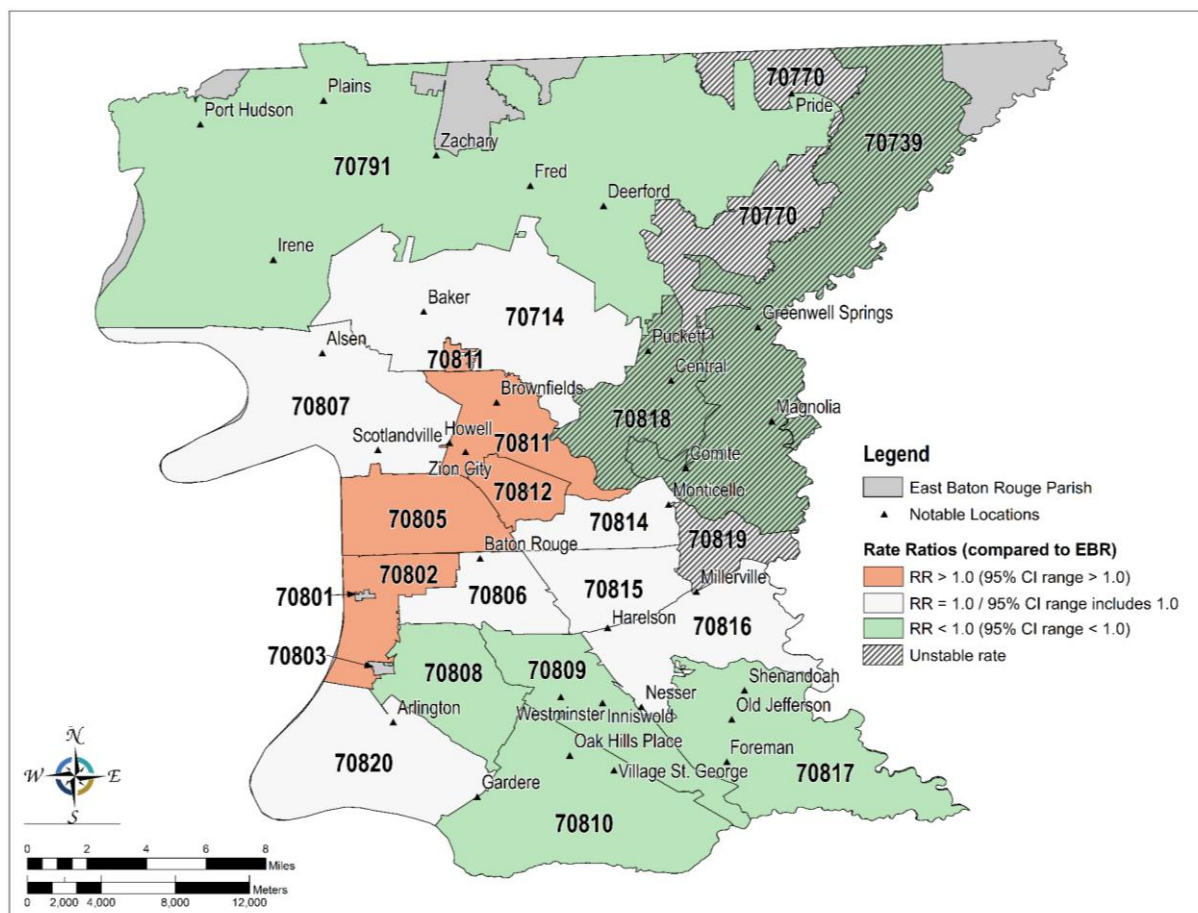

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Orange areas on the map indicate ZCTAs where the rates of hospitalization for childhood asthma were statistically significantly higher[†] than the rate for the parish overall. Green areas on the map indicate ZCTAs where the rates of hospitalization were statistically significantly lower[†] than the parish rate. White indicates ZCTAs where no statistically significant[†] differences were observed. The actual rates, rate ratios and confidence intervals for each ZCTA are provided in Table 1.

[†]Rate ratios are considered statistically significant if the confidence interval (CI) range does not include 1.0. Rate ratios greater than (>) 1.0 indicate that the ZCTA rate is higher than the parish rate, and rate ratios less than 1.0 (<) indicate that the ZCTA rate is lower than the parish rate.

Table 1. Childhood asthma as a primary diagnosis (2010-2015): Rate comparison of hospitalizations for childhood asthma in East Baton Rouge Parish ZCTAs to the parish rate. ZCTA rates that are significantly higher and lower than the parish rate are highlighted in orange and green, respectively. Rates derived from less than 20 cases are marked "unstable" (*italicized*).

ZCTA	Rate (per 1,000 persons, age < 18)	Rate Ratio	95% CI* (lower)	95% CI* (upper)
Louisiana	1.90	*N/A*		
East Baton Rouge	2.26	*Reference*		
70714	1.85	0.82	0.63	1.06
70739	*0.86*	*0.38*	*0.23*	*0.62*
70770	*3.29*	*1.45*	*0.76*	*2.80*
70791	**1.44**	**0.64**	**0.49**	**0.82**
70802	**3.60**	**1.59**	**1.32**	**1.93**
70805	**4.52**	**2.00**	**1.75**	**2.30**
70806	2.51	1.11	0.90	1.36
70807	2.32	1.03	0.80	1.32
70808	**1.31**	**0.58**	**0.42**	**0.80**
70809	**1.17**	**0.52**	**0.37**	**0.72**
70810	**1.77**	**0.79**	**0.64**	**0.97**
70811	**2.92**	**1.29**	**1.01**	**1.66**
70812	**4.21**	**1.86**	**1.49**	**2.34**
70814	2.05	0.91	0.68	1.21
70815	2.27	1.01	0.83	1.23
70816	2.28	1.01	0.85	1.20
70817	**1.12**	**0.49**	**0.37**	**0.66**
70818	*1.02*	*0.45*	*0.26*	*0.78*
70819	*1.48*	*0.65*	*0.38*	*1.13*
70820	2.00	0.88	0.62	1.27

* 95% CI (lower/upper) refer to the lower and upper bounds of the 95% confidence interval calculated for the rate ratios. Rate ratios are considered statistically significant if the confidence interval range does not include 1.0. Rate ratios greater than 1.0 indicate that the ZCTA rate is higher than the parish rate, and vice versa.

Note: The rate ratio for hospitalizations for childhood asthma in East Baton Rouge Parish compared to Louisiana State was 1.19 (95% CI: 1.12, 1.25). Thus, the EBR rate was *higher* than the state rate by 19%.

1. The hospitalization rate of ZCTA **70805** was twice the parish rate.

2. The hospitalization rates in ZCTAs **70812**, **70802**, and **70811** were also higher than the parish rate, by **~86%**, **~59%**, and **~29%** respectively.

Figure 3. Average annual rate of hospitalizations for childhood asthma in East Baton Rouge Parish by ZCTA (2010-2015; per 1,000 residents under age 18). Rates for 70801 and 70803 could not be calculated due to lack of population data (not shaded). Hospitalization data source: LDH.
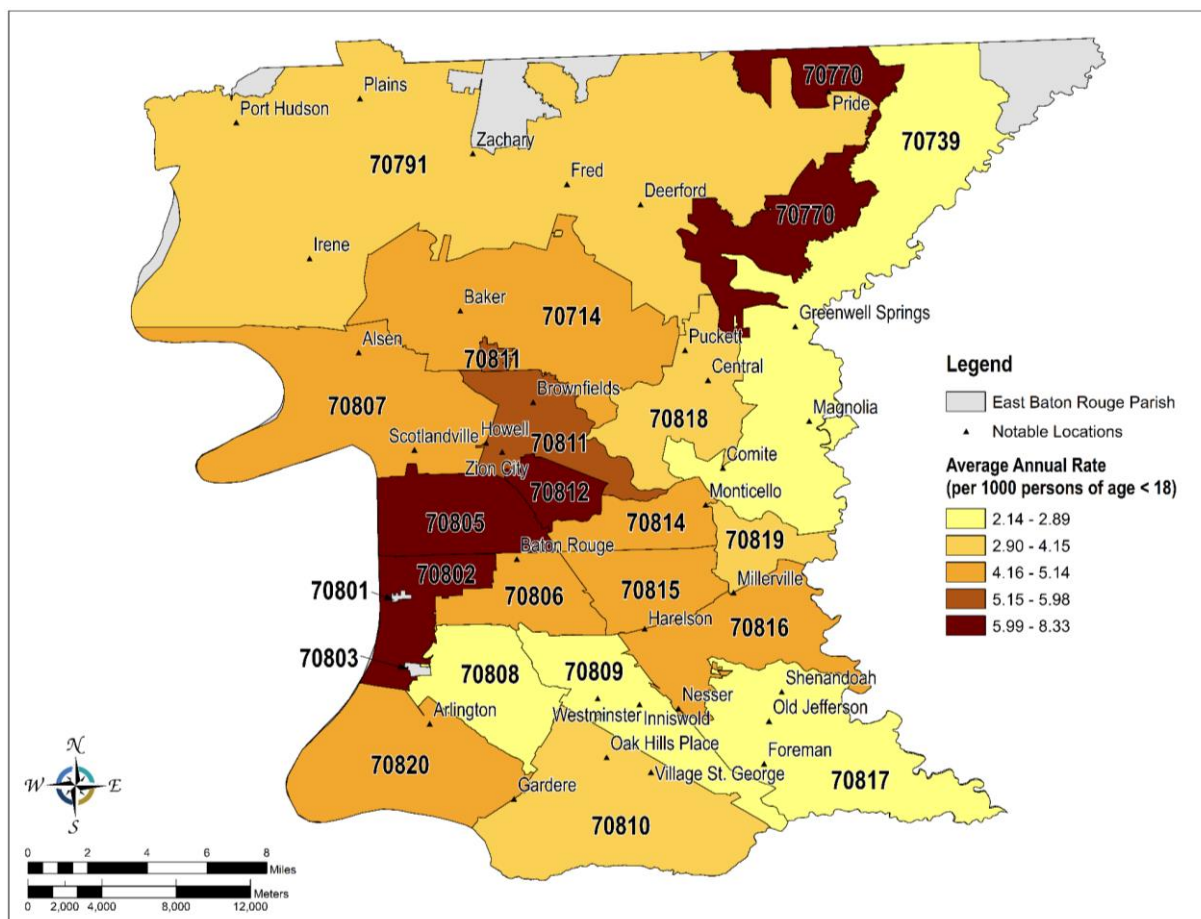
Map prepared November 15, 2018 by the Louisiana Department of Health (LDH), Office of Public Health, Section of Environmental Epidemiology and Toxicology (SEET). LDH SEET cannot guarantee the accuracy of the information contained on this map and expressly disclaims liability for errors and omissions in its contents.

ZCTAs **70802** and **70805** had the highest rate of hospitalization events among children, where asthma was a primary or secondary diagnosis, during 2010-2015. The next highest rates were observed for ZCTAs **70770** and **70812**, during this time.

Figure 4. Childhood asthma as a primary or secondary diagnosis (2010-2015): Comparison of the rate of hospitalizations in ZCTA to the rate of hospitalizations in East Baton Rouge Parish (EBR). Rate ratios unavailable for areas 70801 and 70803 (not shaded). Hospitalization data source: LDH.

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Orange areas on the map indicate ZCTAs where the rates of hospitalization for childhood asthma were statistically significantly higher[†] than the rate for the parish overall. Green areas on the map indicate ZCTAs where the rates of hospitalization were statistically significantly lower[†] than the parish rate. White indicates ZCTAs where no statistically significant[†] differences were observed. The actual rates, rate ratios and confidence intervals for each ZCTA are provided in Table 2.

[†]Rate ratios are considered statistically significant if the confidence interval (CI) range does not include 1.0. Rate ratios greater than (>) 1.0 indicate that the ZCTA rate is higher than the parish rate, and rate ratios less than (<) 1.0 indicate that the ZCTA rate is lower than the parish rate.

Table 2. Childhood asthma as a primary or secondary diagnosis (2010-2015): Rate comparison of hospitalizations for childhood asthma in East Baton Rouge Parish ZCTAs to the parish rate. ZCTA rates that are significantly higher and lower than the parish rate are highlighted in orange and green, respectively.

ZCTA	Rate (per 1,000 persons, age < 18)	Rate Ratio	95% CI* (lower)	95% CI* (upper)
Louisiana	4.46	*N/A*		
East Baton Rouge	4.80	*Reference*		
70714	4.60	0.96	0.81	1.13
70739	**2.14**	**0.45**	**0.33**	**0.61**
70770	**7.67**	**1.60**	**1.04**	**2.45**
70791	**3.42**	**0.71**	**0.60**	**0.84**
70802	**8.04**	**1.67**	**1.47**	**1.90**
70805	**8.33**	**1.73**	**1.57**	**1.92**
70806	4.79	1.00	0.86	1.16
70807	5.14	1.07	0.91	1.26
70808	**2.89**	**0.60**	**0.49**	**0.75**
70809	**2.71**	**0.56**	**0.45**	**0.70**
70810	**3.73**	**0.78**	**0.67**	**0.90**
70811	**5.98**	**1.24**	**1.05**	**1.48**
70812	**7.25**	**1.51**	**1.27**	**1.79**
70814	4.66	0.97	0.80	1.17
70815	4.66	0.97	0.84	1.11
70816	4.78	1.00	0.88	1.12
70817	**2.80**	**0.58**	**0.49**	**0.70**
70818	4.15	0.86	0.66	1.13
70819	3.52	0.73	0.51	1.04
70820	4.79	1.00	0.79	1.26

* 95% CI (lower/upper) refer to the lower and upper bounds of the 95% confidence interval calculated for the rate ratios. Rate ratios are considered statistically significant if the confidence interval range does not include 1.0. Rate ratios greater than 1.0 indicate that the ZCTA rate is higher than the parish rate, and vice versa.

Note: The rate ratio for hospitalizations for childhood asthma in East Baton Rouge Parish compared to Louisiana State was 1.03 (95% CI: 0.87, 1.22). Thus, the EBR rate would be considered comparable to the state rate.

1. The hospitalization rates of ZCTAs **70770**, **70802** and **70805** were **~60-73%** higher than the parish rate.
2. Hospitalization rates for **70811** and **70812** were higher by **~24-51%** compared to the parish.

Medicaid Usage

Note: Only ED visits and hospitalization events where asthma was a primary diagnosis were analyzed for Medicaid usage.

## Medicaid Usage for Childhood Asthma as a Primary Diagnosis: ED

Figure 1. Percent ED visits for childhood asthma in East Baton Rouge Parish, by ZCTA, where Medicaid was listed as the primary payer (2010-2015). Rates based on fewer than 20 cases are marked "unstable." Medicaid usage data source: LDH
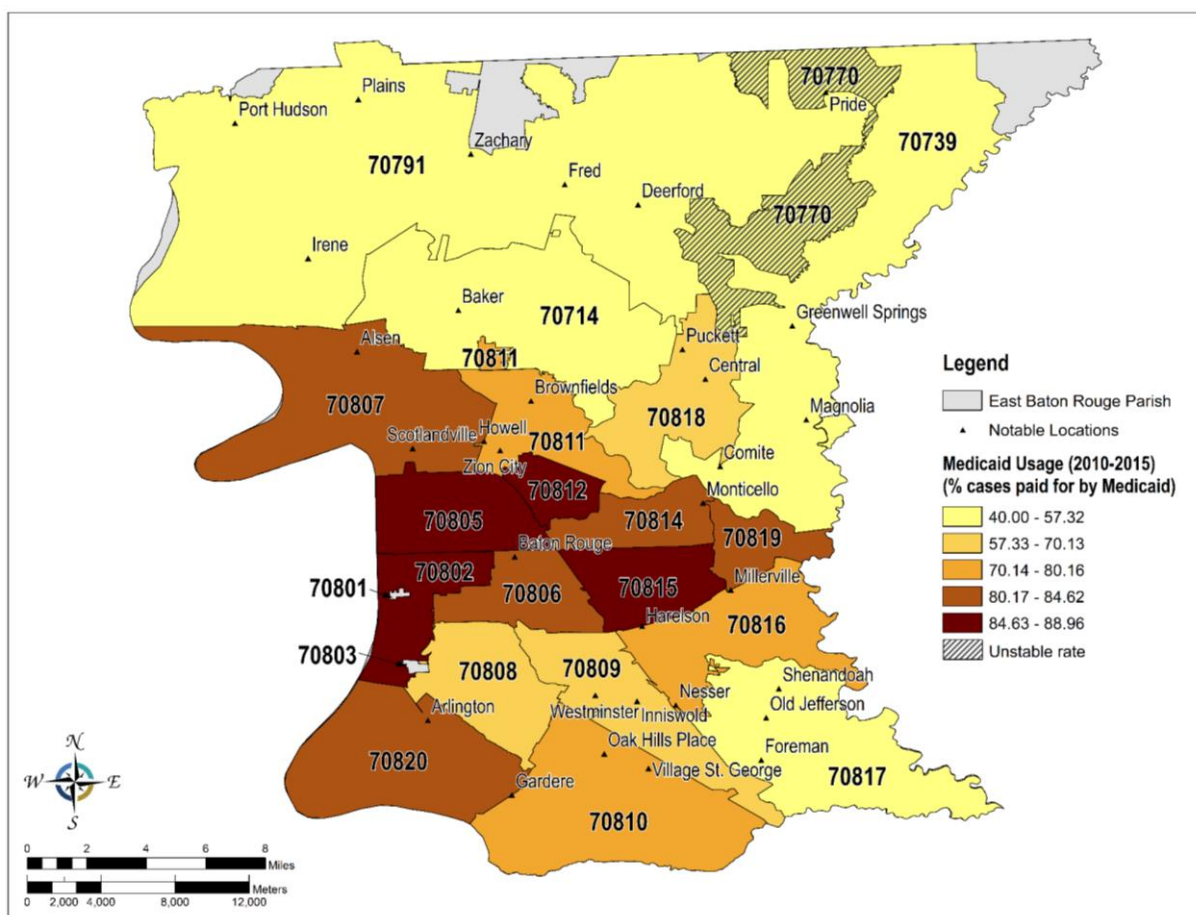
Map prepared December 10, 2018 by the Louisiana Department of Health (LDH), Office of Public Health, Section of Environmental Epidemiology and Toxicology (SEET). LDH SEET cannot guarantee the accuracy of the information contained on this map and expressly disclaims liability for errors and omissions in its contents.

Approximately **85-89%** of ED visits, where asthma was a primary diagnosis, listed Medicaid as a "payer" in ZCTAs **70802**, **70805**, **70806**, **70812** and **70820**.

Figure 2. Medicaid usage for childhood asthma during an ED visit (2010-2015): Rate comparison of percent ED visits in East Baton Rouge Parish ZCTAs to the parish rate. Rate ratios unavailable for areas 70801 and 70803 (not shaded). Rates based on fewer than 20 cases are marked "unstable." Medicaid usage data source: LDH.
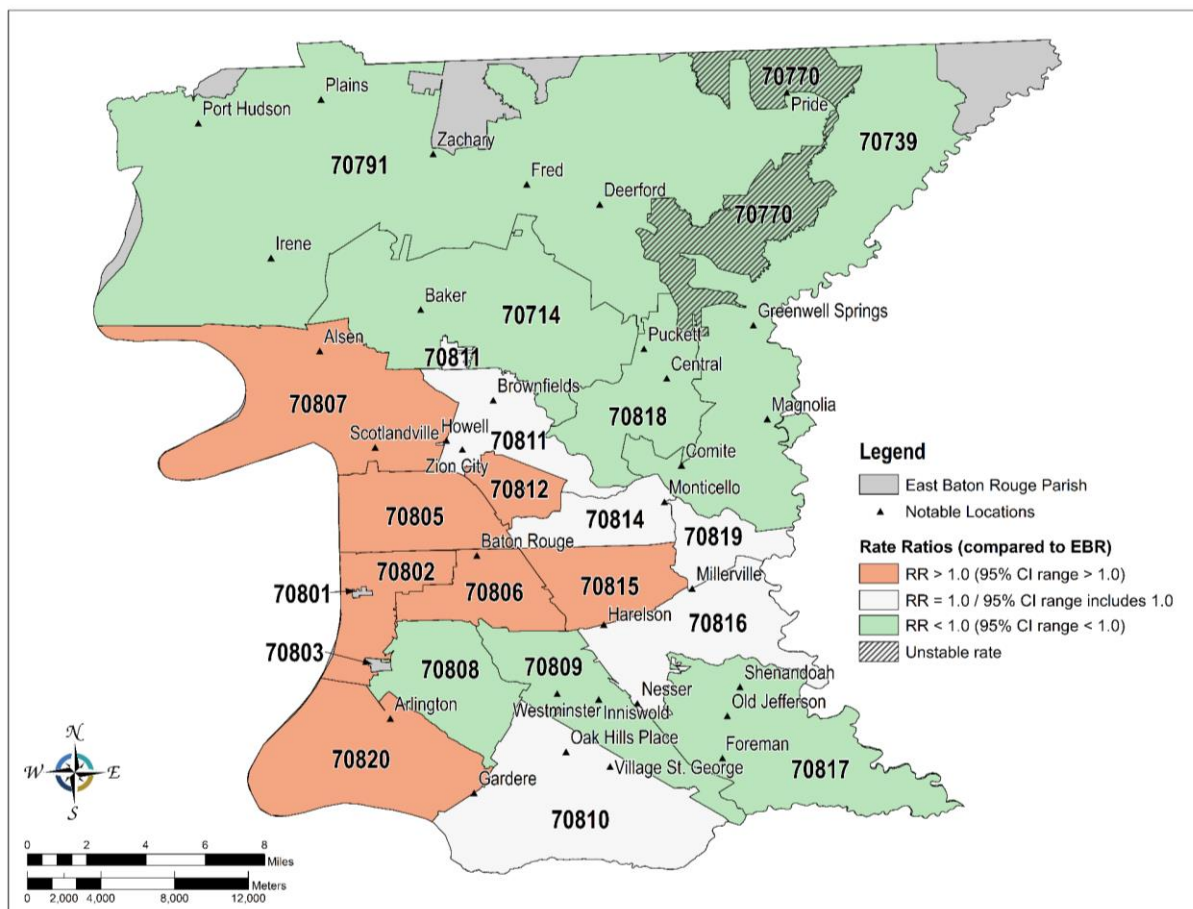
Map prepared December 10, 2018 by the Louisiana Department of Health (LDH), Office of Public Health, Section of Environmental Epidemiology and Toxicology (SEET). LDH SEET cannot guarantee the accuracy of the information contained on this map and expressly disclaims liability for errors and omissions in its contents.

Orange areas on the map indicate ZCTAs where Medicaid usage rates were statistically significantly higher[†] than the rate for the parish overall. Green areas on the map indicate ZCTAs where the rates were statistically significantly lower[†] than the parish rate, and white indicates ZCTAs where no statistically significant[†] differences were observed. The actual rates, rate ratios and confidence intervals for each ZCTA are provided in Table 1.

[†]Rate ratios are considered statistically significant if the confidence interval (CI) range does not include 1.0. Rate ratios greater than (>) 1.0 indicate that the ZCTA rate is higher than the parish rate, and rate ratios less than 1.0 (<) indicate that the ZCTA rate is lower than the parish rate

Table 1. Medicaid usage for childhood asthma during an ED visit (2010-2015): Rate comparison of percent ED visits in East Baton Rouge Parish ZCTAs to the parish rate.
ZCTA rates that are significantly higher and lower than the parish rate are highlighted in orange and green, respectively. Rates based on fewer than 20 cases are marked "unstable" (*italicized*).

| ZCTA	Rate (% ED visits paid for by Medicaid)	Rate Ratio	95% CI* (lower)	95% CI* (upper)
Louisiana	77.74	*N/A*		
East Baton Rouge	78.33	*Reference*		
70714	56.00	0.71	0.65	0.78
70739	50.88	0.65	0.50	0.84
70770	*40.00*	*0.51*	*0.33*	*0.79*
70791	42.98	0.55	0.49	0.62
70802	88.96	1.14	1.10	1.17
70805	87.69	1.12	1.09	1.15
70806	84.60	1.08	1.03	1.13
70807	82.37	1.05	1.01	1.10
70808	70.13	0.90	0.81	0.99
70809	68.55	0.88	0.79	0.97
70810	79.23	1.01	0.96	1.06
70811	76.79	0.98	0.92	1.05
70812	88.53	1.13	1.09	1.18
70814	82.00	1.05	0.99	1.11
70815	85.80	1.10	1.05	1.14
70816	80.16	1.02	0.98	1.07
70817	57.32	0.73	0.64	0.84
70818	65.38	0.83	0.71	0.98
70819	81.82	1.04	0.94	1.16
70820	84.62	1.08	1.01	1.15

* 95% CI (lower/upper) refer to the lower and upper bounds of the 95% confidence interval calculated for the rate ratios. Rate ratios are considered statistically significant if the confidence interval range does not include 1.0. Rate ratios greater than 1.0 indicate that the ZCTA rate is higher than the parish rate, and vice versa.

Note: The rate ratio for Medicaid usage in East Baton Rouge Parish compared to Louisiana State was 1.00 (95% CI: 0.99, 1.02). Thus, the EBR rate is comparable to the state rate.

1. Medicaid usage in ZCTAs **70802**, **70805** and **70812** were higher than the parish rate by **~12-14%**.
2. Medicaid usage in ZCTAs 70806, 70807, 70815 and 70820 were higher than the parish rate by **~5-10%**.

Figure 3. Percent hospitalizations for childhood asthma in East Baton Rouge Parish, by ZCTA, where Medicaid was listed as a "payer" (2010-2015). Rates based on fewer than 20 cases are marked "unstable." Rates based on 5 or fewer cases are suppressed (not shown). Medicaid usage data source: LDH
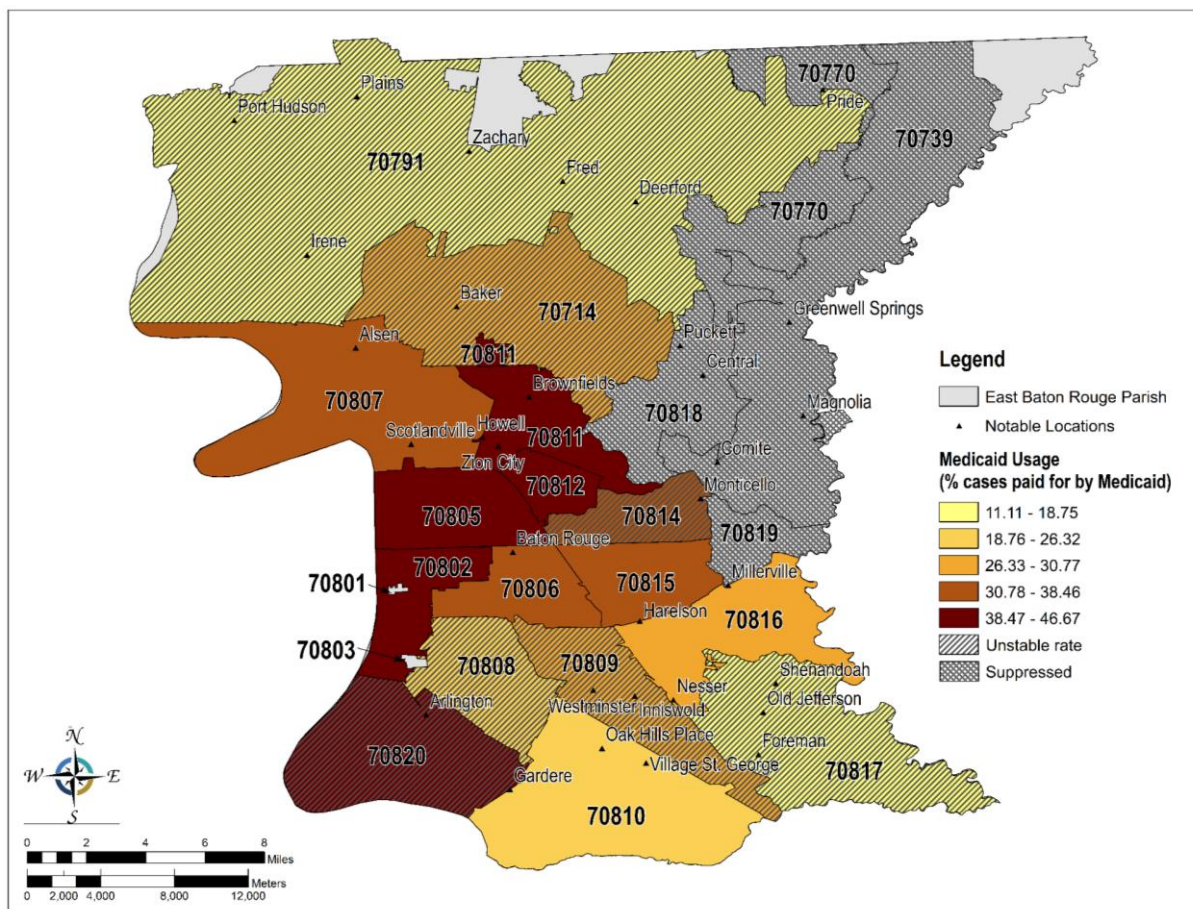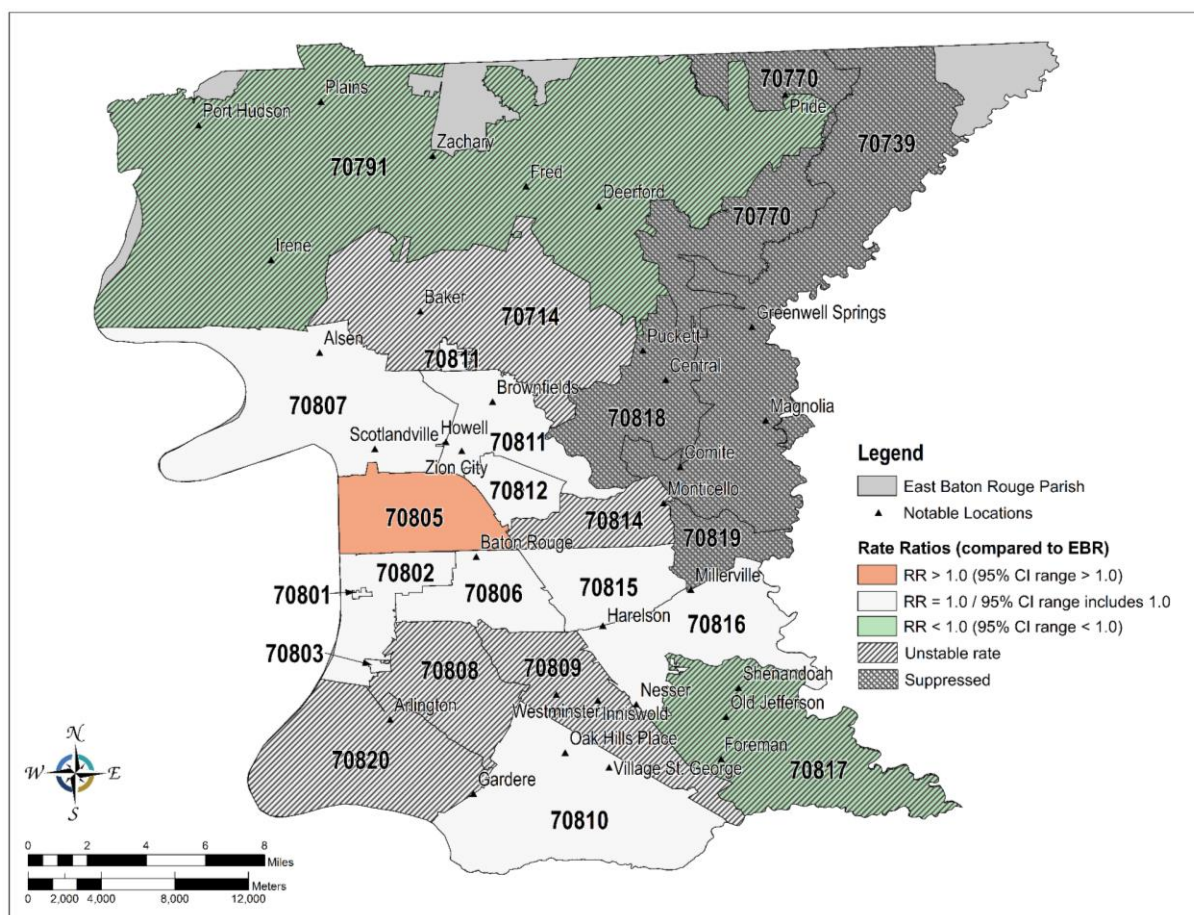

Map prepared December 10, 2018 by the Louisiana Department of Health (LDH), Office of Public Health, Section of Environmental Epidemiology and Toxicology (SEET). LDH SEET cannot guarantee the accuracy of the information contained on this map and expressly disclaims liability for errors and omissions in its contents.

Medicaid was listed as a "payer" for **>40%** of hospitalization cases, where childhood asthma as a primary diagnosis, in ZCTAs **70802**, **70805**, **70811** and **70812**. Of note, "payer" information was available for only about half of the hospitalization events; thus the percentage of Medicaid cases may be higher than the estimate provided here.

Figure 4. Medicaid usage for hospitalizations for childhood asthma (2010-2015): Rate comparison of percent hospitalizations in East Baton Rouge Parish ZCTAs to the parish rate. Rate ratios unavailable for areas 70801 and 70803 (not shaded). Rates based on fewer than 20 cases are marked "unstable." Rates based on 5 or fewer cases are suppressed (not shown). Medicaid usage data source: LDH.

Map prepared December 10, 2018 by the Louisiana Department of Health (LDH), Office of Public Health, Section of Environmental Epidemiology and Toxicology (SEET). LDH SEET cannot guarantee the accuracy of the information contained on this map and expressly disclaims liability for errors and omissions in its contents.

Orange area on the map indicates the ZCTA where the Medicaid usage rate was statistically significantly higher[†] than the rate for the parish overall. Green areas on the map indicate ZCTAs where the rates were statistically significantly lower[†] than the parish rate, and white indicates ZCTAs where no statistically significant[†] differences were observed. Since most rates were unstable or suppressed, we recommend caution in interpreting the Medicaid usage data for asthma-related hospitalization events. Nonetheless, the actual numbers are presented in Table 2.

[†]Rate ratios are considered statistically significant if the confidence interval (CI) range does not include 1.0. Rate ratios greater than (>) 1.0 indicate that the ZCTA rate is higher than the parish rate, and rate ratios less than 1.0 (<) indicate that the ZCTA rate is lower than the parish rate

Table 2. Medicaid usage for hospitalizations for childhood asthma (2010-2015): Rate comparison of percent hospitalizations in East Baton Rouge Parish ZCTAs to the parish rate. ZCTA rates that are significantly higher and lower than the parish rate are highlighted in orange and green, respectively. Rates based on fewer than 20 cases are marked "unstable" (*italicized*). Rates based on 5 or fewer cases are suppressed (not shown).

ZCTA	Rate (% hospitalizations paid for, at least in part, by Medicaid)	Rate Ratio	95% CI* (lower)	95% CI* (upper)
Louisiana	40.76		*N/A*	
East Baton Rouge	34.92		*Reference*	
70714	*28.07*	*0.80*	*0.53*	*1.23*
70739	-	-	-	-
70770	-	-	-	-
70791	*17.74*	*0.51*	*0.30*	*0.87*
70802	42.74	1.22	0.98	1.53
70805	**42.86**	**1.23**	**1.04**	**1.45**
70806	38.14	1.09	0.84	1.42
70807	36.92	1.06	0.76	1.46
70808	*23.08*	*0.66*	*0.37*	*1.18*
70809	*28.57*	*0.82*	*0.48*	*1.39*
70810	26.32	0.75	0.53	1.06
70811	42.42	1.21	0.91	1.62
70812	43.04	1.23	0.95	1.60
70814	*35.42*	*1.01*	*0.69*	*1.50*
70815	37.74	1.08	0.84	1.39
70816	29.79	0.85	0.66	1.11
70817	***14.29***	***0.41***	***0.21***	***0.82***
70818	-	-	-	-
70819	-	-	-	-
70820	*46.67*	*1.34*	*0.91*	*1.97*

* 95% CI (lower/upper) refer to the lower and upper bounds of the 95% confidence interval calculated for the rate ratios. Rate ratios are considered statistically significant if the confidence interval range does not include 1.0. Rate ratios greater than 1.0 indicate that the ZCTA rate is higher than the parish rate, and vice versa.

Note: The rate ratio for Medicaid usage in East Baton Rouge Parish compared to Louisiana State was 0.86 (95% CI: 0.79, 0.92). Thus, the EBR rate was *lower* than the state rate by 14%.

Medicaid usage for ZCTA **70805** was higher than the parish rate by **~23%**.

AIR QUALITY IN EAST BATON ROUGE PARISH

The U.S. Environmental Protection Agency (EPA) notes the adverse effects of air pollutants, such as particulate matter and ozone, on respiratory health. Fine inhalable particles with diameters that are generally 2.5 micrometers and smaller, abbreviated as PM2.5, have been linked to asthma development, inflammation of the airways, bronchial hyperreactivity, respiratory infections and emergency department visits for respiratory-related symptoms.

Ozone is a highly reactive compound consisting of 3 oxygen atoms (O_3). It is formed by chemical reactions of oxides of nitrogen (NOx) and volatile organic compounds (VOC), in the presence of oxygen (air) and sunlight. According to the EPA, ground-level ozone can cause constriction of airway muscles, and lead to wheezing and shortness of breath. Ozone is also known to cause Chronic Obstructive Pulmonary Disease (COPD), and aggravate respiratory conditions like asthma, leading to increased frequency of asthma attacks.

Locations of Ambient Air Quality Monitors
(EBR and neighboring parishes)

Image source: LDEQ
(http://deq.louisiana.gov/page/capital)

As a result, the levels of all these pollutants are monitored and regulated by the EPA's National Ambient Air Quality Standards (NAAQS). Primary standards provide public health protection, including protecting the health of 'sensitive' populations such as asthmatics, children, and the elderly. Secondary standards provide public welfare protection, including protection against decreased visibility and damage to animals, crops, vegetation, and buildings. The standards are revised periodically, as deemed necessary.

Ambient air quality in Louisiana is monitored by the Louisiana Department of Environmental Quality (LDEQ) at various monitoring stations (relevant sites shown in map above). Most of the air monitors in East Baton Rouge (EBR) Parish are along the border between East and West Baton Rouge, with one monitor located in the City of Pride, northern EBR.

Several sampling areas in the EBR Parish area in Louisiana were out of compliance for ozone for specific years, as the EPA standards were lowered in 2008 and again in 2015 (see example graph below). As of June 2018, however, East Baton Rouge Parish is compliant with EPA standards for all the monitored pollutants.
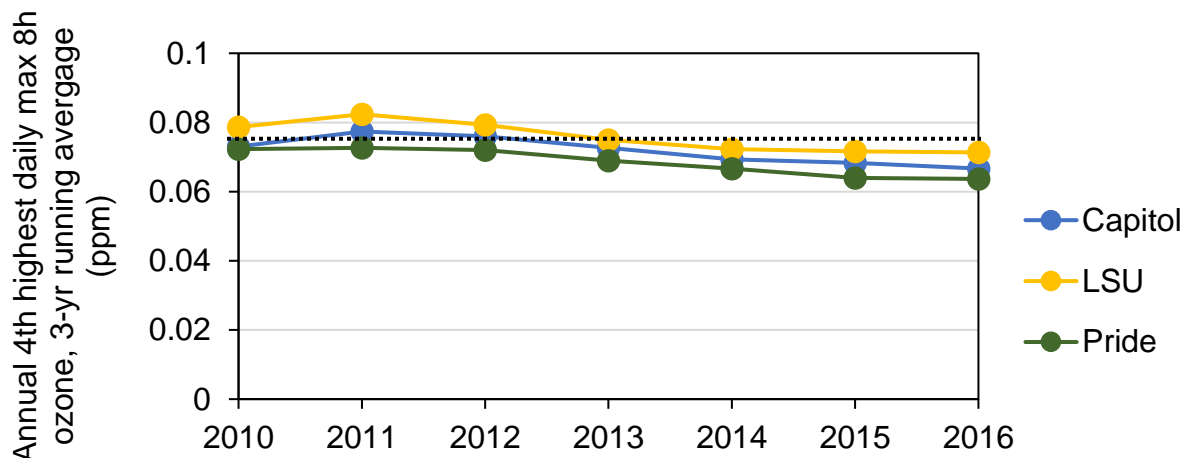
Ozone

Figure 1. Fourth-highest annual daily maximum 8-hour ozone, plotted as a 3-year running average, in East Baton Rouge Parish (2010-2016). Ozone level in air is measured in parts per million (ppm). Dotted line represents the 2008 ozone standard. Three sampling stations located within EBR, for which ozone data were available, are shown below. Data source: LDEQ.


Interpreting the measure: Ozone levels in ambient air are collected by the LDEQ monitors several times a day, and averaged over an 8-hour period. The maximum 8-hour ozone level in a day is then noted for each day of the year. To compare the ambient ozone to the EPA standard, the 4th highest daily maximum 8-hour ozone level recorded for each year is used to calculate a running 3-year average. For example, the 2010 data point, as plotted in Figure 1, represents the average of the 4th highest daily maximum 8-hour ozone levels recorded for the years 2008, 2009 and 2010. Thus, the data point for 2016 includes the years 2014, 2015 and 2016. Further years of data are not currently available.

In 2008, the EPA standard for ozone was reduced from 0.080 ppm to 0.075 ppm (dotted line). During this time, EBR Parish was out of compliance the EPA standard for the years 2010-2013 according to at least one monitor. The East Baton Rouge Parish area was only considered to have 'attained' the EPA standard for ozone in 2015, when the acceptable level was reduced to 0.070 ppm. Ozone levels in East Baton Rouge Parish area continued to be too high, based on the new EPA standard (0.070 ppm). However, in June 2018, no Louisiana parish was included in a list of counties, compiled by the EPA, that are projected to not attain the current standard for ozone. Thus, East Baton Rouge Parish is currently compliant with the latest EPA standards for ozone.

PM2.5

Figure 2. Annual mean PM2.5 concentration, plotted as a 3-year running average, in East Baton Rouge Parish (2010-2015). PM2.5 level in air is measured in micrograms of the particulate matter over cubic meter of air ($\mu g/m^3$). Dotted line represents the PM 2.5 standard. Two sampling stations located within EBR, which record data for PM2.5, are shown below. Data source: LDEQ.
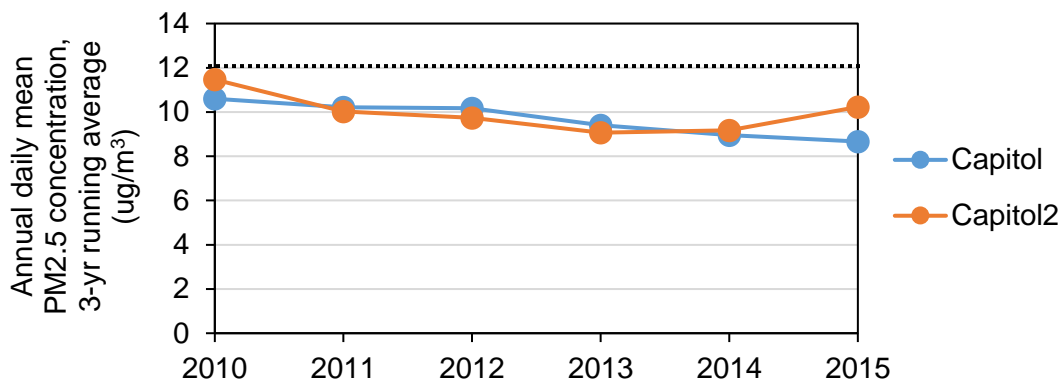
Interpreting the measure: The LDEQ monitors collect PM2.5 levels several times a day. These numbers are averaged to derive a daily mean. The annual daily mean is then calculated by averaging the daily mean values for the entire year. To compare the PM2.5 level to the EPA standard, a running 3-year average is then calculated. Thus, the data point for each year represents the average PM2.5 level for the three prior years. For example, the data point for 2010, as plotted in Figure 2, is the average of the annual daily mean PM2.5 levels for 2008, 2009 and 2010. Thus, the data point for 2015 includes the averages of years 2013, 2014 and 2015. Further years of data are not currently available.

"Capitol" and "Capitol2" are two co-located PM2.5 monitors in Baton Rouge. Both monitors suggested compliance with the primary EPA standard for PM2.5 (12 $\mu g/m^3$, dotted line), designed to provide public health protection, including protecting the health of 'sensitive' populations such as asthmatics, children, and the elderly.

References:
https://www.epa.gov/particle-pollution-and-your-patients-health/health-effects-pm-patients-lung-disease
https://www.epa.gov/ozone-pollution/health-effects-ozone-pollution
https://www.epa.gov/criteria-air-pollutants/naaqs-table
https://www3.epa.gov/airquality/greenbook/ancl.html

APPENDIX

Methodological Notes

1. Case criteria:

Residents under 18 years of age

2010-2015 Quarters 1-3 (Q1-Q3) cases were selected using the ICD-9 code 493.XX. Nearly all Q4 2015 cases were selected using the ICD-10 codes J45.XXX and J46.XXX. (See note below regarding switch from ICD-9 to ICD-10)

Case counts were obtained for all of Louisiana, all of East Baton Rouge Parish, and for each ZIP code in East Baton Rouge Parish (as captured in the ED data sets) for the years 2010 – 2015.

Case counts were obtained, and rates were calculated for the above listed geographical areas where asthma was the primary diagnosis as well as where asthma was listed as any diagnosis in the record.

The switch from the ICD-9 to the ICD-10 coding occurred in the fourth quarter of 2015. To cover this transition, ED data for this period was queried using both the ICD-9 and ICD-10 codes for asthma. All but one case of asthma was captured using ICD-10 asthma codes for Q4 2015.

ED cases that listed Medicaid as the "primary payer," and hospitalization cases that listed Medicaid in one of the "payer" fields were counted for Medicaid usage. Percent Medicaid usage was estimated by dividing that number by the total number of ED or hospitalization cases for that geography, and multiplying the value by 100.

2. Population (denominator) data for rate calculations:

Parish and state population estimates for 2010 -2015 were obtained using 2015 intercensal estimates (also from American FactFinder).

ZIP Code Tabulation Area (ZCTA) data, an estimate of ZIP code population and demographic data (see notes below in section 2.1), was obtained from the 2000 and 2010 censuses (using American FactFinder). Population estimates for the years 2011 – 2015 was extrapolated using data from these two censuses. Essentially, the average annual increase or decrease in population that occurred from the 2000 to the 2010 census was calculated. This was added for every year that has elapsed since the 2010 census. The extrapolation method was used for ZCTA level data because intercensal estimates are not available. Finally, the total populations for 2010-2015 were added to derive the aggregate total population for this time. This value was divided by 6 to derive the average population for each year during 2010-2015 for mapping purposes. The aggregate population was used as the denominator to calculate rates of ED cases for 2010-2015. Rates per 1,000 resident children (under 18 years of age) were calculated by dividing the number of cases in the specific geography by the total population of that geography and multiplying by 1,000.

2.1 An important consideration about using ZCTA/ZIP code level population estimates:

Many researchers wish to use ZIP code level data because it is something that is easily understood, but it is important to be aware of the associated limitations.

- ZIP codes were implemented by the USPS to facilitate efficient mail delivery, and are not meant to represent specific geography; therefore, they may cross state and parish boundaries.

- Census data captures ZCTA data. These are generalized representations of the USPS ZIP code service areas.

- ZCTAs are constructed by aggregating census blocks whose addresses use a given ZIP code.

- The Census Bureau takes the ZIP code used by the *majority* of addresses in each census unit. As a result, sometimes an address will end up in ZCTA different from their ZIP code.

- P.O. Box ZIP codes are ineligible to become ZCTAs, and ZCTAs are not created for ZIP codes with only a small number of residents.

Emergency department (ED) data contains ZIP codes that are assigned to East Baton Rouge Parish, but do not have ZCTA census population estimates available. These may be ZIP codes associated with P.O. Box only mail delivery, unique ZIP codes assigned to a single high-volume address, or ZIP codes without a residential population.

ZCTA population estimates for the following ZIP codes (majority are P.O. Box ZIP codes) are not available:

70704 70803 70804 70813 70821 70822 70825 70831 70835 70837 70874 70879 70884 70892 70895 70896 70898

Rates were not calculated for the above listed ZIP codes but counts from these ZIP codes were included in the total case counts for East Baton Rouge Parish and Louisiana, which were used to calculate parish and state rates.

3. Rate ratio analysis:

The average annual rate of ED visits/hospitalization events was calculated from the 6-year period of 2010-2015, for asthma as a primary or any diagnosis in patients under the age of 18. This calculation was performed for residents in each Baton Rouge ZCTA as well as for the total number of cases in East Baton Rouge Parish and Louisiana State. Medicaid usage was estimated by dividing the number of cases where at least one "payer" field listed Medicaid by the total number of ED visit/hospitalization cases and multiplying the result by 10, yielding % cases which were at least partially paid for by Medicaid.

The rate ratios were calculated and interpreted as follows:

1. The rate for East Baton Rouge Parish included case counts which corresponded to the parish, but which could not be assigned a ZIP code or belonged to ZIP codes for which population data were unavailable.

2. Next, the average annual rate in each Baton Rouge ZCTA was divided by the rate in East Baton Rouge Parish to derive a rate ratio for each ZCTA.

A rate ratio greater than 1.0 indicates that the rate of ED visits was higher in the ZCTA than the parish as a whole. Conversely, a rate ratio of less than 1.0 indicates that rate of ED visits was lower in the ZCTA than the parish as a whole.

3. To assess statistical significance, 95% confidence intervals (CI) were calculated for each rate ratio.

Confidence intervals whose range does not include the value of 1.0 indicate statistically significant differences in rates. If the 95% confidence interval range includes the value of 1.0, then the ratio is not considered statistically significant.

The percentage by which the rate is higher or lower in a ZCTA compared to the parish is calculated by subtracting 1.0 from the rate ratio, and multiplying the value by 100. For example, if the rate ratio is 1.85, then {(1.85 – 1.0)*100} = 85%. Thus, the rate of ED visits in the ZCTA would be 85% <u>higher</u> than the parish rate. If the rate ratio is less than 1.0, *e.g.* 0.85, then subtracting 1.0 from 0.85 yields -0.15, the negative sign indicating that the ZCTA rate is 15% <u>lower</u> than the parish rate.

All calculations were performed in R using the epitools package.

4. American Community Survey (ACS) data

Information regarding poverty and health insurance coverage among children was obtained from the 2015 release of the American Community Survey data (downloaded from American FactFinder). Each ACS release offers a 5-year estimate; thus, the 2015 ACS release contained an estimate for the percentage of children living in poverty and without health insurance for the period of 2011-2015.