



TEXAS
Health and Human
Services

**Texas Department of State
Health Services**

Assessment of the Occurrence of Birth Defects

**Ten Census Tracts of Interest Combined Compared to Harris County
2000-2016
March 3, 2020**

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Executive Summary

At the request of the Houston Health Department, the Birth Defects Epidemiology and Surveillance Branch of the Texas Department of State Health Services (DSHS) have examined the occurrence of birth defects in the city of Houston, Texas consisting of ten census tracts.

DSHS followed the Birth Defect Concerns: Investigation Protocol (last revised October 2007) developed to guide investigations as permitted under [Texas Health and Safety Code, Title 2, Subtitle D, Chapter 87, Subchapter C. Effective September 1, 1993.](#)

In accordance with these guidelines DSHS focused the analysis on the area of interest that encompasses ten-census tracts (2110-2117, 2119, 2124), that have groundwater contaminated with creosote. We examined several birth defects delivered from 2000-2016 that are considered common as well as consistently diagnosed, critical in severity and encompass several body systems.

Only gastroschisis was found to be initially elevated above that of Harris County. Gastroschisis is an abdominal wall defect in which the intestines are exposed outside of the body. Risk factors for gastroschisis include young maternal age and exposure to alcohol or smoking during pregnancy. After adjusting for maternal age, gastroschisis was statistically the same as Harris County. The apparent unadjusted prevalence of gastroschisis was explained by maternal age differences between the area of concern and Harris County. This investigation is closed as there is no evidence of statistically significantly elevated birth defects in the area of interest.

Background

On 12/19/2019, staff from the Houston Health Department requested an evaluation of birth defects for an area of interest in Houston, Texas.

This area includes an approximate 1-mile radius around a facility owned by Union Pacific Railroad and encompasses ten-census tracts (2110-2117, 2119, 2124). On- and off-site soils are contaminated with creosote at the facility, as is the groundwater underneath 100 or more properties north of it. After a telephone conference and subsequent communique between the Houston Health Department and the Department of State Health Services (DSHS), DSHS focused the analysis on the occurrence of 7 specific birth defects, as well as total birth defects for the census tracts of interest, compared to Harris County. The timeframe for evaluation was agreed upon as delivery years 2000-2016. The birth defects selected encompass several body systems, are common as well as consistently diagnosed and recorded (see Table 1) and are considered critical in severity.

Objectives

Determine whether the occurrence of any of the selected birth defects exhibit statistically significant elevations in occurrence in the area of interest, compared to Harris County as a whole, for the same timeframe.

Methods

Case Finding

The Texas Birth Defects Registry at the DSHS was used to find and verify infants with birth defects born to residents in the area and time-period of interest. When available, birth and fetal death certificates were used to determine the mother's place of residence at the time of delivery.

Case Definition

Cases were defined as any infant or fetus (live born, spontaneous fetal death, or terminated):

- who was diagnosed as a definite case of a birth defect of interest collected by the Registry;
- who was delivered between 1/1/2000-12/31/2016;
- whose mother was a resident of Harris County (as the comparison area) or a resident within the area of interest:
 - ▶ 2000 Census Tracts of 2110 through 2120
 - ▶ 2010 Census Tracts of 2110 through 2117, 2119, 2124

Calculations

For each birth defect examined, the prevalence at birth (a measure of occurrence) was calculated as the number of cases per 10,000 live births.

$$\frac{\text{\# cases of the defect category in area}}{\text{\# live births in area}} * 10,000 \text{ live births}$$

The cases were obtained from the Texas Birth Defects Registry and include only cases with a definite diagnosis for the birth defects selected for this analysis. The number of live births for the denominator was obtained from the DSHS Center for Health Statistics live birth records and met the same geographical and temporal criteria as the above cases.

To estimate the amount of random variation that may occur in a calculated prevalence, confidence intervals are given. A 95% confidence interval means that the true underlying prevalence will be found within the confidence interval 95% of the time. Small case numbers generate large confidence intervals due to the lower reliability of a small sample size. Statistical significance is determined by the comparison of the prevalences in the area of interest to Harris County. Two prevalences are considered to be statistically significantly different if the 95% confidence intervals do not overlap.

The Houston Health Department requested calculations of prevalence ratios and 95% confidence intervals. This ratio represents the crude (unadjusted) prevalence in the area of interest divided by the crude prevalence in the Harris County. If the confidence interval for the prevalence ratio excludes 1.0 for a particular birth defect, the prevalence is considered statistically different between the two areas.

Results

One birth defect (gastroschisis) was nearly twice as prevalent in the area of interest (crude prevalence ratio=1.98; 95% confidence interval=1.05-3.35). For all other birth defects examined, prevalence was statistically the same between the area of interest compared to Harris County for delivery years 2000-2016 (Table 1).

Gastroschisis is an abdominal wall defect in which the intestines are exposed outside of the body. A known risk factor is young maternal age¹. Table 2 shows that after adjusting for maternal age differences between the area of interest and Harris County. After indirect adjustment of maternal ages, the standardized morbidity ratio is 1.49 with the 95% confidence intervals including 1.0 (0.77-2.60). This means that that after accounting for maternal age, gastroschisis was no longer statistically elevated in the area of interest as compared to Harris County.

Discussion

We examined an area of interest that encompasses ten-census tracts (2110-2117, 2119, 2124), that have groundwater contaminated with creosote. We examined several birth defects delivered from 2000-2016 that are considered common as well as consistently diagnosed, critical in severity and encompass several body systems.

Only gastroschisis was found to be initially elevated above that of Harris County. Gastroschisis is an abdominal wall defect in which the intestines are exposed outside of the body. Risk factors for gastroschisis include young maternal age and exposure to alcohol or smoking during pregnancy.¹ African Americans are less likely to deliver a baby with gastroschisis than non-Hispanic whites and Hispanics. Additionally, women who are obese are

¹ <https://www.cdc.gov/ncbddd/birthdefects/gastroschisis.html>

less likely than normal-weight women to have an affected infant.² After adjusting for maternal age, gastroschisis was statistically the same as Harris County. The apparent unadjusted prevalence of gastroschisis was explained by maternal age differences between the area of concern and Harris County.

This investigation is closed as there is no evidence of statistically significantly elevated birth defects in the area of interest.

Limitations

This analysis was subject to certain limitations:

- Small case numbers generate large confidence intervals due to the lower reliability of a small sample size.
- The Registry data collection is dynamic, cases are continuously added, and results may change with subsequent analysis. This analysis is based on the statistically locked Annual Reporting database of 5/17/2019.

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² <https://www.ncbi.nlm.nih.gov/pmc/articles/PMC4605404/>

Table 1. Texas Birth Defects Investigation Number 2019.03: Selected Birth Defects Among 2000-2016 Deliveries to Residents of Census Tracts of Interest Using Harris County as the Referent Population

Birth Defect	Area of Interest*				Harris County				Crude Prevalence Ratio (cPR) for Area of Interest Using Harris County as Referent				
	Cases	Births	Prevalence†	95% Confidence Interval for Prevalence	Cases	Births	Prevalence†	95% Confidence Interval for Prevalence	cPR†	95% Confidence Interval for cPR			
Central Nervous System													
Spina bifida without anencephaly	6	14,747	4.07	1.49 - 8.86	390	1,165,451	3.35	3.01 - 3.68	1.22	0.48	-	2.49	
Cardiac and Circulatory													
Pulmonary valve atresia	2	14,747	1.36	0.16 - 4.90	143	1,165,451	1.23	1.03 - 1.43	1.11	0.18	-	3.47	
Hypoplastic left heart syndrome	3	14,747	2.03	0.42 - 5.95	213	1,165,451	1.83	1.58 - 2.07	1.11	0.28	-	2.92	
Oral Clefts													
Cleft palate alone (without cleft lip)	5	14,747	3.39	1.10 - 7.91	564	1,165,451	4.84	4.44 - 5.24	0.70	0.25	-	1.51	
Cleft lip with or without cleft palate	16	14,747	10.85	6.20 - 17.62	1,028	1,165,451	8.82	8.28 - 9.36	1.23	0.72	-	1.95	
Musculoskeletal													
Gastroschisis	12	14,747	8.14	4.20 - 14.21	485	1,165,451	4.16	3.79 - 4.53	1.98	1.05	-	3.35	
Chromosomal													
Trisomy 21 (Down syndrome)	26	14,747	17.63	11.52 - 25.83	1,425	1,165,451	12.23	11.59 - 12.86	1.45	0.96	-	2.09	
Infants and fetuses with any monitored birth defect													
	595	14,747	403.47	371.05 - 435.89	48,455	1,165,451	415.76	412.06 - 419.46	0.97	0.89	-	1.05	

† cases per 10,000 live births

*2000 Census Tracts of Interest: 2110-2120 and 2010 Census Tracts of Interest: 2110-2117, 2119, 2124

Table 2. Texas Birth Defects Investigation Number 2019.03: Crude and Unadjusted Gastroschisis Rates for Residents of Census Tracts of Interest Using Harris County as Referent Population, 2000-2016

Birth Defect	Area of Interest*				Harris County				Crude Prevalence Ratio (cPR) for Area of Interest Using Harris County as Referent				Indirect Standardization Morbidity Ratio (SMR) for Area of Interest by Maternal Age Using Harris County as Referent				
	Cases	Births	Prevalence†	95% Confidence Interval for Prevalence	Cases	Births	Prevalence†	95% Confidence Interval for Prevalence	cPR†	95% Confidence Interval for cPR			SMR#	95% Confidence Interval for SMR			
Musculoskeletal																	
Gastroschisis	12	14,747	8.14	4.20 - 14.21	485	1,165,451	4.16	3.79 - 4.53	1.98	1.05	-	3.35	1.49	0.77	-	2.60	

† cases per 10,000 live births

*2000 Census Tracts of Interest: 2110-2120 and 2010 Census Tracts of Interest: 2110-2117, 2119, 2124

#SMR-Standardized Morbidity Ratio