Methods

Indicator

S1. Birth Defects in Texas, 1999-2007.

Summary

Since 1994, the Texas Birth Defects Epidemiology and Surveillance Branch has maintained the Texas Birth Defects Registry, a population-based birth defects surveillance system. The Texas Birth Defects Registry began monitoring the Houston/Galveston and South Texas areas in 1995 and gradually expanded so that beginning with births in 1999, it covered the entire state. Since 1999, the registry has monitored all births in Texas (approximately 380,000 each year) and has identified cases of birth defects using multiple sources of information. Indicator S1 uses Texas Birth Defects Registry data to calculate the rates of different types of birth defects in Texas by the structural category and three-year period. Table S1a gives the rates of different types of birth defects in Texas by the structural category and mother's race/ethnicity, for the period 2005-2007.

Data Summary

Indicator	S1. Birth defects in Texas, 1999-2007.		
Time Period	1999-2007		
Data	Texas Birth Defects Registry		
Years (1999-2007)	1999-2001	2002-2004	2005-2007
Live births	1,077,574	1,131,184	1,192,367
Missing or unknown race/ethnicity (%)	1,728 (0.2%)	1,963 (0.2%)	1,120 (0.1%)

Overview of Data Files

Summary data were compiled by the Texas Department of State Health Services. These data gave the numbers of cases, total numbers of live births, and rates of birth defects per 10,000 live births for each combination of structural category, mother's race/ethnicity (All, White non-Hispanic, Black non-Hispanic, Hispanic, and "Other non-Hispanic"), and time period. The number of cases includes birth defects occurring in a fetal death or pregnancy termination as well as birth defects occurring in live births. Birth defects identified in the first twelve months after the birth are included.

Calculation of Indicator

For each structural category and three-year period, the rate of birth defects was calculated as the number of birth defects divided by the total number of live births:

Rate of birth defects per 10,000 live births =
Number of birth defects in structural category and time period / Number of live births in time period $\times$ 10000

Questions and Comments

Questions regarding these methods, and suggestions to improve the description of the methods, are welcome. Please use the "Contact Us" link at the bottom of any page in the America's Children and the Environment website.

Statistical Comparisons

Statistical analyses of the rates of birth defects in Texas were used to determine whether the differences between rates for different race/ethnicity groups were statistically significant. Using a Poisson regression model adjusted for dispersion, the number of cases for each race/ethnicity group was assumed to have a Poisson distribution with a mean equal to the number of live births of that demographic subgroup multiplied by the rate, and a variance equal to the mean multiplied by a dispersion parameter. The logarithm of the rate was assumed to be the sum of explanatory terms for the mother's race/ethnicity. Using this model, the difference in the percentage between different race/ethnicity groups is statistically significant if the difference between the corresponding sums of explanatory terms is statistically significantly different from zero. The p-values for each comparison between the rates of particular types of birth defects in Texas from 2005 to 2007 for different race/ethnicity groups are shown in Table 1. A p-value at or below 0.05 implies that the difference is statistically significant at the 5% significance level. No adjustment is made for multiple comparisons.

For these statistical analyses we used five race/ethnicity groups: White non-Hispanic; Black non-Hispanic; Hispanic; "Other non-Hispanic" and; Unknown. Data on race/ethnicity of the mother was missing or unknown for a small percentage of births (0.1-0.2%). The numbers and cases in this category were calculated by subtracting the totals for the other four race/ethnicity groups from the totals for all births. Statistical comparisons between the first four race/ethnicity groups and Unknown race/ethnicity are not shown.

Comparisons of the trends in the rates of birth defects in Texas from 1999 to 2007 are shown in Table 2. For each comparison, we present unadjusted and adjusted analyses. The unadjusted analyses directly compare the rates for different three-year periods. For the unadjusted comparisons, the only explanatory variables in the Poisson regression model are the intercept and a term for the middle year of the three-year period considered as a continuous variable. The adjusted analyses add race/ethnicity terms to the statistical model and compare the rates between different three-year periods after accounting for any differences in the race/ethnicity distributions between the three-year periods. For example, if births to White non-Hispanic mothers tend to have much higher probabilities of a birth defect in a given structural category, compared with Black non-Hispanics, and if the number of births to White non-Hispanic mothers is increasing much more rapidly than the number of births to Black non-Hispanic mothers, then the unadjusted trend would be significant but the adjusted trend (taking into account race/ethnicity) would not be significant.

For more details on these statistical analyses, see the description of the similar methods used for the National Cancer Institute, Surveillance, Epidemiology, and End Results (SEER) Program childhood cancer incidence indicator in the memorandum by Cohen (2011).[1]

Table 1. Statistical significance tests comparing the rates of birth defects in Texas between pairs of race/ethnicity groups for the years 2005 to 2007.

Structural Category	First race/ethnicity group	Second race/ethnicity group	P-VALUE
Musculoskeletal	White non-Hispanic	Black non-Hispanic	0.039
Musculoskeletal	White non-Hispanic	Hispanic	< 0.001
Musculoskeletal	White non-Hispanic	Other non-Hispanic	< 0.001
Musculoskeletal	Black non-Hispanic	Hispanic	0.780
Musculoskeletal	Black non-Hispanic	Other non-Hispanic	0.002
Musculoskeletal	Hispanic	Other non-Hispanic	0.001
Cardiac and Circulatory	White non-Hispanic	Black non-Hispanic	0.369
Cardiac and Circulatory	White non-Hispanic	Hispanic	< 0.001
Cardiac and Circulatory	White non-Hispanic	Other non-Hispanic	< 0.001
Cardiac and Circulatory	Black non-Hispanic	Hispanic	< 0.001
Cardiac and Circulatory	Black non-Hispanic	Other non-Hispanic	< 0.001
Cardiac and Circulatory	Hispanic	Other non-Hispanic	< 0.001
Genitourinary	White non-Hispanic	Black non-Hispanic	< 0.001
Genitourinary	White non-Hispanic	Hispanic	< 0.001
Genitourinary	White non-Hispanic	Other non-Hispanic	0.028
Genitourinary	Black non-Hispanic	Hispanic	0.084
Genitourinary	Black non-Hispanic	Other non-Hispanic	0.371
Genitourinary	Hispanic	Other non-Hispanic	0.034
Eye and Ear	White non-Hispanic	Black non-Hispanic	< 0.001
Eye and Ear	White non-Hispanic	Hispanic	< 0.001
Eye and Ear	White non-Hispanic	Other non-Hispanic	0.033
Eye and Ear	Black non-Hispanic	Hispanic	< 0.001
Eye and Ear	Black non-Hispanic	Other non-Hispanic	0.243
Eye and Ear	Hispanic	Other non-Hispanic	< 0.001
Gastrointestinal	White non-Hispanic	Black non-Hispanic	< 0.001
Gastrointestinal	White non-Hispanic	Hispanic	0.988
Gastrointestinal	White non-Hispanic	Other non-Hispanic	< 0.001
Gastrointestinal	Black non-Hispanic	Hispanic	< 0.001
Gastrointestinal	Black non-Hispanic	Other non-Hispanic	0.061
Gastrointestinal	Hispanic	Other non-Hispanic	< 0.001
Central Nervous System	White non-Hispanic	Black non-Hispanic	0.373
Central Nervous System	White non-Hispanic	Hispanic	0.074
Central Nervous System	White non-Hispanic	Other non-Hispanic	0.046
Central Nervous System	Black non-Hispanic	Hispanic	0.033
Central Nervous System	Black non-Hispanic	Other non-Hispanic	0.019

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[1] Cohen, J. 2011. *Selected statistical methods for testing for trends and comparing years or demographic groups in other ACE health-based indicators.* Memorandum submitted to Dan Axelrad, EPA, 3 October, 2011.

Structural Category	First race/ethnicity group	Second race/ethnicity group	P-VALUE
Central Nervous System	Hispanic	Other non-Hispanic	0.200
Respiratory	White non-Hispanic	Black non-Hispanic	0.873
Respiratory	White non-Hispanic	Hispanic	< 0.001
Respiratory	White non-Hispanic	Other non-Hispanic	0.245
Respiratory	Black non-Hispanic	Hispanic	0.005
Respiratory	Black non-Hispanic	Other non-Hispanic	0.250
Respiratory	Hispanic	Other non-Hispanic	0.002
Chromosomal	White non-Hispanic	Black non-Hispanic	0.015
Chromosomal	White non-Hispanic	Hispanic	0.074
Chromosomal	White non-Hispanic	Other non-Hispanic	0.017
Chromosomal	Black non-Hispanic	Hispanic	< 0.001
Chromosomal	Black non-Hispanic	Other non-Hispanic	0.457
Chromosomal	Hispanic	Other non-Hispanic	0.002
Oral Cleft	White non-Hispanic	Black non-Hispanic	< 0.001
Oral Cleft	White non-Hispanic	Hispanic	0.499
Oral Cleft	White non-Hispanic	Other non-Hispanic	0.244
Oral Cleft	Black non-Hispanic	Hispanic	< 0.001
Oral Cleft	Black non-Hispanic	Other non-Hispanic	0.015
Oral Cleft	Hispanic	Other non-Hispanic	0.368

Table 2. Statistical significance tests for the trends of birth defects in Texas, from 1999-2007.

Structural Category	From	To	Against	P-Values	
				Unadjusted	Adjusted for race/ethnicity
Musculoskeletal	1999	2007	year	< 0.001	< 0.001
Cardiac and Circulatory	1999	2007	year	< 0.001	< 0.001
Genitourinary	1999	2007	year	0.003	< 0.001
Eye and Ear	1999	2007	year	< 0.001	< 0.001
Gastrointestinal	1999	2007	year	0.156	0.008
Central Nervous System	1999	2007	year	< 0.001	< 0.001
Respiratory	1999	2007	year	0.303	0.174
Chromosomal	1999	2007	year	0.628	0.615
Oral Cleft	1999	2007	year	0.948	0.889