

# The Texas Birth Defects MONITOR

A Semi-Annual Data  
and Research Update



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## Milestone: Texas Birth Defects Epidemiology and Surveillance Branch Recognizes 20 Years

The Texas Birth Defects Registry was established by the Texas State Legislature when the Texas Birth Defects Act was passed in 1993. The mission of the program has been to identify and describe the patterns of birth defects in Texas, and to collaborate with others in research, prevention, and referral to services. The legislation was in response to a cluster of anencephaly cases in The Woodlands (near Houston) and in Brownsville (bordering Mexico), as well as other clusters of birth defects reported across the state. A number of interested parties were involved in developing and supporting the legislation. This is a good opportunity to remember some of these individuals:

- David and Anne Andis, The Woodlands
- Dr. Carmen Rocco/Ms. Paula Gomez, Brownsville
- Dr. Dennis Perrotta/Dr. David Smith, DSHS
- Helen Botsonis/Melanie Lockhart, March of Dimes
- Dr. John Harris, California Birth Defects Monitoring
- Elected Texas officials (SB 89 and HB 1801)
  - Representative Kevin Brady (R-The Woodlands)
  - Representative Hugo Berlanga (D-Corpus Christi)
  - Senator Carlos Truan (D-Corpus Christi)
  - Senator Judith Zaffarini (D-Laredo)
  - Senator Jeff Wentworth (R-San Antonio)
  - Senator Eddie Lucio (D-Brownsville)
  - Senator Peggy Rosson (D-El Paso)
  - Governor Ann Richards

The Texas Birth Defects Epidemiology and Surveillance Branch opened on March 21, 1994, and after a pilot, the Registry became statewide in 1999. The CDC-funded Texas Birth Defects Research Center was established in 1996 to foster collaborative, population-based epidemiologic and genetic research in Texas based in part from information gathered on case infants in the Registry. One such effort was participation in the design and conduction of the multi-center National Birth Defects Prevention Study, the largest epidemiologic study conducted on birth defects in the U.S. Since then, scientists from the Branch and the Texas Center have published hundreds of peer-reviewed journal articles pertaining to the patterns, causes, and survival of birth defects.

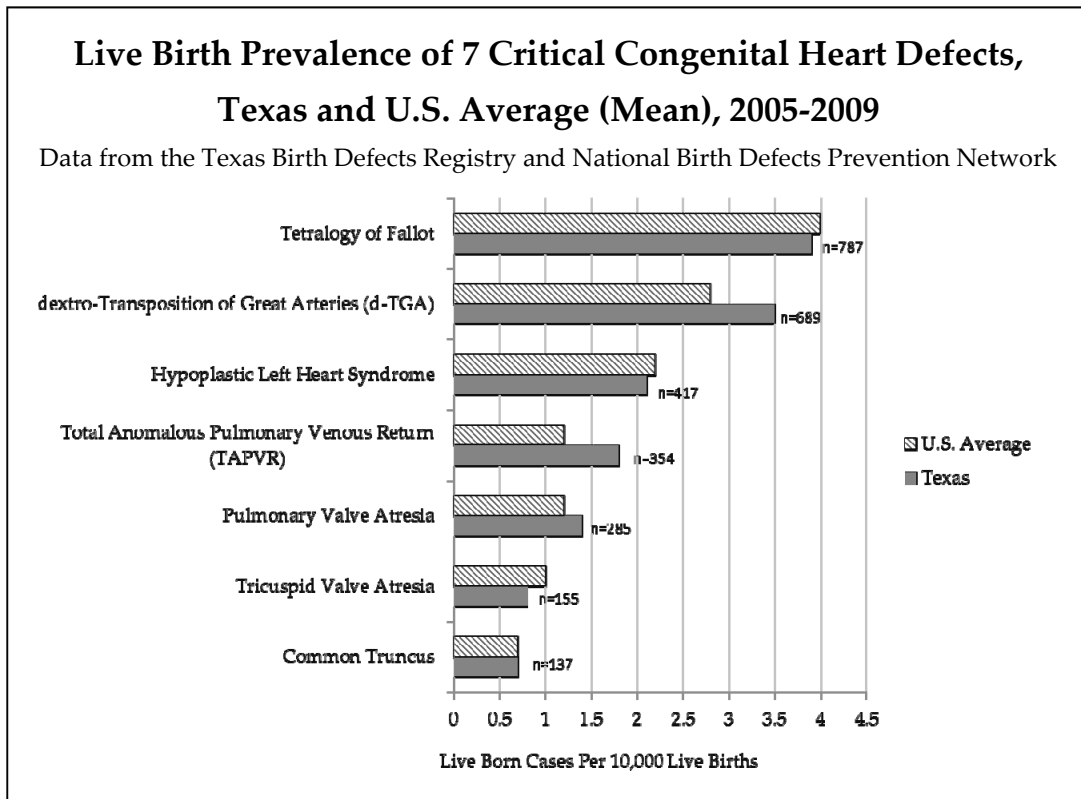
# Legislation from the 83rd Session: Required Screening for Critical Congenital Heart Disease

Critical congenital heart disease (CCHD) is one of the leading causes of death in infants less than one year old. Pulse oximetry screening is a simple, inexpensive test that can detect most cases of seven specific CCHDs in infants. These seven heart defects include hypoplastic left heart syndrome, pulmonary atresia (with intact atrial septum), tetralogy of Fallot, total anomalous pulmonary venous return, transposition of the great arteries, tricuspid atresia, and truncus arteriosus.

In September 2011, the U.S. Secretary of Health and Human Services approved the Secretary’s Advisory Committee on Heritable Disorders in Newborns and Children recommendation to add CCHD screening using pulse oximetry to the Recommended Uniform Screening Panel (RUSP). Texas House Bill 740, legislation requiring CCHD screening for all newborns in Texas, was signed into law in June 2013.

According to the Texas Birth Defects Registry, from 2005-2009, 2,582 babies were born with at least one CCHD. About 20% of CCHDs are not prenatally diagnosed or diagnosed prior to discharge from the hospital nursery. Using this data, it is expected that about 100 infants born in Texas can potentially benefit from pulse oximetry screening each year. Screening soon after birth can help identify newborns with CCHDs early on, allowing them to receive prompt treatment that may help prevent early death or disability.

Mai, Cara T., et al. "Selected birth defects data from population-based birth defects surveillance programs in the United States, 2005–2009: Featuring critical congenital heart defects targeted for pulse oximetry screening." *Birth Defects Research Part A: Clinical and Molecular Teratology* 94.12 (2012): 970-983.



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## 2012 Birth Defects Research Symposium: Bridging the Gap From Bench to Bedside

On November 15, 2012, Texas health care providers, public health practitioners, researchers, and community advocates met in Dallas at the 8th Biennial Texas Birth Defects Research Symposium to discuss recent findings in epidemiology, medicine, and genetics. Highlights included a focus on heart defects, including a panel on pulse oximetry screening for critical congenital heart defects, as well as a session on risk factors for birth defects that included occupational environmental exposures, obesity, and diabetes. The goal of the 2012 Symposium was to enable conference participants' use of medical research to improve the health of populations through changes in behaviors, policies, and treatments, and apply birth defects research results to bridge the gap from bench to bedside.

The 2012 Symposium was sponsored by the Birth Defects Epidemiology and Surveillance Branch, the CDC-funded Texas Center for Birth Defects Research and Prevention, and the Title V Office, all housed at the Texas Department of State Health Services, as well as The Children's Hospital Association of Texas, March of Dimes, and Medical City Children's Hospital. Continuing education units were provided for physicians and other health care providers. We thank all of the moderators, speakers, participants, and sponsors for making the 2012 Texas Birth Defects Research Symposium a success.

### 9th Biennial Birth Defects Symposium to be Held in 2014

The Texas Center for Birth Defects Research and Prevention will host the 9th Biennial Birth Defects Research Symposium in the fall of 2014. The location, date, registration information, and additional details will be announced in the spring. For more information, contact Ms. Morgan Wilson at [morgan.wilson@dshs.state.tx.us](mailto:morgan.wilson@dshs.state.tx.us) or at 512-776-2814.

## Body Mass Index and Birth Defects

Texas ranks 12th nationally in the proportion of adult residents who are obese; approximately 66.7% of Texans are overweight or obese. Dozens of studies have reported associations of obesity with birth defects; however, small sample sizes limited the scope of birth defects investigated. This study evaluated the association between maternal Body Mass Index (BMI) and birth defects as well as the effect modification by maternal diabetes in a population-based registry covering ~1.6 million births delivered from 2005 to 2008.

Texas Birth Defects Registry cases were linked to their vital records. Maternal BMI was calculated by using the vital record's self-reported pre-pregnancy weight and height then categorized as follows: underweight (BMI <18.5), normal weight (BMI 18.5–24.9), overweight (BMI 25–29.9), class I obese (BMI 30–34.9), class II obese (BMI 35–39.9) and class III obese (BMI ≥40). Forty-nine birth defect prevalence ratios were adjusted for maternal age and race/ethnicity and stratified by both maternal BMI categories and diabetes status. Normal weight by diabetes status was used as the referent group.

For non-diabetic mothers, an association was found between class II and III obesity and an increased risk for having offspring with a birth defect. Among non-diabetic, obese mothers, there was an increased risk for giving birth to a child with spina bifida, tetralogy of Fallot, cleft lip with or without cleft palate, hypospadias, and epispadias. There was increasing risk with increasing BMI for atrial septal defects, ventricular septal defects, pulmonary valve atresia/stenosis, patent ductus arteriosus, and clubfoot. The presence of diabetes strengthened the association of BMI with ventricular septal defects, pulmonary valve atresia/stenosis, and patent ductus arteriosus. Gastroschisis prevalence, however, decreased with increasing BMI. Compared to normal weight mothers, class I and III obese mothers had a 65% decreased prevalence of gastroschisis.

This study reports a significant association between obesity and a number of birth defects. Maternal diabetes further increased risk for certain heart defects in obese mothers. Preconception counseling should emphasize the

importance of maintaining a normal weight and controlling diabetes.

*Marengo L., Farag NH, and Canfield M, Body Mass Index and Birth Defects: Texas, 2005-2008. Matern Child Health J, 2013 Jan 31. [Epub ahead of print].*

## Mayo Clinic Holds First Clinical Trial in the U.S. Using Stem Cells to Treat Congenital Heart Disease

Mayo Clinic will conduct a clinical trial using stem cells from umbilical cord blood to treat infants with hypoplastic left heart syndrome (HLHS). This clinical trial is the first in the U.S. to use stem cells to treat pediatric congenital heart disease. HLHS is a birth defect in which the left ventricle of the infant's heart does not completely develop, affecting normal blood flow through the heart and the rest of the body. Each year in the U.S., about 960 babies are born with the condition.

Currently, treatment for HLHS involves three surgeries aimed at increasing blood flow in and out of the heart. In the first surgery, the infant's heart is reconstructed so that the right ventricle can do the work of both the right and left ventricle. The second and third surgeries involve rerouting blood flow from the body to the lungs. In this study, stem cells will be collected at birth from the umbilical cords of newborns with HLHS and frozen for preservation. During the second surgery, these stem cells will be injected into the heart. Researchers are hoping the injection of the stem cells will lead to a larger, stronger heart muscle.



# Maternal Occupational Exposure to Polycyclic Aromatic Hydrocarbons and Birth Defects

Polycyclic Aromatic Hydrocarbons (PAHs) are compounds containing multiple carbon rings, formed from the incomplete burning of coal or tobacco. Common exposure occurs through tobacco smoke, air pollution, eating charbroiled food, and occupations that involve burning substances such as using coke ovens, foundries, coal tar use, and asphalt manufacturing and use.

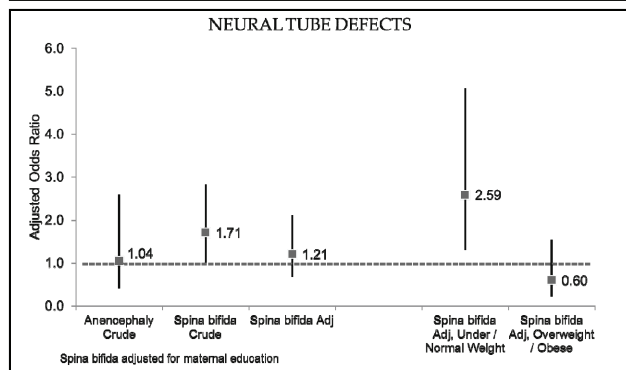
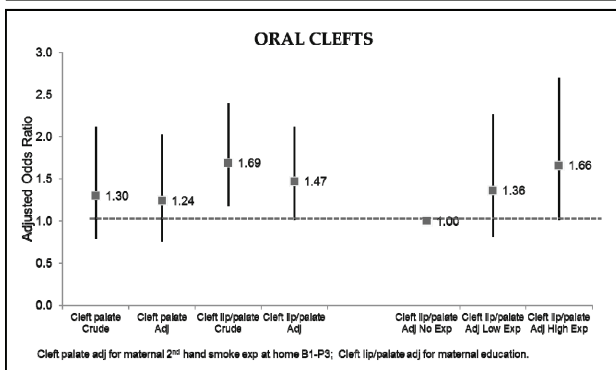
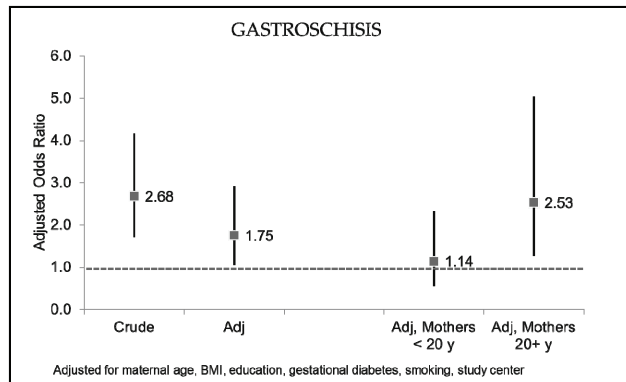
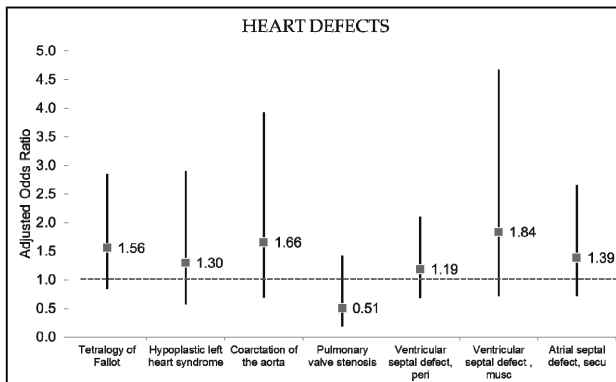
Several recent analyses led by investigators in the Texas Center for Birth Defects Research and Prevention looked at the association between maternal occupational exposure to PAHs and birth defects in their offspring, specifically heart defects, oral clefts, gastroschisis, and neural tube defects. National Birth Defects Prevention Study data from 1997-2002 were used. Occupational exposure to PAHs was assessed by the National Institute for Occupational Safety and Health based on NBDPS questions regarding job title, place worked, main duties, and machines used. The jobs most commonly reported with PAHs exposure were food preparation and serving related, and sales and related jobs.

No association was found between maternal occupational PAH exposure and cleft palate alone, anencephaly, or heart defects. Occupational PAH exposure was associat-

ed with cleft lip with or without cleft palate. Furthermore, the odds increased with higher estimated levels of exposure. An association was found for gastroschisis among all mothers. Interestingly, this association was evident mainly in mothers over twenty years of age. The investigators also found different associations among study subpopulations and spina bifida. The overall association of occupational PAH exposure was not statistically significant among all mothers or among overweight or obese mothers, but there was an association among mothers who were under or normal weight.

The study suggests that there is an association between maternal occupational exposure to PAHs and some birth defects, and that certain groups of mothers may be more susceptible. PAHs may be associated with neural tube defects, especially spina bifida in normal or underweight women, and may be associated with oral clefts. PAHs may also be associated with gastroschisis, particularly in women over 20 years of age. Further studies are needed to replicate the findings in oral clefts and to investigate the mechanisms of increased susceptibility in certain population groups.

(continued on page 7)



*(Polycyclic Aromatic Hydrocarbons and Birth Defects continued)*

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## End of Data Collection for National Birth Defects Prevention Study

Data collection for the National Birth Defects Prevention Study (NBDPS) has come to an end after 18 years. The study has been collecting data since 1997 and is currently the largest study of its kind. Over 200 studies have been published to date. Researchers have looked at obesity, medication use during pregnancy, folic acid use, survival patterns of heart defects, birth defects and pre-maturity, and many other factors. Some recent, notable NBDPS studies\* have found:

- Obese mothers have about twice the risk of having a baby with spina bifida, as compared to mothers who are of healthy weight; and overweight or obese mothers may have a slightly higher risk for giving birth to a baby with a congenital heart defect than mothers who are a healthy weight. (Waller DK, Shaw GM, Rasmussen SA, Hobbs CA, Canfield MA, Siega-Riz AM, Gallaway MS, Correa A. Prepregnancy obesity as a risk factor for structural birth defects. *Archives of Pediatrics & Adolescent Medicine*. 2007; 161(8):745-750.)
- No association between the use of selective serotonin-reuptake inhibitors (SSRIs) during pregnancy and risk for most birth defects. However, SSRIs may be linked to a slight increase in anencephaly, craniosynostosis, and omphalocele and further studies are needed to confirm this association. (Alwan S, Reefhuis J, Rasmussen SA, Olney RS, Friedman JM. Use of selective serotonin-reuptake inhibitors in pregnancy and the risk of birth defects. *New England Journal of Medicine*. 2007; 356(26):2684-92.)
- A lowered risk for having a baby with a neural tube defect or cleft lip in women with a healthier diet. (Carmichael SL, Yang W, Feldkamp ML, Munger RG, Siega-Riz AM, Botto LD, Shaw G. Reduced Risks of Neural Tube Defects and Orofacial Clefts With Higher Diet Quality. *Archives of Pediatrics and Adolescent Medicine*. 2012; 166(2):121-126.)
- Babies born to diabetic mothers who did not take a folic acid- containing supplement may have an increased risk for birth defects, as compared to babies born to mothers who took the folic acid-containing supplement prior to and during pregnancy. (Correa AF, Gilboa SM, Botto LD, Moore CA, Hobbs CA, Cleves MA, Riehle-Colarusso TJ, Waller DK, Reece EA. Lack of periconceptual vitamins or supplements that contain folic acid and diabetes mellitus-associated birth defects. *American Journal of Obstetrics and Gynecology*. 2012; 206(3):218.e1-218.e.13.)
- During the time period studied, after the U.S. began fortifying foods with folic acid, no link was found between neural tube defect occurrence and maternal folic acid intake via vitamins /supplements or dietary folate intake. One possible explanation is that folic acid fortification of the U.S. food supply may have reduced the occurrence of neural tube defects in the time period after fortification. (Mosley BS, Cleves MA, Siega-Riz AM, Shaw GM, Canfield MA, Waller DK, Werler MM, Hobbs CA. Neural tube defects and maternal folate intake among pregnancies conceived after folic acid fortification in the United States. *American Journal of Epidemiology*. 2009; 169(1):9-17.)
- An increased risk for some birth defects with certain paternal occupations. Further studies are needed to confirm the associations due to small sample size. (Desrosiers, Tania A., et al. Paternal occupation and birth defects: findings from the National Birth Defects Prevention Study. *Occupational and environmental medicine* 69.8 (2012): 534-542.)

Although the NBDPS has officially ended, researchers will continue to analyze and publish results for years to come because the study has provided such a rich source of data.

\*courtesy of NBDPS

The Monitor is published twice a year by the Birth Defects Epidemiology and Surveillance Branch, Texas Department of State Health Services:

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## 2014 Calendar

- January: National Birth Defects Prevention Month
- January 5-11: National Folic Acid Awareness Week
- January 25-28: Association of Maternal and Child Health Programs (AMCHP) Annual Conference, Washington, DC
- February: American Heart Month
- February 3-8: Society for Maternal-Fetal Medicine Annual Meeting
- February 20-23: NEO Conference 2014: The Conference for Neonatology, Orlando, FL
- February 7-14: Congenital Heart Defect Awareness Week
- February 15-18: 14th Annual International Symposium on Congenital Heart Disease, St. Petersburg, Florida
- Spring 2014: March of Dimes March for Babies (check with MOD for specific dates and locations)
- March: National Nutrition Month
- March 9: Parents of Preemies Day
- March 19-21: Society for Public Health Education Annual Meeting, "Discovery 2014: New Health Education Strategies, Connections & Ideas"
- March 29-April 1: National Healthy Start Association Annual Spring Conference, Washington, DC
- April: National Autism Awareness Month
- April 1-7: National Public Health Week, American Public Health
- April 28-May 1: National Family Planning & Reproductive Health Association Conference, Alexandria, VA
- June 28-July 2: 54th Annual Meeting of the Teratology Society, Bellevue, WA