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Tennessee Birth Defects 2004-2008

3.5 35
CA
PW 702
FOV 137
FPS 9
GRAY 6
PERS 3
EDGE 1
COMP 6

NAME
ID



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Executive Summary

This is a statewide population-based report produced by the Tennessee Birth Defects Registry (TBDR). It details the birth prevalence of 45 major birth defects for Tennessee infants born in the years 2004 through 2008. The report contains sections detailing the overall statewide birth defects counts and rates for each of the 45 birth defect diagnoses tracked by the TBDR. Additional statewide counts and rates are presented broken down by infant sex, race/ethnicity, and perinatal region. Other tabled risk factors are maternal age, education, smoking, and diabetes (types I and II).

Overall, 14,301 infants were born with a birth defect, resulting in an overall case rate of 342.3 per 10,000 live births or 3.4 percent for the five-year period 2004 through 2008. However, 2,984 newborns (21.3%) were affected by multiple birth defects with 1,017 having 3 or more birth defects. This resulted in an overall birth defects rate of 451.6 per 10,000 live births or 4.5% for the five-year period.

Birth defects were the leading cause of infant mortality in Tennessee in 2008, accounting for 146 infant deaths, which was 21.3% of all infant deaths that year.¹ In addition to infant deaths and the obvious pain and disability associated with birth defects, birth defects are expensive. The direct estimated lifetime cost of the 182 cases of the neural tube defect, spina bifida, documented in this report is \$101,920,000 in 2003 dollars.² If all potential child-bearing women were to take a daily multivitamin with 400 micrograms of folic acid, the majority of these cases would likely not have occurred.^{3,4} Likewise for many of the 57 anencephaly cases (i.e., babies born with little or no brain) that are documented in this report and are among the 146 infants that died in 2008.

Birth defects rates and case rates have both increased each of the five years 2004 to 2008 with birth defects rates of 388.6 and 520.4 per 10,000 live births in 2004 and 2008, respectively and case rates of 298.7 and 380.0 per 10,000 live births. The reason for the increase from 2004 to 2008 remains unexplained. It may represent a true increase in birth defects rates related to familial, maternal or environmental risk factors, or

improved birth defects surveillance. Or it may represent changes in clinical practice and the coding of birth defects diagnoses in hospitals. It could also be a combination of all these factors.

Birth defects were more common among whites, males and babies born to mothers aged 35 and older, but this is not the case for all birth defects. Birth defect rates vary by perinatal region with the highest rates in the Northeast and East perinatal regions and lower rates in the Southeast, Middle and West regions. The TBDR is working to evaluate factors that may affect regional differences as well as the racial/ethnic and gender differences in birth defects rates.

Birth defects were also more common among mothers who smoke cigarettes and who have only a high school or lesser education. Of the potential risk factors evaluated in this report, maternal diabetes (type I or type II) was the most potent. Mothers with type I or type II diabetes were 2.6 times more likely to have a baby born with a birth defect than a non-diabetic mother. Controlling maternal blood sugar levels before and during pregnancy is both achievable and essential to preventing diabetes-related birth defects in Tennessee.

Birth Defects Overview

Birth defects occur in the first three months of pregnancy with most originating in the first six weeks and can affect almost any part of the body. Nationally nearly one out of every 33 babies is born with a birth defect. Some defects are obvious at birth while others may not be apparent until adulthood. Some defects can result in life-long debilitating illnesses or death, whereas surgery and medical interventions may correct others but not without cost. Hospital costs alone for birth defects totaled \$2.6 billion in the United States in 2004, with birth defect admissions being on average more than twice as costly as other admissions (Russo and Elixhauser, 2007).⁵

Unfortunately, the underlying causes of individual birth defects are largely unknown; nearly 70% of birth defects have no known cause. This leaves many questions about the causes and patterns of birth defects unanswered. Information obtained through monitoring diseases and the surveillance of birth defects can assist with the task of addressing these questions. The primary use of data collected by TBDR is to observe patterns and detect changes in the patterns of leading birth defects. This data provides the basis for research studies into the causes of birth defects and to help develop and evaluate birth defects prevention programs. In 2008 birth defects were the leading cause of infant mortality in Tennessee, accounting for more than one in five infant deaths and causing 146 infants to die during the first year of life.¹

Tennessee Birth Defects Registry

The Tennessee Birth Defects Registry (TBDR) was established in law (TCA 68-5-506) by the Tennessee State Legislature in June 2000. The TBDR was established with the mission of: 1) providing annual information on birth defects prevalence and trends; 2) to provide information on the possible association of environmental hazards and other potential causes of birth defects; 3) to evaluate current birth defects prevention initiatives, providing guidance and strategies for improving those initiatives; and 4) to provide families of children with birth defects information on public services available to children with birth defects. Initially, the TBDR was a pilot program conducting birth

defects surveillance in Northeast Tennessee. Since 2003 the program has expanded to provide population-based birth defects surveillance for the entire state of Tennessee. The TBDR was established in order to 1) provide information on birth defect prevalence and trends; 2) to provide information on possible association of environmental hazards, behavioral risk factors and other potential causes of birth defects; 3) to evaluate current birth defects prevention initiatives, providing guidance and strategies for improving those initiatives; and 4) to provide families of children with birth defects information on public services available to children with birth defects.

Birth Defect Definition

This report details the birth prevalence of 45 major birth defects for Tennessee infants who were born to resident mothers during the period 2004 through 2008. The tracking of these birth defects is recommended by the Centers of Disease Control and Prevention (CDC) and the National Birth Defects Prevention Network (NBDPN). These birth defects are classified as major birth defects because they require medical or surgical treatment, have serious adverse effects on health and development, or have a significant cosmetic impact. Additionally, the 45 birth defects can be organized within eight diagnostic categories plus fetal alcohol syndrome:

Central Nervous System

Eye and Ear

Cardiovascular

Orofacial

Gastrointestinal

Genitourinary

Musculoskeletal

Chromosomal

Birth defect counts include: 1) live-born infants diagnosed with a birth defect during the first year of life; and 2) diagnosed fetal-death cases that were at least 500 grams in weight or in the absence of weight at least 22 weeks gestation. Effective July 1, 2010 the Department of Health's fetal death definition was changed to include cases of at

least 350 grams or 20 weeks completed gestation. But the fetal death cases included in this report were not covered by the new definition. The denominators for calculating birth defects rates include only live births and are reported per 10,000 live births.

Data Sources

The primary data sources in compiling this report are the Hospital Discharge Data System (HDDS) and the Birth, Death, and Fetal Death Statistical Data Systems, which are compiled, processed and stored by the Office of Vital Records and the Division of Health Statistics in the Office of Policy, Planning, and Assessment (PPA). The Tennessee Birth Defects Registry (TBDR), which is responsible for production of this report, is housed in the Research Division of PPA. The HDDS contains admission-level records for all patients treated in Tennessee licensed hospitals and their outpatient treatment and rehabilitation centers. The TBDR uses these records to track the 45 major birth defects. Infants' HDDS records containing diagnostic codes corresponding to the tracked birth defects are extracted, compiled and linked with their birth certificate records. The linkages provide validity checks and add information such as maternal risk factors, demographics and street-level geography that are not available in the HDDS. Together these data systems provide statewide population-based birth defects surveillance for Tennessee.

Data Limitations

The use of administrative data systems such as these for birth defects surveillance has limitations. The diagnostic codes used in the HDDS can contain minor variants of birth defects that should not be coded as major birth defects. Thus the coding system, The International Classification of Diseases Revision 9 Clinical Modification (ICD-9-CM), prevents distinguishing these differences for certain birth defects. As noted in previous reports, this has the effect of elevating rates for some of the more common birth defects, such as atrial septal defects, other heart defects and hypospadias, a common genitourinary defect. Less systematically, there are simple coding errors that result in non-cases being miscoded as having a birth defect. There is also evidence that there may be increased use of diagnostic codes to support the "off-label" use of surgical and

diagnostic procedures. This practice has the effect of artificially elevating counts of some birth defects diagnoses. For example, following up on a possible hospital-based pyloric stenosis cluster, reviews of affected infants' medical records by TBDR staff showed that the majority did not have pyloric stenosis, but instead were diagnosed with gastroesophageal reflux disease, which is not classified as a birth defect. Their gastric reflux was treated with a procedure called pyloromyotomy, which is used to treat infants with pyloric stenosis, and the diagnosis code for pyloric stenosis was subsequently added to their hospital discharge records.

Had the apparent cluster not triggered a review of individual records, all of these cases would have been recorded in the birth defects data system as having pyloric stenosis. The best way to eliminate this problem is to actively review all potential birth defects-related medical records at all Tennessee hospitals. However, TBDR did not have the capacity to perform this resource intensive review in recent years. Though not entirely eliminating the problem, the upcoming adoption of the International Classification of Diseases Revision 10 Clinical Modification (ICD-10-CM) in 2013 will likely diminish some of the coding-specificity problems encountered in the ICD-9-CM. However only active medical record reviews can differentiate improperly coded birth defects. Thus, the active review of medical records remains the gold standard for birth defects surveillance. Beginning in January 2012 the TBDR will renew efforts to review the medical records of Tennessee resident infants with birth defects diagnoses. These activities will be conducted by two public health nurse consultants specifically trained in the coding of birth defects.

Data Tables

Individual birth defect counts and rates are presented in tabular form for the state overall and broken down by infant sex, race/ethnicity and the five perinatal regions, which are served by Tennessee's five designated Perinatal Center Hospitals (Tables 1-4). Additional tables provide breakdowns by potential birth defect risk factors: maternal age, education, smoking, and type I and type II diabetes (Tables 5-8). Finally, birth

defects diagnostic category counts and rates for each of Tennessee's 95 counties are presented in Table 9.

All of the tables provide 95 percent confidence intervals for each of the rates. A 95 percent confidence interval is the interval that contains the true prevalence, which can only be estimated, 95 percent of the time. Narrower confidence intervals support greater certainty regarding an estimated rate, whereas wider confidence intervals support less certainty. In this report, confidence intervals for 100 cases or less are exact Poisson. Otherwise confidence intervals are based on the normal approximation. The width of a confidence interval is primarily dependent upon the number of birth defects (exact Poisson) or the size of the population used to compute the rate (normal approximation). Thus, confidence intervals become increasingly wider progressing through tables for the entire population to smaller subgroups and from more common to rarer birth defects. Accordingly, these rate estimates should be interpreted with caution. This is especially true of the county-level birth defects rates presented in Table 10. Confidence intervals are effective for determining the likely range for birth defects rate estimates that are affected by random error. Confidence intervals are less effective for determining the likely range of birth defects rate estimates affected by systematic error, such as limitations in disease classification coding systems and nonstandard coding practices in hospitals.

Birth defects may occur alone or in conjunction with other birth defects. Therefore, birth defects counts and rates are presented in two ways: 1) the number of birth defect diagnoses (i.e., birth defects rate); and 2) the number of patients, or cases, affected by birth defects (i.e., case rate). For example, when an infant or case has multiple birth defect diagnoses, we count and report each diagnosis separately. The totals for each of the eight birth defects categories, however, represent the number of cases (or patients) with one or more diagnoses in that category. Since it is also possible for a case to have diagnoses in multiple categories, the category totals cannot be added to obtain the total number of Tennessee cases, as this would overestimate the cases (i.e., affected infants). More specifically, of the 14,301 infants diagnosed with a birth defect between

2004 and 2008, 2,984 (20.87%) had more than one birth defect and while each represents a single case within a category, some are counted as cases in more than one diagnostic category and others may have multiple diagnoses within a category.

Risk Factors and Prevention

All of the tables except for the overall state and county tables (Tables 1 and 9) also include statistical significance indicators, showing whether differences in individual birth defects rates were related to or affected by the tabled risk factor. The potential differences were assessed using Poisson regression. Tables 2 through 8 present breakdowns by infant sex, race/ethnicity, region, maternal age, smoking, education and diabetes, respectively. All of these factors were related to some birth defects rates and to some birth defects more than others. Whereas infant sex, maternal age, smoking, and diabetes may affect birth defect rates more or less directly, maternal education is an indicator of educational achievement and socioeconomic status that may affect birth defect rates indirectly. Maternal education is also related to age in that as a group mothers with only a high school education or less tend to be younger, whereas mothers with a graduate degree tend to be older. Thus the finding in Table 6 (maternal education) that mothers with a graduate degree are at greatest risk of having a Down syndrome baby and that mothers with high school education or less are at lowest risk. Also, many birth defects are affected by more than one risk factor. Thus when evaluating these results, it may be informative to consider possible interactions among risk factors, looking at the results for individual birth defects across the different tables.

For example, gastroschisis is a musculoskeletal birth defect in which a newborn's intestines protrude through a rupture in the abdominal wall usually to the right side of the umbilical cord. Though sometimes treated with surgery immediately following birth, gastroschisis often requires a stay in the neonatal intensive care unit, where the newborn is ventilated and the intestines are sheathed in silastic sheeting and slowly lowered into the abdominal cavity over several days. Gastroschisis prevalence has been increasing in recent decades and is more prevalent in births to younger mothers. A number of studies have also shown relationships with recreational and therapeutic

drug use, especially vasodilators such as cocaine, amphetamines and ecstasy.^{6,7} Reviewing the tables shows that gastroschisis was not related to the basic demographics of infant sex (Table 2), race/ethnicity (Table 3) or perinatal region (Table 4), whereas, it was associated with maternal age (Table 5), maternal education (Table 6) and maternal smoking. Gastroschisis was most prevalent among mothers less than 20 years of age and of the 220 cases only 1 involved a mother 35 years and older. Gastroschisis was most prevalent among mothers without a high school diploma and least prevalent among mothers with a graduate degree. Gastroschisis was most prevalent among heavy smokers and least prevalent among mothers who did not smoke.

Looking at infant sex (Table 2) there was a very strong effect sex on pyloric stenosis rates with males affected at a rate more than four times higher than females. This finding is also consistent with findings in the birth defects literature.^{8,9} Overall male infants were nearly twice (1.8) as likely to be affected by birth defects as female infants. Maternal age (Table 5) also showed a strong association with some birth defects, especially Down syndrome, cardiovascular defects and orofacial clefts being more prevalent in older mothers and pyloric stenosis more prevalent in younger mothers. Each of the tables provides some insights into the correlates of birth defects in Tennessee.

Of the potential risk factors evaluated in this report, maternal diabetes (type I or type II) (Table 6) was the most potent. Overall, others with type I or type II diabetes were 2.6 times more likely to have a baby born with a birth defect than a non-diabetic mother. Controlling maternal blood sugar levels before and during pregnancy is both achievable and essential to preventing diabetes-related birth defects in Tennessee. In order to reduce the risk of birth defects diabetic women and obese women, who are at risk for becoming diabetic, should work with their health care provider to control their blood sugar before and during their pregnancies. The CDC recommends that a diabetic woman who wants to become pregnant should: 1) Plan her pregnancy; 2) See her doctor to assess the effects of her diabetes; 3) Eat healthy foods from a meal plan

made for her as a person with diabetes; 4) Exercise regularly; 5) Monitor blood sugar often; 6) Take her medications on time; 7) Control and treat low blood sugar and high blood sugar quickly; and 8) Follow-up regularly with her health care provider.^{10,11}

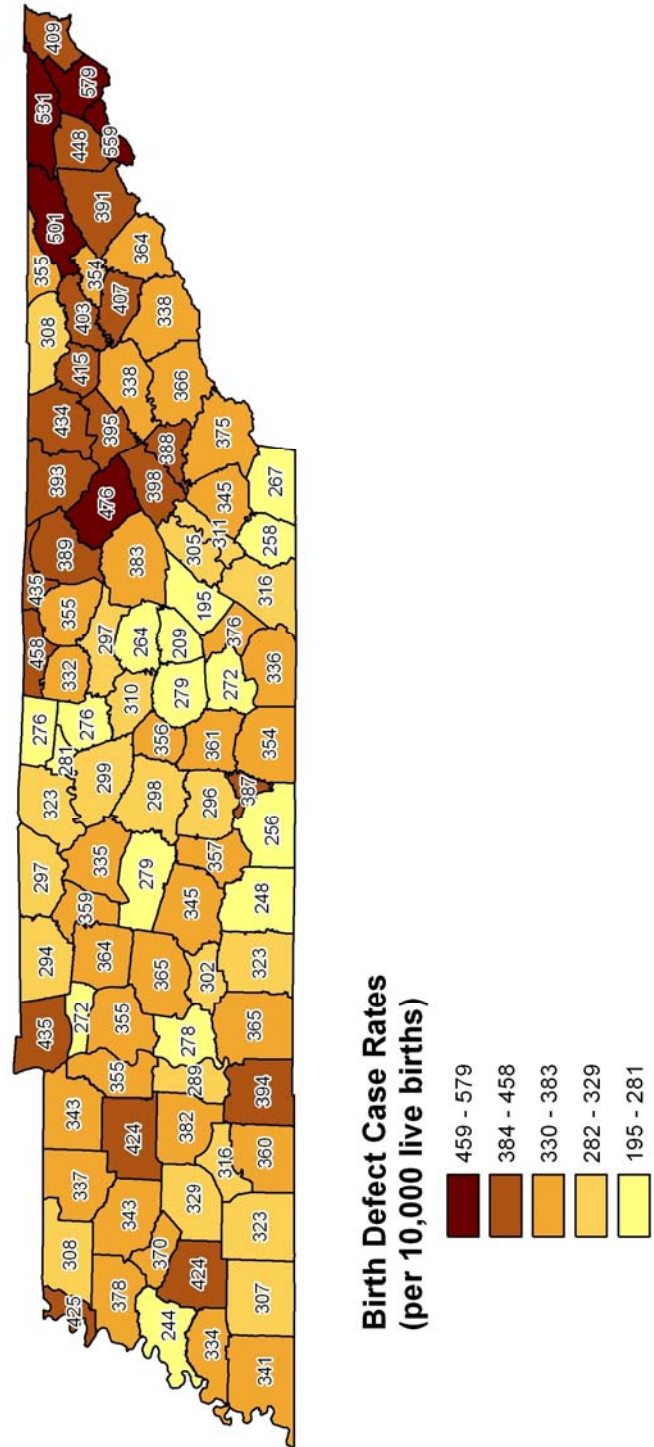
Gestational diabetes, which is a type of diabetes that develops during pregnancy, is generally not associated with elevated risk for birth defects. That is because gestational diabetes develops later in pregnancy than the critical period for the development of most birth defects, which is the first six weeks of pregnancy. Given this six week critical period, it is suggested that all women who could become pregnant should take a daily multivitamin containing 400 micrograms of folic acid. Doing so protects against neural tube defects such as spina bifida and anencephalus and waiting until one knows they are pregnant may be too late to benefit from folic acid.

Birth Defects Figures

Figures 1 and 2 are maps, showing the five Tennessee Perinatal Regions and the overall county-level birth defects rates for each of Tennessee's 95 counties, respectively. Tables 1 through 10 show the five-year (2004-2008) birth defect counts, rates and confidence intervals for the state overall and by infant sex, race/ethnicity, perinatal region, maternal age, maternal smoking and county of residence, maternal education and diabetes respectively. Definitions for each of the birth defects and a number of birth defects related terms are provided in the glossary at the end of the report. Figures 3 through 11 are graphs that show three-year backward moving averages for the overall birth defects and eight diagnostic category rates for the years 2001 through 2008. The moving average for the 2002 is based on the years 2000, 2001 and 2002. Using the moving average in data presentations tends to smooth the data, diminishing random fluctuation, making the underlying trend more apparent.

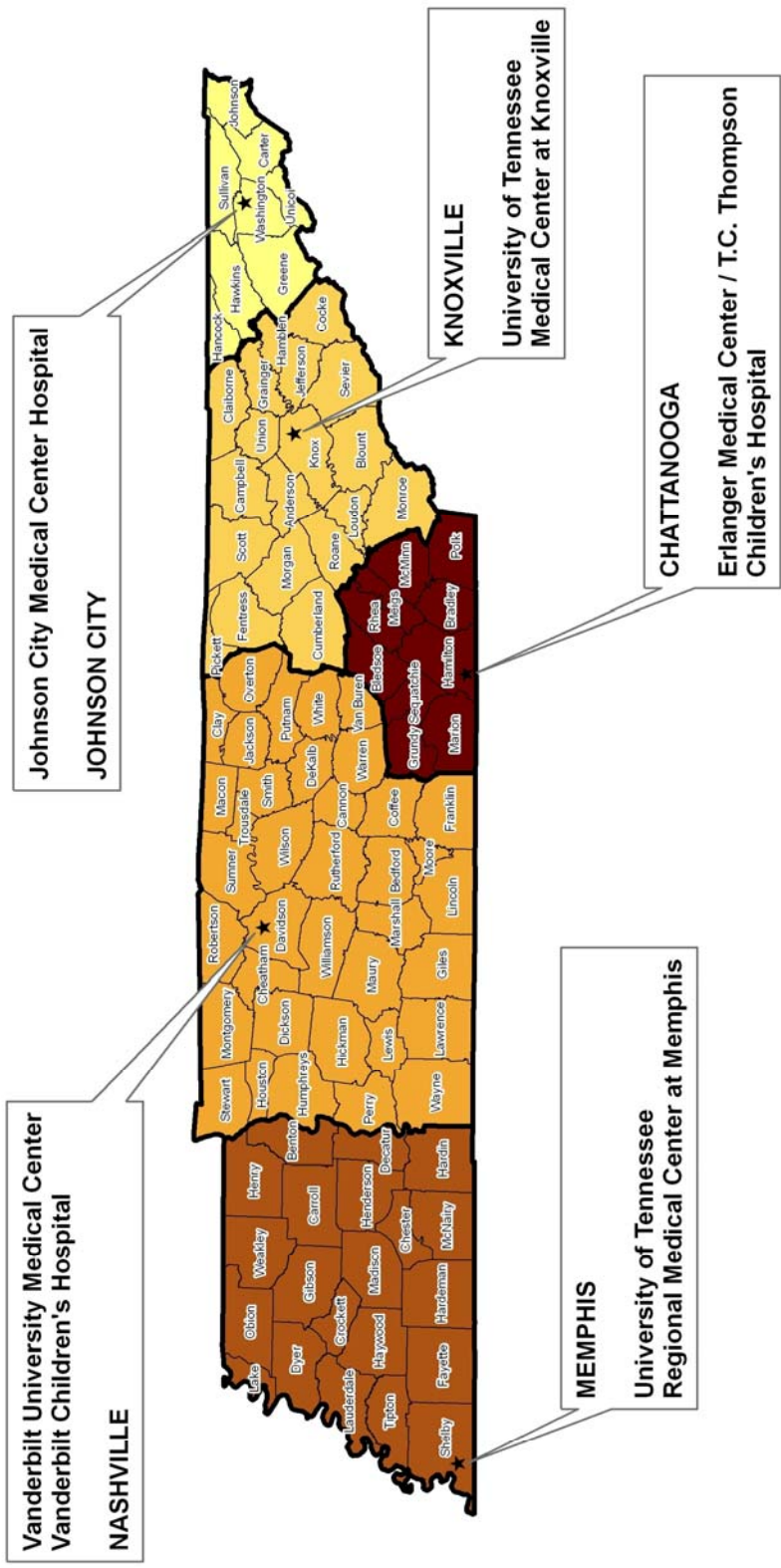
Seven of the nine charts showed generally increasing trend. It was apparent in the overall rates (Figure 3), central nervous system rates (Figure 4), cardiovascular rates (Figure 6), gastrointestinal rates (Figure 8), genitourinary rates (Figure 9), musculoskeletal rates (Figure 10) and chromosomal rates (Figure 11). Of the seven

increasing trends, five of the categories the overall, central nervous, cardiovascular, and gastrointestinal showed a flattening or slight downward trend for 2008, which was the final year. One can hope that this is an indication of a future trend, but whether or not it represents a trend is indeterminable at this time. Of the two charts not showing the trend the eye and ear birth defect rates (Chart 5) represent very small numbers and the rates are relatively unstable. The orofacial birth defects are also somewhat small in number, but these rates are not atypical for the orofacial defects and appear to represent a relatively flat and stable trend.



Source: Tennessee Birth Defects Registry 2004-2008

Figure 1. Tennessee County-Level Birth Defects Rates 2004-2008.



Source: Tennessee Birth Defects Registry

Figure 2. Tennessee Perinatal Regions and Perinatal Center Hospitals.

Table 1. Overall Tennessee Birth Defects Rates by
Organ System
2004-2008

| Birth Defect | Count ¹ | Rate ² | LL ³ | UL ⁴ |
|-------------------------------------------------|--------------------|-------------------|-----------------|-----------------|
| Central Nervous System | | | | |
| Anencephalus | 57 | 1.4 | 1.0 | 1.8 |
| Spina Bifida | 182 | 4.4 | 3.8 | 5.0 |
| Hydrocephalus | 303 | 7.3 | 6.5 | 8.1 |
| Encephalocele | 53 | 1.3 | 1.0 | 1.7 |
| Microcephalus | 414 | 9.9 | 9.0 | 10.9 |
| Total Central Nervous System Cases | 972 | 23.3 | 21.8 | 24.8 |
| Eye and Ear | | | | |
| Aniridia | 6 | 0.1 | 0.1 | 0.3 |
| Anophthalmia/Microphthalmia | 38 | 0.9 | 0.6 | 1.3 |
| Congenital Cataract | 108 | 2.6 | 2.1 | 3.1 |
| Anotia/Microtia | 26 | 0.6 | 0.4 | 0.9 |
| Total Eye and Ear Cases | 171 | 4.1 | 3.5 | 4.8 |
| Cardiovascular | | | | |
| Common Truncus | 40 | 1.0 | 0.7 | 1.3 |
| Transposition of Great Arteries | 260 | 6.2 | 5.5 | 7.0 |
| Tetralogy of Fallot | 236 | 5.6 | 5.0 | 6.4 |
| Ventricular Septal Defect | 1,818 | 43.5 | 41.5 | 45.6 |
| Atrial Septal Defect | 3,287 | 78.7 | 76.0 | 81.4 |
| Endocardial Cushion Defect | 162 | 3.9 | 3.3 | 4.5 |
| Pulmonary Valve Atresia & Stenosis | 449 | 10.7 | 9.8 | 11.8 |
| Tricuspid Valve Atresia & Stenosis | 45 | 1.1 | 0.8 | 1.4 |
| Ebsteins Anomaly | 33 | 0.8 | 0.5 | 1.1 |
| Aortic Valve Stenosis | 80 | 1.9 | 1.5 | 2.4 |
| Hypoplastic Left Heart Syndrome | 145 | 3.5 | 2.9 | 4.1 |
| Patent Ductus Arteriosus | 2,366 | 56.6 | 54.4 | 59.0 |
| Coarctation of Aorta | 263 | 6.3 | 5.6 | 7.1 |
| Total Cardiovascular Cases | 6,421 | 153.7 | 150.0 | 157.5 |
| Orofacial | | | | |
| Cleft Palate w/o Cleft Lip | 306 | 7.3 | 6.5 | 8.2 |
| Cleft Lip w/ & w/o Cleft Palate | 468 | 11.2 | 10.2 | 12.3 |
| Choanal Atresia | 82 | 2.0 | 1.6 | 2.4 |
| Total Orofacial Cases | 850 | 20.3 | 19.0 | 21.8 |
| Gastrointestinal | | | | |
| Esophageal Atresia/Tracheoesophageal Fistula | 96 | 2.3 | 1.9 | 2.8 |
| Rectal & Large Intestinal Atresia/Stenosis | 228 | 5.5 | 4.8 | 6.2 |
| Pyloric Stenosis | 1,869 | 44.7 | 42.7 | 46.8 |
| Hirschsprungs Disease (congenital megacolon) | 121 | 2.9 | 2.4 | 3.5 |
| Biliary Atresia | 38 | 0.9 | 0.6 | 1.3 |
| Total Gastrointestinal Cases | 2,334 | 55.9 | 53.6 | 58.2 |

Table 1. Overall Tennessee Birth Defects Rates by
Organ System
2004-2008

| Birth Defect | Count ¹ | Rate ² | LL ³ | UL ⁴ |
|------------------------------------|--------------------|-------------------|-----------------|-----------------|
| Genitourinary | | | | |
| Bladder Exstrophy | 21 | 0.5 | 0.3 | 0.8 |
| Hypospadias | 2,213 | 53.0 | 50.8 | 55.2 |
| Epispadias | 43 | 1.0 | 0.7 | 1.4 |
| Obstructive Genitourinary Defect | 1,099 | 26.3 | 24.8 | 27.9 |
| Renal Agenesis/Hypoplasia | 197 | 4.7 | 4.1 | 5.4 |
| Total Genitourinary Cases | 3,505 | 83.9 | 81.2 | 86.7 |
| Musculoskeletal | | | | |
| Reduction Deformity (upper limbs) | 85 | 2.0 | 1.6 | 2.5 |
| Reduction Deformity (lower limbs) | 75 | 1.8 | 1.4 | 2.3 |
| Gastroschisis | 220 | 5.3 | 4.6 | 6.0 |
| Omphalocele | 126 | 3.0 | 2.5 | 3.6 |
| Diaphragmatic Hernia | 143 | 3.4 | 2.9 | 4.0 |
| Congenital Hip Dislocation | 293 | 7.0 | 6.2 | 7.9 |
| Total Musculoskeletal Cases | 908 | 21.7 | 20.3 | 23.2 |
| Chromosomal | | | | |
| Trisomy 13 | 33 | 0.8 | 0.5 | 1.1 |
| Down Syndrome | 592 | 14.2 | 13.1 | 15.4 |
| Trisomy 18 | 63 | 1.5 | 1.2 | 1.9 |
| Total Chromosomal Cases | 683 | 16.3 | 15.2 | 17.6 |
| Fetal Alcohol Syndrome | 87 | 2.1 | 1.7 | 2.6 |
| Total Cases | 14,301 | 342.3 | 336.8 | 348.0 |
| Total Live Births | 417,741 | | | |

Source: Tennessee Birth Defects Registry 2004-2008

¹Counts include cases resulting from live births and fetal deaths. ²Per 10,000 live births. ³ 95% confidence interval lower limit. ⁴95 percent confidence interval upper limit. Confidence intervals for 100 or less cases are exact Poisson; otherwise confidence intervals are based on the normal approximation.

Diagnostic data were derived from the Tennessee Hospital Discharge Data System (2004-2009), the Tennessee Death Statistical System (2004-2009) and the Tennessee Fetal Death Statistical System (2004-2008).

Total live births were derived from the Tennessee Birth Statistical system (2004-2008).

Figure 3. Tennessee Overall Birth Defects Rates 2001-2008

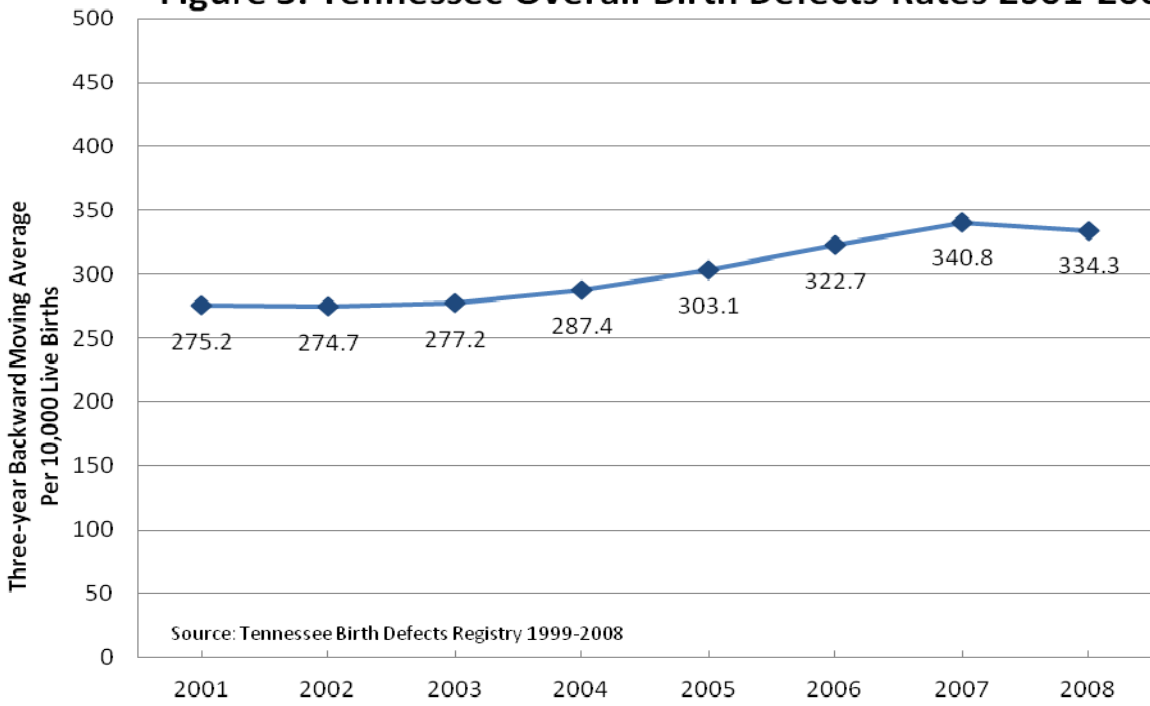


Figure 4. Tennessee Central Nervous System Birth Defects Rates 2001-2008

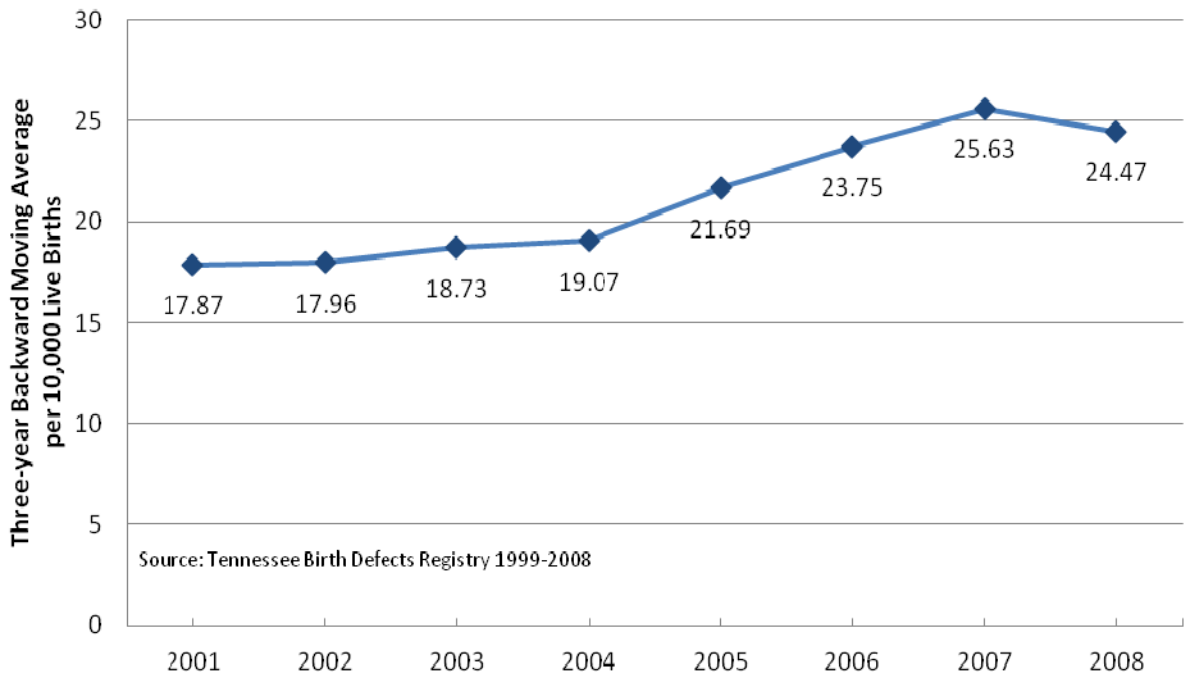


Figure 5. Tennessee Eye and Ear Birth Defects Rates 2001-2008

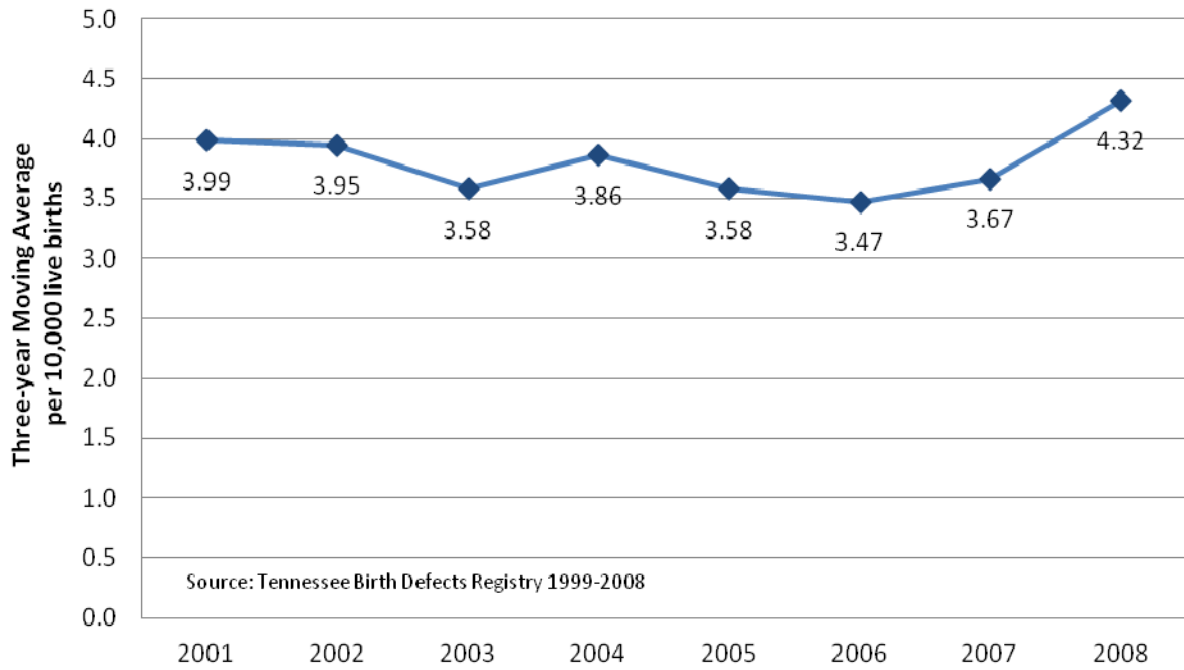


Figure 6. Tennessee Cardiovascular Birth Defects Rates 2001-2008

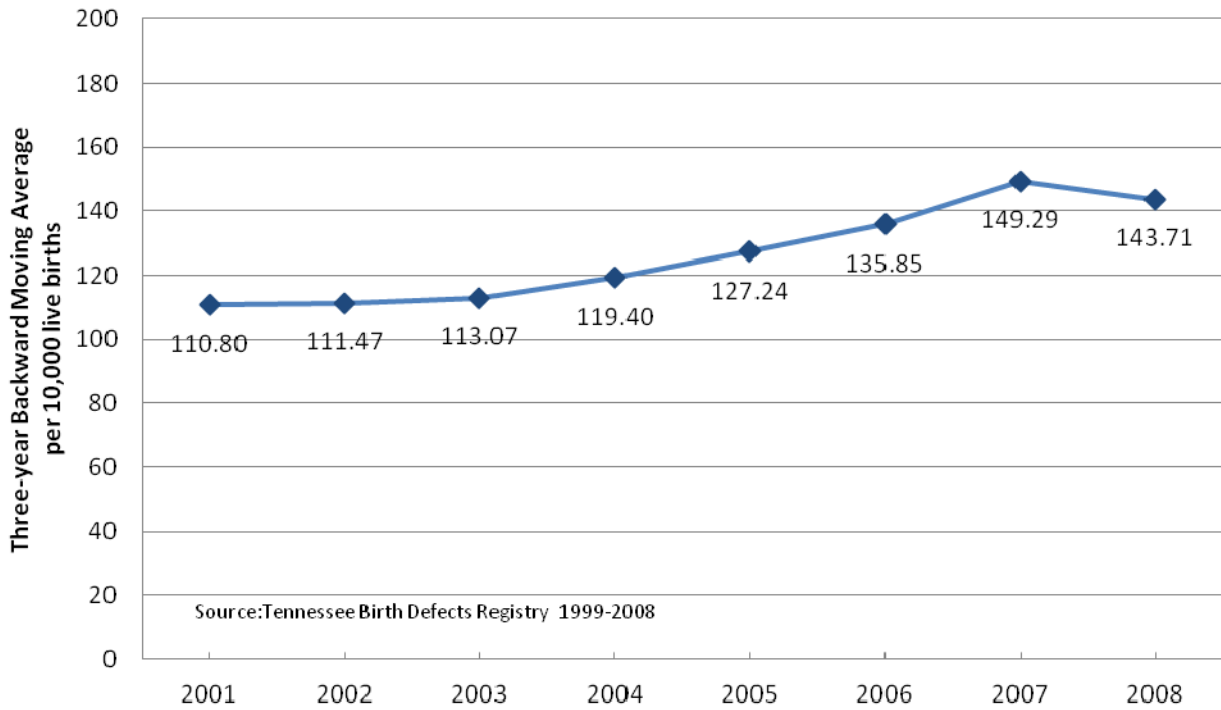


Figure 7. Tennessee Orofacial Birth Defects Rates 2001-2008

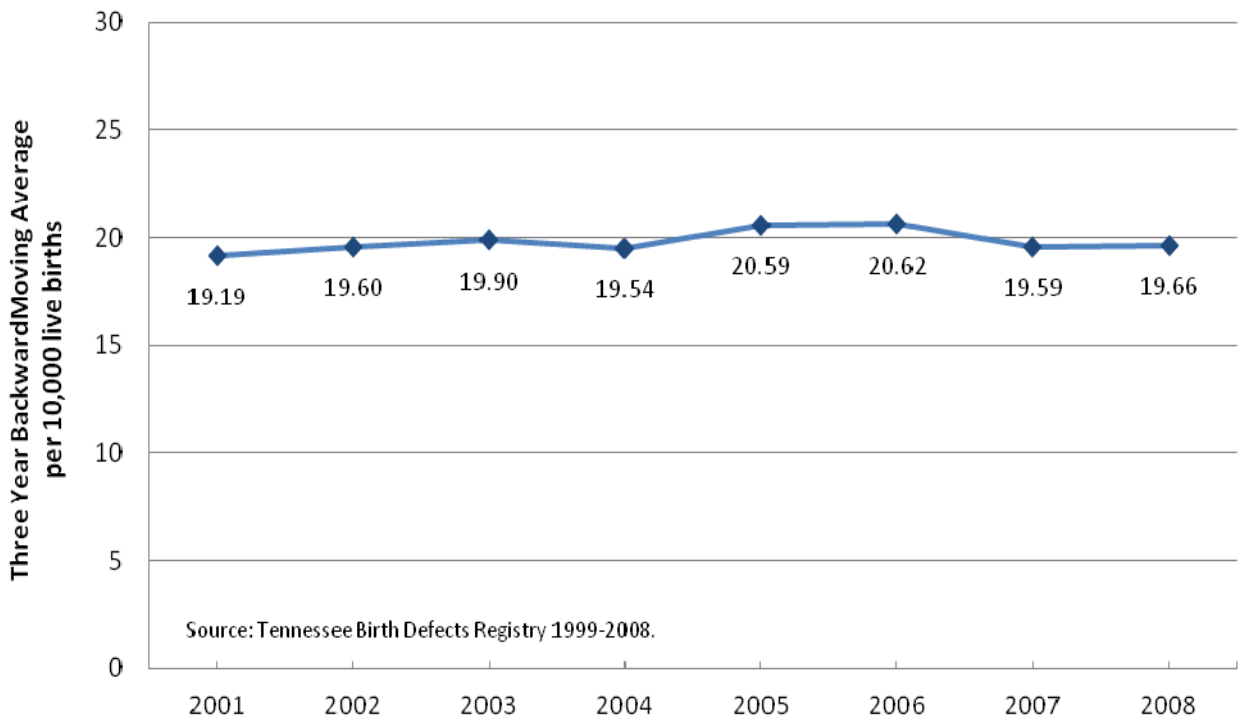


Figure 8. Tennessee Gastrointestinal Birth Defects Rates 2001-2008

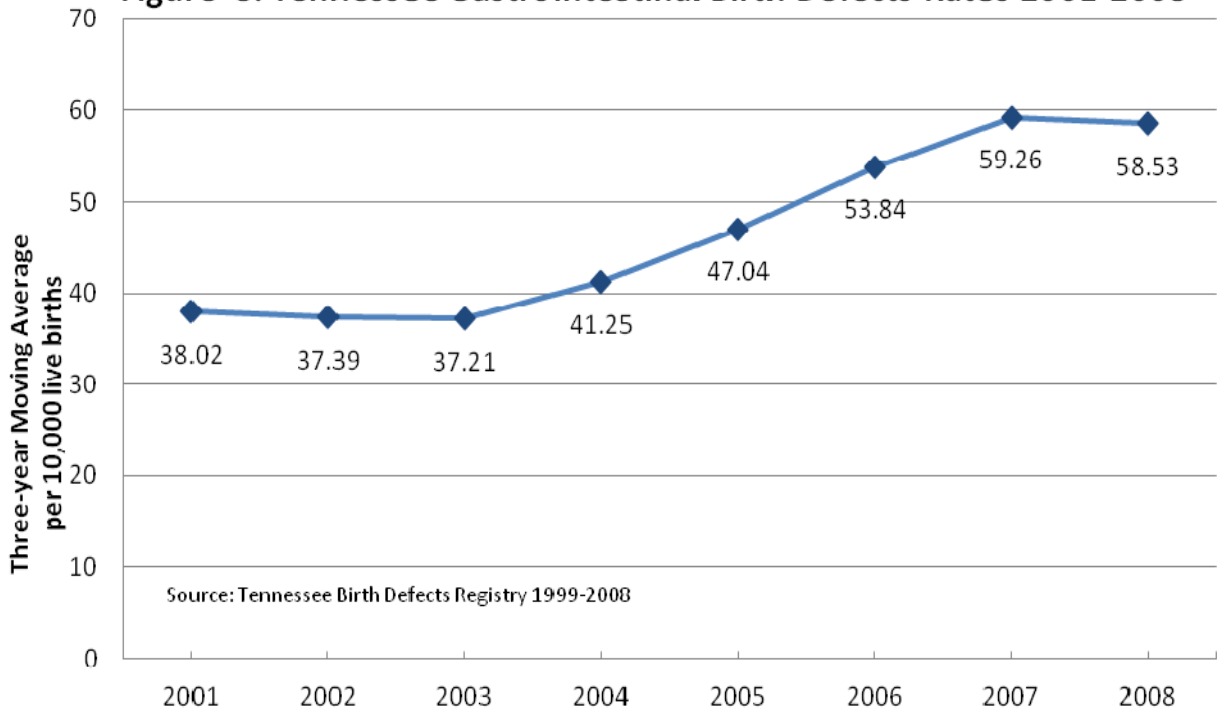


Figure 9. Genitourinary Birth Defects Rates 2001-2008

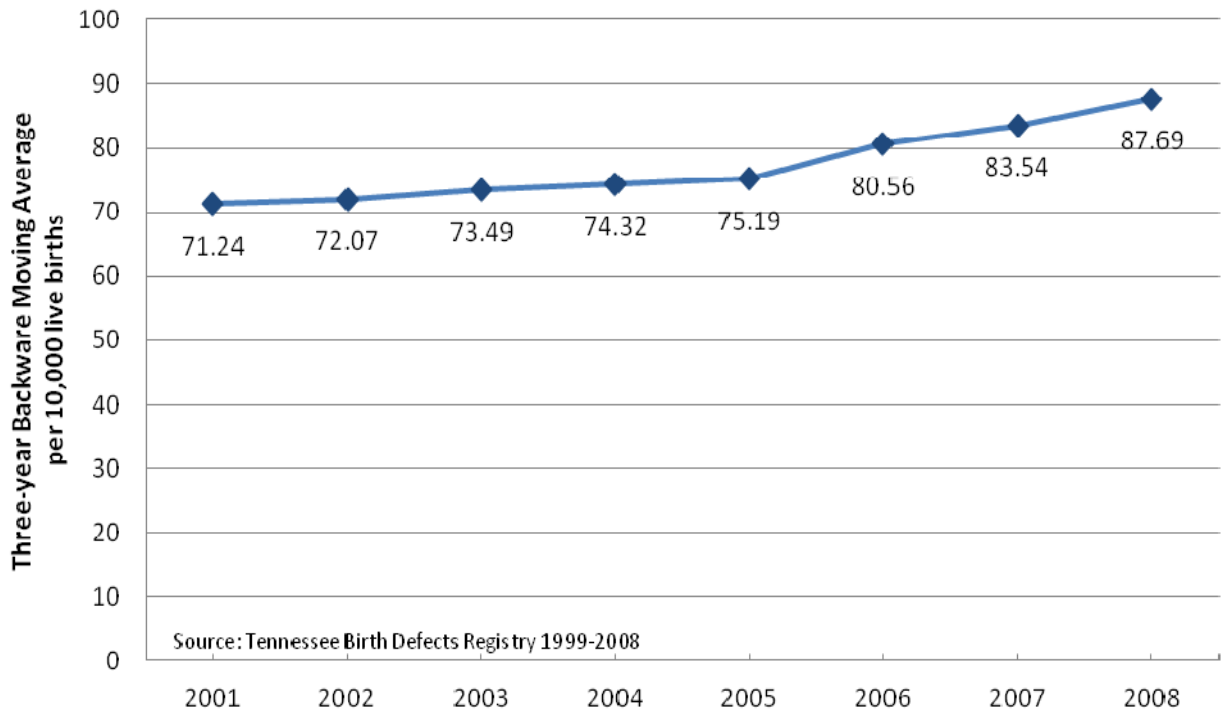


Figure 10. Tennessee Musculoskeletal Birth Defects 2001-2008

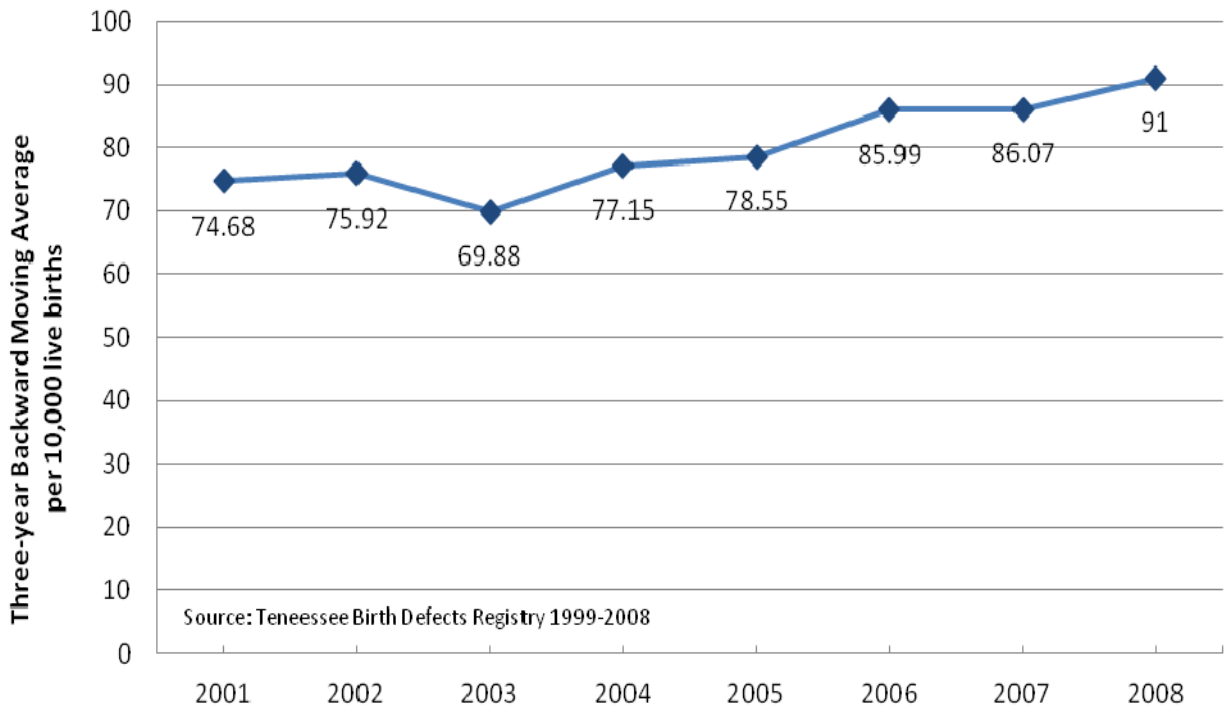
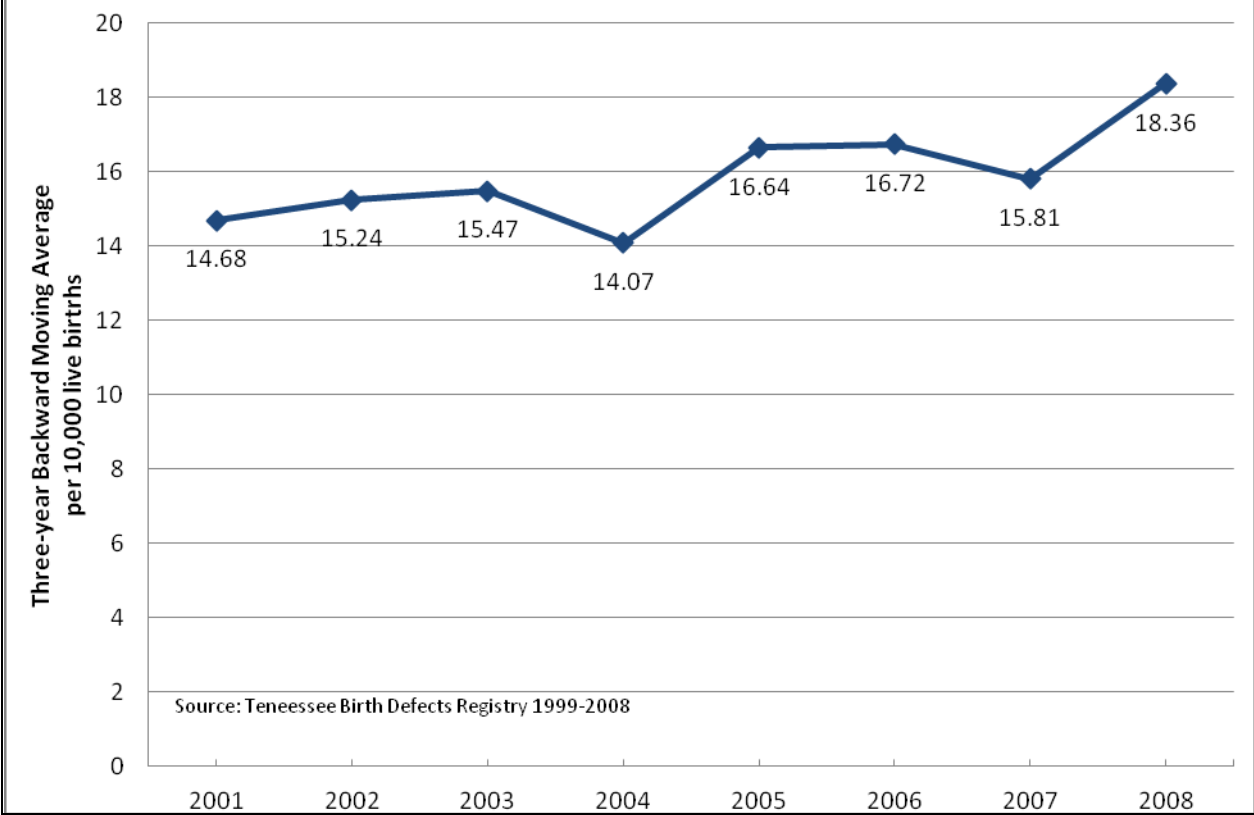


Figure 11: Tennessee Chromosomal Birth Defects Rates 2001-2008



**Table 2. Tennessee Birth Defects Rates by Infant Sex
2004-2008**

| Birth Defect | Sex | Count ¹ | Rate ² | LL ³ | UL ⁴ |
|-----------------------------------------------------|--------|--------------------|-------------------|-----------------|-----------------|
| Central Nervous System | | | | | |
| Anencephalus | Male | 29 | 1.4 | 0.9 | 2.0 |
| | Female | 28 | 1.4 | 0.9 | 2.0 |
| Spina Bifida | Male | 84 | 3.9 | 3.1 | 4.9 |
| | Female | 96 | 4.7 | 3.8 | 5.7 |
| Hydrocephalus | Male | 164 | 7.7 | 6.6 | 9.0 |
| | Female | 139 | 6.8 | 5.7 | 8.0 |
| Encephalocele | Male | 24 | 1.1 | 0.7 | 1.7 |
| | Female | 29 | 1.4 | 1.0 | 2.0 |
| Microcephalus * (p=0.0011) | Male | 178 | 8.3 | 7.2 | 9.7 |
| | Female | 235 | 11.5 | 10.1 | 13.1 |
| <i>Central Nervous System Cases</i> * (p=0.0187) | Male | 459 | 21.5 | 19.6 | 23.6 |
| | Female | 511 | 25.0 | 22.9 | 27.3 |
| Eye and Ear | | | | | |
| Anophthalmia/Microphthalmia | Male | 19 | 0.9 | 0.5 | 1.4 |
| | Female | 19 | 0.9 | 0.6 | 1.5 |
| Congenital Cataract | Male | 56 | 2.6 | 2.0 | 3.4 |
| | Female | 52 | 2.5 | 1.9 | 3.3 |
| Aniridia | Male | 3 | 0.1 | 0.0 | 0.4 |
| | Female | 3 | 0.1 | 0.0 | 0.4 |
| Anotia/Microtia | Male | 14 | 0.7 | 0.4 | 1.1 |
| | Female | 12 | 0.6 | 0.3 | 1.0 |
| Eye and Ear Cases | Male | 90 | 4.2 | 3.4 | 5.2 |
| | Female | 81 | 4.0 | 3.2 | 4.9 |
| Cardiovascular | | | | | |
| Common Truncus | Male | 21 | 1.0 | 0.6 | 1.5 |
| | Female | 19 | 0.9 | 0.6 | 1.5 |
| Transposition of Great Arteries * (p=0.0017) | Male | 158 | 7.4 | 6.3 | 8.7 |
| | Female | 102 | 5.0 | 4.1 | 6.1 |
| Tetralogy of Fallot | Male | 118 | 5.5 | 4.6 | 6.6 |
| | Female | 118 | 5.8 | 4.8 | 6.9 |
| Ventricular Septal Defect | Male | 919 | 43.1 | 40.3 | 45.9 |
| | Female | 899 | 44.0 | 41.2 | 47.0 |
| Atrial Septal Defect * (p=0.0006) | Male | 1,778 | 83.3 | 79.5 | 87.3 |
| | Female | 1,509 | 73.9 | 70.2 | 77.7 |
| Endocardial Cushion Defect | Male | 71 | 3.3 | 2.6 | 4.2 |
| | Female | 91 | 4.5 | 3.6 | 5.5 |
| Pulmonary Valve Atresia & Stenosis | Male | 235 | 11.0 | 9.7 | 12.5 |
| | Female | 214 | 10.5 | 9.1 | 12.0 |
| Tricuspid Valve Atresia & Stenosis | Male | 26 | 1.2 | 0.8 | 1.8 |
| | Female | 19 | 0.9 | 0.6 | 1.5 |
| Ebsteins Anomaly * (p=0.0054) | Male | 9 | 0.4 | 0.2 | 0.8 |
| | Female | 24 | 1.2 | 0.8 | 1.8 |

**Table 2. Tennessee Birth Defects Rates by Infant Sex
2004-2008**

| Birth Defect | Sex | Count ¹ | Rate ² | LL ³ | UL ⁴ |
|------------------------------------------------------------|--------|--------------------|-------------------|-----------------|-----------------|
| Aortic Valve Stenosis * (p=0.0002) | Male | 57 | 2.7 | 2.0 | 3.5 |
| | Female | 23 | 1.1 | 0.7 | 1.7 |
| Hypoplastic Left Heart Syndrome * (p=0.0008) | Male | 94 | 4.4 | 3.6 | 5.4 |
| | Female | 51 | 2.5 | 1.9 | 3.3 |
| Patent Ductus Arteriosus * (p=0.0003) | Male | 1,297 | 60.8 | 57.5 | 64.2 |
| | Female | 1,069 | 52.3 | 49.2 | 55.6 |
| Coarctation of Aorta * (p<0.0001) | Male | 168 | 7.9 | 6.7 | 9.2 |
| | Female | 95 | 4.7 | 3.8 | 5.7 |
| <i>Cardiovascular Cases *</i> (p=0.0004) | Male | 3,422 | 160.3 | 155.0 | 165.8 |
| | Female | 2,999 | 146.8 | 141.6 | 152.2 |
| Orofacial | | | | | |
| Cleft Palate w/o Cleft Lip | Male | 142 | 6.7 | 5.6 | 7.8 |
| | Female | 164 | 8.0 | 6.9 | 9.4 |
| Cleft Lip w/ & w/o Cleft Palate * (p<0.0001) | Male | 296 | 13.9 | 12.3 | 15.5 |
| | Female | 172 | 8.4 | 7.2 | 9.8 |
| Choanal Atresia | Male | 42 | 2.0 | 1.4 | 2.7 |
| | Female | 40 | 2.0 | 1.4 | 2.7 |
| <i>Orofacial Cases *</i> (p=0.0033) | Male | 477 | 22.3 | 20.4 | 24.5 |
| | Female | 373 | 18.3 | 16.5 | 20.2 |
| Gastrointestinal | | | | | |
| Esophageal Atresia/Tracheoesophageal Fistula | Male | 51 | 2.4 | 1.8 | 3.1 |
| | Female | 45 | 2.2 | 1.6 | 3.0 |
| Rectal & Large Intestinal Atresia/Stenosis (p=0.0193) | Male | 133 | 6.2 | 5.2 | 7.4 |
| | Female | 93 | 4.6 | 3.7 | 5.6 |
| Pyloric Stenosis * (p<0.0001) | Male | 1,505 | 70.5 | 67.0 | 74.2 |
| | Female | 364 | 17.8 | 16.0 | 19.8 |
| Hirschsprungs Disease (congenital megacolon) (p<0.0001) | Male | 91 | 4.3 | 3.4 | 5.2 |
| | Female | 30 | 1.5 | 1.0 | 2.1 |
| Biliary Atresia | Male | 15 | 0.7 | 0.4 | 1.2 |
| | Female | 23 | 1.1 | 0.7 | 1.7 |
| <i>Gastrointestinal Cases *</i> (p<0.0001) | Male | 1,784 | 83.6 | 79.8 | 87.6 |
| | Female | 548 | 26.8 | 24.6 | 29.2 |
| Genitourinary | | | | | |
| Renal Agenesis/Hypoplasia * (p=0.0004) | Male | 124 | 5.8 | 4.8 | 6.9 |
| | Female | 71 | 3.5 | 2.7 | 4.4 |
| Bladder Exstrophy | Male | 12 | 0.6 | 0.3 | 1.0 |
| | Female | 8 | 0.4 | 0.2 | 0.8 |
| Hypospadias | Male | 2,213 | 103.7 | 99.4 | 108.1 |
| | Female | 0 | 0.0 | 0.0 | 0.2 |
| Epispadias | Male | 43 | 2.0 | 1.5 | 2.7 |
| | Female | 0 | 0.0 | 0.0 | 0.2 |
| Obstructive Genitourinary Defect * (p<0.0001) | Male | 763 | 35.7 | 33.3 | 38.4 |
| | Female | 336 | 16.4 | 14.7 | 18.3 |

**Table 2. Tennessee Birth Defects Rates by Infant Sex
2004-2008**

| Birth Defect | Sex | Count ¹ | Rate ² | LL ³ | UL ⁴ |
|-------------------------------------------------------|--------|--------------------|-------------------|-----------------|-----------------|
| <i>Genitourinary Cases *</i> (<i>p</i> <0.0001) | Male | 3095 | 145.0 | 139.9 | 150.2 |
| | Female | 407 | 19.9 | 18.0 | 22.0 |
| Musculoskeletal | | | | | |
| Reduction Deformity (upper limbs) | Male | 52 | 2.4 | 1.8 | 3.2 |
| | Female | 33 | 1.6 | 1.1 | 2.3 |
| Reduction Deformity (lower limbs) | Male | 37 | 1.7 | 1.2 | 2.4 |
| | Female | 38 | 1.9 | 1.3 | 2.6 |
| Gastroschisis | Male | 113 | 5.3 | 4.4 | 6.4 |
| | Female | 107 | 5.2 | 4.3 | 6.3 |
| Omphalocele | Male | 75 | 3.5 | 2.8 | 4.4 |
| | Female | 51 | 2.5 | 1.9 | 3.3 |
| Diaphragmatic Hernia | Male | 83 | 3.9 | 3.1 | 4.8 |
| | Female | 60 | 2.9 | 2.2 | 3.8 |
| Congenital Hip Dislocation * (<i>p</i> <0.0001) | Male | 86 | 4.0 | 3.2 | 5.0 |
| | Female | 207 | 10.1 | 8.8 | 11.6 |
| <i>Musculoskeletal Cases *</i> (<i>p</i> =0.0080) | Male | 424 | 19.9 | 18.0 | 21.9 |
| | Female | 484 | 23.7 | 21.6 | 25.9 |
| Chromosomal | | | | | |
| Trisomy 13 | Male | 17 | 0.8 | 0.5 | 1.3 |
| | Female | 16 | 0.8 | 0.5 | 1.3 |
| Down Syndrome | Male | 323 | 15.1 | 13.5 | 16.9 |
| | Female | 269 | 13.2 | 11.6 | 14.8 |
| Trisomy 18 * (<i>p</i> =0.0003) | Male | 18 | 0.8 | 0.5 | 1.3 |
| | Female | 45 | 2.2 | 1.6 | 3.0 |
| <i>Chromosomal Cases</i> | Male | 357 | 16.7 | 15.0 | 18.6 |
| | Female | 326 | 16.0 | 14.3 | 17.8 |
| Fetal Alcohol Syndrome | Male | 50 | 2.3 | 1.7 | 3.1 |
| | Female | 37 | 1.8 | 1.3 | 2.5 |
| <i>Total Cases *</i> (<i>p</i> <0.0001) | Male | 9,198 | 430.9 | 422.2 | 439.8 |
| | Female | 5,099 | 249.6 | 242.8 | 256.5 |
| Total Live Births | Male | 213,438 | | | |
| | Female | 204,290 | | | |
| Unknown Cases | | 4 | | | |
| Unknown Live Births | | 13 | | | |

Source: Tennessee Birth Defects Registry 2004-2008

¹Counts include cases resulting from live births and fetal deaths. ²Per 10,000 live births. ³95% confidence interval lower limit. ⁴95 percent confidence interval upper limit. Confidence intervals for 100 or less cases are exact Poisson; otherwise confidence intervals are based on the normal approximation. *Indicates a statistically significant difference determined by Poisson regression.

Diagnostic data were derived from the Tennessee Hospital Discharge Data System (2004-2009), the Tennessee Death Statistical System (2004-2009) and the Tennessee Fetal Death Statistical System (2004-2008). Live births and sex were derived from the Tennessee Birth Statistical system (2004-2008).

**Table 3. Tennessee Birth Defects Rates by Race\Ethnicity
2004-2008**

| Birth Defect | Race | Count¹ | Rate² | LL³ | UL⁴ |
|------------------------------------------------------|-------------|--------------------------|-------------------------|-----------------------|-----------------------|
| Central Nervous System | | | | | |
| Anencephalus | White | 34 | 1.2 | 0.8 | 1.7 |
| | Black | 11 | 1.3 | 0.6 | 2.3 |
| | Hispanic | 10 | 2.7 | 1.3 | 5.0 |
| | Other | 2 | 2.0 | 0.2 | 7.2 |
| Spina Bifida * (p=0.0017) | White | 125 | 4.4 | 3.7 | 5.2 |
| | Black | 27 | 3.2 | 2.1 | 4.6 |
| | Hispanic | 29 | 7.8 | 5.2 | 11.2 |
| | Other | 1 | 1.0 | 0.0 | 5.6 |
| Hydrocephalus * (p=0.0025) | White | 179 | 6.3 | 5.4 | 7.3 |
| | Black | 86 | 10.1 | 8.1 | 12.4 |
| | Hispanic | 33 | 8.9 | 6.1 | 12.5 |
| | Other | 5 | 5.0 | 1.6 | 11.7 |
| Encephalocele | White | 37 | 1.3 | 0.9 | 1.8 |
| | Black | 9 | 1.1 | 0.5 | 2.0 |
| | Hispanic | 7 | 1.9 | 0.8 | 3.9 |
| | Other | 0 | 0.0 | 0.0 | 3.7 |
| Microcephalus * (p=0.0400) | White | 263 | 9.2 | 8.1 | 10.4 |
| | Black | 106 | 12.4 | 10.2 | 15.0 |
| | Hispanic | 39 | 10.5 | 7.5 | 14.4 |
| | Other | 6 | 6.0 | 2.2 | 13.1 |
| Central Nervous System Cases * (p=0.0003) | | | | | |
| | White | 616 | 21.6 | 19.9 | 23.4 |
| | Black | 232 | 27.2 | 23.8 | 30.9 |
| | Hispanic | 110 | 29.7 | 24.4 | 35.8 |
| | Other | 14 | 14.0 | 7.7 | 23.5 |
| Eye and Ear | | | | | |
| Anophthalmia/Microphthalmia * (p=0.0248) | White | 19 | 0.7 | 0.4 | 1.0 |
| | Black | 16 | 1.9 | 1.1 | 3.0 |
| | Hispanic | 2 | 0.5 | 0.1 | 2.0 |
| | Other | 1 | 1.0 | 0.0 | 5.6 |
| Congenital Cataract | White | 78 | 2.7 | 2.2 | 3.4 |
| | Black | 20 | 2.3 | 1.4 | 3.6 |
| | Hispanic | 5 | 1.3 | 0.4 | 3.2 |
| | Other | 5 | 5.0 | 1.6 | 11.7 |
| Aniridia | White | 6 | 0.2 | 0.1 | 0.5 |
| | Black | 0 | 0.0 | 0.0 | 0.4 |
| | Hispanic | 0 | 0.0 | 0.0 | 1.0 |
| | Other | 0 | 0.0 | 0.0 | 3.7 |
| Anotia/Microtia * (p=0.0334) | White | 18 | 0.6 | 0.4 | 1.0 |
| | Black | 2 | 0.2 | 0.0 | 0.9 |
| | Hispanic | 6 | 1.6 | 0.6 | 3.5 |
| | Other | 0 | 0.0 | 0.0 | 3.7 |

**Table 3. Tennessee Birth Defects Rates by Race\Ethnicity
2004-2008**

| Birth Defect | Race | Count¹ | Rate² | LL³ | UL⁴ |
|----------------------------------------------------|-------------|--------------------------|-------------------------|-----------------------|-----------------------|
| Eye and Ear Cases | White | 115 | 4.0 | 3.3 | 4.8 |
| | Black | 37 | 4.3 | 3.1 | 6.0 |
| | Hispanic | 13 | 3.5 | 1.9 | 6.0 |
| | Other | 6 | 6.0 | 2.2 | 13.1 |
| Cardiovascular | | | | | |
| Common Truncus | White | 34 | 1.2 | 0.8 | 1.7 |
| | Black | 4 | 0.5 | 0.1 | 1.2 |
| | Hispanic | 2 | 0.5 | 0.1 | 2.0 |
| | Other | 0 | 0.0 | 0.0 | 3.7 |
| Transposition of Great Arteries | White | 187 | 6.6 | 5.7 | 7.6 |
| | Black | 47 | 5.5 | 4.0 | 7.3 |
| | Hispanic | 24 | 6.5 | 4.2 | 9.6 |
| | Other | 2 | 2.0 | 0.2 | 7.2 |
| Tetralogy of Fallot | White | 163 | 5.7 | 4.9 | 6.7 |
| | Black | 52 | 6.1 | 4.6 | 8.0 |
| | Hispanic | 13 | 3.5 | 1.9 | 6.0 |
| | Other | 8 | 8.0 | 3.5 | 15.8 |
| Ventricular Septal Defect * (p=0.0174) | White | 1,276 | 44.7 | 42.3 | 47.3 |
| | Black | 353 | 41.3 | 37.1 | 45.9 |
| | Hispanic | 163 | 44.0 | 37.5 | 51.3 |
| | Other | 26 | 26.0 | 17.0 | 38.1 |
| Atrial Septal Defect * (p<0.0001) | White | 2,121 | 74.3 | 71.2 | 77.6 |
| | Black | 890 | 104.2 | 97.4 | 111.3 |
| | Hispanic | 224 | 60.5 | 52.8 | 68.9 |
| | Other | 52 | 52.1 | 38.9 | 68.3 |
| Endocardial Cushion Defect | White | 115 | 4.0 | 3.3 | 4.8 |
| | Black | 33 | 3.9 | 2.7 | 5.4 |
| | Hispanic | 12 | 3.2 | 1.7 | 5.7 |
| | Other | 2 | 2.0 | 0.2 | 7.2 |
| Pulmonary Valve Atresia & Stenosis * (p=0.0059) | White | 301 | 10.6 | 9.4 | 11.8 |
| | Black | 115 | 13.5 | 11.1 | 16.2 |
| | Hispanic | 26 | 7.0 | 4.6 | 10.3 |
| | Other | 7 | 7.0 | 2.8 | 14.4 |
| Tricuspid Valve Atresia & Stenosis | White | 34 | 1.2 | 0.8 | 1.7 |
| | Black | 8 | 0.9 | 0.4 | 1.9 |
| | Hispanic | 2 | 0.5 | 0.1 | 2.0 |
| | Other | 1 | 1.0 | 0.0 | 5.6 |
| Ebsteins Anomaly | White | 23 | 0.8 | 0.5 | 1.2 |
| | Black | 7 | 0.8 | 0.3 | 1.7 |
| | Hispanic | 2 | 0.5 | 0.1 | 2.0 |
| | Other | 1 | 1.0 | 0.0 | 5.6 |
| Aortic Valve Stenosis * (p=0.0265) | White | 65 | 2.3 | 1.8 | 2.9 |
| | Black | 7 | 0.8 | 0.3 | 1.7 |
| | Hispanic | 7 | 1.9 | 0.8 | 3.9 |
| | Other | 1 | 1.0 | 0.0 | 5.6 |

**Table 3. Tennessee Birth Defects Rates by Race\Ethnicity
2004-2008**

| Birth Defect | Race | Count¹ | Rate² | LL³ | UL⁴ |
|---------------------------------------------------------------|-------------|--------------------------|-------------------------|-----------------------|-----------------------|
| Hypoplastic Left Heart Syndrome | White | 102 | 3.6 | 2.9 | 4.3 |
| | Black | 33 | 3.9 | 2.7 | 5.4 |
| | Hispanic | 9 | 2.4 | 1.1 | 4.6 |
| | Other | 1 | 1.0 | 0.0 | 5.6 |
| Patent Ductus Arteriosus * (p<0.0001) | White | 1,496 | 52.4 | 49.8 | 55.2 |
| | Black | 647 | 75.7 | 70.0 | 81.8 |
| | Hispanic | 189 | 51.0 | 44.0 | 58.8 |
| | Other | 34 | 34.0 | 23.6 | 47.6 |
| Coarctation of Aorta * (p=0.0435) | White | 191 | 6.7 | 5.8 | 7.7 |
| | Black | 49 | 5.7 | 4.2 | 7.6 |
| | Hispanic | 22 | 5.9 | 3.7 | 9.0 |
| | Other | 1 | 1.0 | 0.0 | 5.6 |
| Cardiovascular Cases * (p<0.0001) | White | 4,226 | 148.1 | 143.7 | 152.7 |
| | Black | 1,618 | 189.4 | 180.3 | 198.9 |
| | Hispanic | 476 | 128.5 | 117.2 | 140.6 |
| | Other | 101 | 101.1 | 82.4 | 122.9 |
| Orofacial | | | | | |
| Cleft Palate w/o Cleft Lip * (p=0.0005) | White | 238 | 8.3 | 7.3 | 9.5 |
| | Black | 42 | 4.9 | 3.5 | 6.7 |
| | Hispanic | 16 | 4.3 | 2.5 | 7.0 |
| | Other | 10 | 10.0 | 4.8 | 18.4 |
| Cleft Lip w/ & w/o Cleft Palate * (p<0.0001) | White | 372 | 13.0 | 11.8 | 14.4 |
| | Black | 56 | 6.6 | 5.0 | 8.5 |
| | Hispanic | 32 | 8.6 | 5.9 | 12.2 |
| | Other | 8 | 8.0 | 3.5 | 15.8 |
| Choanal Atresia | White | 64 | 2.2 | 1.7 | 2.9 |
| | Black | 13 | 1.5 | 0.8 | 2.6 |
| | Hispanic | 4 | 1.1 | 0.3 | 2.8 |
| | Other | 1 | 1.0 | 0.0 | 5.6 |
| Orofacial Cases * (p<0.0001) | White | 669 | 23.5 | 21.7 | 25.3 |
| | Black | 110 | 12.9 | 10.6 | 15.5 |
| | Hispanic | 52 | 14.0 | 10.5 | 18.4 |
| | Other | 19 | 19.0 | 11.5 | 29.7 |
| Gastrointestinal | | | | | |
| Esophageal Atresia/Tracheoesophageal Fistula (p=0.0306) | White | 78 | 2.7 | 2.2 | 3.4 |
| | Black | 11 | 1.3 | 0.6 | 2.3 |
| | Hispanic | 7 | 1.9 | 0.8 | 3.9 |
| | Other | 0 | 0.0 | 0.0 | 3.7 |
| Rectal & Large Intestinal Atresia/Stenosis | White | 153 | 5.4 | 4.6 | 6.3 |
| | Black | 44 | 5.2 | 3.7 | 6.9 |
| | Hispanic | 26 | 7.0 | 4.6 | 10.3 |
| | Other | 5 | 5.0 | 1.6 | 11.7 |
| Pyloric Stenosis * (p<0.0001) | White | 1,468 | 51.5 | 48.9 | 54.2 |
| | Black | 210 | 24.6 | 21.4 | 28.1 |
| | Hispanic | 176 | 47.5 | 40.8 | 55.1 |
| | Other | 15 | 15.0 | 8.4 | 24.8 |

**Table 3. Tennessee Birth Defects Rates by Race\Ethnicity
2004-2008**

| Birth Defect | Race | Count¹ | Rate² | LL³ | UL⁴ |
|------------------------------------------------------------|-------------|--------------------------|-------------------------|-----------------------|-----------------------|
| Hirschsprungs Disease (congenital megacolon) (p=0.0117) | White | 77 | 2.7 | 2.1 | 3.4 |
| | Black | 38 | 4.4 | 3.2 | 6.1 |
| | Hispanic | 6 | 1.6 | 0.6 | 3.5 |
| | Other | 0 | 0.0 | 0.0 | 3.7 |
| Biliary Atresia * (p=0.0363) | White | 21 | 0.7 | 0.5 | 1.1 |
| | Black | 11 | 1.3 | 0.6 | 2.3 |
| | Hispanic | 2 | 0.5 | 0.1 | 2.0 |
| | Other | 4 | 4.0 | 1.1 | 10.3 |
| Gastrointestinal Cases * (p<0.0001) | White | 1,784 | 62.5 | 59.7 | 65.5 |
| | Black | 312 | 36.5 | 32.6 | 40.8 |
| | Hispanic | 214 | 57.8 | 50.3 | 66.1 |
| | Other | 24 | 24.0 | 15.4 | 35.8 |
| Genitourinary Cases | | | | | |
| Renal Agenesis/Hypoplasia | White | 136 | 4.8 | 4.0 | 5.6 |
| | Black | 39 | 4.6 | 3.3 | 6.2 |
| | Hispanic | 19 | 5.1 | 3.1 | 8.0 |
| | Other | 3 | 3.0 | 0.6 | 8.8 |
| Bladder Exstrophy | White | 18 | 0.6 | 0.4 | 1.0 |
| | Black | 3 | 0.4 | 0.1 | 1.0 |
| | Hispanic | 0 | 0.0 | 0.0 | 1.0 |
| | Other | 0 | 0.0 | 0.0 | 3.7 |
| Hypospadias * (p<0.0001) | White | 1,661 | 58.2 | 55.5 | 61.1 |
| | Black | 458 | 53.6 | 48.8 | 58.8 |
| | Hispanic | 64 | 17.3 | 13.3 | 22.1 |
| | Other | 30 | 30.0 | 20.3 | 42.9 |
| Epispadias | White | 33 | 1.2 | 0.8 | 1.6 |
| | Black | 9 | 1.1 | 0.5 | 2.0 |
| | Hispanic | 1 | 0.3 | 0.0 | 1.5 |
| | Other | 0 | 0.0 | 0.0 | 3.7 |
| Obstructive Genitourinary Defect * (p<0.0001) | White | 842 | 29.5 | 27.6 | 31.6 |
| | Black | 148 | 17.3 | 14.6 | 20.4 |
| | Hispanic | 79 | 21.3 | 16.9 | 26.6 |
| | Other | 30 | 30.0 | 20.3 | 42.9 |
| Genitourinary Cases * (p<0.0001) | White | 2,635 | 92.4 | 88.9 | 96.0 |
| | Black | 647 | 75.7 | 70.0 | 81.8 |
| | Hispanic | 160 | 43.2 | 36.8 | 50.4 |
| | Other | 63 | 63.1 | 48.5 | 80.7 |
| Musculoskeletal | | | | | |
| Reduction Deformity (upper limbs) | White | 51 | 1.8 | 1.3 | 2.4 |
| | Black | 20 | 2.3 | 1.4 | 3.6 |
| | Hispanic | 12 | 3.2 | 1.7 | 5.7 |
| | Other | 2 | 2.0 | 0.2 | 7.2 |

**Table 3. Tennessee Birth Defects Rates by Race\Ethnicity
2004-2008**

| Birth Defect | Race | Count¹ | Rate² | LL³ | UL⁴ |
|--------------------------------------------|-------------|--------------------------|-------------------------|-----------------------|-----------------------|
| Reduction Deformity (lower limbs) | White | 42 | 1.5 | 1.1 | 2.0 |
| | Black | 24 | 2.8 | 1.8 | 4.2 |
| | Hispanic | 7 | 1.9 | 0.8 | 3.9 |
| | Other | 2 | 2.0 | 0.2 | 7.2 |
| Gastroschisis * (p=0.0038) | White | 173 | 6.1 | 5.2 | 7.0 |
| | Black | 26 | 3.0 | 2.0 | 4.5 |
| | Hispanic | 17 | 4.6 | 2.7 | 7.4 |
| | Other | 4 | 4.0 | 1.1 | 10.3 |
| Omphalocele * (p=0.0030) | White | 73 | 2.6 | 2.0 | 3.2 |
| | Black | 43 | 5.0 | 3.6 | 6.8 |
| | Hispanic | 9 | 2.4 | 1.1 | 4.6 |
| | Other | 1 | 1.0 | 0.0 | 5.6 |
| Diaphragmatic Hernia | White | 101 | 3.5 | 2.9 | 4.3 |
| | Black | 25 | 2.9 | 1.9 | 4.3 |
| | Hispanic | 13 | 3.5 | 1.9 | 6.0 |
| | Other | 4 | 4.0 | 1.1 | 10.3 |
| Congenital Hip Dislocation * (p=0.0001) | White | 235 | 8.2 | 7.2 | 9.4 |
| | Black | 33 | 3.9 | 2.7 | 5.4 |
| | Hispanic | 20 | 5.4 | 3.3 | 8.3 |
| | Other | 5 | 5.0 | 1.6 | 11.7 |
| Musculoskeletal Cases | White | 652 | 22.9 | 21.1 | 24.7 |
| | Black | 163 | 19.1 | 16.3 | 22.2 |
| | Hispanic | 75 | 20.2 | 15.9 | 25.4 |
| | Other | 18 | 18.0 | 10.7 | 28.5 |
| Chromosomal | | | | | |
| Trisomy 13 | White | 18 | 0.6 | 0.4 | 1.0 |
| | Black | 11 | 1.3 | 0.6 | 2.3 |
| | Hispanic | 3 | 0.8 | 0.2 | 2.4 |
| | Other | 1 | 1.0 | 0.0 | 5.6 |
| Down Syndrome | White | 414 | 14.5 | 13.2 | 16.0 |
| | Black | 110 | 12.9 | 10.6 | 15.5 |
| | Hispanic | 57 | 15.4 | 11.7 | 19.9 |
| | Other | 11 | 11.0 | 5.5 | 19.7 |
| Trisomy 18 | White | 44 | 1.5 | 1.1 | 2.1 |
| | Black | 11 | 1.3 | 0.6 | 2.3 |
| | Hispanic | 8 | 2.2 | 0.9 | 4.3 |
| | Other | 0 | 0.0 | 0.0 | 3.7 |
| Chromosomal Cases | | | | | |
| Fetal Alcohol Syndrome * (p=0.0004) | White | 50 | 1.8 | 1.3 | 2.3 |
| | Black | 36 | 4.2 | 3.0 | 5.8 |
| | Hispanic | 0 | 0.0 | 0.0 | 1.0 |
| | Other | 1 | 1.0 | 0.0 | 5.6 |

**Table 3. Tennessee Birth Defects Rates by Race\Ethnicity
2004-2008**

| Birth Defect | Race | Count¹ | Rate² | LL³ | UL⁴ |
|------------------------------------|-------------|--------------------------|-------------------------|-----------------------|-----------------------|
| Total Cases * (p<0.0001) | White | 10,106 | 354.2 | 347.4 | 361.2 |
| | Black | 2,949 | 345.2 | 332.8 | 357.9 |
| | Hispanic | 1,016 | 274.3 | 257.7 | 291.7 |
| | Other | 230 | 230.3 | 201.5 | 262.0 |
| Total Live Births | White | 285,280 | | | |
| | Black | 85,433 | | | |
| | Hispanic | 37,040 | | | |
| | Other | 9,988 | | | |

Source: Tennessee Birth Defects Registry 2004-2008

¹Counts include cases resulting from live births and fetal deaths. ²Per 10,000 live births. ³ 95% confidence interval lower limit. ⁴95 percent confidence interval upper limit. Confidence intervals for 100 or less cases are exact Poisson; otherwise confidence intervals are based on the normal approximation. *Indicates a statistically significant difference determined by Poisson regression.

Diagnostic data were derived from the Tennessee Hospital Discharge Data System (2004-2009), the Tennessee Death Statistical System (2004-2009) and the Tennessee Fetal Death Statistical System (2004-2008). Live births and race\ethnicity were derived from the Tennessee Birth Statistical system and race\ethnicity (2004-2008).

**Table 4. Tennessee Birth Defects by Perinatal Region
2004-2008**

| Birth Defect | Region | Count¹ | Rate² | LL³ | UL⁴ |
|------------------------------------------------------|---------------|--------------------------|-------------------------|-----------------------|-----------------------|
| Central Nervous System | | | | | |
| Anencephalus * (p=0.0129) | Northeast | 2 | 0.7 | 0.1 | 2.7 |
| | East | 2 | 0.3 | 0.0 | 1.0 |
| | Southeast | 6 | 1.6 | 0.6 | 3.5 |
| | Middle | 28 | 1.7 | 1.1 | 2.5 |
| | West | 19 | 1.7 | 1.0 | 2.6 |
| Spina Bifida | Northeast | 10 | 3.7 | 1.8 | 6.8 |
| | East | 35 | 4.7 | 3.3 | 6.6 |
| | Southeast | 17 | 4.5 | 2.6 | 7.2 |
| | Middle | 78 | 4.7 | 3.7 | 5.9 |
| | West | 42 | 3.7 | 2.7 | 5.0 |
| Hydrocephalus | Northeast | 23 | 8.4 | 5.4 | 12.7 |
| | East | 43 | 5.8 | 4.2 | 7.9 |
| | Southeast | 30 | 7.9 | 5.4 | 11.3 |
| | Middle | 107 | 6.5 | 5.3 | 7.8 |
| | West | 100 | 8.8 | 7.2 | 10.7 |
| Encephalocele | Northeast | 4 | 1.5 | 0.4 | 3.8 |
| | East | 7 | 0.9 | 0.4 | 2.0 |
| | Southeast | 5 | 1.3 | 0.4 | 3.1 |
| | Middle | 17 | 1.0 | 0.6 | 1.7 |
| | West | 20 | 1.8 | 1.1 | 2.7 |
| Microcephalus * (p<0.0001) | Northeast | 40 | 14.7 | 10.5 | 20.0 |
| | East | 84 | 11.4 | 9.1 | 14.1 |
| | Southeast | 54 | 14.3 | 10.7 | 18.6 |
| | Middle | 99 | 6.0 | 4.9 | 7.3 |
| | West | 137 | 12.0 | 10.1 | 14.2 |
| Central Nervous System Cases * (p=0.0001) | | | | | |
| | Northeast | 79 | 29.0 | 23.0 | 36.2 |
| | East | 168 | 22.8 | 19.5 | 26.5 |
| | Southeast | 107 | 28.3 | 23.2 | 34.2 |
| | Middle | 317 | 19.2 | 17.1 | 21.4 |
| | West | 301 | 26.4 | 23.5 | 29.6 |
| Eye and Ear | | | | | |
| Anophthalmia/Microphthalmia * (p=0.0184) | Northeast | 4 | 1.5 | 0.4 | 3.8 |
| | East | 4 | 0.5 | 0.2 | 1.4 |
| | Southeast | 3 | 0.8 | 0.2 | 2.3 |
| | Middle | 8 | 0.5 | 0.2 | 1.0 |
| | West | 19 | 1.7 | 1.0 | 2.6 |
| Congenital Cataract | Northeast | 12 | 4.4 | 2.3 | 7.7 |
| | East | 14 | 1.9 | 1.0 | 3.2 |
| | Southeast | 8 | 2.1 | 0.9 | 4.2 |
| | Middle | 38 | 2.3 | 1.6 | 3.2 |
| | West | 36 | 3.2 | 2.2 | 4.4 |

**Table 4. Tennessee Birth Defects by Perinatal Region
2004-2008**

| Birth Defect | Region | Count¹ | Rate² | LL³ | UL⁴ |
|-------------------------------------------------|---------------|--------------------------|-------------------------|-----------------------|-----------------------|
| Aniridia | Northeast | 0 | 0.0 | 0.0 | 1.4 |
| | East | 0 | 0.0 | 0.0 | 0.5 |
| | Southeast | 0 | 0.0 | 0.0 | 1.0 |
| | Middle | 5 | 0.3 | 0.1 | 0.7 |
| | West | 1 | 0.1 | 0.0 | 0.5 |
| Anotia/Microtia | Northeast | 4 | 1.5 | 0.4 | 3.8 |
| | East | 7 | 0.9 | 0.4 | 2.0 |
| | Southeast | 4 | 1.1 | 0.3 | 2.7 |
| | Middle | 4 | 0.2 | 0.1 | 0.6 |
| | West | 7 | 0.6 | 0.3 | 1.3 |
| Eye and Ear Cases * <i>(p=0.0054)</i> | Northeast | 19 | 7.0 | 4.2 | 10.9 |
| | East | 22 | 3.0 | 1.9 | 4.5 |
| | Southeast | 14 | 3.7 | 2.0 | 6.2 |
| | Middle | 54 | 3.3 | 2.5 | 4.3 |
| | West | 62 | 5.4 | 4.2 | 7.0 |
| Cardiovascular | | | | | |
| Common Truncus | Northeast | 1 | 0.4 | 0.0 | 2.1 |
| | East | 11 | 1.5 | 0.8 | 2.7 |
| | Southeast | 5 | 1.3 | 0.4 | 3.1 |
| | Middle | 16 | 1.0 | 0.6 | 1.6 |
| | West | 7 | 0.6 | 0.3 | 1.3 |
| Transposition of Great Arteries | Northeast | 12 | 4.4 | 2.3 | 7.7 |
| | East | 50 | 6.8 | 5.0 | 8.9 |
| | Southeast | 26 | 6.9 | 4.5 | 10.1 |
| | Middle | 106 | 6.4 | 5.3 | 7.8 |
| | West | 66 | 5.8 | 4.5 | 7.4 |
| Tetralogy of Fallot | Northeast | 14 | 5.1 | 2.8 | 8.6 |
| | East | 46 | 6.2 | 4.6 | 8.3 |
| | Southeast | 24 | 6.3 | 4.1 | 9.4 |
| | Middle | 85 | 5.1 | 4.1 | 6.4 |
| | West | 67 | 5.9 | 4.6 | 7.5 |
| Ventricular Septal Defect | Northeast | 140 | 51.4 | 43.3 | 60.7 |
| | East | 351 | 47.6 | 42.8 | 52.9 |
| | Southeast | 155 | 41.0 | 34.8 | 48.0 |
| | Middle | 691 | 41.8 | 38.8 | 45.1 |
| | West | 481 | 42.3 | 38.6 | 46.2 |
| Atrial Septal Defect * <i>(p<0.0001)</i> | Northeast | 484 | 177.8 | 162.3 | 194.3 |
| | East | 546 | 74.1 | 68.0 | 80.6 |
| | Southeast | 198 | 52.3 | 45.3 | 60.2 |
| | Middle | 942 | 57.0 | 53.5 | 60.8 |
| | West | 1,117 | 98.1 | 92.5 | 104.1 |

**Table 4. Tennessee Birth Defects by Perinatal Region
2004-2008**

| Birth Defect | Region | Count¹ | Rate² | LL³ | UL⁴ |
|----------------------------------------------------|---------------|--------------------------|-------------------------|-----------------------|-----------------------|
| Endocardial Cushion Defect | Northeast | 7 | 2.6 | 1.0 | 5.3 |
| | East | 38 | 5.2 | 3.7 | 7.1 |
| | Southeast | 17 | 4.5 | 2.6 | 7.2 |
| | Middle | 55 | 3.3 | 2.5 | 4.3 |
| | West | 45 | 4.0 | 2.9 | 5.3 |
| Pulmonary Valve Atresia & Stenosis * (p<0.0001) | Northeast | 43 | 15.8 | 11.4 | 21.3 |
| | East | 58 | 7.9 | 6.0 | 10.2 |
| | Southeast | 26 | 6.9 | 4.5 | 10.1 |
| | Middle | 216 | 13.1 | 11.4 | 14.9 |
| | West | 106 | 9.3 | 7.6 | 11.3 |
| Tricuspid Valve Atresia & Stenosis | Northeast | 3 | 1.1 | 0.2 | 3.2 |
| | East | 11 | 1.5 | 0.8 | 2.7 |
| | Southeast | 6 | 1.6 | 0.6 | 3.5 |
| | Middle | 12 | 0.7 | 0.4 | 1.3 |
| | West | 13 | 1.1 | 0.6 | 2.0 |
| Ebsteins Anomaly | Northeast | 0 | 0.0 | 0.0 | 1.4 |
| | East | 10 | 1.4 | 0.7 | 2.5 |
| | Southeast | 0 | 0.0 | 0.0 | 1.0 |
| | Middle | 17 | 1.0 | 0.6 | 1.7 |
| | West | 6 | 0.5 | 0.2 | 1.2 |
| Aortic Valve Stenosis | Northeast | 3 | 1.1 | 0.2 | 3.2 |
| | East | 17 | 2.3 | 1.3 | 3.7 |
| | Southeast | 6 | 1.6 | 0.6 | 3.5 |
| | Middle | 39 | 2.4 | 1.7 | 3.2 |
| | West | 15 | 1.3 | 0.7 | 2.2 |
| Hypoplastic Left Heart Syndrome | Northeast | 8 | 2.9 | 1.3 | 5.8 |
| | East | 32 | 4.3 | 3.0 | 6.1 |
| | Southeast | 15 | 4.0 | 2.2 | 6.5 |
| | Middle | 54 | 3.3 | 2.5 | 4.3 |
| | West | 36 | 3.2 | 2.2 | 4.4 |
| Patent Ductus Arteriosus * (p<0.0001) | Northeast | 305 | 112.0 | 99.8 | 125.3 |
| | East | 338 | 45.9 | 41.1 | 51.0 |
| | Southeast | 137 | 36.2 | 30.4 | 42.8 |
| | Middle | 739 | 44.7 | 41.6 | 48.1 |
| | West | 847 | 74.4 | 69.5 | 79.6 |
| Coarctation of Aorta | Northeast | 17 | 6.2 | 3.6 | 10.0 |
| | East | 43 | 5.8 | 4.2 | 7.9 |
| | Southeast | 25 | 6.6 | 4.3 | 9.8 |
| | Middle | 112 | 6.8 | 5.6 | 8.2 |
| | West | 66 | 5.8 | 4.5 | 7.4 |
| Cardiovascular Cases * (p<0.0001) | Northeast | 758 | 278.4 | 258.9 | 298.9 |
| | East | 1,119 | 151.8 | 143.1 | 161.0 |
| | Southeast | 425 | 112.4 | 101.9 | 123.6 |
| | Middle | 2,114 | 128.0 | 122.6 | 133.6 |
| | West | 2,005 | 176.1 | 168.5 | 184.0 |

**Table 4. Tennessee Birth Defects by Perinatal Region
2004-2008**

| Birth Defect | Region | Count¹ | Rate² | LL³ | UL⁴ |
|-------------------------------------------------|---------------|--------------------------|-------------------------|-----------------------|-----------------------|
| Orofacial | | | | | |
| Cleft Palate w/o Cleft Lip * (p=0.0139) | Northeast | 31 | 11.4 | 7.7 | 16.2 |
| | East | 64 | 8.7 | 6.7 | 11.1 |
| | Southeast | 29 | 7.7 | 5.1 | 11.0 |
| | Middle | 119 | 7.2 | 6.0 | 8.6 |
| | West | 63 | 5.5 | 4.3 | 7.1 |
| Cleft Lip w/ & w/o Cleft Palate * (p=0.0006) | Northeast | 37 | 13.6 | 9.6 | 18.7 |
| | East | 105 | 14.2 | 11.7 | 17.3 |
| | Southeast | 43 | 11.4 | 8.2 | 15.3 |
| | Middle | 193 | 11.7 | 10.1 | 13.5 |
| | West | 90 | 7.9 | 6.4 | 9.7 |
| Choanal Atresia | Northeast | 7 | 2.6 | 1.0 | 5.3 |
| | East | 16 | 2.2 | 1.2 | 3.5 |
| | Southeast | 7 | 1.9 | 0.7 | 3.8 |
| | Middle | 34 | 2.1 | 1.4 | 2.9 |
| | West | 18 | 1.6 | 0.9 | 2.5 |
| Orofacial Cases * (p<0.0001) | | | | | |
| | Northeast | 74 | 27.2 | 21.3 | 34.1 |
| | East | 184 | 25.0 | 21.5 | 28.9 |
| | Southeast | 79 | 20.9 | 16.5 | 26.0 |
| | Middle | 343 | 20.8 | 18.6 | 23.1 |
| | West | 170 | 14.9 | 12.8 | 17.4 |
| Gastrointestinal | | | | | |
| Esophageal Atresia/Tracheoesophageal Fistula | Northeast | 5 | 1.8 | 0.6 | 4.3 |
| | East | 15 | 2.0 | 1.1 | 3.4 |
| | Southeast | 9 | 2.4 | 1.1 | 4.5 |
| | Middle | 45 | 2.7 | 2.0 | 3.7 |
| | West | 22 | 1.9 | 1.2 | 2.9 |
| Rectal & Large Intestinal Atresia/Stenosis | Northeast | 16 | 5.9 | 3.4 | 9.5 |
| | East | 46 | 6.2 | 4.6 | 8.3 |
| | Southeast | 22 | 5.8 | 3.6 | 8.8 |
| | Middle | 91 | 5.5 | 4.4 | 6.8 |
| | West | 53 | 4.7 | 3.5 | 6.1 |
| Pyloric Stenosis * (p<0.0001) | Northeast | 168 | 61.7 | 52.7 | 71.8 |
| | East | 384 | 52.1 | 47.0 | 57.6 |
| | Southeast | 171 | 45.2 | 38.7 | 52.5 |
| | Middle | 720 | 43.6 | 40.5 | 46.9 |
| | West | 426 | 37.4 | 34.0 | 41.2 |
| Hirschsprungs Disease (congenital megacolon) | Northeast | 12 | 4.4 | 2.3 | 7.7 |
| | East | 18 | 2.4 | 1.5 | 3.9 |
| | Southeast | 9 | 2.4 | 1.1 | 4.5 |
| | Middle | 42 | 2.5 | 1.8 | 3.4 |
| | West | 40 | 3.5 | 2.5 | 4.8 |

**Table 4. Tennessee Birth Defects by Perinatal Region
2004-2008**

| Birth Defect | Region | Count¹ | Rate² | LL³ | UL⁴ |
|-----------------------------------------------------------|---------------|--------------------------|-------------------------|-----------------------|-----------------------|
| Biliary Atresia | Northeast | 1 | 0.4 | 0.0 | 2.1 |
| | East | 5 | 0.7 | 0.2 | 1.6 |
| | Southeast | 5 | 1.3 | 0.4 | 3.1 |
| | Middle | 22 | 1.3 | 0.8 | 2.0 |
| | West | 5 | 0.4 | 0.1 | 1.0 |
| Gastrointestinal Cases * (<i>p</i> <0.0001) | Northeast | 199 | 73.1 | 63.3 | 84.0 |
| | East | 466 | 63.2 | 57.6 | 69.2 |
| | Southeast | 216 | 57.1 | 49.7 | 65.3 |
| | Middle | 914 | 55.3 | 51.8 | 59.1 |
| | West | 539 | 47.4 | 43.4 | 51.5 |
| Genitourinary | | | | | |
| Renal Agenesis/Hypoplasia | Northeast | 11 | 4.0 | 2.0 | 7.2 |
| | East | 42 | 5.7 | 4.1 | 7.7 |
| | Southeast | 18 | 4.8 | 2.8 | 7.5 |
| | Middle | 75 | 4.5 | 3.6 | 5.7 |
| | West | 51 | 4.5 | 3.3 | 5.9 |
| Bladder Exstrophy | Northeast | 2 | 0.7 | 0.1 | 2.7 |
| | East | 6 | 0.8 | 0.3 | 1.8 |
| | Southeast | 2 | 0.5 | 0.1 | 1.9 |
| | Middle | 8 | 0.5 | 0.2 | 1.0 |
| | West | 3 | 0.3 | 0.1 | 0.8 |
| Hypospadias * (<i>p</i> <0.0001) | Northeast | 113 | 41.5 | 34.2 | 49.9 |
| | East | 413 | 56.0 | 50.8 | 61.7 |
| | Southeast | 179 | 47.3 | 40.6 | 54.8 |
| | Middle | 970 | 58.7 | 55.1 | 62.6 |
| | West | 538 | 47.3 | 43.4 | 51.4 |
| Epispadias | Northeast | 1 | 0.4 | 0.0 | 2.1 |
| | East | 10 | 1.4 | 0.7 | 2.5 |
| | Southeast | 4 | 1.1 | 0.3 | 2.7 |
| | Middle | 16 | 1.0 | 0.6 | 1.6 |
| | West | 12 | 1.1 | 0.5 | 1.8 |
| Obstructive Genitourinary Defect * (<i>p</i> <0.0001) | Northeast | 114 | 41.9 | 34.5 | 50.3 |
| | East | 278 | 37.7 | 33.4 | 42.4 |
| | Southeast | 81 | 21.4 | 17.0 | 26.6 |
| | Middle | 419 | 25.4 | 23.0 | 27.9 |
| | West | 207 | 18.2 | 15.8 | 20.8 |
| Genitourinary Cases * (<i>p</i> <0.0001) | Northeast | 229 | 84.1 | 73.6 | 95.7 |
| | East | 737 | 100.0 | 92.9 | 107.5 |
| | Southeast | 279 | 73.8 | 65.4 | 82.9 |
| | Middle | 1,463 | 88.6 | 84.1 | 93.2 |
| | West | 797 | 70.0 | 65.2 | 75.1 |

**Table 4. Tennessee Birth Defects by Perinatal Region
2004-2008**

| Birth Defect | Region | Count¹ | Rate² | LL³ | UL⁴ |
|--------------------------------------------|---------------|--------------------------|-------------------------|-----------------------|-----------------------|
| Musculoskeletal | | | | | |
| Reduction Deformity (upper limbs) | Northeast | 4 | 1.5 | 0.4 | 3.8 |
| | East | 19 | 2.6 | 1.6 | 4.0 |
| | Southeast | 14 | 3.7 | 2.0 | 6.2 |
| | Middle | 24 | 1.5 | 0.9 | 2.2 |
| | West | 24 | 2.1 | 1.4 | 3.1 |
| Reduction Deformity (lower limbs) | Northeast | 4 | 1.5 | 0.4 | 3.8 |
| | East | 11 | 1.5 | 0.8 | 2.7 |
| | Southeast | 6 | 1.6 | 0.6 | 3.5 |
| | Middle | 24 | 1.5 | 0.9 | 2.2 |
| | West | 30 | 2.6 | 1.8 | 3.8 |
| Gastroschisis | Northeast | 11 | 4.0 | 2.0 | 7.2 |
| | East | 44 | 6.0 | 4.3 | 8.0 |
| | Southeast | 19 | 5.0 | 3.0 | 7.8 |
| | Middle | 91 | 5.5 | 4.4 | 6.8 |
| | West | 55 | 4.8 | 3.6 | 6.3 |
| Omphalocele | Northeast | 4 | 1.5 | 0.4 | 3.8 |
| | East | 30 | 4.1 | 2.8 | 5.8 |
| | Southeast | 9 | 2.4 | 1.1 | 4.5 |
| | Middle | 53 | 3.2 | 2.4 | 4.2 |
| | West | 30 | 2.6 | 1.8 | 3.8 |
| Diaphragmatic Hernia | Northeast | 17 | 6.2 | 3.6 | 10.0 |
| | East | 26 | 3.5 | 2.3 | 5.2 |
| | Southeast | 8 | 2.1 | 0.9 | 4.2 |
| | Middle | 57 | 3.5 | 2.6 | 4.5 |
| | West | 35 | 3.1 | 2.1 | 4.3 |
| Congenital Hip Dislocation * (p=0.0024) | Northeast | 22 | 8.1 | 5.1 | 12.2 |
| | East | 50 | 6.8 | 5.0 | 8.9 |
| | Southeast | 45 | 11.9 | 8.7 | 15.9 |
| | Middle | 116 | 7.0 | 5.8 | 8.4 |
| | West | 60 | 5.3 | 4.0 | 6.8 |
| Musculoskeletal Cases | | | | | |
| | Northeast | 61 | 22.4 | 17.1 | 28.8 |
| | East | 174 | 23.6 | 20.2 | 27.4 |
| | Southeast | 98 | 25.9 | 21.0 | 31.6 |
| | Middle | 350 | 21.2 | 19.0 | 23.5 |
| | West | 225 | 19.8 | 17.3 | 22.5 |
| Chromosomal | | | | | |
| Trisomy 13 | Northeast | 4 | 1.5 | 0.4 | 3.8 |
| | East | 4 | 0.5 | 0.2 | 1.4 |
| | Southeast | 0 | 0.0 | 0.0 | 1.0 |
| | Middle | 10 | 0.6 | 0.3 | 1.1 |
| | West | 15 | 1.3 | 0.7 | 2.2 |

**Table 4. Tennessee Birth Defects by Perinatal Region
2004-2008**

| Birth Defect | Region | Count¹ | Rate² | LL³ | UL⁴ |
|----------------------------------------------|---------------|--------------------------|-------------------------|-----------------------|-----------------------|
| Down Syndrome | Northeast | 32 | 11.8 | 8.0 | 16.6 |
| | East | 112 | 15.2 | 12.5 | 18.3 |
| | Southeast | 52 | 13.7 | 10.3 | 18.0 |
| | Middle | 244 | 14.8 | 13.0 | 16.8 |
| | West | 152 | 13.4 | 11.3 | 15.7 |
| Trisomy 18 | Northeast | 3 | 1.1 | 0.2 | 3.2 |
| | East | 14 | 1.9 | 1.0 | 3.2 |
| | Southeast | 8 | 2.1 | 0.9 | 4.2 |
| | Middle | 25 | 1.5 | 1.0 | 2.2 |
| | West | 13 | 1.1 | 0.6 | 2.0 |
| Chromosomal Cases | Northeast | 39 | 14.3 | 10.2 | 19.6 |
| | East | 129 | 17.5 | 14.6 | 20.8 |
| | Southeast | 60 | 15.9 | 12.1 | 20.4 |
| | Middle | 277 | 16.8 | 14.9 | 18.9 |
| | West | 178 | 15.6 | 13.4 | 18.1 |
| Fetal Alcohol Syndrome | Northeast | 10 | 3.7 | 1.8 | 6.8 |
| | East | 19 | 2.6 | 1.6 | 4.0 |
| | Southeast | 12 | 3.2 | 1.6 | 5.5 |
| | Middle | 27 | 1.6 | 1.1 | 2.4 |
| | West | 19 | 1.7 | 1.0 | 2.6 |
| Total Cases * (p<0.0001) | Northeast | 1,328 | 487.7 | 461.9 | 514.7 |
| | East | 2,687 | 364.6 | 351.0 | 378.7 |
| | Southeast | 1,158 | 306.1 | 288.8 | 324.3 |
| | Middle | 5,239 | 317.2 | 308.7 | 325.9 |
| | West | 3,889 | 341.7 | 331.0 | 352.6 |
| Total Live Births | Northeast | 27,228 | | | |
| | East | 73,696 | | | |
| | Southeast | 37,827 | | | |
| | Middle | 165,161 | | | |
| | West | 113,824 | | | |
| Unknown Cases | | 0 | | | |
| Unknown Live Births | | 5 | | | |

Source: Tennessee Birth Defects Registry 2004-2008

¹Counts include cases resulting from live births and fetal deaths. ²Per 10,000 live births. ³ 95% confidence interval lower limit. ⁴95 percent confidence interval upper limit. Confidence intervals for 100 or less cases are exact Poisson; otherwise confidence intervals are based on the normal approximation. *Indicates a statistically significant difference based on Poisson regression.

Diagnostic data were derived from the Tennessee Hospital Discharge Data System (2004-2009), the Tennessee Death Statistical System (2004-2009) and the Tennessee Fetal Death Statistical System (2004-2008). Live births and perinatal region were derived from the Tennessee Birth Statistical system (2004-2008).

**Table 5. Tennessee Birth Defects by Maternal Age
2004-2008**

| Birth Defect | Age Group | Count ¹ | Rate ² | LL ³ | UL ⁴ |
|-----------------------------------------------------|--------------|--------------------|-------------------|-----------------|-----------------|
| Central Nervous System | | | | | |
| Anencephalus | Less than 20 | 8 | 1.5 | 0.6 | 2.9 |
| | 20 - 24 | 20 | 1.6 | 1.0 | 2.5 |
| | 25 - 29 | 18 | 1.5 | 0.9 | 2.4 |
| | 30 - 34 | 9 | 1.1 | 0.5 | 2.2 |
| | 35 - 39 | 2 | 0.6 | 0.1 | 2.1 |
| | 40 and older | 0 | 0.0 | 0.0 | 5.3 |
| Spina Bifida | Less than 20 | 26 | 4.7 | 3.1 | 6.9 |
| | 20 - 24 | 46 | 3.7 | 2.7 | 4.9 |
| | 25 - 29 | 53 | 4.5 | 3.4 | 6.0 |
| | 30 - 34 | 30 | 3.8 | 2.6 | 5.4 |
| | 35 - 39 | 22 | 6.3 | 3.9 | 9.5 |
| | 40 and older | 5 | 7.1 | 2.3 | 16.6 |
| Hydrocephalus | Less than 20 | 47 | 8.6 | 6.3 | 11.4 |
| | 20 - 24 | 95 | 7.6 | 6.1 | 9.3 |
| | 25 - 29 | 77 | 6.6 | 5.2 | 8.3 |
| | 30 - 34 | 50 | 6.3 | 4.7 | 8.4 |
| | 35 - 39 | 31 | 8.8 | 6.0 | 12.5 |
| | 40 and older | 3 | 4.3 | 0.9 | 12.5 |
| Encephalocele | Less than 20 | 6 | 1.1 | 0.4 | 2.4 |
| | 20 - 24 | 14 | 1.1 | 0.6 | 1.9 |
| | 25 - 29 | 16 | 1.4 | 0.8 | 2.2 |
| | 30 - 34 | 13 | 1.6 | 0.9 | 2.8 |
| | 35 - 39 | 4 | 1.1 | 0.3 | 2.9 |
| | 40 and older | 0 | 0.0 | 0.0 | 5.3 |
| Microcephalus * (p=0.0042) | Less than 20 | 79 | 14.4 | 11.4 | 18.0 |
| | 20 - 24 | 123 | 9.8 | 8.2 | 11.7 |
| | 25 - 29 | 103 | 8.8 | 7.2 | 10.7 |
| | 30 - 34 | 60 | 7.6 | 5.8 | 9.8 |
| | 35 - 39 | 42 | 12.0 | 8.6 | 16.2 |
| | 40 and older | 7 | 9.9 | 4.0 | 20.5 |
| Central Nervous System Cases * (p=0.0027) | Less than 20 | 162 | 29.5 | 25.2 | 34.4 |
| | 20 - 24 | 287 | 22.9 | 20.3 | 25.7 |
| | 25 - 29 | 256 | 22.0 | 19.4 | 24.8 |
| | 30 - 34 | 154 | 19.5 | 16.6 | 22.9 |
| | 35 - 39 | 99 | 28.2 | 22.9 | 34.4 |
| | 40 and older | 14 | 19.9 | 10.9 | 33.4 |
| Eye and Ear | | | | | |
| Anophthalmia/Microphthalmia | Less than 20 | 9 | 1.6 | 0.8 | 3.1 |
| | 20 - 24 | 15 | 1.2 | 0.7 | 2.0 |
| | 25 - 29 | 5 | 0.4 | 0.1 | 1.0 |
| | 30 - 34 | 5 | 0.6 | 0.2 | 1.5 |
| | 35 - 39 | 3 | 0.9 | 0.2 | 2.5 |
| | 40 and older | 1 | 1.4 | 0.0 | 7.9 |

**Table 5. Tennessee Birth Defects by Maternal Age
2004-2008**

| Birth Defect | Age Group | Count ¹ | Rate ² | LL ³ | UL ⁴ |
|-------------------------------------|--------------|--------------------|-------------------|-----------------|-----------------|
| Congenital Cataract | Less than 20 | 16 | 2.9 | 1.7 | 4.7 |
| | 20 - 24 | 37 | 3.0 | 2.1 | 4.1 |
| | 25 - 29 | 29 | 2.5 | 1.7 | 3.6 |
| | 30 - 34 | 14 | 1.8 | 1.0 | 3.0 |
| | 35 - 39 | 9 | 2.6 | 1.2 | 4.9 |
| | 40 and older | 2 | 2.8 | 0.3 | 10.3 |
| Aniridia | Less than 20 | 0 | 0.0 | 0.0 | 0.7 |
| | 20 - 24 | 2 | 0.2 | 0.0 | 0.6 |
| | 25 - 29 | 2 | 0.2 | 0.0 | 0.6 |
| | 30 - 34 | 2 | 0.3 | 0.0 | 0.9 |
| | 35 - 39 | 0 | 0.0 | 0.0 | 1.1 |
| | 40 and older | 0 | 0.0 | 0.0 | 5.3 |
| Anotia/Microtia | Less than 20 | 5 | 0.9 | 0.3 | 2.1 |
| | 20 - 24 | 8 | 0.6 | 0.3 | 1.3 |
| | 25 - 29 | 5 | 0.4 | 0.1 | 1.0 |
| | 30 - 34 | 3 | 0.4 | 0.1 | 1.1 |
| | 35 - 39 | 4 | 1.1 | 0.3 | 2.9 |
| | 40 and older | 1 | 1.4 | 0.0 | 7.9 |
| Eye and Ear Cases | Less than 20 | 28 | 5.1 | 3.4 | 7.4 |
| | 20 - 24 | 61 | 4.9 | 3.7 | 6.3 |
| | 25 - 29 | 40 | 3.4 | 2.5 | 4.7 |
| | 30 - 34 | 22 | 2.8 | 1.8 | 4.2 |
| | 35 - 39 | 15 | 4.3 | 2.4 | 7.1 |
| | 40 and older | 4 | 5.7 | 1.6 | 14.6 |
| Cardiovascular | | | | | |
| Common Truncus | Less than 20 | 7 | 1.3 | 0.5 | 2.6 |
| | 20 - 24 | 13 | 1.0 | 0.6 | 1.8 |
| | 25 - 29 | 11 | 0.9 | 0.5 | 1.7 |
| | 30 - 34 | 6 | 0.8 | 0.3 | 1.7 |
| | 35 - 39 | 2 | 0.6 | 0.1 | 2.1 |
| | 40 and older | 1 | 1.4 | 0.0 | 7.9 |
| Transposition of Great Arteries | Less than 20 | 33 | 6.0 | 4.1 | 8.5 |
| | 20 - 24 | 80 | 6.4 | 5.1 | 8.0 |
| | 25 - 29 | 61 | 5.2 | 4.0 | 6.7 |
| | 30 - 34 | 49 | 6.2 | 4.6 | 8.2 |
| | 35 - 39 | 34 | 9.7 | 6.7 | 13.6 |
| | 40 and older | 3 | 4.3 | 0.9 | 12.5 |
| Tetralogy of Fallot * (p=0.0296) | Less than 20 | 22 | 4.0 | 2.5 | 6.1 |
| | 20 - 24 | 75 | 6.0 | 4.7 | 7.5 |
| | 25 - 29 | 61 | 5.2 | 4.0 | 6.7 |
| | 30 - 34 | 39 | 4.9 | 3.5 | 6.8 |
| | 35 - 39 | 32 | 9.1 | 6.2 | 12.9 |
| | 40 and older | 7 | 9.9 | 4.0 | 20.5 |

**Table 5. Tennessee Birth Defects by Maternal Age
2004-2008**

| Birth Defect | Age Group | Count ¹ | Rate ² | LL ³ | UL ⁴ |
|-------------------------------------------------------|--------------|--------------------|-------------------|-----------------|-----------------|
| Ventricular Septal Defect * (p<0.0001) | Less than 20 | 229 | 41.7 | 36.5 | 47.5 |
| | 20 - 24 | 472 | 37.7 | 34.4 | 41.3 |
| | 25 - 29 | 498 | 42.7 | 39.1 | 46.7 |
| | 30 - 34 | 339 | 43.0 | 38.6 | 47.9 |
| | 35 - 39 | 226 | 64.4 | 56.3 | 73.4 |
| | 40 and older | 54 | 76.7 | 57.6 | 100.1 |
| Atrial Septal Defect * (p<0.0001) | Less than 20 | 474 | 86.4 | 78.8 | 94.5 |
| | 20 - 24 | 979 | 78.2 | 73.4 | 83.2 |
| | 25 - 29 | 858 | 73.6 | 68.8 | 78.7 |
| | 30 - 34 | 550 | 69.8 | 64.1 | 75.9 |
| | 35 - 39 | 350 | 99.8 | 89.6 | 110.8 |
| | 40 and older | 75 | 106.5 | 83.8 | 133.5 |
| Endocardial Cushion Defect * (p<0.0001) | Less than 20 | 27 | 4.9 | 3.2 | 7.2 |
| | 20 - 24 | 37 | 3.0 | 2.1 | 4.1 |
| | 25 - 29 | 30 | 2.6 | 1.7 | 3.7 |
| | 30 - 34 | 21 | 2.7 | 1.7 | 4.1 |
| | 35 - 39 | 29 | 8.3 | 5.5 | 11.9 |
| | 40 and older | 18 | 25.6 | 15.2 | 40.4 |
| Pulmonary Valve Atresia & Stenosis * (p=0.0444) | Less than 20 | 52 | 9.5 | 7.1 | 12.4 |
| | 20 - 24 | 139 | 11.1 | 9.3 | 13.1 |
| | 25 - 29 | 117 | 10.0 | 8.3 | 12.0 |
| | 30 - 34 | 74 | 9.4 | 7.4 | 11.8 |
| | 35 - 39 | 54 | 15.4 | 11.6 | 20.1 |
| | 40 and older | 12 | 17.0 | 8.8 | 29.8 |
| Tricuspid Valve Atresia & Stenosis | Less than 20 | 6 | 1.1 | 0.4 | 2.4 |
| | 20 - 24 | 9 | 0.7 | 0.3 | 1.4 |
| | 25 - 29 | 16 | 1.4 | 0.8 | 2.2 |
| | 30 - 34 | 4 | 0.5 | 0.1 | 1.3 |
| | 35 - 39 | 8 | 2.3 | 1.0 | 4.5 |
| | 40 and older | 2 | 2.8 | 0.3 | 10.3 |
| Ebsteins Anomaly | Less than 20 | 6 | 1.1 | 0.4 | 2.4 |
| | 20 - 24 | 15 | 1.2 | 0.7 | 2.0 |
| | 25 - 29 | 5 | 0.4 | 0.1 | 1.0 |
| | 30 - 34 | 6 | 0.8 | 0.3 | 1.7 |
| | 35 - 39 | 1 | 0.3 | 0.0 | 1.6 |
| | 40 and older | 0 | 0.0 | 0.0 | 5.3 |
| Aortic Valve Stenosis | Less than 20 | 13 | 2.4 | 1.3 | 4.1 |
| | 20 - 24 | 21 | 1.7 | 1.0 | 2.6 |
| | 25 - 29 | 27 | 2.3 | 1.5 | 3.4 |
| | 30 - 34 | 10 | 1.3 | 0.6 | 2.3 |
| | 35 - 39 | 9 | 2.6 | 1.2 | 4.9 |
| | 40 and older | 0 | 0.0 | 0.0 | 5.3 |

**Table 5. Tennessee Birth Defects by Maternal Age
2004-2008**

| Birth Defect | Age Group | Count ¹ | Rate ² | LL ³ | UL ⁴ |
|---------------------------------------------|--------------|--------------------|-------------------|-----------------|-----------------|
| Hypoplastic Left Heart Syndrome | Less than 20 | 21 | 3.8 | 2.4 | 5.9 |
| | 20 - 24 | 46 | 3.7 | 2.7 | 4.9 |
| | 25 - 29 | 35 | 3.0 | 2.1 | 4.2 |
| | 30 - 34 | 29 | 3.7 | 2.5 | 5.3 |
| | 35 - 39 | 14 | 4.0 | 2.2 | 6.7 |
| | 40 and older | 0 | 0.0 | 0.0 | 5.3 |
| Patent Ductus Arteriosus * (p<0.0001) | Less than 20 | 317 | 57.8 | 51.6 | 64.5 |
| | 20 - 24 | 624 | 49.8 | 46.0 | 53.9 |
| | 25 - 29 | 632 | 54.2 | 50.1 | 58.6 |
| | 30 - 34 | 469 | 59.5 | 54.3 | 65.2 |
| | 35 - 39 | 262 | 74.7 | 65.9 | 84.3 |
| | 40 and older | 61 | 86.6 | 66.3 | 111.3 |
| Coarctation of Aorta * (p=0.0002) | Less than 20 | 49 | 8.9 | 6.6 | 11.8 |
| | 20 - 24 | 59 | 4.7 | 3.6 | 6.1 |
| | 25 - 29 | 79 | 6.8 | 5.4 | 8.5 |
| | 30 - 34 | 35 | 4.4 | 3.1 | 6.2 |
| | 35 - 39 | 31 | 8.8 | 6.0 | 12.5 |
| | 40 and older | 10 | 14.2 | 6.8 | 26.1 |
| Cardiovascular Cases * (p<0.0001) | Less than 20 | 852 | 155.3 | 145.0 | 166.1 |
| | 20 - 24 | 1,833 | 146.4 | 139.8 | 153.2 |
| | 25 - 29 | 1,698 | 145.7 | 138.9 | 152.8 |
| | 30 - 34 | 1,173 | 148.9 | 140.5 | 157.6 |
| | 35 - 39 | 701 | 199.9 | 185.3 | 215.2 |
| | 40 and older | 162 | 230.1 | 196.0 | 268.4 |
| Orofacial | | | | | |
| Cleft Palate w/o Cleft Lip * (p=0.0008) | Less than 20 | 35 | 6.4 | 4.4 | 8.9 |
| | 20 - 24 | 88 | 7.0 | 5.6 | 8.7 |
| | 25 - 29 | 72 | 6.2 | 4.8 | 7.8 |
| | 30 - 34 | 54 | 6.9 | 5.2 | 8.9 |
| | 35 - 39 | 48 | 13.7 | 10.1 | 18.1 |
| | 40 and older | 9 | 12.8 | 5.9 | 24.3 |
| Cleft Lip w/ & w/o Cleft Palate | Less than 20 | 58 | 10.6 | 8.0 | 13.7 |
| | 20 - 24 | 166 | 13.3 | 11.3 | 15.4 |
| | 25 - 29 | 120 | 10.3 | 8.5 | 12.3 |
| | 30 - 34 | 71 | 9.0 | 7.0 | 11.4 |
| | 35 - 39 | 43 | 12.3 | 8.9 | 16.5 |
| | 40 and older | 10 | 14.2 | 6.8 | 26.1 |
| Choanal Atresia | Less than 20 | 8 | 1.5 | 0.6 | 2.9 |
| | 20 - 24 | 23 | 1.8 | 1.2 | 2.8 |
| | 25 - 29 | 21 | 1.8 | 1.1 | 2.8 |
| | 30 - 34 | 15 | 1.9 | 1.1 | 3.1 |
| | 35 - 39 | 10 | 2.9 | 1.4 | 5.2 |
| | 40 and older | 5 | 7.1 | 2.3 | 16.6 |

**Table 5. Tennessee Birth Defects by Maternal Age
2004-2008**

| Birth Defect | Age Group | Count ¹ | Rate ² | LL ³ | UL ⁴ |
|----------------------------------------------------|--------------------------------------------------------|--------------------|-------------------|-----------------|-----------------|
| Orofacial Cases * (<i>p</i> =0.0002) | Less than 20 | 100 | 18.2 | 14.8 | 22.2 |
| | 20 - 24 | 275 | 22.0 | 19.4 | 24.7 |
| | 25 - 29 | 211 | 18.1 | 15.8 | 20.7 |
| | 30 - 34 | 140 | 17.8 | 15.0 | 21.0 |
| | 35 - 39 | 100 | 28.5 | 23.2 | 34.7 |
| | 40 and older | 24 | 34.1 | 21.8 | 50.7 |
| | Gastrointestinal | | | | |
| Esophageal Atresia/Tracheoesophageal Fistula | Less than 20 | 12 | 2.2 | 1.1 | 3.8 |
| | 20 - 24 | 28 | 2.2 | 1.5 | 3.2 |
| | 25 - 29 | 29 | 2.5 | 1.7 | 3.6 |
| | 30 - 34 | 11 | 1.4 | 0.7 | 2.5 |
| | 35 - 39 | 10 | 2.9 | 1.4 | 5.2 |
| | 40 and older | 6 | 8.5 | 3.1 | 18.6 |
| | Rectal & Large Intestinal Atresia/Stenosis | Less than 20 | 35 | 6.4 | 4.4 |
| 20 - 24 | | 71 | 5.7 | 4.4 | 7.2 |
| 25 - 29 | | 52 | 4.5 | 3.3 | 5.9 |
| 30 - 34 | | 45 | 5.7 | 4.2 | 7.6 |
| 35 - 39 | | 22 | 6.3 | 3.9 | 9.5 |
| 40 and older | | 3 | 4.3 | 0.9 | 12.5 |
| Pyloric Stenosis * (<i>p</i> <0.0001) | | Less than 20 | 343 | 62.5 | 56.1 |
| | 20 - 24 | 659 | 52.6 | 48.7 | 56.8 |
| | 25 - 29 | 472 | 40.5 | 36.9 | 44.3 |
| | 30 - 34 | 272 | 34.5 | 30.5 | 38.9 |
| | 35 - 39 | 111 | 31.6 | 26.0 | 38.1 |
| | 40 and older | 12 | 17.0 | 8.8 | 29.8 |
| | Hirschsprungs Disease (congenital megacolon) | Less than 20 | 19 | 3.5 | 2.1 |
| 20 - 24 | | 41 | 3.3 | 2.4 | 4.4 |
| 25 - 29 | | 32 | 2.7 | 1.9 | 3.9 |
| 30 - 34 | | 17 | 2.2 | 1.3 | 3.5 |
| 35 - 39 | | 8 | 2.3 | 1.0 | 4.5 |
| 40 and older | | 4 | 5.7 | 1.6 | 14.6 |
| Biliary Atresia | | Less than 20 | 4 | 0.7 | 0.2 |
| | 20 - 24 | 10 | 0.8 | 0.4 | 1.5 |
| | 25 - 29 | 14 | 1.2 | 0.7 | 2.0 |
| | 30 - 34 | 4 | 0.5 | 0.1 | 1.3 |
| | 35 - 39 | 5 | 1.4 | 0.5 | 3.3 |
| | 40 and older | 1 | 1.4 | 0.0 | 7.9 |
| | Gastrointestinal Cases * (<i>p</i> <0.0001) | Less than 20 | 409 | 74.5 | 67.5 |
| 20 - 24 | | 805 | 64.3 | 59.9 | 68.9 |
| 25 - 29 | | 593 | 50.9 | 46.9 | 55.2 |
| 30 - 34 | | 347 | 44.0 | 39.5 | 48.9 |
| 35 - 39 | | 154 | 43.9 | 37.2 | 51.4 |
| 40 and older | | 26 | 36.9 | 24.1 | 54.1 |

**Table 5. Tennessee Birth Defects by Maternal Age
2004-2008**

| Birth Defect | Age Group | Count ¹ | Rate ² | LL ³ | UL ⁴ |
|--------------------------------------------------|--------------|--------------------|-------------------|-----------------|-----------------|
| Genitourinary | | | | | |
| Renal Agenesis/Hypoplasia * (p=0.0365) | Less than 20 | 15 | 2.7 | 1.5 | 4.5 |
| | 20 - 24 | 50 | 4.0 | 3.0 | 5.3 |
| | 25 - 29 | 62 | 5.3 | 4.1 | 6.8 |
| | 30 - 34 | 47 | 6.0 | 4.4 | 7.9 |
| | 35 - 39 | 17 | 4.8 | 2.8 | 7.8 |
| | 40 and older | 6 | 8.5 | 3.1 | 18.6 |
| Bladder Exstrophy | Less than 20 | 3 | 0.5 | 0.1 | 1.6 |
| | 20 - 24 | 8 | 0.6 | 0.3 | 1.3 |
| | 25 - 29 | 4 | 0.3 | 0.1 | 0.9 |
| | 30 - 34 | 3 | 0.4 | 0.1 | 1.1 |
| | 35 - 39 | 2 | 0.6 | 0.1 | 2.1 |
| | 40 and older | 1 | 1.4 | 0.0 | 7.9 |
| Hypospadias | Less than 20 | 270 | 49.2 | 43.5 | 55.5 |
| | 20 - 24 | 652 | 52.1 | 48.2 | 56.2 |
| | 25 - 29 | 652 | 56.0 | 51.7 | 60.4 |
| | 30 - 34 | 407 | 51.6 | 46.8 | 56.9 |
| | 35 - 39 | 194 | 55.3 | 47.8 | 63.7 |
| | 40 and older | 38 | 54.0 | 38.2 | 74.1 |
| Epispadias | Less than 20 | 8 | 1.5 | 0.6 | 2.9 |
| | 20 - 24 | 12 | 1.0 | 0.5 | 1.7 |
| | 25 - 29 | 11 | 0.9 | 0.5 | 1.7 |
| | 30 - 34 | 10 | 1.3 | 0.6 | 2.3 |
| | 35 - 39 | 2 | 0.6 | 0.1 | 2.1 |
| | 40 and older | 0 | 0.0 | 0.0 | 5.3 |
| Obstructive Genitourinary Defect * (p=0.0118) | Less than 20 | 137 | 25.0 | 21.0 | 29.5 |
| | 20 - 24 | 285 | 22.8 | 20.2 | 25.6 |
| | 25 - 29 | 308 | 26.4 | 23.6 | 29.6 |
| | 30 - 34 | 245 | 31.1 | 27.3 | 35.2 |
| | 35 - 39 | 104 | 29.7 | 24.2 | 35.9 |
| | 40 and older | 20 | 28.4 | 17.4 | 43.9 |
| Genitourinary Cases * (p=0.0304) | | | | | |
| | Less than 20 | 429 | 78.2 | 71.0 | 86.0 |
| | 20 - 24 | 982 | 78.4 | 73.6 | 83.5 |
| | 25 - 29 | 1,013 | 86.9 | 81.7 | 92.5 |
| | 30 - 34 | 701 | 89.0 | 82.5 | 95.8 |
| | 35 - 39 | 317 | 90.4 | 80.7 | 100.9 |
| | 40 and older | 63 | 89.5 | 68.8 | 114.5 |
| Musculoskeletal | | | | | |
| Reduction Deformity (upper limbs) | Less than 20 | 11 | 2.0 | 1.0 | 3.6 |
| | 20 - 24 | 31 | 2.5 | 1.7 | 3.5 |
| | 25 - 29 | 26 | 2.2 | 1.5 | 3.3 |
| | 30 - 34 | 12 | 1.5 | 0.8 | 2.7 |
| | 35 - 39 | 4 | 1.1 | 0.3 | 2.9 |
| | 40 and older | 1 | 1.4 | 0.0 | 7.9 |

**Table 5. Tennessee Birth Defects by Maternal Age
2004-2008**

| Birth Defect | Age Group | Count ¹ | Rate ² | LL ³ | UL ⁴ |
|----------------------------------------------|--------------|--------------------|-------------------|-----------------|-----------------|
| Reduction Deformity (lower limbs) | Less than 20 | 11 | 2.0 | 1.0 | 3.6 |
| | 20 - 24 | 23 | 1.8 | 1.2 | 2.8 |
| | 25 - 29 | 23 | 2.0 | 1.3 | 3.0 |
| | 30 - 34 | 13 | 1.6 | 0.9 | 2.8 |
| | 35 - 39 | 4 | 1.1 | 0.3 | 2.9 |
| | 40 and older | 1 | 1.4 | 0.0 | 7.9 |
| Gastroschisis * (p<0.0001) | Less than 20 | 85 | 15.5 | 12.4 | 19.2 |
| | 20 - 24 | 89 | 7.1 | 5.7 | 8.8 |
| | 25 - 29 | 31 | 2.7 | 1.8 | 3.8 |
| | 30 - 34 | 14 | 1.8 | 1.0 | 3.0 |
| | 35 - 39 | 1 | 0.3 | 0.0 | 1.6 |
| | 40 and older | 0 | 0.0 | 0.0 | 5.3 |
| Omphalocele | Less than 20 | 19 | 3.5 | 2.1 | 5.4 |
| | 20 - 24 | 52 | 4.2 | 3.1 | 5.5 |
| | 25 - 29 | 26 | 2.2 | 1.5 | 3.3 |
| | 30 - 34 | 18 | 2.3 | 1.4 | 3.6 |
| | 35 - 39 | 8 | 2.3 | 1.0 | 4.5 |
| | 40 and older | 3 | 4.3 | 0.9 | 12.5 |
| Diaphragmatic Hernia | Less than 20 | 18 | 3.3 | 1.9 | 5.2 |
| | 20 - 24 | 46 | 3.7 | 2.7 | 4.9 |
| | 25 - 29 | 36 | 3.1 | 2.2 | 4.3 |
| | 30 - 34 | 30 | 3.8 | 2.6 | 5.4 |
| | 35 - 39 | 11 | 3.1 | 1.6 | 5.6 |
| | 40 and older | 2 | 2.8 | 0.3 | 10.3 |
| Congenital Hip Dislocation | Less than 20 | 36 | 6.6 | 4.6 | 9.1 |
| | 20 - 24 | 76 | 6.1 | 4.8 | 7.6 |
| | 25 - 29 | 75 | 6.4 | 5.1 | 8.1 |
| | 30 - 34 | 66 | 8.4 | 6.5 | 10.7 |
| | 35 - 39 | 33 | 9.4 | 6.5 | 13.2 |
| | 40 and older | 7 | 9.9 | 4.0 | 20.5 |
| Musculoskeletal Cases * (p<0.0001) | Less than 20 | 175 | 31.9 | 27.4 | 37.0 |
| | 20 - 24 | 306 | 24.4 | 21.8 | 27.3 |
| | 25 - 29 | 207 | 17.8 | 15.4 | 20.4 |
| | 30 - 34 | 147 | 18.7 | 15.8 | 21.9 |
| | 35 - 39 | 60 | 17.1 | 13.1 | 22.0 |
| | 40 and older | 13 | 18.5 | 9.8 | 31.6 |
| Chromosomal | | | | | |
| Trisomy 13 | Less than 20 | 3 | 0.5 | 0.1 | 1.6 |
| | 20 - 24 | 6 | 0.5 | 0.2 | 1.0 |
| | 25 - 29 | 12 | 1.0 | 0.5 | 1.8 |
| | 30 - 34 | 4 | 0.5 | 0.1 | 1.3 |
| | 35 - 39 | 6 | 1.7 | 0.6 | 3.7 |
| | 40 and older | 2 | 2.8 | 0.3 | 10.3 |

**Table 5. Tennessee Birth Defects by Maternal Age
2004-2008**

| Birth Defect | Age Group | Count ¹ | Rate ² | LL ³ | UL ⁴ |
|------------------------------------------|--------------|--------------------|-------------------|-----------------|-----------------|
| Down Syndrome * (p<0.0001) | Less than 20 | 46 | 8.4 | 6.1 | 11.2 |
| | 20 - 24 | 94 | 7.5 | 6.1 | 9.2 |
| | 25 - 29 | 106 | 9.1 | 7.5 | 11.0 |
| | 30 - 34 | 102 | 12.9 | 10.6 | 15.7 |
| | 35 - 39 | 144 | 41.1 | 34.6 | 48.3 |
| | 40 and older | 100 | 142.0 | 115.6 | 172.8 |
| Trisomy 18 * (p<0.0001) | Less than 20 | 7 | 1.3 | 0.5 | 2.6 |
| | 20 - 24 | 13 | 1.0 | 0.6 | 1.8 |
| | 25 - 29 | 13 | 1.1 | 0.6 | 1.9 |
| | 30 - 34 | 7 | 0.9 | 0.4 | 1.8 |
| | 35 - 39 | 15 | 4.3 | 2.4 | 7.1 |
| | 40 and older | 8 | 11.4 | 4.9 | 22.4 |
| Chromosomal Cases * (p<0.0001) | Less than 20 | 55 | 10.0 | 7.6 | 13.1 |
| | 20 - 24 | 113 | 9.0 | 7.4 | 10.9 |
| | 25 - 29 | 129 | 11.1 | 9.2 | 13.2 |
| | 30 - 34 | 112 | 14.2 | 11.7 | 17.1 |
| | 35 - 39 | 165 | 47.0 | 40.1 | 54.8 |
| | 40 and older | 109 | 154.8 | 127.1 | 186.8 |
| Fetal Alcohol Syndrome * (p=0.0001) | Less than 20 | 6 | 1.1 | 0.4 | 2.4 |
| | 20 - 24 | 20 | 1.6 | 1.0 | 2.5 |
| | 25 - 29 | 23 | 2.0 | 1.3 | 3.0 |
| | 30 - 34 | 13 | 1.6 | 0.9 | 2.8 |
| | 35 - 39 | 20 | 5.7 | 3.5 | 8.8 |
| | 40 and older | 5 | 7.1 | 2.3 | 16.6 |
| Total Cases * (p<0.0001) | Less than 20 | 2,015 | 367.3 | 351.4 | 383.7 |
| | 20 - 24 | 4,232 | 338.0 | 327.9 | 348.3 |
| | 25 - 29 | 3,819 | 327.7 | 317.4 | 338.3 |
| | 30 - 34 | 2,527 | 320.7 | 308.3 | 333.4 |
| | 35 - 39 | 1,387 | 395.4 | 374.9 | 416.8 |
| | 40 and older | 318 | 451.6 | 403.4 | 504.1 |
| Total Live Births | Less than 20 | 54,865 | | | |
| | 20 - 24 | 125,220 | | | |
| | 25 - 29 | 116,527 | | | |
| | 30 - 34 | 78,801 | | | |
| | 35 - 39 | 35,075 | | | |
| | 40 and older | 7,041 | | | |
| Unknown Cases | | 3 | | | |
| Unknown Live Births | | 212 | | | |

Source: Tennessee Birth Defects Registry 2004-2008

¹Counts include cases resulting from live births and fetal deaths. ²Per 10,000 live births. ³ 95% confidence interval lower limit. ⁴95 percent confidence interval upper limit. Confidence intervals for 100 or less cases are exact Poisson; otherwise confidence intervals are based on the normal approximation. *Indicates a statistically significant difference.

Diagnostic data were derived from the Tennessee Hospital Discharge Data System (2004-2009), the Tennessee Death Statistical System (2004-2009) and the Tennessee Fetal Death Statistical System (2004-2008). Live births and maternal age were derived from the Tennessee Birth Statistical system (2004-2008).

**Table 6. Tennessee Birth Defects by Maternal Education
2004-2008**

| Birth Defect | Maternal Education | Count¹ | Rate² | LL³ | UL⁴ |
|------------------------------------------------|---------------------------------------------------------------|--------------------------|-------------------------|-----------------------|-----------------------|
| Central Nervous System | | | | | |
| Anencephalus | No High School Diploma | 17 | 1.8 | 1.1 | 2.9 |
| | High School Diploma | 19 | 1.5 | 0.9 | 2.4 |
| | Bachelor or Some College | 17 | 1.0 | 0.6 | 1.6 |
| | Graduate Degree | 3 | 1.1 | 0.2 | 3.3 |
| | Spina Bifida | No High School Diploma | 54 | 5.7 | 4.3 |
| High School Diploma | | 43 | 3.5 | 2.5 | 4.7 |
| Bachelor or Some College | | 74 | 4.3 | 3.4 | 5.4 |
| Graduate Degree | | 9 | 3.4 | 1.5 | 6.4 |
| Hydrocephalus * (p<0.0001) | | No High School Diploma | 106 | 11.3 | 9.2 |
| | High School Diploma | 98 | 7.9 | 6.4 | 9.6 |
| | Bachelor or Some College | 87 | 5.1 | 4.1 | 6.3 |
| | Graduate Degree | 10 | 3.7 | 1.8 | 6.9 |
| | Encephalocele | No High School Diploma | 13 | 1.4 | 0.7 |
| High School Diploma | | 19 | 1.5 | 0.9 | 2.4 |
| Bachelor or Some College | | 18 | 1.1 | 0.6 | 1.7 |
| Graduate Degree | | 3 | 1.1 | 0.2 | 3.3 |
| Microcephalus * (p<0.0001) | | No High School Diploma | 142 | 15.1 | 12.7 |
| | High School Diploma | 121 | 9.7 | 8.1 | 11.7 |
| | Bachelor or Some College | 132 | 7.7 | 6.5 | 9.1 |
| | Graduate Degree | 16 | 6.0 | 3.4 | 9.7 |
| | Central Nervous System Cases * (p<0.0001) | No High School Diploma | 322 | 34.2 | 30.6 |
| High School Diploma | | 287 | 23.1 | 20.5 | 26.0 |
| Bachelor or Some College | | 316 | 18.5 | 16.5 | 20.6 |
| Graduate Degree | | 40 | 15.0 | 10.7 | 20.4 |
| Eye and Ear | | | | | |
| Anophthalmia/Microphthalmia | No High School Diploma | 8 | 0.9 | 0.4 | 1.7 |
| | High School Diploma | 12 | 1.0 | 0.5 | 1.7 |
| | Bachelor or Some College | 16 | 0.9 | 0.5 | 1.5 |
| | Graduate Degree | 1 | 0.4 | 0.0 | 2.1 |
| | Congenital Cataract | No High School Diploma | 25 | 2.7 | 1.7 |
| High School Diploma | | 42 | 3.4 | 2.4 | 4.6 |
| Bachelor or Some College | | 32 | 1.9 | 1.3 | 2.6 |
| Graduate Degree | | 9 | 3.4 | 1.5 | 6.4 |
| Aniridia | | No High School Diploma | 1 | 0.1 | 0.0 |
| | High School Diploma | 2 | 0.2 | 0.0 | 0.6 |
| | Bachelor or Some College | 2 | 0.1 | 0.0 | 0.4 |
| | Graduate Degree | 1 | 0.4 | 0.0 | 2.1 |

**Table 6. Tennessee Birth Defects by Maternal Education
2004-2008**

| Birth Defect | Maternal Education | Count¹ | Rate² | LL³ | UL⁴ |
|---------------------------------------|-------------------------------------------------|--------------------------|-------------------------|-----------------------|-----------------------|
| Anotia/Microtia | No High School Diploma | 9 | 1.0 | 0.4 | 1.8 |
| | High School Diploma | 6 | 0.5 | 0.2 | 1.1 |
| | Bachelor or Some College | 9 | 0.5 | 0.2 | 1.0 |
| | Graduate Degree | 1 | 0.4 | 0.0 | 2.1 |
| | Eye and Ear Cases | No High School Diploma | 43 | 4.6 | 3.3 |
| | High School Diploma | 58 | 4.7 | 3.6 | 6.0 |
| | Bachelor or Some College | 56 | 3.3 | 2.5 | 4.3 |
| | Graduate Degree | 12 | 4.5 | 2.3 | 7.8 |
| Cardiovascular | | | | | |
| Common Truncus * (p=0.0243) | No High School Diploma | 7 | 0.7 | 0.3 | 1.5 |
| | High School Diploma | 21 | 1.7 | 1.1 | 2.6 |
| | Bachelor or Some College | 11 | 0.6 | 0.3 | 1.2 |
| | Graduate Degree | 1 | 0.4 | 0.0 | 2.1 |
| | Transposition of Great Arteries * (p=0.0383) | No High School Diploma | 58 | 6.2 | 4.7 |
| High School Diploma | | 92 | 7.4 | 6.0 | 9.1 |
| Bachelor or Some College | | 102 | 6.0 | 4.9 | 7.2 |
| Graduate Degree | | 8 | 3.0 | 1.3 | 5.9 |
| Tetralogy of Fallot | | No High School Diploma | 55 | 5.8 | 4.4 |
| | High School Diploma | 72 | 5.8 | 4.5 | 7.3 |
| | Bachelor or Some College | 91 | 5.3 | 4.3 | 6.5 |
| | Graduate Degree | 18 | 6.7 | 4.0 | 10.6 |
| | Ventricular Septal Defect | No High School Diploma | 454 | 48.2 | 43.9 |
| High School Diploma | | 544 | 43.8 | 40.2 | 47.7 |
| Bachelor or Some College | | 700 | 40.9 | 37.9 | 44.0 |
| Graduate Degree | | 114 | 42.6 | 35.2 | 51.2 |
| Atrial Septal Defect * (p<0.0001) | | No High School Diploma | 867 | 92.1 | 86.1 |
| | High School Diploma | 1,079 | 86.9 | 81.8 | 92.3 |
| | Bachelor or Some College | 1,170 | 68.3 | 64.5 | 72.4 |
| | Graduate Degree | 162 | 60.6 | 51.6 | 70.7 |
| | Endocardial Cushion Defect | No High School Diploma | 32 | 3.4 | 2.3 |
| High School Diploma | | 52 | 4.2 | 3.1 | 5.5 |
| Bachelor or Some College | | 65 | 3.8 | 2.9 | 4.8 |
| Graduate Degree | | 13 | 4.9 | 2.6 | 8.3 |
| Pulmonary Valve Atresia & Stenosis | | No High School Diploma | 114 | 12.1 | 10.0 |
| | High School Diploma | 130 | 10.5 | 8.8 | 12.4 |
| | Bachelor or Some College | 180 | 10.5 | 9.0 | 12.2 |
| | Graduate Degree | 25 | 9.4 | 6.1 | 13.8 |

**Table 6. Tennessee Birth Defects by Maternal Education
2004-2008**

| Birth Defect | Maternal Education | Count¹ | Rate² | LL³ | UL⁴ |
|-------------------------------------------------------|------------------------------------------------|--------------------------|-------------------------|-----------------------|-----------------------|
| Tricuspid Valve Atresia & Stenosis | No High School Diploma | 11 | 1.2 | 0.6 | 2.1 |
| | High School Diploma | 18 | 1.4 | 0.9 | 2.3 |
| | Bachelor or Some College | 16 | 0.9 | 0.5 | 1.5 |
| | Graduate Degree | 0 | 0.0 | 0.0 | 1.4 |
| | Ebsteins Anomaly | No High School Diploma | 9 | 1.0 | 0.4 |
| High School Diploma | | 8 | 0.6 | 0.3 | 1.3 |
| Bachelor or Some College | | 16 | 0.9 | 0.5 | 1.5 |
| Graduate Degree | | 0 | 0.0 | 0.0 | 1.4 |
| Aortic Valve Stenosis | No High School Diploma | 20 | 2.1 | 1.3 | 3.3 |
| | High School Diploma | 23 | 1.9 | 1.2 | 2.8 |
| | Bachelor or Some College | 32 | 1.9 | 1.3 | 2.6 |
| | Graduate Degree | 5 | 1.9 | 0.6 | 4.4 |
| | Hypoplastic Left Heart Syndrome | No High School Diploma | 35 | 3.7 | 2.6 |
| High School Diploma | | 53 | 4.3 | 3.2 | 5.6 |
| Bachelor or Some College | | 46 | 2.7 | 2.0 | 3.6 |
| Graduate Degree | | 11 | 4.1 | 2.1 | 7.4 |
| Patent Ductus Arteriosus * (p=0.0410) | No High School Diploma | 535 | 56.8 | 52.1 | 61.9 |
| | High School Diploma | 759 | 61.1 | 56.9 | 65.6 |
| | Bachelor or Some College | 938 | 54.8 | 51.3 | 58.4 |
| | Graduate Degree | 131 | 49.0 | 41.0 | 58.2 |
| | Coarctation of Aorta | No High School Diploma | 70 | 7.4 | 5.8 |
| High School Diploma | | 86 | 6.9 | 5.5 | 8.6 |
| Bachelor or Some College | | 92 | 5.4 | 4.3 | 6.6 |
| Graduate Degree | | 14 | 5.2 | 2.9 | 8.8 |
| Cardiovascular Cases * (p<0.0001) | | No High School Diploma | 1,597 | 169.7 | 161.5 |
| | High School Diploma | 2,041 | 164.4 | 157.3 | 171.7 |
| | Bachelor or Some College | 2,407 | 140.6 | 135.0 | 146.3 |
| | Graduate Degree | 359 | 134.3 | 120.8 | 148.9 |
| | Orofacial Cleft Palate w/o Cleft Lip | No High School Diploma | 70 | 7.4 | 5.8 |
| High School Diploma | | 87 | 7.0 | 5.6 | 8.6 |
| Bachelor or Some College | | 122 | 7.1 | 5.9 | 8.5 |
| Graduate Degree | | 25 | 9.4 | 6.1 | 13.8 |

**Table 6. Tennessee Birth Defects by Maternal Education
2004-2008**

| Birth Defect | Maternal Education | Count¹ | Rate² | LL³ | UL⁴ |
|---------------------------------------------------------|---------------------------|--------------------------|-------------------------|-----------------------|-----------------------|
| Cleft Lip w/ & w/o Cleft Palate | No High School Diploma | 104 | 11.1 | 9.0 | 13.4 |
| | High School Diploma | 164 | 13.2 | 11.3 | 15.4 |
| | Bachelor or Some College | 173 | 10.1 | 8.7 | 11.7 |
| | Graduate Degree | 27 | 10.1 | 6.7 | 14.7 |
| | | | | | |
| Choanal Atresia | No High School Diploma | 16 | 1.7 | 1.0 | 2.8 |
| | High School Diploma | 26 | 2.1 | 1.4 | 3.1 |
| | Bachelor or Some College | 35 | 2.0 | 1.4 | 2.8 |
| | Graduate Degree | 4 | 1.5 | 0.4 | 3.8 |
| | | | | | |
| Orofacial Cases | No High School Diploma | 190 | 20.2 | 17.4 | 23.3 |
| | High School Diploma | 276 | 22.2 | 19.7 | 25.0 |
| | Bachelor or Some College | 326 | 19.0 | 17.0 | 21.2 |
| | Graduate Degree | 55 | 20.6 | 15.5 | 26.8 |
| | | | | | |
| Gastrointestinal | | | | | |
| Esophageal Atresia/Tracheoesophageal Fistula | No High School Diploma | 20 | 2.1 | 1.3 | 3.3 |
| | High School Diploma | 30 | 2.4 | 1.6 | 3.5 |
| | Bachelor or Some College | 37 | 2.2 | 1.5 | 3.0 |
| | Graduate Degree | 8 | 3.0 | 1.3 | 5.9 |
| | | | | | |
| Rectal & Large Intestinal Atresia/Stenosis | No High School Diploma | 55 | 5.8 | 4.4 | 7.6 |
| | High School Diploma | 76 | 6.1 | 4.8 | 7.7 |
| | Bachelor or Some College | 83 | 4.8 | 3.9 | 6.0 |
| | Graduate Degree | 14 | 5.2 | 2.9 | 8.8 |
| | | | | | |
| Pyloric Stenosis * (p<0.0001) | No High School Diploma | 539 | 57.3 | 52.5 | 62.3 |
| | High School Diploma | 669 | 53.9 | 49.9 | 58.1 |
| | Bachelor or Some College | 599 | 35.0 | 32.2 | 37.9 |
| | Graduate Degree | 56 | 20.9 | 15.8 | 27.2 |
| | | | | | |
| Hirschsprungs Disease (congenital megacolon (p=0.0187)) | No High School Diploma | 38 | 4.0 | 2.9 | 5.5 |
| | High School Diploma | 40 | 3.2 | 2.3 | 4.4 |
| | Bachelor or Some College | 40 | 2.3 | 1.7 | 3.2 |
| | Graduate Degree | 3 | 1.1 | 0.2 | 3.3 |
| | | | | | |
| Biliary Atresia | No High School Diploma | 8 | 0.9 | 0.4 | 1.7 |
| | High School Diploma | 10 | 0.8 | 0.4 | 1.5 |
| | Bachelor or Some College | 17 | 1.0 | 0.6 | 1.6 |
| | Graduate Degree | 3 | 1.1 | 0.2 | 3.3 |
| | | | | | |
| Gastrointestinal Cases * (p<0.0001) | No High School Diploma | 657 | 69.8 | 64.6 | 75.4 |
| | High School Diploma | 819 | 66.0 | 61.5 | 70.6 |
| | Bachelor or Some College | 769 | 44.9 | 41.8 | 48.2 |
| | Graduate Degree | 82 | 30.7 | 24.4 | 38.1 |
| | | | | | |

**Table 6. Tennessee Birth Defects by Maternal Education
2004-2008**

| Birth Defect | Maternal Education | Count¹ | Rate² | LL³ | UL⁴ |
|--------------------------------------------------|------------------------------------------------------|--------------------------|-------------------------|-----------------------|-----------------------|
| Genitourinary | | | | | |
| Renal Agenesis/Hypoplasia | No High School Diploma | 50 | 5.3 | 3.9 | 7.0 |
| | High School Diploma | 59 | 4.8 | 3.6 | 6.1 |
| | Bachelor or Some College | 78 | 4.6 | 3.6 | 5.7 |
| | Graduate Degree | 10 | 3.7 | 1.8 | 6.9 |
| | Bladder Exstrophy | No High School Diploma | 4 | 0.4 | 0.1 |
| High School Diploma | | 8 | 0.6 | 0.3 | 1.3 |
| Bachelor or Some College | | 9 | 0.5 | 0.2 | 1.0 |
| Graduate Degree | | 0 | 0.0 | 0.0 | 1.4 |
| Hypospadias * (p<0.0001) | | No High School Diploma | 408 | 43.4 | 39.3 |
| | High School Diploma | 676 | 54.4 | 50.4 | 58.7 |
| | Bachelor or Some College | 958 | 55.9 | 52.5 | 59.6 |
| | Graduate Degree | 167 | 62.5 | 53.4 | 72.7 |
| | Epispadias | No High School Diploma | 10 | 1.1 | 0.5 |
| High School Diploma | | 14 | 1.1 | 0.6 | 1.9 |
| Bachelor or Some College | | 18 | 1.1 | 0.6 | 1.7 |
| Graduate Degree | | 1 | 0.4 | 0.0 | 2.1 |
| Obstructive Genitourinary Defect * (p=0.0021) | | No High School Diploma | 237 | 25.2 | 22.1 |
| | High School Diploma | 309 | 24.9 | 22.2 | 27.8 |
| | Bachelor or Some College | 449 | 26.2 | 23.9 | 28.8 |
| | Graduate Degree | 103 | 38.5 | 31.5 | 46.7 |
| | Genitourinary Cases * (p<0.0001) | No High School Diploma | 689 | 73.2 | 67.8 |
| High School Diploma | | 1,049 | 84.5 | 79.5 | 89.8 |
| Bachelor or Some College | | 1,481 | 86.5 | 82.1 | 91.0 |
| Graduate Degree | | 281 | 105.1 | 93.2 | 118.2 |
| Musculoskeletal | | | | | |
| Reduction Deformity (upper limbs) | No High School Diploma | 24 | 2.6 | 1.6 | 3.8 |
| | High School Diploma | 32 | 2.6 | 1.8 | 3.6 |
| | Bachelor or Some College | 27 | 1.6 | 1.0 | 2.3 |
| | Graduate Degree | 2 | 0.7 | 0.1 | 2.7 |
| | Reduction Deformity (lower limbs) | No High School Diploma | 21 | 2.2 | 1.4 |
| High School Diploma | | 27 | 2.2 | 1.4 | 3.2 |
| Bachelor or Some College | | 26 | 1.5 | 1.0 | 2.2 |
| Graduate Degree | | 1 | 0.4 | 0.0 | 2.1 |

**Table 6. Tennessee Birth Defects by Maternal Education
2004-2008**

| Birth Defect | Maternal Education | Count¹ | Rate² | LL³ | UL⁴ |
|----------------------------------------------|--------------------------------------------|--------------------------|-------------------------|-----------------------|-----------------------|
| Gastroschisis * (p<0.0001) | No High School Diploma | 74 | 7.9 | 6.2 | 9.9 |
| | High School Diploma | 76 | 6.1 | 4.8 | 7.7 |
| | Bachelor or Some College | 66 | 3.9 | 3.0 | 4.9 |
| | Graduate Degree | 4 | 1.5 | 0.4 | 3.8 |
| | Omphalocele | No High School Diploma | 35 | 3.7 | 2.6 |
| High School Diploma | | 40 | 3.2 | 2.3 | 4.4 |
| Bachelor or Some College | | 48 | 2.8 | 2.1 | 3.7 |
| Graduate Degree | | 3 | 1.1 | 0.2 | 3.3 |
| Diaphragmatic Hernia | | No High School Diploma | 38 | 4.0 | 2.9 |
| | High School Diploma | 49 | 3.9 | 2.9 | 5.2 |
| | Bachelor or Some College | 52 | 3.0 | 2.3 | 4.0 |
| | Graduate Degree | 4 | 1.5 | 0.4 | 3.8 |
| | Congenital Hip Dislocation * (p=0.0008) | No High School Diploma | 54 | 5.7 | 4.3 |
| High School Diploma | | 80 | 6.4 | 5.1 | 8.0 |
| Bachelor or Some College | | 120 | 7.0 | 5.8 | 8.4 |
| Graduate Degree | | 37 | 13.8 | 9.8 | 19.1 |
| Musculoskeletal Cases * (p=0.0048) | | No High School Diploma | 238 | 25.3 | 22.2 |
| | High School Diploma | 289 | 23.3 | 20.7 | 26.1 |
| | Bachelor or Some College | 329 | 19.2 | 17.2 | 21.4 |
| | Graduate Degree | 50 | 18.7 | 13.9 | 24.7 |
| | Chromosomal Trisomy 13 | No High School Diploma | 9 | 1.0 | 0.4 |
| High School Diploma | | 7 | 0.6 | 0.2 | 1.2 |
| Bachelor or Some College | | 14 | 0.8 | 0.5 | 1.4 |
| Graduate Degree | | 3 | 1.1 | 0.2 | 3.3 |
| Down Syndrome * (p=0.0001) | | No High School Diploma | 116 | 12.3 | 10.2 |
| | High School Diploma | 150 | 12.1 | 10.2 | 14.2 |
| | Bachelor or Some College | 259 | 15.1 | 13.3 | 17.1 |
| | Graduate Degree | 63 | 23.6 | 18.1 | 30.2 |
| | Trisomy 18 | No High School Diploma | 15 | 1.6 | 0.9 |
| High School Diploma | | 17 | 1.4 | 0.8 | 2.2 |
| Bachelor or Some College | | 28 | 1.6 | 1.1 | 2.4 |
| Graduate Degree | | 3 | 1.1 | 0.2 | 3.3 |
| Chromosomal Cases * (p=0.0002) | | No High School Diploma | 139 | 14.8 | 12.4 |
| | High School Diploma | 174 | 14.0 | 12.0 | 16.3 |
| | Bachelor or Some College | 297 | 17.3 | 15.4 | 19.4 |
| | Graduate Degree | 69 | 25.8 | 20.1 | 32.7 |

**Table 6. Tennessee Birth Defects by Maternal Education
2004-2008**

| Birth Defect | Maternal Education | Count¹ | Rate² | LL³ | UL⁴ |
|----------------------------------------|----------------------------------------------|--------------------------|-------------------------|-----------------------|-----------------------|
| Fetal Alcohol Syndrome * (p<0.0001) | No High School Diploma | 41 | 4.4 | 3.1 | 5.9 |
| | High School Diploma | 29 | 2.3 | 1.6 | 3.4 |
| | Bachelor or Some College | 15 | 0.9 | 0.5 | 1.4 |
| | Graduate Degree | 1 | 0.4 | 0.0 | 2.1 |
| | Total Cases * (p<0.0001) | No High School Diploma | 3,500 | 371.9 | 359.7 |
| | High School Diploma | 4,533 | 365.1 | 354.6 | 375.9 |
| | Bachelor or Some College | 5,381 | 314.2 | 305.9 | 322.7 |
| | Graduate Degree | 843 | 315.4 | 294.4 | 337.4 |
| Total Live Births | No High School Diploma | 94,114 | | | |
| | High School Diploma | 124,156 | | | |
| | Bachelor or Some College | 171,247 | | | |
| | Graduate Degree | 26,732 | | | |
| | Unknown Cases | | 44 | | |

Source: Tennessee Birth Defects Registry 2004-2008

¹Counts include cases resulting from live births and fetal deaths. ²Per 10,000 live births. ³ 95% confidence interval lower limit. ⁴95 percent confidence interval upper limit. Confidence intervals for 100 or less cases are exact Poisson; otherwise confidence intervals are based on the normal approximation. *Indicates a statistically significant difference based on Poisson regression.

Diagnostic data were derived from the Tennessee Hospital Discharge Data System (2004-2009), the Tennessee Death Statistical System (2004-2009) and the Tennessee Fetal Death Statistical System (2004-2008). Live births and maternal education were derived from the Tennessee Birth Statistical system (2004-2008).

**Table 7: Tennessee Birth Defects by Maternal Smoking
2004-2008**

| Birth Defect | Smoking | Count¹ | Rate² | LL³ | UL⁴ | |
|---------------------------------------------|----------------|--------------------------|-------------------------|-----------------------|-----------------------|------|
| Central Nervous System | | | | | | |
| Anencephalus | None | 50 | 1.5 | 1.1 | 2.0 | |
| | Moderate | 4 | 0.8 | 0.2 | 2.1 | |
| | Heavy | 3 | 1.0 | 0.2 | 2.9 | |
| Spina Bifida | None | 152 | 4.5 | 3.8 | 5.3 | |
| | Moderate | 16 | 3.2 | 1.8 | 5.2 | |
| | Heavy | 13 | 4.3 | 2.3 | 7.4 | |
| Hydrocephalus | None | 236 | 7.0 | 6.1 | 8.0 | |
| | Moderate | 42 | 8.4 | 6.1 | 11.4 | |
| | Heavy | 23 | 7.6 | 4.8 | 11.4 | |
| Encephalocele | None | 38 | 1.1 | 0.8 | 1.6 | |
| | Moderate | 7 | 1.4 | 0.6 | 2.9 | |
| | Heavy | 8 | 2.6 | 1.1 | 5.2 | |
| Microcephalus | None | 323 | 9.6 | 8.6 | 10.7 | |
| | Moderate | 54 | 10.8 | 8.1 | 14.1 | |
| | Heavy | 35 | 11.6 | 8.1 | 16.1 | |
| Central Nervous System Cases | | None | 769 | 22.8 | 21.2 | 24.5 |
| | | Moderate | 118 | 23.6 | 19.6 | 28.3 |
| | | Heavy | 81 | 26.8 | 21.3 | 33.3 |
| Eye and Ear | | | | | | |
| Anophthalmia/Microphthalmia * (p=0.0408) | None | 36 | 1.1 | 0.8 | 1.5 | |
| | Moderate | 1 | 0.2 | 0.0 | 1.1 | |
| | Heavy | 1 | 0.3 | 0.0 | 1.8 | |
| Congenital Cataract | None | 91 | 2.7 | 2.2 | 3.3 | |
| | Moderate | 12 | 2.4 | 1.2 | 4.2 | |
| | Heavy | 5 | 1.7 | 0.5 | 3.9 | |
| Aniridia | None | 6 | 0.2 | 0.1 | 0.4 | |
| | Moderate | 0 | 0.0 | 0.0 | 0.7 | |
| | Heavy | 0 | 0.0 | 0.0 | 1.2 | |
| Anotia/Microtia | None | 23 | 0.7 | 0.4 | 1.0 | |
| | Moderate | 1 | 0.2 | 0.0 | 1.1 | |
| | Heavy | 2 | 0.7 | 0.1 | 2.4 | |
| Ear and Eye Cases | | None | 149 | 4.4 | 3.7 | 5.2 |
| | | Moderate | 14 | 2.8 | 1.5 | 4.7 |
| | | Heavy | 8 | 2.6 | 1.1 | 5.2 |
| Cardiovascular | | | | | | |
| Common Truncus | None | 30 | 0.9 | 0.6 | 1.3 | |
| | Moderate | 3 | 0.6 | 0.1 | 1.8 | |
| | Heavy | 7 | 2.3 | 0.9 | 4.8 | |
| Transposition of Great Arteries | None | 204 | 6.0 | 5.2 | 6.9 | |
| | Moderate | 29 | 5.8 | 3.9 | 8.4 | |
| | Heavy | 27 | 8.9 | 5.9 | 13.0 | |

**Table 7: Tennessee Birth Defects by Maternal Smoking
2004-2008**

| Birth Defect | Smoking | Count¹ | Rate² | LL³ | UL⁴ |
|----------------------------------------------------|----------------|--------------------------|-------------------------|-----------------------|-----------------------|
| Tetralogy of Fallot | None | 179 | 5.3 | 4.6 | 6.1 |
| | Moderate | 41 | 8.2 | 5.9 | 11.2 |
| | Heavy | 16 | 5.3 | 3.0 | 8.6 |
| Ventricular Septal Defect | None | 1,446 | 42.9 | 40.7 | 45.1 |
| | Moderate | 228 | 45.7 | 40.0 | 52.0 |
| | Heavy | 143 | 47.3 | 39.9 | 55.7 |
| Atrial Septal Defect * (p<0.0001) | None | 2,544 | 75.4 | 72.5 | 78.4 |
| | Moderate | 454 | 91.0 | 82.8 | 99.8 |
| | Heavy | 288 | 95.3 | 84.6 | 107.0 |
| Endocardial Cushion Defect | None | 132 | 3.9 | 3.3 | 4.6 |
| | Moderate | 20 | 4.0 | 2.5 | 6.2 |
| | Heavy | 10 | 3.3 | 1.6 | 6.1 |
| Pulmonary Valve Atresia & Stenosis * (p<0.0001) | None | 330 | 9.8 | 8.8 | 10.9 |
| | Moderate | 55 | 11.0 | 8.3 | 14.4 |
| | Heavy | 64 | 21.2 | 16.3 | 27.0 |
| Tricuspid Valve Atresia & Stenosis * (p=0.0216) | None | 31 | 0.9 | 0.6 | 1.3 |
| | Moderate | 5 | 1.0 | 0.3 | 2.3 |
| | Heavy | 9 | 3.0 | 1.4 | 5.7 |
| Ebsteins Anomaly | None | 24 | 0.7 | 0.5 | 1.1 |
| | Moderate | 6 | 1.2 | 0.4 | 2.6 |
| | Heavy | 3 | 1.0 | 0.2 | 2.9 |
| Aortic Valve Stenosis | None | 65 | 1.9 | 1.5 | 2.5 |
| | Moderate | 7 | 1.4 | 0.6 | 2.9 |
| | Heavy | 8 | 2.6 | 1.1 | 5.2 |
| Hypoplastic Left Heart Syndrome | None | 112 | 3.3 | 2.7 | 4.0 |
| | Moderate | 19 | 3.8 | 2.3 | 6.0 |
| | Heavy | 14 | 4.6 | 2.5 | 7.8 |
| Patent Ductus Arteriosus * (p<0.0001) | None | 1,999 | 59.2 | 56.7 | 61.9 |
| | Moderate | 229 | 45.9 | 40.1 | 52.2 |
| | Heavy | 138 | 45.7 | 38.4 | 54.0 |
| Coarctation of Aorta | None | 214 | 6.3 | 5.5 | 7.3 |
| | Moderate | 28 | 5.6 | 3.7 | 8.1 |
| | Heavy | 21 | 6.9 | 4.3 | 10.6 |
| Cardiovascular Cases * (p=0.002) | None | 5,082 | 150.6 | 146.5 | 154.8 |
| | Moderate | 811 | 162.5 | 151.5 | 174.1 |
| | Heavy | 526 | 174.1 | 159.5 | 189.6 |
| Orofacial | | | | | |
| Cleft Palate w/o Cleft Lip | None | 235 | 7.0 | 6.1 | 7.9 |
| | Moderate | 44 | 8.8 | 6.4 | 11.8 |
| | Heavy | 27 | 8.9 | 5.9 | 13.0 |
| Cleft Lip w/ & w/o Cleft Palate * (p=0.0004) | None | 341 | 10.1 | 9.1 | 11.2 |
| | Moderate | 71 | 14.2 | 11.1 | 18.0 |
| | Heavy | 52 | 17.2 | 12.9 | 22.6 |

**Table 7: Tennessee Birth Defects by Maternal Smoking
2004-2008**

| Birth Defect | Smoking | Count¹ | Rate² | LL³ | UL⁴ |
|---------------------------------------------------------------|----------------|--------------------------|-------------------------|-----------------------|-----------------------|
| Choanal Atresia | None | 63 | 1.9 | 1.4 | 2.4 |
| | Moderate | 10 | 2.0 | 1.0 | 3.7 |
| | Heavy | 9 | 3.0 | 1.4 | 5.7 |
| Orofacial Cases * (p=0.0001) | None | 635 | 18.8 | 17.4 | 20.3 |
| | Moderate | 124 | 24.8 | 20.7 | 29.6 |
| | Heavy | 87 | 28.8 | 23.1 | 35.5 |
| Gastrointestinal | | | | | |
| Esophageal Atresia/Tracheoesophageal Fistula (p=0.0058) | None | 65 | 1.9 | 1.5 | 2.5 |
| | Moderate | 22 | 4.4 | 2.8 | 6.7 |
| | Heavy | 9 | 3.0 | 1.4 | 5.7 |
| Rectal & Large Intestinal Atresia Stenosis | None | 175 | 5.2 | 4.5 | 6.0 |
| | Moderate | 35 | 7.0 | 4.9 | 9.8 |
| | Heavy | 18 | 6.0 | 3.5 | 9.4 |
| Pyloric Stenosis * (p<0.0001) | None | 1,300 | 38.5 | 36.5 | 40.7 |
| | Moderate | 339 | 67.9 | 60.9 | 75.6 |
| | Heavy | 230 | 76.1 | 66.6 | 86.6 |
| Hirschsprungs Disease (congenital megacolon) | None | 92 | 2.7 | 2.2 | 3.3 |
| | Moderate | 21 | 4.2 | 2.6 | 6.4 |
| | Heavy | 8 | 2.6 | 1.1 | 5.2 |
| Biliary Atresia | None | 32 | 0.9 | 0.7 | 1.3 |
| | Moderate | 2 | 0.4 | 0.1 | 1.5 |
| | Heavy | 4 | 1.3 | 0.4 | 3.4 |
| Gastrointestinal Cases * (p<0.0001) | None | 1,651 | 48.9 | 46.6 | 51.3 |
| | Moderate | 416 | 83.4 | 75.6 | 91.8 |
| | Heavy | 267 | 88.4 | 78.1 | 99.6 |
| Genitourinary | | | | | |
| Renal Agenesis/Hypoplasia | None | 154 | 4.6 | 3.9 | 5.3 |
| | Moderate | 30 | 6.0 | 4.1 | 8.6 |
| | Heavy | 12 | 4.0 | 2.1 | 6.9 |
| Bladder Exstrophy | None | 16 | 0.5 | 0.3 | 0.8 |
| | Moderate | 2 | 0.4 | 0.1 | 1.5 |
| | Heavy | 3 | 1.0 | 0.2 | 2.9 |
| Hypospadias | None | 1,805 | 53.5 | 51.1 | 56.0 |
| | Moderate | 259 | 51.9 | 45.8 | 58.6 |
| | Heavy | 148 | 49.0 | 41.4 | 57.5 |
| Epispadias | None | 33 | 1.0 | 0.7 | 1.4 |
| | Moderate | 7 | 1.4 | 0.6 | 2.9 |
| | Heavy | 3 | 1.0 | 0.2 | 2.9 |
| Obstructive Genitourinary Defect | None | 890 | 26.4 | 24.7 | 28.2 |
| | Moderate | 140 | 28.1 | 23.6 | 33.1 |
| | Heavy | 69 | 22.8 | 17.8 | 28.9 |

**Table 7: Tennessee Birth Defects by Maternal Smoking
2004-2008**

| Birth Defect | Smoking | Count¹ | Rate² | LL³ | UL⁴ |
|-----------------------------------------------|----------------|--------------------------|-------------------------|-----------------------|-----------------------|
| Genitourinary Cases | None | 2,847 | 84.4 | 81.3 | 87.5 |
| | Moderate | 425 | 85.2 | 77.3 | 93.7 |
| | Heavy | 231 | 76.4 | 66.9 | 87.0 |
| Musculoskeletal | | | | | |
| Reduction Deformity (upper limbs) | None | 62 | 1.8 | 1.4 | 2.4 |
| | Moderate | 14 | 2.8 | 1.5 | 4.7 |
| | Heavy | 9 | 3.0 | 1.4 | 5.7 |
| Reduction Deformity (lower limbs) | None | 60 | 1.8 | 1.4 | 2.3 |
| | Moderate | 10 | 2.0 | 1.0 | 3.7 |
| | Heavy | 5 | 1.7 | 0.5 | 3.9 |
| Gastroschisis * (p<0.0001) | None | 140 | 4.1 | 3.5 | 4.9 |
| | Moderate | 48 | 9.6 | 7.1 | 12.8 |
| | Heavy | 32 | 10.6 | 7.2 | 15.0 |
| Omphalocele | None | 97 | 2.9 | 2.3 | 3.5 |
| | Moderate | 14 | 2.8 | 1.5 | 4.7 |
| | Heavy | 14 | 4.6 | 2.5 | 7.8 |
| Diaphragmatic Hernia | None | 111 | 3.3 | 2.7 | 4.0 |
| | Moderate | 19 | 3.8 | 2.3 | 6.0 |
| | Heavy | 13 | 4.3 | 2.3 | 7.4 |
| Congenital Hip Dislocation * (p=0.0085) | None | 248 | 7.3 | 6.5 | 8.3 |
| | Moderate | 36 | 7.2 | 5.1 | 10.0 |
| | Heavy | 9 | 3.0 | 1.4 | 5.7 |
| Musculoskeletal Cases * (p=0.0121) | | | | | |
| | None | 697 | 20.7 | 19.2 | 22.3 |
| | Moderate | 129 | 25.9 | 21.6 | 30.7 |
| | Heavy | 81 | 26.8 | 21.3 | 33.3 |
| Chromosomal | | | | | |
| Trisomy 13 | None | 30 | 0.9 | 0.6 | 1.3 |
| | Moderate | 3 | 0.6 | 0.1 | 1.8 |
| | Heavy | 0 | 0.0 | 0.0 | 1.2 |
| Down Syndrome | None | 494 | 14.6 | 13.4 | 16.0 |
| | Moderate | 64 | 12.8 | 9.9 | 16.4 |
| | Heavy | 33 | 10.9 | 7.5 | 15.3 |
| Trisomy 18 | None | 47 | 1.4 | 1.0 | 1.9 |
| | Moderate | 9 | 1.8 | 0.8 | 3.4 |
| | Heavy | 7 | 2.3 | 0.9 | 4.8 |
| Chromosomal Cases | | | | | |
| | None | 566 | 16.8 | 15.4 | 18.2 |
| | Moderate | 76 | 15.2 | 12.0 | 19.1 |
| | Heavy | 40 | 13.2 | 9.5 | 18.0 |
| Fetal Alcohol Syndrome * (p<0.0001) | None | 29 | 0.9 | 0.6 | 1.2 |
| | Moderate | 30 | 6.0 | 4.1 | 8.6 |
| | Heavy | 28 | 9.3 | 6.2 | 13.4 |

**Table 7: Tennessee Birth Defects by Maternal Smoking
2004-2008**

| Birth Defect | Smoking | Count¹ | Rate² | LL³ | UL⁴ |
|----------------------------------------------|----------------|--------------------------|-------------------------|-----------------------|-----------------------|
| Total Cases * <i>(p<0.0001)</i> | None | 11,150 | 330.4 | 324.3 | 336.6 |
| | Moderate | 1,917 | 384.2 | 367.2 | 401.8 |
| | Heavy | 1,220 | 403.7 | 381.4 | 427.0 |
| Total Live Births | None | 337,451 | | | |
| | Moderate | 49,901 | | | |
| | Heavy | 30,220 | | | |
| Unknown Cases | | 14 | | | |
| Unknown Live Births | | 169 | | | |

Source: Tennessee Birth Defects Registry 2004-2008

¹Counts include cases resulting from live births and fetal deaths. ²Per 10,000 live births. ³ 95% confidence interval lower limit. ⁴95 percent confidence interval upper limit. Confidence intervals for 100 or less cases are exact Poisson; otherwise confidence intervals are based on the normal approximation.
*Indicates a statistically significant difference based on Poisson regression.

Diagnostic data were derived from the Tennessee Hospital Discharge Data System (2004-2009), the Tennessee Death Statistical System (2004-2009) and the Tennessee Fetal Death Statistical System (2004-2008). Live births and maternal smoking were derived from the Tennessee Birth Statistical system (2004-2008).

**Table 8. Tennessee Birth Defects by Maternal Diabetes (Type I/Type II)
2004-2008**

| Birth Defect | Diabetes | Count¹ | Rate² | LL³ | UL⁴ |
|---------------------------------------------------------|-----------------|--------------------------|-------------------------|-----------------------|-----------------------|
| Central Nervous System | | | | | |
| Anencephalus | Yes | 0 | 0.0 | 0.0 | 9.3 |
| | No | 46 | 1.1 | 0.8 | 1.5 |
| Spina Bifida * (p=0.0373) | Yes | 5 | 12.6 | 4.1 | 29.5 |
| | No | 172 | 4.2 | 3.6 | 4.8 |
| Hydrocephalus * (p<0.0001) | Yes | 13 | 32.8 | 17.5 | 56.1 |
| | No | 285 | 6.9 | 6.1 | 7.7 |
| Encephalocele | Yes | 1 | 2.5 | 0.1 | 14.1 |
| | No | 52 | 1.3 | 0.9 | 1.7 |
| Microcephalus | Yes | 8 | 20.2 | 8.7 | 39.8 |
| | No | 404 | 9.8 | 8.8 | 10.8 |
| Central Nervous System Cases * (p<0.0001) | | | | | |
| | Yes | 26 | 65.6 | 42.9 | 96.2 |
| | No | 924 | 22.3 | 20.9 | 23.8 |
| Eye and Ear | | | | | |
| Anophthalmia/Microphthalmia | Yes | 0 | 0.0 | 0.0 | 9.3 |
| | No | 38 | 0.9 | 0.7 | 1.3 |
| Congenital Cataract | Yes | 0 | 0.0 | 0.0 | 9.3 |
| | No | 108 | 2.6 | 2.1 | 3.2 |
| Aniridia | Yes | 0 | 0.0 | 0.0 | 9.3 |
| | No | 6 | 0.1 | 0.1 | 0.3 |
| Anotia/Microtia | Yes | 0 | 0.0 | 0.0 | 9.3 |
| | No | 26 | 0.6 | 0.4 | 0.9 |
| Eye and Ear Cases | | | | | |
| | Yes | 0 | 0.0 | 0.0 | 9.3 |
| | No | 171 | 4.1 | 3.5 | 4.8 |
| Cardiovascular | | | | | |
| Common Truncus * (p=0.0067) | Yes | 3 | 7.6 | 1.6 | 22.1 |
| | No | 37 | 0.9 | 0.6 | 1.2 |
| Transposition of Great Arteries * (p<0.0001) | Yes | 14 | 35.3 | 19.3 | 59.3 |
| | No | 246 | 5.9 | 5.2 | 6.7 |
| Tetralogy of Fallot * (p=0.0027) | Yes | 8 | 20.2 | 8.7 | 39.8 |
| | No | 228 | 5.5 | 4.8 | 6.3 |
| Ventricular Septal Defect * (p<0.0001) | Yes | 70 | 176.7 | 137.7 | 223.2 |
| | No | 1,748 | 42.2 | 40.3 | 44.3 |
| Atrial Septal Defect * (p<0.0001) | Yes | 116 | 292.8 | 241.9 | 351.2 |
| | No | 3,171 | 76.6 | 74.0 | 79.4 |
| Endocardial Cushion Defect * (p<0.0001) | Yes | 9 | 22.7 | 10.4 | 43.1 |
| | No | 153 | 3.7 | 3.1 | 4.3 |
| Pulmonary Valve Atresia & Stenosis * (p=0.0020) | Yes | 12 | 30.3 | 15.7 | 52.9 |
| | No | 437 | 10.6 | 9.6 | 11.6 |
| Tricuspid Valve Atresia & Stenosis | Yes | 2 | 5.0 | 0.6 | 18.2 |
| | No | 43 | 1.0 | 0.8 | 1.4 |
| Ebsteins Anomaly | Yes | 1 | 2.5 | 0.1 | 14.1 |
| | No | 32 | 0.8 | 0.5 | 1.1 |

**Table 8. Tennessee Birth Defects by Maternal Diabetes (Type I/Type II)
2004-2008**

| Birth Defect | Diabetes | Count¹ | Rate² | LL³ | UL⁴ |
|-------------------------------------------------------------|-----------------|--------------------------|-------------------------|-----------------------|-----------------------|
| Aortic Valve Stenosis | Yes | 1 | 2.5 | 0.1 | 14.1 |
| | No | 79 | 1.9 | 1.5 | 2.4 |
| Hypoplastic Left Heart Syndrome * (p=0.0006) | Yes | 7 | 17.7 | 7.1 | 36.4 |
| | No | 138 | 3.3 | 2.8 | 3.9 |
| Patent Ductus Arteriosus * (p<0.0001) | Yes | 102 | 257.4 | 209.9 | 312.5 |
| | No | 2,264 | 54.7 | 52.5 | 57.0 |
| Coarctation of Aorta * (p<0.0001) | Yes | 13 | 32.8 | 17.5 | 56.1 |
| | No | 250 | 6.0 | 5.3 | 6.8 |
| Cardiovascular Cases * (p<0.0001) | Yes | 245 | 618.4 | 543.4 | 700.9 |
| | No | 6,176 | 149.3 | 145.6 | 153.0 |
| Orofacial | | | | | |
| Cleft Palate w/o Cleft Lip | Yes | 5 | 12.6 | 4.1 | 29.5 |
| | No | 301 | 7.3 | 6.5 | 8.1 |
| Cleft Lip w/ & w/o Cleft Palate | Yes | 3 | 7.6 | 1.6 | 22.1 |
| | No | 449 | 10.9 | 9.9 | 11.9 |
| Choanal Atresia | Yes | 2 | 5.0 | 0.6 | 18.2 |
| | No | 80 | 1.9 | 1.5 | 2.4 |
| Orofacial Cases | Yes | 10 | 25.2 | 12.1 | 46.4 |
| | No | 824 | 19.9 | 18.6 | 21.3 |
| Gastrointestinal | | | | | |
| Esophageal Atresia/Tracheoesophagea l Fistula (p=0.0164) | Yes | 4 | 10.1 | 2.8 | 25.9 |
| | No | 92 | 2.2 | 1.8 | 2.7 |
| Rectal & Large Intestinal Atresia/Stenosis | Yes | 3 | 7.6 | 1.6 | 22.1 |
| | No | 223 | 5.4 | 4.7 | 6.2 |
| Pyloric Stenosis | Yes | 17 | 42.9 | 25.0 | 68.7 |
| | No | 1,852 | 44.8 | 42.7 | 46.8 |
| Hirschsprungs Disease (congenital megacolon) | Yes | 2 | 5.0 | 0.6 | 18.2 |
| | No | 119 | 2.9 | 2.4 | 3.4 |
| Biliary Atresia | Yes | 1 | 2.5 | 0.1 | 14.1 |
| | No | 37 | 0.9 | 0.6 | 1.2 |
| Gastrointestinal Cases | Yes | 26 | 65.6 | 42.9 | 96.2 |
| | No | 2,306 | 55.7 | 53.5 | 58.1 |
| Genitourinary | | | | | |
| Renal Agenesis/Hypoplasia * (p<0.0001) | Yes | 13 | 32.8 | 17.5 | 56.1 |
| | No | 180 | 4.4 | 3.7 | 5.0 |
| Bladder Exstrophy | Yes | 0 | 0.0 | 0.0 | 9.3 |
| | No | 21 | 0.5 | 0.3 | 0.8 |
| Hypospadias * (p<0.0001) | Yes | 43 | 108.5 | 78.5 | 146.2 |
| | No | 2,170 | 52.4 | 50.3 | 54.7 |
| Epispadias | Yes | 1 | 2.5 | 0.1 | 14.1 |
| | No | 42 | 1.0 | 0.7 | 1.4 |

**Table 8. Tennessee Birth Defects by Maternal Diabetes (Type I/Type II)
2004-2008**

| Birth Defect | Diabetes | Count¹ | Rate² | LL³ | UL⁴ |
|--------------------------------------------------|-----------------|--------------------------|-------------------------|-----------------------|-----------------------|
| Obstructive Genitourinary Defect * (p=0.0038) | Yes | 21 | 53.0 | 32.8 | 81.0 |
| | No | 1,078 | 26.1 | 24.5 | 27.7 |
| Genitourinary Cases * (p<0.0001) | Yes | 74 | 186.8 | 146.7 | 234.5 |
| | No | 3,427 | 82.8 | 80.1 | 85.6 |
| Musculoskeletal | | | | | |
| Reduction Deformity (upper limbs) | Yes | 2 | 5.0 | 0.6 | 18.2 |
| | No | 83 | 2.0 | 1.6 | 2.5 |
| Reduction Deformity (lower limbs)* (p=0.0421) | Yes | 3 | 7.6 | 1.6 | 22.1 |
| | No | 72 | 1.7 | 1.4 | 2.2 |
| Gastroschisis | Yes | 1 | 2.5 | 0.1 | 14.1 |
| | No | 219 | 5.3 | 4.6 | 6.0 |
| Omphalocele | Yes | 2 | 5.0 | 0.6 | 18.2 |
| | No | 122 | 2.9 | 2.5 | 3.5 |
| Diaphragmatic Hernia | Yes | 2 | 5.0 | 0.6 | 18.2 |
| | No | 139 | 3.4 | 2.8 | 4.0 |
| Congenital Hip Dislocation | Yes | 6 | 15.1 | 5.6 | 33.0 |
| | No | 287 | 6.9 | 6.2 | 7.8 |
| Musculoskeletal Cases | Yes | 14 | 35.3 | 19.3 | 59.3 |
| | No | 890 | 21.5 | 20.1 | 23.0 |
| Chromosomal | | | | | |
| Trisomy 13 | Yes | 1 | 2.5 | 0.1 | 14.1 |
| | No | 32 | 0.8 | 0.5 | 1.1 |
| Down Syndrome | Yes | 6 | 15.1 | 5.6 | 33.0 |
| | No | 570 | 13.8 | 12.7 | 15.0 |
| Trisomy 18 | Yes | 1 | 2.5 | 0.1 | 14.1 |
| | No | 62 | 1.5 | 1.2 | 1.9 |
| Chromosomal Cases | Yes | 8 | 20.2 | 8.7 | 39.8 |
| | No | 659 | 15.9 | 14.7 | 17.2 |
| Fetal Alcohol Syndrome | Yes | 0 | 0.0 | 0.0 | 9.3 |
| | No | 87 | 2.1 | 1.7 | 2.6 |
| Total Cases * (p<0.0001) | Yes | 349 | 880.9 | 790.9 | 978.3 |
| | No | 13,893 | 335.8 | 330.2 | 341.4 |
| Total Live Births | Yes | 3,962 | | | |
| | No | 413,779 | | | |
| Unknown Cases | | 59 | | | |
| Unknown Live Births | | 0 | | | |

Source: Tennessee Birth Defects Registry 2004-2008

¹Counts include cases resulting from live births and fetal deaths. ²Per 10,000 live births. ³ 95% confidence interval lower limit. ⁴95 percent confidence interval upper limit. Confidence intervals for 100 or less cases are exact Poisson; otherwise confidence intervals are based on the normal approximation. *Indicates a statistically significant difference based on Poisson regression.

Diagnostic data were derived from the Tennessee Hospital Discharge Data System (2004-2009), the Tennessee Death Statistical System (2004-2009) and the Tennessee Fetal Death Statistical System (2004-2008). Live births and maternal diabetes were derived from the Tennessee Birth Statistical system (2004-2008).

**Table 9. Tennessee County Birth Defects Rates by Diagnostic Categories
2004-2008**

| County | Birth Defect | Count¹ | Rate² | LL³ | UL⁴ |
|---------------|------------------------|--------------------------|-------------------------|-----------------------|-----------------------|
| Anderson | Total Cases | 172 | 395.0 | 338.2 | 458.7 |
| Anderson | Central Nervous System | 11 | 25.3 | 12.6 | 45.2 |
| Anderson | Eye and Ear | 2 | 4.6 | 0.6 | 16.6 |
| Anderson | Cardiovascular | 63 | 144.7 | 111.2 | 185.1 |
| Anderson | Orofacial | 10 | 23.0 | 11.0 | 42.2 |
| Anderson | Gastrointestinal | 28 | 64.3 | 42.7 | 93.0 |
| Anderson | Genitourinary | 58 | 133.2 | 101.2 | 172.2 |
| Anderson | Musculoskeletal | 18 | 41.3 | 24.5 | 65.3 |
| Anderson | Chromosomal | 8 | 18.4 | 7.9 | 36.2 |
| Bedford | Total Cases | 103 | 296.5 | 242.0 | 359.6 |
| Bedford | Central Nervous System | 13 | 37.4 | 19.9 | 64.0 |
| Bedford | Cardiovascular | 36 | 103.6 | 72.6 | 143.5 |
| Bedford | Orofacial | 6 | 17.3 | 6.3 | 37.6 |
| Bedford | Gastrointestinal | 22 | 63.3 | 39.7 | 95.9 |
| Bedford | Genitourinary | 22 | 63.3 | 39.7 | 95.9 |
| Bedford | Musculoskeletal | 12 | 34.5 | 17.9 | 60.3 |
| Bedford | Chromosomal | 6 | 17.3 | 6.3 | 37.6 |
| Benton | Total Cases | 30 | 355.5 | 239.8 | 507.4 |
| Benton | Central Nervous System | 2 | 23.7 | 2.9 | 85.6 |
| Benton | Eye and Ear | 1 | 11.8 | 0.3 | 66.0 |
| Benton | Cardiovascular | 7 | 82.9 | 33.4 | 170.9 |
| Benton | Orofacial | 3 | 35.5 | 7.3 | 103.9 |
| Benton | Gastrointestinal | 3 | 35.5 | 7.3 | 103.9 |
| Benton | Genitourinary | 10 | 118.5 | 56.8 | 217.9 |
| Benton | Musculoskeletal | 4 | 47.4 | 12.9 | 121.4 |
| Benton | Chromosomal | 2 | 23.7 | 2.9 | 85.6 |
| Bledsoe | Total Cases | 13 | 195.5 | 104.1 | 334.3 |
| Bledsoe | Central Nervous System | 1 | 15.0 | 0.4 | 83.8 |
| Bledsoe | Eye and Ear | 1 | 15.0 | 0.4 | 83.8 |
| Bledsoe | Cardiovascular | 5 | 75.2 | 24.4 | 175.5 |
| Bledsoe | Orofacial | 2 | 30.1 | 3.6 | 108.6 |
| Bledsoe | Gastrointestinal | 4 | 60.2 | 16.4 | 154.0 |
| Bledsoe | Musculoskeletal | 2 | 30.1 | 3.6 | 108.6 |
| Bledsoe | Chromosomal | 1 | 15.0 | 0.4 | 83.8 |
| Blount | Total Cases | 246 | 366.1 | 321.8 | 414.9 |
| Blount | Central Nervous System | 21 | 31.3 | 19.4 | 47.8 |
| Blount | Eye and Ear | 3 | 4.5 | 0.9 | 13.1 |
| Blount | Cardiovascular | 96 | 142.9 | 115.7 | 174.5 |

**Table 9. Tennessee County Birth Defects Rates by Diagnostic Categories
2004-2008**

| County | Birth Defect | Count¹ | Rate² | LL³ | UL⁴ |
|---------------|------------------------|--------------------------|-------------------------|-----------------------|-----------------------|
| Blount | Orofacial | 21 | 31.3 | 19.4 | 47.8 |
| Blount | Gastrointestinal | 34 | 50.6 | 35.0 | 70.7 |
| Blount | Genitourinary | 74 | 110.1 | 86.5 | 138.3 |
| Blount | Musculoskeletal | 13 | 19.3 | 10.3 | 33.1 |
| Blount | Chromosomal | 10 | 14.9 | 7.1 | 27.4 |
| Bradley | Total Cases | 157 | 257.9 | 219.1 | 301.5 |
| Bradley | Central Nervous System | 16 | 26.3 | 15.0 | 42.7 |
| Bradley | Eye and Ear | 3 | 4.9 | 1.0 | 14.4 |
| Bradley | Cardiovascular | 47 | 77.2 | 56.7 | 102.7 |
| Bradley | Orofacial | 18 | 29.6 | 17.5 | 46.7 |
| Bradley | Gastrointestinal | 30 | 49.3 | 33.3 | 70.4 |
| Bradley | Genitourinary | 31 | 50.9 | 34.6 | 72.3 |
| Bradley | Musculoskeletal | 19 | 31.2 | 18.8 | 48.7 |
| Bradley | Chromosomal | 3 | 4.9 | 1.0 | 14.4 |
| Campbell | Total Cases | 105 | 434.1 | 355.0 | 525.5 |
| Campbell | Central Nervous System | 8 | 33.1 | 14.3 | 65.2 |
| Campbell | Cardiovascular | 41 | 169.5 | 121.6 | 229.9 |
| Campbell | Orofacial | 4 | 16.5 | 4.5 | 42.3 |
| Campbell | Gastrointestinal | 15 | 62.0 | 34.7 | 102.3 |
| Campbell | Genitourinary | 38 | 157.1 | 111.2 | 215.6 |
| Campbell | Musculoskeletal | 4 | 16.5 | 4.5 | 42.3 |
| Campbell | Chromosomal | 4 | 16.5 | 4.5 | 42.3 |
| Cannon | Total Cases | 28 | 356.2 | 236.7 | 514.9 |
| Cannon | Central Nervous System | 4 | 50.9 | 13.9 | 130.3 |
| Cannon | Eye and Ear | 1 | 12.7 | 0.3 | 70.9 |
| Cannon | Cardiovascular | 7 | 89.1 | 35.8 | 183.5 |
| Cannon | Orofacial | 1 | 12.7 | 0.3 | 70.9 |
| Cannon | Gastrointestinal | 6 | 76.3 | 28.0 | 166.2 |
| Cannon | Genitourinary | 7 | 89.1 | 35.8 | 183.5 |
| Cannon | Musculoskeletal | 2 | 25.4 | 3.1 | 91.9 |
| Cannon | Chromosomal | 2 | 25.4 | 3.1 | 91.9 |
| Carroll | Total Cases | 75 | 424.2 | 333.7 | 531.7 |
| Carroll | Central Nervous System | 4 | 22.6 | 6.2 | 57.9 |
| Carroll | Eye and Ear | 3 | 17.0 | 3.5 | 49.6 |
| Carroll | Cardiovascular | 20 | 113.1 | 69.1 | 174.7 |
| Carroll | Orofacial | 4 | 22.6 | 6.2 | 57.9 |
| Carroll | Gastrointestinal | 14 | 79.2 | 43.3 | 132.9 |
| Carroll | Genitourinary | 26 | 147.1 | 96.1 | 215.5 |
| Carroll | Musculoskeletal | 6 | 33.9 | 12.5 | 73.9 |

**Table 9. Tennessee County Birth Defects Rates by Diagnostic Categories
2004-2008**

| County | Birth Defect | Count¹ | Rate² | LL³ | UL⁴ |
|---------------|------------------------|--------------------------|-------------------------|-----------------------|-----------------------|
| Carroll | Chromosomal | 1 | 5.7 | 0.1 | 31.5 |
| Carter | Total Cases | 177 | 579.0 | 496.8 | 670.9 |
| Carter | Central Nervous System | 4 | 13.1 | 3.6 | 33.5 |
| Carter | Eye and Ear | 3 | 9.8 | 2.0 | 28.7 |
| Carter | Cardiovascular | 98 | 320.6 | 260.2 | 390.7 |
| Carter | Orofacial | 9 | 29.4 | 13.5 | 55.9 |
| Carter | Gastrointestinal | 30 | 98.1 | 66.2 | 140.1 |
| Carter | Genitourinary | 38 | 124.3 | 88.0 | 170.6 |
| Carter | Musculoskeletal | 7 | 22.9 | 9.2 | 47.2 |
| Carter | Chromosomal | 2 | 6.5 | 0.8 | 23.6 |
| Cheatham | Total Cases | 89 | 359.2 | 288.4 | 442.0 |
| Cheatham | Central Nervous System | 6 | 24.2 | 8.9 | 52.7 |
| Cheatham | Eye and Ear | 1 | 4.0 | 0.1 | 22.5 |
| Cheatham | Cardiovascular | 37 | 149.3 | 105.1 | 205.8 |
| Cheatham | Orofacial | 7 | 28.2 | 11.4 | 58.2 |
| Cheatham | Gastrointestinal | 15 | 60.5 | 33.9 | 99.8 |
| Cheatham | Genitourinary | 23 | 92.8 | 58.8 | 139.3 |
| Cheatham | Musculoskeletal | 6 | 24.2 | 8.9 | 52.7 |
| Cheatham | Chromosomal | 3 | 12.1 | 2.5 | 35.4 |
| Chester | Total Cases | 29 | 315.6 | 211.3 | 453.2 |
| Chester | Central Nervous System | 1 | 10.9 | 0.3 | 60.6 |
| Chester | Cardiovascular | 18 | 195.9 | 116.1 | 309.6 |
| Chester | Orofacial | 1 | 10.9 | 0.3 | 60.6 |
| Chester | Gastrointestinal | 1 | 10.9 | 0.3 | 60.6 |
| Chester | Genitourinary | 5 | 54.4 | 17.7 | 127.0 |
| Chester | Musculoskeletal | 4 | 43.5 | 11.9 | 111.4 |
| Chester | Chromosomal | 2 | 21.8 | 2.6 | 78.6 |
| Claiborne | Total Cases | 55 | 307.6 | 231.7 | 400.4 |
| Claiborne | Central Nervous System | 3 | 16.8 | 3.5 | 49.0 |
| Claiborne | Eye and Ear | 1 | 5.6 | 0.1 | 31.2 |
| Claiborne | Cardiovascular | 20 | 111.9 | 68.3 | 172.8 |
| Claiborne | Orofacial | 4 | 22.4 | 6.1 | 57.3 |
| Claiborne | Gastrointestinal | 14 | 78.3 | 42.8 | 131.4 |
| Claiborne | Genitourinary | 14 | 78.3 | 42.8 | 131.4 |
| Claiborne | Musculoskeletal | 1 | 5.6 | 0.1 | 31.2 |
| Claiborne | Chromosomal | 2 | 11.2 | 1.4 | 40.4 |
| Clay | Total Cases | 22 | 458.3 | 287.2 | 693.9 |
| Clay | Cardiovascular | 8 | 166.7 | 72.0 | 328.4 |

**Table 9. Tennessee County Birth Defects Rates by Diagnostic Categories
2004-2008**

| County | Birth Defect | Count¹ | Rate² | LL³ | UL⁴ |
|---------------|------------------------|--------------------------|-------------------------|-----------------------|-----------------------|
| Clay | Orofacial | 2 | 41.7 | 5.1 | 150.5 |
| Clay | Gastrointestinal | 12 | 250.0 | 129.2 | 436.7 |
| Clay | Genitourinary | 1 | 20.8 | 0.5 | 116.1 |
| Cocke | Total Cases | 78 | 364.5 | 288.1 | 454.9 |
| Cocke | Central Nervous System | 4 | 18.7 | 5.1 | 47.9 |
| Cocke | Eye and Ear | 1 | 4.7 | 0.1 | 26.0 |
| Cocke | Cardiovascular | 37 | 172.9 | 121.7 | 238.3 |
| Cocke | Orofacial | 4 | 18.7 | 5.1 | 47.9 |
| Cocke | Gastrointestinal | 18 | 84.1 | 49.9 | 132.9 |
| Cocke | Genitourinary | 16 | 74.8 | 42.7 | 121.4 |
| Cocke | Musculoskeletal | 4 | 18.7 | 5.1 | 47.9 |
| Cocke | Chromosomal | 3 | 14.0 | 2.9 | 41.0 |
| Coffee | Total Cases | 131 | 360.8 | 301.6 | 428.1 |
| Coffee | Central Nervous System | 9 | 24.8 | 11.3 | 47.1 |
| Coffee | Eye and Ear | 1 | 2.8 | 0.1 | 15.3 |
| Coffee | Cardiovascular | 40 | 110.2 | 78.7 | 150.0 |
| Coffee | Orofacial | 10 | 27.5 | 13.2 | 50.7 |
| Coffee | Gastrointestinal | 36 | 99.1 | 69.4 | 137.3 |
| Coffee | Genitourinary | 32 | 88.1 | 60.3 | 124.4 |
| Coffee | Musculoskeletal | 7 | 19.3 | 7.8 | 39.7 |
| Coffee | Chromosomal | 6 | 16.5 | 6.1 | 36.0 |
| Crockett | Total Cases | 35 | 370.4 | 258.0 | 515.1 |
| Crockett | Central Nervous System | 4 | 42.3 | 11.5 | 108.4 |
| Crockett | Eye and Ear | 2 | 21.2 | 2.6 | 76.5 |
| Crockett | Cardiovascular | 16 | 169.3 | 96.8 | 275.0 |
| Crockett | Orofacial | 1 | 10.6 | 0.3 | 59.0 |
| Crockett | Gastrointestinal | 8 | 84.7 | 36.6 | 166.8 |
| Crockett | Genitourinary | 4 | 42.3 | 11.5 | 108.4 |
| Crockett | Musculoskeletal | 4 | 42.3 | 11.5 | 108.4 |
| Crockett | Chromosomal | 1 | 10.6 | 0.3 | 59.0 |
| Cumberland | Total Cases | 103 | 382.9 | 312.5 | 464.4 |
| Cumberland | Central Nervous System | 5 | 18.6 | 6.0 | 43.4 |
| Cumberland | Cardiovascular | 39 | 145.0 | 103.1 | 198.2 |
| Cumberland | Orofacial | 15 | 55.8 | 31.2 | 92.0 |
| Cumberland | Gastrointestinal | 31 | 115.2 | 78.3 | 163.6 |
| Cumberland | Genitourinary | 23 | 85.5 | 54.2 | 128.3 |
| Cumberland | Musculoskeletal | 4 | 14.9 | 4.1 | 38.1 |
| Cumberland | Chromosomal | 3 | 11.2 | 2.3 | 32.6 |

**Table 9. Tennessee County Birth Defects Rates by Diagnostic Categories
2004-2008**

| County | Birth Defect | Count¹ | Rate² | LL³ | UL⁴ |
|---------------|------------------------|--------------------------|-------------------------|-----------------------|-----------------------|
| Davidson | Total Cases | 1,623 | 334.8 | 318.8 | 351.5 |
| Davidson | Central Nervous System | 92 | 19.0 | 15.3 | 23.3 |
| Davidson | Eye and Ear | 23 | 4.7 | 3.0 | 7.1 |
| Davidson | Cardiovascular | 684 | 141.1 | 130.7 | 152.1 |
| Davidson | Orofacial | 101 | 20.8 | 17.0 | 25.3 |
| Davidson | Gastrointestinal | 219 | 45.2 | 39.4 | 51.6 |
| Davidson | Genitourinary | 487 | 100.5 | 91.8 | 109.8 |
| Davidson | Musculoskeletal | 107 | 22.1 | 18.1 | 26.7 |
| Davidson | Chromosomal | 94 | 19.4 | 15.7 | 23.7 |
| Decatur | Total Cases | 19 | 288.8 | 173.9 | 450.9 |
| Decatur | Central Nervous System | 5 | 76.0 | 24.7 | 177.3 |
| Decatur | Cardiovascular | 1 | 15.2 | 0.4 | 84.7 |
| Decatur | Gastrointestinal | 5 | 76.0 | 24.7 | 177.3 |
| Decatur | Genitourinary | 10 | 152.0 | 72.9 | 279.5 |
| Dekalb | Total Cases | 40 | 309.6 | 221.2 | 421.6 |
| Dekalb | Central Nervous System | 2 | 15.5 | 1.9 | 55.9 |
| Dekalb | Cardiovascular | 14 | 108.4 | 59.2 | 181.8 |
| Dekalb | Orofacial | 2 | 15.5 | 1.9 | 55.9 |
| Dekalb | Gastrointestinal | 10 | 77.4 | 37.1 | 142.3 |
| Dekalb | Genitourinary | 10 | 77.4 | 37.1 | 142.3 |
| Dekalb | Musculoskeletal | 6 | 46.4 | 17.0 | 101.1 |
| Dekalb | Chromosomal | 2 | 15.5 | 1.9 | 55.9 |
| Dickson | Total Cases | 124 | 364.3 | 303.0 | 434.3 |
| Dickson | Central Nervous System | 5 | 14.7 | 4.8 | 34.3 |
| Dickson | Cardiovascular | 51 | 149.8 | 111.6 | 197.0 |
| Dickson | Orofacial | 5 | 14.7 | 4.8 | 34.3 |
| Dickson | Gastrointestinal | 24 | 70.5 | 45.2 | 104.9 |
| Dickson | Genitourinary | 40 | 117.5 | 84.0 | 160.0 |
| Dickson | Musculoskeletal | 9 | 26.4 | 12.1 | 50.2 |
| Dickson | Chromosomal | 4 | 11.8 | 3.2 | 30.1 |
| Dyer | Total Cases | 98 | 377.9 | 306.8 | 460.6 |
| Dyer | Central Nervous System | 3 | 11.6 | 2.4 | 33.8 |
| Dyer | Eye and Ear | 3 | 11.6 | 2.4 | 33.8 |
| Dyer | Cardiovascular | 36 | 138.8 | 97.2 | 192.2 |
| Dyer | Orofacial | 4 | 15.4 | 4.2 | 39.5 |
| Dyer | Gastrointestinal | 21 | 81.0 | 50.1 | 123.8 |
| Dyer | Genitourinary | 18 | 69.4 | 41.1 | 109.7 |
| Dyer | Musculoskeletal | 13 | 50.1 | 26.7 | 85.7 |

**Table 9. Tennessee County Birth Defects Rates by Diagnostic Categories
2004-2008**

| County | Birth Defect | Count¹ | Rate² | LL³ | UL⁴ |
|---------------|------------------------|--------------------------|-------------------------|-----------------------|-----------------------|
| Dyer | Chromosomal | 2 | 7.7 | 0.9 | 27.9 |
| Fayette | Total Cases | 73 | 306.9 | 240.5 | 385.8 |
| Fayette | Central Nervous System | 7 | 29.4 | 11.8 | 60.6 |
| Fayette | Cardiovascular | 37 | 155.5 | 109.5 | 214.4 |
| Fayette | Orofacial | 4 | 16.8 | 4.6 | 43.1 |
| Fayette | Gastrointestinal | 14 | 58.8 | 32.2 | 98.7 |
| Fayette | Genitourinary | 16 | 67.3 | 38.4 | 109.2 |
| Fayette | Musculoskeletal | 3 | 12.6 | 2.6 | 36.9 |
| Fayette | Chromosomal | 5 | 21.0 | 6.8 | 49.1 |
| Fentress | Total Cases | 40 | 388.7 | 277.7 | 529.3 |
| Fentress | Central Nervous System | 5 | 48.6 | 15.8 | 113.4 |
| Fentress | Cardiovascular | 16 | 155.5 | 88.9 | 252.5 |
| Fentress | Orofacial | 2 | 19.4 | 2.4 | 70.2 |
| Fentress | Gastrointestinal | 9 | 87.5 | 40.0 | 166.0 |
| Fentress | Genitourinary | 10 | 97.2 | 46.6 | 178.7 |
| Fentress | Musculoskeletal | 3 | 29.2 | 6.0 | 85.2 |
| Fentress | Chromosomal | 2 | 19.4 | 2.4 | 70.2 |
| Franklin | Total Cases | 77 | 353.5 | 279.0 | 441.9 |
| Franklin | Central Nervous System | 2 | 9.2 | 1.1 | 33.2 |
| Franklin | Eye and Ear | 1 | 4.6 | 0.1 | 25.6 |
| Franklin | Cardiovascular | 40 | 183.7 | 131.2 | 250.1 |
| Franklin | Orofacial | 4 | 18.4 | 5.0 | 47.0 |
| Franklin | Gastrointestinal | 10 | 45.9 | 22.0 | 84.4 |
| Franklin | Genitourinary | 15 | 68.9 | 38.6 | 113.6 |
| Franklin | Musculoskeletal | 9 | 41.3 | 18.9 | 78.4 |
| Franklin | Chromosomal | 1 | 4.6 | 0.1 | 25.6 |
| Gibson | Total Cases | 107 | 342.6 | 280.8 | 414.0 |
| Gibson | Central Nervous System | 5 | 16.0 | 5.2 | 37.4 |
| Gibson | Cardiovascular | 52 | 166.5 | 124.4 | 218.4 |
| Gibson | Orofacial | 10 | 32.0 | 15.4 | 58.9 |
| Gibson | Gastrointestinal | 23 | 73.6 | 46.7 | 110.5 |
| Gibson | Genitourinary | 22 | 70.4 | 44.2 | 106.7 |
| Gibson | Musculoskeletal | 3 | 9.6 | 2.0 | 28.1 |
| Gibson | Chromosomal | 2 | 6.4 | 0.8 | 23.1 |
| Giles | Total Cases | 42 | 248.1 | 178.8 | 335.3 |
| Giles | Central Nervous System | 4 | 23.6 | 6.4 | 60.5 |
| Giles | Eye and Ear | 2 | 11.8 | 1.4 | 42.7 |

**Table 9. Tennessee County Birth Defects Rates by Diagnostic Categories
2004-2008**

| County | Birth Defect | Count¹ | Rate² | LL³ | UL⁴ |
|---------------|------------------------|--------------------------|-------------------------|-----------------------|-----------------------|
| Giles | Cardiovascular | 16 | 94.5 | 54.0 | 153.5 |
| Giles | Orofacial | 1 | 5.9 | 0.2 | 32.9 |
| Giles | Gastrointestinal | 11 | 65.0 | 32.4 | 116.3 |
| Giles | Genitourinary | 9 | 53.2 | 24.3 | 100.9 |
| Giles | Musculoskeletal | 1 | 5.9 | 0.2 | 32.9 |
| Giles | Chromosomal | 5 | 29.5 | 9.6 | 68.9 |
| <hr/> | | | | | |
| Grainger | Total Cases | 53 | 403.3 | 302.2 | 527.6 |
| Grainger | Central Nervous System | 4 | 30.4 | 8.3 | 77.9 |
| Grainger | Eye and Ear | 1 | 7.6 | 0.2 | 42.4 |
| Grainger | Cardiovascular | 23 | 175.0 | 111.0 | 262.6 |
| Grainger | Orofacial | 3 | 22.8 | 4.7 | 66.7 |
| Grainger | Gastrointestinal | 10 | 76.1 | 36.5 | 140.0 |
| Grainger | Genitourinary | 11 | 83.7 | 41.8 | 149.8 |
| Grainger | Musculoskeletal | 3 | 22.8 | 4.7 | 66.7 |
| Grainger | Chromosomal | 3 | 22.8 | 4.7 | 66.7 |
| <hr/> | | | | | |
| Greene | Total Cases | 142 | 391.0 | 329.3 | 460.8 |
| Greene | Central Nervous System | 11 | 30.3 | 15.1 | 54.2 |
| Greene | Eye and Ear | 2 | 5.5 | 0.7 | 19.9 |
| Greene | Cardiovascular | 86 | 236.8 | 189.4 | 292.4 |
| Greene | Orofacial | 14 | 38.5 | 21.1 | 64.7 |
| Greene | Gastrointestinal | 17 | 46.8 | 27.3 | 74.9 |
| Greene | Genitourinary | 23 | 63.3 | 40.1 | 95.0 |
| Greene | Musculoskeletal | 9 | 24.8 | 11.3 | 47.0 |
| Greene | Chromosomal | 4 | 11.0 | 3.0 | 28.2 |
| <hr/> | | | | | |
| Grundy | Total Cases | 25 | 272.0 | 176.0 | 401.6 |
| Grundy | Cardiovascular | 10 | 108.8 | 52.2 | 200.1 |
| Grundy | Gastrointestinal | 6 | 65.3 | 24.0 | 142.1 |
| Grundy | Genitourinary | 8 | 87.1 | 37.6 | 171.5 |
| Grundy | Musculoskeletal | 3 | 32.6 | 6.7 | 95.4 |
| Grundy | Chromosomal | 3 | 32.6 | 6.7 | 95.4 |
| <hr/> | | | | | |
| Hamblen | Total Cases | 155 | 354.0 | 300.4 | 414.3 |
| Hamblen | Central Nervous System | 8 | 18.3 | 7.9 | 36.0 |
| Hamblen | Cardiovascular | 67 | 153.0 | 118.6 | 194.3 |
| Hamblen | Orofacial | 8 | 18.3 | 7.9 | 36.0 |
| Hamblen | Gastrointestinal | 30 | 68.5 | 46.2 | 97.8 |
| Hamblen | Genitourinary | 31 | 70.8 | 48.1 | 100.5 |
| Hamblen | Musculoskeletal | 14 | 32.0 | 17.5 | 53.6 |
| Hamblen | Chromosomal | 9 | 20.6 | 9.4 | 39.0 |
| <hr/> | | | | | |
| Hamilton | Total Cases | 659 | 316.0 | 292.3 | 341.1 |

**Table 9. Tennessee County Birth Defects Rates by Diagnostic Categories
2004-2008**

| County | Birth Defect | Count¹ | Rate² | LL³ | UL⁴ |
|---------------|------------------------|--------------------------|-------------------------|-----------------------|-----------------------|
| Hamilton | Central Nervous System | 57 | 27.3 | 20.7 | 35.4 |
| Hamilton | Eye and Ear | 5 | 2.4 | 0.8 | 5.6 |
| Hamilton | Cardiovascular | 258 | 123.7 | 109.1 | 139.8 |
| Hamilton | Orofacial | 44 | 21.1 | 15.3 | 28.3 |
| Hamilton | Gastrointestinal | 100 | 47.9 | 39.0 | 58.3 |
| Hamilton | Genitourinary | 172 | 82.5 | 70.6 | 95.8 |
| Hamilton | Musculoskeletal | 48 | 23.0 | 17.0 | 30.5 |
| Hamilton | Chromosomal | 40 | 19.2 | 13.7 | 26.1 |
| Hancock | Total Cases | 15 | 355.5 | 199.0 | 586.2 |
| Hancock | Central Nervous System | 1 | 23.7 | 0.6 | 132.0 |
| Hancock | Eye and Ear | 1 | 23.7 | 0.6 | 132.0 |
| Hancock | Cardiovascular | 5 | 118.5 | 38.5 | 276.5 |
| Hancock | Orofacial | 2 | 47.4 | 5.7 | 171.2 |
| Hancock | Gastrointestinal | 3 | 71.1 | 14.7 | 207.8 |
| Hancock | Genitourinary | 4 | 94.8 | 25.8 | 242.7 |
| Hancock | Musculoskeletal | 2 | 47.4 | 5.7 | 171.2 |
| Hancock | Chromosomal | 1 | 23.7 | 0.6 | 132.0 |
| Hardeman | Total Cases | 54 | 323.4 | 242.9 | 421.9 |
| Hardeman | Central Nervous System | 3 | 18.0 | 3.7 | 52.5 |
| Hardeman | Cardiovascular | 34 | 203.6 | 141.0 | 284.5 |
| Hardeman | Orofacial | 2 | 12.0 | 1.5 | 43.3 |
| Hardeman | Gastrointestinal | 4 | 24.0 | 6.5 | 61.3 |
| Hardeman | Genitourinary | 7 | 41.9 | 16.9 | 86.4 |
| Hardeman | Musculoskeletal | 4 | 24.0 | 6.5 | 61.3 |
| Hardeman | Chromosomal | 3 | 18.0 | 3.7 | 52.5 |
| Hardin | Total Cases | 57 | 394.5 | 298.8 | 511.1 |
| Hardin | Central Nervous System | 7 | 48.4 | 19.5 | 99.8 |
| Hardin | Cardiovascular | 23 | 159.2 | 100.9 | 238.8 |
| Hardin | Orofacial | 3 | 20.8 | 4.3 | 60.7 |
| Hardin | Gastrointestinal | 18 | 124.6 | 73.8 | 196.9 |
| Hardin | Genitourinary | 7 | 48.4 | 19.5 | 99.8 |
| Hardin | Musculoskeletal | 3 | 20.8 | 4.3 | 60.7 |
| Hardin | Chromosomal | 3 | 20.8 | 4.3 | 60.7 |
| Hawkins | Total Cases | 159 | 500.9 | 426.1 | 585.2 |
| Hawkins | Central Nervous System | 10 | 31.5 | 15.1 | 57.9 |
| Hawkins | Eye and Ear | 3 | 9.5 | 2.0 | 27.6 |
| Hawkins | Cardiovascular | 101 | 318.2 | 259.2 | 386.7 |
| Hawkins | Orofacial | 10 | 31.5 | 15.1 | 57.9 |

**Table 9. Tennessee County Birth Defects Rates by Diagnostic Categories
2004-2008**

| County | Birth Defect | Count¹ | Rate² | LL³ | UL⁴ |
|---------------|------------------------|--------------------------|-------------------------|-----------------------|-----------------------|
| Hawkins | Gastrointestinal | 18 | 56.7 | 33.6 | 89.6 |
| Hawkins | Genitourinary | 16 | 50.4 | 28.8 | 81.9 |
| Hawkins | Musculoskeletal | 4 | 12.6 | 3.4 | 32.3 |
| Hawkins | Chromosomal | 6 | 18.9 | 6.9 | 41.2 |
| Haywood | Total Cases | 55 | 424.4 | 319.7 | 552.4 |
| Haywood | Central Nervous System | 5 | 38.6 | 12.5 | 90.0 |
| Haywood | Cardiovascular | 32 | 246.9 | 168.9 | 348.6 |
| Haywood | Orofacial | 7 | 54.0 | 21.7 | 111.3 |
| Haywood | Gastrointestinal | 8 | 61.7 | 26.7 | 121.6 |
| Haywood | Genitourinary | 7 | 54.0 | 21.7 | 111.3 |
| Haywood | Chromosomal | 1 | 7.7 | 0.2 | 43.0 |
| Henderson | Total Cases | 71 | 381.5 | 298.0 | 481.2 |
| Henderson | Central Nervous System | 3 | 16.1 | 3.3 | 47.1 |
| Henderson | Eye and Ear | 2 | 10.7 | 1.3 | 38.8 |
| Henderson | Cardiovascular | 33 | 177.3 | 122.1 | 249.0 |
| Henderson | Orofacial | 4 | 21.5 | 5.9 | 55.0 |
| Henderson | Gastrointestinal | 12 | 64.5 | 33.3 | 112.6 |
| Henderson | Genitourinary | 15 | 80.6 | 45.1 | 132.9 |
| Henderson | Musculoskeletal | 4 | 21.5 | 5.9 | 55.0 |
| Henderson | Chromosomal | 1 | 5.4 | 0.1 | 29.9 |
| Henry | Total Cases | 65 | 342.8 | 264.6 | 437.0 |
| Henry | Central Nervous System | 7 | 36.9 | 14.9 | 76.1 |
| Henry | Eye and Ear | 2 | 10.5 | 1.3 | 38.1 |
| Henry | Cardiovascular | 23 | 121.3 | 76.9 | 182.0 |
| Henry | Orofacial | 3 | 15.8 | 3.3 | 46.2 |
| Henry | Gastrointestinal | 16 | 84.4 | 48.2 | 137.0 |
| Henry | Genitourinary | 17 | 89.7 | 52.2 | 143.6 |
| Henry | Musculoskeletal | 1 | 5.3 | 0.1 | 29.4 |
| Henry | Chromosomal | 3 | 15.8 | 3.3 | 46.2 |
| Hickman | Total Cases | 50 | 364.7 | 270.7 | 480.8 |
| Hickman | Central Nervous System | 1 | 7.3 | 0.2 | 40.6 |
| Hickman | Eye and Ear | 1 | 7.3 | 0.2 | 40.6 |
| Hickman | Cardiovascular | 11 | 80.2 | 40.1 | 143.6 |
| Hickman | Orofacial | 1 | 7.3 | 0.2 | 40.6 |
| Hickman | Gastrointestinal | 19 | 138.6 | 83.4 | 216.4 |
| Hickman | Genitourinary | 13 | 94.8 | 50.5 | 162.1 |
| Hickman | Musculoskeletal | 6 | 43.8 | 16.1 | 95.3 |
| Hickman | Chromosomal | 3 | 21.9 | 4.5 | 64.0 |

**Table 9. Tennessee County Birth Defects Rates by Diagnostic Categories
2004-2008**

| County | Birth Defect | Count¹ | Rate² | LL³ | UL⁴ |
|---------------|------------------------|--------------------------|-------------------------|-----------------------|-----------------------|
| Houston | Total Cases | 14 | 272.4 | 148.9 | 457.0 |
| Houston | Cardiovascular | 6 | 116.7 | 42.8 | 254.1 |
| Houston | Gastrointestinal | 4 | 77.8 | 21.2 | 199.3 |
| Houston | Genitourinary | 3 | 58.4 | 12.0 | 170.6 |
| Houston | Chromosomal | 1 | 19.5 | 0.5 | 108.4 |
| Humphreys | Total Cases | 38 | 354.8 | 251.1 | 487.0 |
| Humphreys | Central Nervous System | 4 | 37.3 | 10.2 | 95.6 |
| Humphreys | Cardiovascular | 13 | 121.4 | 64.6 | 207.6 |
| Humphreys | Orofacial | 1 | 9.3 | 0.2 | 52.0 |
| Humphreys | Gastrointestinal | 3 | 28.0 | 5.8 | 81.9 |
| Humphreys | Genitourinary | 13 | 121.4 | 64.6 | 207.6 |
| Humphreys | Musculoskeletal | 3 | 28.0 | 5.8 | 81.9 |
| Humphreys | Chromosomal | 1 | 9.3 | 0.2 | 52.0 |
| Jackson | Total Cases | 18 | 332.1 | 196.8 | 524.9 |
| Jackson | Cardiovascular | 11 | 203.0 | 101.3 | 363.1 |
| Jackson | Orofacial | 2 | 36.9 | 4.5 | 133.3 |
| Jackson | Gastrointestinal | 4 | 73.8 | 20.1 | 189.0 |
| Jackson | Musculoskeletal | 2 | 36.9 | 4.5 | 133.3 |
| Jackson | Chromosomal | 1 | 18.5 | 0.5 | 102.8 |
| Jefferson | Total Cases | 118 | 406.9 | 336.8 | 487.3 |
| Jefferson | Central Nervous System | 9 | 31.0 | 14.2 | 58.9 |
| Jefferson | Eye and Ear | 2 | 6.9 | 0.8 | 24.9 |
| Jefferson | Cardiovascular | 52 | 179.3 | 133.9 | 235.2 |
| Jefferson | Orofacial | 7 | 24.1 | 9.7 | 49.7 |
| Jefferson | Gastrointestinal | 26 | 89.7 | 58.6 | 131.4 |
| Jefferson | Genitourinary | 26 | 89.7 | 58.6 | 131.4 |
| Jefferson | Musculoskeletal | 12 | 41.4 | 21.4 | 72.3 |
| Jefferson | Chromosomal | 3 | 10.3 | 2.1 | 30.2 |
| Johnson | Total Cases | 36 | 408.6 | 286.2 | 565.7 |
| Johnson | Central Nervous System | 1 | 11.4 | 0.3 | 63.2 |
| Johnson | Cardiovascular | 23 | 261.1 | 165.5 | 391.7 |
| Johnson | Orofacial | 2 | 22.7 | 2.8 | 82.0 |
| Johnson | Gastrointestinal | 7 | 79.5 | 32.0 | 163.7 |
| Johnson | Genitourinary | 5 | 56.8 | 18.4 | 132.5 |
| Knox | Total Cases | 890 | 338.0 | 316.2 | 361.0 |
| Knox | Central Nervous System | 45 | 17.1 | 12.5 | 22.9 |
| Knox | Eye and Ear | 5 | 1.9 | 0.6 | 4.4 |
| Knox | Cardiovascular | 410 | 155.7 | 141.0 | 171.6 |

**Table 9. Tennessee County Birth Defects Rates by Diagnostic Categories
2004-2008**

| County | Birth Defect | Count¹ | Rate² | LL³ | UL⁴ |
|---------------|------------------------|--------------------------|-------------------------|-----------------------|-----------------------|
| Knox | Orofacial | 54 | 20.5 | 15.4 | 26.8 |
| Knox | Gastrointestinal | 119 | 45.2 | 37.4 | 54.1 |
| Knox | Genitourinary | 254 | 96.5 | 85.0 | 109.1 |
| Knox | Musculoskeletal | 57 | 21.6 | 16.4 | 28.1 |
| Knox | Chromosomal | 41 | 15.6 | 11.2 | 21.1 |
| Lake | Total Cases | 15 | 424.9 | 237.8 | 700.8 |
| Lake | Cardiovascular | 6 | 170.0 | 62.4 | 370.0 |
| Lake | Orofacial | 1 | 28.3 | 0.7 | 157.8 |
| Lake | Gastrointestinal | 5 | 141.6 | 46.0 | 330.6 |
| Lake | Genitourinary | 4 | 113.3 | 30.9 | 290.1 |
| Lake | Chromosomal | 1 | 28.3 | 0.7 | 157.8 |
| Lauderdale | Total Cases | 45 | 243.6 | 177.7 | 326.0 |
| Lauderdale | Central Nervous System | 2 | 10.8 | 1.3 | 39.1 |
| Lauderdale | Eye and Ear | 1 | 5.4 | 0.1 | 30.2 |
| Lauderdale | Cardiovascular | 20 | 108.3 | 66.1 | 167.2 |
| Lauderdale | Orofacial | 2 | 10.8 | 1.3 | 39.1 |
| Lauderdale | Gastrointestinal | 10 | 54.1 | 26.0 | 99.6 |
| Lauderdale | Genitourinary | 9 | 48.7 | 22.3 | 92.5 |
| Lauderdale | Musculoskeletal | 2 | 10.8 | 1.3 | 39.1 |
| Lauderdale | Chromosomal | 3 | 16.2 | 3.4 | 47.5 |
| Lawrence | Total Cases | 93 | 322.7 | 260.5 | 395.3 |
| Lawrence | Central Nervous System | 3 | 10.4 | 2.2 | 30.4 |
| Lawrence | Cardiovascular | 30 | 104.1 | 70.2 | 148.6 |
| Lawrence | Orofacial | 7 | 24.3 | 9.8 | 50.0 |
| Lawrence | Gastrointestinal | 21 | 72.9 | 45.1 | 111.4 |
| Lawrence | Genitourinary | 29 | 100.6 | 67.4 | 144.5 |
| Lawrence | Musculoskeletal | 5 | 17.3 | 5.6 | 40.5 |
| Lawrence | Chromosomal | 7 | 24.3 | 9.8 | 50.0 |
| Lewis | Total Cases | 23 | 301.8 | 191.3 | 452.9 |
| Lewis | Cardiovascular | 8 | 105.0 | 45.3 | 206.9 |
| Lewis | Orofacial | 3 | 39.4 | 8.1 | 115.1 |
| Lewis | Gastrointestinal | 4 | 52.5 | 14.3 | 134.4 |
| Lewis | Genitourinary | 5 | 65.6 | 21.3 | 153.1 |
| Lewis | Musculoskeletal | 4 | 52.5 | 14.3 | 134.4 |
| Lewis | Chromosomal | 2 | 26.2 | 3.2 | 94.8 |
| Lincoln | Total Cases | 55 | 256.2 | 193.0 | 333.4 |
| Lincoln | Central Nervous System | 5 | 23.3 | 7.6 | 54.4 |
| Lincoln | Cardiovascular | 28 | 130.4 | 86.7 | 188.5 |
| Lincoln | Orofacial | 7 | 32.6 | 13.1 | 67.2 |

**Table 9. Tennessee County Birth Defects Rates by Diagnostic Categories
2004-2008**

| County | Birth Defect | Count¹ | Rate² | LL³ | UL⁴ |
|---------------|------------------------|--------------------------|-------------------------|-----------------------|-----------------------|
| Lincoln | Gastrointestinal | 7 | 32.6 | 13.1 | 67.2 |
| Lincoln | Genitourinary | 10 | 46.6 | 22.3 | 85.7 |
| Lincoln | Musculoskeletal | 3 | 14.0 | 2.9 | 40.8 |
| Lincoln | Chromosomal | 4 | 18.6 | 5.1 | 47.7 |
| Loudon | Total Cases | 101 | 387.6 | 315.7 | 470.9 |
| Loudon | Central Nervous System | 4 | 15.3 | 4.2 | 39.3 |
| Loudon | Cardiovascular | 35 | 134.3 | 93.5 | 186.8 |
| Loudon | Orofacial | 10 | 38.4 | 18.4 | 70.6 |
| Loudon | Gastrointestinal | 16 | 61.4 | 35.1 | 99.7 |
| Loudon | Genitourinary | 31 | 119.0 | 80.8 | 168.9 |
| Loudon | Musculoskeletal | 7 | 26.9 | 10.8 | 55.3 |
| Loudon | Chromosomal | 9 | 34.5 | 15.8 | 65.6 |
| McMinn | Total Cases | 106 | 344.7 | 282.2 | 416.9 |
| McMinn | Central Nervous System | 16 | 52.0 | 29.7 | 84.5 |
| McMinn | Eye and Ear | 1 | 3.3 | 0.1 | 18.1 |
| McMinn | Cardiovascular | 32 | 104.1 | 71.2 | 146.9 |
| McMinn | Orofacial | 7 | 22.8 | 9.2 | 46.9 |
| McMinn | Gastrointestinal | 25 | 81.3 | 52.6 | 120.0 |
| McMinn | Genitourinary | 20 | 65.0 | 39.7 | 100.5 |
| McMinn | Musculoskeletal | 12 | 39.0 | 20.2 | 68.2 |
| McMinn | Chromosomal | 6 | 19.5 | 7.2 | 42.5 |
| McNairy | Total Cases | 56 | 360.4 | 272.2 | 468.0 |
| McNairy | Central Nervous System | 3 | 19.3 | 4.0 | 56.4 |
| McNairy | Eye and Ear | 1 | 6.4 | 0.2 | 35.9 |
| McNairy | Cardiovascular | 24 | 154.4 | 99.0 | 229.8 |
| McNairy | Orofacial | 4 | 25.7 | 7.0 | 65.9 |
| McNairy | Gastrointestinal | 10 | 64.4 | 30.9 | 118.3 |
| McNairy | Genitourinary | 11 | 70.8 | 35.3 | 126.7 |
| McNairy | Musculoskeletal | 5 | 32.2 | 10.5 | 75.1 |
| McNairy | Chromosomal | 4 | 25.7 | 7.0 | 65.9 |
| Macon | Total Cases | 40 | 276.1 | 197.2 | 375.9 |
| Macon | Central Nervous System | 3 | 20.7 | 4.3 | 60.5 |
| Macon | Cardiovascular | 17 | 117.3 | 68.3 | 187.8 |
| Macon | Orofacial | 3 | 20.7 | 4.3 | 60.5 |
| Macon | Gastrointestinal | 10 | 69.0 | 33.1 | 126.9 |
| Macon | Genitourinary | 7 | 48.3 | 19.4 | 99.5 |
| Macon | Musculoskeletal | 2 | 13.8 | 1.7 | 49.9 |
| Macon | Chromosomal | 5 | 34.5 | 11.2 | 80.5 |

**Table 9. Tennessee County Birth Defects Rates by Diagnostic Categories
2004-2008**

| County | Birth Defect | Count¹ | Rate² | LL³ | UL⁴ |
|---------------|------------------------|--------------------------|-------------------------|-----------------------|-----------------------|
| Madison | Total Cases | 229 | 328.9 | 287.7 | 374.4 |
| Madison | Central Nervous System | 15 | 21.5 | 12.1 | 35.5 |
| Madison | Eye and Ear | 4 | 5.7 | 1.6 | 14.7 |
| Madison | Cardiovascular | 122 | 175.2 | 145.5 | 209.2 |
| Madison | Orofacial | 9 | 12.9 | 5.9 | 24.5 |
| Madison | Gastrointestinal | 31 | 44.5 | 30.3 | 63.2 |
| Madison | Genitourinary | 51 | 73.2 | 54.5 | 96.3 |
| Madison | Musculoskeletal | 8 | 11.5 | 5.0 | 22.6 |
| Madison | Chromosomal | 14 | 20.1 | 11.0 | 33.7 |
| Marion | Total Cases | 56 | 335.5 | 253.5 | 435.7 |
| Marion | Central Nervous System | 6 | 35.9 | 13.2 | 78.3 |
| Marion | Eye and Ear | 1 | 6.0 | 0.2 | 33.4 |
| Marion | Cardiovascular | 23 | 137.8 | 87.4 | 206.8 |
| Marion | Orofacial | 2 | 12.0 | 1.5 | 43.3 |
| Marion | Gastrointestinal | 12 | 71.9 | 37.2 | 125.6 |
| Marion | Genitourinary | 18 | 107.8 | 63.9 | 170.4 |
| Marion | Musculoskeletal | 3 | 18.0 | 3.7 | 52.5 |
| Marion | Chromosomal | 3 | 18.0 | 3.7 | 52.5 |
| Marshall | Total Cases | 70 | 357.0 | 278.3 | 451.0 |
| Marshall | Central Nervous System | 7 | 35.7 | 14.4 | 73.6 |
| Marshall | Cardiovascular | 16 | 81.6 | 46.6 | 132.5 |
| Marshall | Orofacial | 4 | 20.4 | 5.6 | 52.2 |
| Marshall | Gastrointestinal | 16 | 81.6 | 46.6 | 132.5 |
| Marshall | Genitourinary | 24 | 122.4 | 78.4 | 182.1 |
| Marshall | Musculoskeletal | 6 | 30.6 | 11.2 | 66.6 |
| Marshall | Chromosomal | 4 | 20.4 | 5.6 | 52.2 |
| Maury | Total Cases | 190 | 344.8 | 297.5 | 397.4 |
| Maury | Central Nervous System | 20 | 36.3 | 22.2 | 56.1 |
| Maury | Cardiovascular | 59 | 107.1 | 81.5 | 138.1 |
| Maury | Orofacial | 9 | 16.3 | 7.5 | 31.0 |
| Maury | Gastrointestinal | 45 | 81.7 | 59.6 | 109.3 |
| Maury | Genitourinary | 60 | 108.9 | 83.1 | 140.1 |
| Maury | Musculoskeletal | 16 | 29.0 | 16.6 | 47.2 |
| Maury | Chromosomal | 5 | 9.1 | 3.0 | 21.2 |
| Meigs | Total Cases | 20 | 310.6 | 189.7 | 479.6 |
| Meigs | Central Nervous System | 3 | 46.6 | 9.6 | 136.1 |
| Meigs | Cardiovascular | 5 | 77.6 | 25.2 | 181.2 |
| Meigs | Gastrointestinal | 6 | 93.2 | 34.2 | 202.8 |

**Table 9. Tennessee County Birth Defects Rates by Diagnostic Categories
2004-2008**

| County | Birth Defect | Count¹ | Rate² | LL³ | UL⁴ |
|---------------|------------------------|--------------------------|-------------------------|-----------------------|-----------------------|
| Meigs | Genitourinary | 5 | 77.6 | 25.2 | 181.2 |
| Meigs | Chromosomal | 1 | 15.5 | 0.4 | 86.5 |
| Monroe | Total Cases | 103 | 375.1 | 306.2 | 454.9 |
| Monroe | Central Nervous System | 10 | 36.4 | 17.5 | 67.0 |
| Monroe | Eye and Ear | 3 | 10.9 | 2.3 | 31.9 |
| Monroe | Cardiovascular | 40 | 145.7 | 104.1 | 198.4 |
| Monroe | Orofacial | 7 | 25.5 | 10.3 | 52.5 |
| Monroe | Gastrointestinal | 19 | 69.2 | 41.7 | 108.1 |
| Monroe | Genitourinary | 27 | 98.3 | 64.8 | 143.1 |
| Monroe | Musculoskeletal | 6 | 21.8 | 8.0 | 47.6 |
| Monroe | Chromosomal | 5 | 18.2 | 5.9 | 42.5 |
| Montgomery | Total Cases | 405 | 293.5 | 265.7 | 323.6 |
| Montgomery | Central Nervous System | 25 | 18.1 | 11.7 | 26.8 |
| Montgomery | Eye and Ear | 4 | 2.9 | 0.8 | 7.4 |
| Montgomery | Cardiovascular | 187 | 135.5 | 116.8 | 156.4 |
| Montgomery | Orofacial | 26 | 18.8 | 12.3 | 27.6 |
| Montgomery | Gastrointestinal | 75 | 54.4 | 42.8 | 68.1 |
| Montgomery | Genitourinary | 94 | 68.1 | 55.1 | 83.4 |
| Montgomery | Musculoskeletal | 24 | 17.4 | 11.2 | 25.9 |
| Montgomery | Chromosomal | 22 | 15.9 | 10.0 | 24.1 |
| Moore | Total Cases | 11 | 387.3 | 193.4 | 693.0 |
| Moore | Cardiovascular | 3 | 105.6 | 21.8 | 308.7 |
| Moore | Orofacial | 2 | 70.4 | 8.5 | 254.4 |
| Moore | Gastrointestinal | 2 | 70.4 | 8.5 | 254.4 |
| Moore | Genitourinary | 3 | 105.6 | 21.8 | 308.7 |
| Moore | Musculoskeletal | 1 | 35.2 | 0.9 | 196.2 |
| Moore | Chromosomal | 2 | 70.4 | 8.5 | 254.4 |
| Morgan | Total Cases | 54 | 476.2 | 357.7 | 621.3 |
| Morgan | Central Nervous System | 2 | 17.6 | 2.1 | 63.7 |
| Morgan | Eye and Ear | 1 | 8.8 | 0.2 | 49.1 |
| Morgan | Cardiovascular | 16 | 141.1 | 80.7 | 229.1 |
| Morgan | Orofacial | 4 | 35.3 | 9.6 | 90.3 |
| Morgan | Gastrointestinal | 10 | 88.2 | 42.3 | 162.2 |
| Morgan | Genitourinary | 20 | 176.4 | 107.7 | 272.4 |
| Morgan | Musculoskeletal | 3 | 26.5 | 5.5 | 77.3 |
| Morgan | Chromosomal | 2 | 17.6 | 2.1 | 63.7 |
| Obion | Total Cases | 59 | 307.8 | 234.3 | 397.0 |
| Obion | Central Nervous System | 5 | 26.1 | 8.5 | 60.9 |

**Table 9. Tennessee County Birth Defects Rates by Diagnostic Categories
2004-2008**

| County | Birth Defect | Count¹ | Rate² | LL³ | UL⁴ |
|---------------|------------------------|--------------------------|-------------------------|-----------------------|-----------------------|
| Obion | Cardiovascular | 31 | 161.7 | 109.9 | 229.5 |
| Obion | Orofacial | 1 | 5.2 | 0.1 | 29.1 |
| Obion | Gastrointestinal | 10 | 52.2 | 25.0 | 95.9 |
| Obion | Genitourinary | 10 | 52.2 | 25.0 | 95.9 |
| Obion | Musculoskeletal | 6 | 31.3 | 11.5 | 68.1 |
| Obion | Chromosomal | 1 | 5.2 | 0.1 | 29.1 |
| Overton | Total Cases | 45 | 355.2 | 259.1 | 475.3 |
| Overton | Central Nervous System | 5 | 39.5 | 12.8 | 92.1 |
| Overton | Cardiovascular | 12 | 94.7 | 48.9 | 165.4 |
| Overton | Orofacial | 7 | 55.2 | 22.2 | 113.8 |
| Overton | Gastrointestinal | 8 | 63.1 | 27.3 | 124.4 |
| Overton | Genitourinary | 9 | 71.0 | 32.5 | 134.8 |
| Overton | Musculoskeletal | 5 | 39.5 | 12.8 | 92.1 |
| Overton | Chromosomal | 2 | 15.8 | 1.9 | 57.0 |
| Perry | Total Cases | 13 | 278.4 | 148.2 | 476.0 |
| Perry | Central Nervous System | 1 | 21.4 | 0.5 | 119.3 |
| Perry | Eye and Ear | 1 | 21.4 | 0.5 | 119.3 |
| Perry | Cardiovascular | 4 | 85.7 | 23.3 | 219.3 |
| Perry | Gastrointestinal | 2 | 42.8 | 5.2 | 154.7 |
| Perry | Genitourinary | 3 | 64.2 | 13.3 | 187.7 |
| Perry | Musculoskeletal | 2 | 42.8 | 5.2 | 154.7 |
| Perry | Chromosomal | 1 | 21.4 | 0.5 | 119.3 |
| Pickett | Total Cases | 12 | 434.8 | 224.7 | 759.5 |
| Pickett | Cardiovascular | 5 | 181.2 | 58.8 | 422.8 |
| Pickett | Orofacial | 2 | 72.5 | 8.8 | 261.8 |
| Pickett | Gastrointestinal | 4 | 144.9 | 39.5 | 371.1 |
| Pickett | Genitourinary | 3 | 108.7 | 22.4 | 317.7 |
| Pickett | Musculoskeletal | 2 | 72.5 | 8.8 | 261.8 |
| Polk | Total Cases | 25 | 266.5 | 172.5 | 393.4 |
| Polk | Central Nervous System | 2 | 21.3 | 2.6 | 77.0 |
| Polk | Cardiovascular | 7 | 74.6 | 30.0 | 153.8 |
| Polk | Orofacial | 1 | 10.7 | 0.3 | 59.4 |
| Polk | Gastrointestinal | 8 | 85.3 | 36.8 | 168.1 |
| Polk | Genitourinary | 5 | 53.3 | 17.3 | 124.4 |
| Polk | Musculoskeletal | 2 | 21.3 | 2.6 | 77.0 |
| Putnam | Total Cases | 140 | 296.9 | 249.8 | 350.4 |
| Putnam | Central Nervous System | 11 | 23.3 | 11.7 | 41.7 |
| Putnam | Eye and Ear | 2 | 4.2 | 0.5 | 15.3 |

**Table 9. Tennessee County Birth Defects Rates by Diagnostic Categories
2004-2008**

| County | Birth Defect | Count¹ | Rate² | LL³ | UL⁴ |
|---------------|------------------------|--------------------------|-------------------------|-----------------------|-----------------------|
| Putnam | Cardiovascular | 51 | 108.2 | 80.5 | 142.2 |
| Putnam | Orofacial | 9 | 19.1 | 8.7 | 36.2 |
| Putnam | Gastrointestinal | 38 | 80.6 | 57.0 | 110.6 |
| Putnam | Genitourinary | 26 | 55.1 | 36.0 | 80.8 |
| Putnam | Musculoskeletal | 11 | 23.3 | 11.7 | 41.7 |
| Putnam | Chromosomal | 6 | 12.7 | 4.7 | 27.7 |
| Rhea | Total Cases | 64 | 305.5 | 235.3 | 390.1 |
| Rhea | Central Nervous System | 3 | 14.3 | 3.0 | 41.9 |
| Rhea | Eye and Ear | 2 | 9.5 | 1.2 | 34.5 |
| Rhea | Cardiovascular | 25 | 119.3 | 77.2 | 176.2 |
| Rhea | Orofacial | 4 | 19.1 | 5.2 | 48.9 |
| Rhea | Gastrointestinal | 18 | 85.9 | 50.9 | 135.8 |
| Rhea | Genitourinary | 10 | 47.7 | 22.9 | 87.8 |
| Rhea | Musculoskeletal | 7 | 33.4 | 13.4 | 68.8 |
| Rhea | Chromosomal | 2 | 9.5 | 1.2 | 34.5 |
| Roane | Total Cases | 107 | 398.2 | 326.3 | 481.2 |
| Roane | Central Nervous System | 10 | 37.2 | 17.9 | 68.4 |
| Roane | Eye and Ear | 1 | 3.7 | 0.1 | 20.7 |
| Roane | Cardiovascular | 37 | 137.7 | 97.0 | 189.8 |
| Roane | Orofacial | 9 | 33.5 | 15.3 | 63.6 |
| Roane | Gastrointestinal | 20 | 74.4 | 45.5 | 115.0 |
| Roane | Genitourinary | 27 | 100.5 | 66.2 | 146.2 |
| Roane | Musculoskeletal | 9 | 33.5 | 15.3 | 63.6 |
| Roane | Chromosomal | 8 | 29.8 | 12.9 | 58.7 |
| Robertson | Total Cases | 153 | 297.1 | 251.9 | 348.1 |
| Robertson | Central Nervous System | 5 | 9.7 | 3.2 | 22.7 |
| Robertson | Eye and Ear | 1 | 1.9 | 0.1 | 10.8 |
| Robertson | Cardiovascular | 65 | 126.2 | 97.4 | 160.9 |
| Robertson | Orofacial | 16 | 31.1 | 17.8 | 50.5 |
| Robertson | Gastrointestinal | 25 | 48.6 | 31.4 | 71.7 |
| Robertson | Genitourinary | 36 | 69.9 | 49.0 | 96.8 |
| Robertson | Musculoskeletal | 13 | 25.2 | 13.4 | 43.2 |
| Robertson | Chromosomal | 8 | 15.5 | 6.7 | 30.6 |
| Rutherford | Total Cases | 552 | 298.1 | 273.8 | 324.0 |
| Rutherford | Central Nervous System | 34 | 18.4 | 12.7 | 25.7 |
| Rutherford | Eye and Ear | 6 | 3.2 | 1.2 | 7.1 |
| Rutherford | Cardiovascular | 214 | 115.6 | 100.6 | 132.1 |
| Rutherford | Orofacial | 35 | 18.9 | 13.2 | 26.3 |
| Rutherford | Gastrointestinal | 75 | 40.5 | 31.9 | 50.8 |

**Table 9. Tennessee County Birth Defects Rates by Diagnostic Categories
2004-2008**

| County | Birth Defect | Count¹ | Rate² | LL³ | UL⁴ |
|---------------|------------------------|--------------------------|-------------------------|-----------------------|-----------------------|
| Rutherford | Genitourinary | 197 | 106.4 | 92.1 | 122.3 |
| Rutherford | Musculoskeletal | 29 | 15.7 | 10.5 | 22.5 |
| Rutherford | Chromosomal | 27 | 14.6 | 9.6 | 21.2 |
| Scott | Total Cases | 61 | 392.5 | 300.3 | 504.2 |
| Scott | Central Nervous System | 4 | 25.7 | 7.0 | 65.9 |
| Scott | Cardiovascular | 23 | 148.0 | 93.8 | 222.1 |
| Scott | Orofacial | 5 | 32.2 | 10.5 | 75.1 |
| Scott | Gastrointestinal | 14 | 90.1 | 49.3 | 151.2 |
| Scott | Genitourinary | 16 | 103.0 | 58.9 | 167.2 |
| Scott | Musculoskeletal | 7 | 45.0 | 18.1 | 92.8 |
| Scott | Chromosomal | 4 | 25.7 | 7.0 | 65.9 |
| Sequatchie | Total Cases | 33 | 375.9 | 258.7 | 527.9 |
| Sequatchie | Central Nervous System | 3 | 34.2 | 7.1 | 99.9 |
| Sequatchie | Eye and Ear | 1 | 11.4 | 0.3 | 63.5 |
| Sequatchie | Cardiovascular | 13 | 148.1 | 78.8 | 253.2 |
| Sequatchie | Orofacial | 1 | 11.4 | 0.3 | 63.5 |
| Sequatchie | Gastrointestinal | 7 | 79.7 | 32.1 | 164.3 |
| Sequatchie | Genitourinary | 10 | 113.9 | 54.6 | 209.5 |
| Sequatchie | Musculoskeletal | 2 | 22.8 | 2.8 | 82.3 |
| Sequatchie | Chromosomal | 1 | 11.4 | 0.3 | 63.5 |
| Sevier | Total Cases | 182 | 338.3 | 290.9 | 391.2 |
| Sevier | Central Nervous System | 11 | 20.4 | 10.2 | 36.6 |
| Sevier | Eye and Ear | 2 | 3.7 | 0.5 | 13.4 |
| Sevier | Cardiovascular | 72 | 133.8 | 104.7 | 168.5 |
| Sevier | Orofacial | 10 | 18.6 | 8.9 | 34.2 |
| Sevier | Gastrointestinal | 41 | 76.2 | 54.7 | 103.4 |
| Sevier | Genitourinary | 49 | 91.1 | 67.4 | 120.4 |
| Sevier | Musculoskeletal | 7 | 13.0 | 5.2 | 26.8 |
| Sevier | Chromosomal | 10 | 18.6 | 8.9 | 34.2 |
| Shelby | Total Cases | 2,529 | 340.9 | 327.8 | 354.5 |
| Shelby | Central Nervous System | 210 | 28.3 | 24.6 | 32.4 |
| Shelby | Eye and Ear | 41 | 5.5 | 4.0 | 7.5 |
| Shelby | Cardiovascular | 1,382 | 186.3 | 176.6 | 196.4 |
| Shelby | Orofacial | 100 | 13.5 | 11.0 | 16.4 |
| Shelby | Gastrointestinal | 290 | 39.1 | 34.7 | 43.9 |
| Shelby | Genitourinary | 508 | 68.5 | 62.7 | 74.7 |
| Shelby | Musculoskeletal | 144 | 19.4 | 16.4 | 22.9 |
| Shelby | Chromosomal | 122 | 16.4 | 13.7 | 19.6 |

**Table 9. Tennessee County Birth Defects Rates by Diagnostic Categories
2004-2008**

| County | Birth Defect | Count¹ | Rate² | LL³ | UL⁴ |
|---------------|------------------------|--------------------------|-------------------------|-----------------------|-----------------------|
| Smith | Total Cases | 32 | 275.9 | 188.7 | 389.4 |
| Smith | Central Nervous System | 2 | 17.2 | 2.1 | 62.3 |
| Smith | Cardiovascular | 14 | 120.7 | 66.0 | 202.5 |
| Smith | Orofacial | 1 | 8.6 | 0.2 | 48.0 |
| Smith | Gastrointestinal | 10 | 86.2 | 41.3 | 158.5 |
| Smith | Genitourinary | 6 | 51.7 | 19.0 | 112.6 |
| Smith | Chromosomal | 1 | 8.6 | 0.2 | 48.0 |
| Stewart | Total Cases | 30 | 434.8 | 293.4 | 620.7 |
| Stewart | Central Nervous System | 1 | 14.5 | 0.4 | 80.8 |
| Stewart | Eye and Ear | 1 | 14.5 | 0.4 | 80.8 |
| Stewart | Cardiovascular | 15 | 217.4 | 121.7 | 358.5 |
| Stewart | Orofacial | 1 | 14.5 | 0.4 | 80.8 |
| Stewart | Gastrointestinal | 5 | 72.5 | 23.5 | 169.1 |
| Stewart | Genitourinary | 6 | 87.0 | 31.9 | 189.3 |
| Stewart | Musculoskeletal | 1 | 14.5 | 0.4 | 80.8 |
| Stewart | Chromosomal | 1 | 14.5 | 0.4 | 80.8 |
| Sullivan | Total Cases | 442 | 531.3 | 482.9 | 583.2 |
| Sullivan | Central Nervous System | 33 | 39.7 | 27.3 | 55.7 |
| Sullivan | Eye and Ear | 7 | 8.4 | 3.4 | 17.3 |
| Sullivan | Cardiovascular | 253 | 304.1 | 267.8 | 344.0 |
| Sullivan | Orofacial | 18 | 21.6 | 12.8 | 34.2 |
| Sullivan | Gastrointestinal | 65 | 78.1 | 60.3 | 99.6 |
| Sullivan | Genitourinary | 77 | 92.6 | 73.1 | 115.7 |
| Sullivan | Musculoskeletal | 20 | 24.0 | 14.7 | 37.1 |
| Sullivan | Chromosomal | 16 | 19.2 | 11.0 | 31.2 |
| Sumner | Total Cases | 323 | 322.7 | 288.5 | 359.9 |
| Sumner | Central Nervous System | 19 | 19.0 | 11.4 | 29.6 |
| Sumner | Eye and Ear | 3 | 3.0 | 0.6 | 8.8 |
| Sumner | Cardiovascular | 140 | 139.9 | 117.7 | 165.1 |
| Sumner | Orofacial | 24 | 24.0 | 15.4 | 35.7 |
| Sumner | Gastrointestinal | 74 | 73.9 | 58.1 | 92.8 |
| Sumner | Genitourinary | 81 | 80.9 | 64.3 | 100.6 |
| Sumner | Musculoskeletal | 19 | 19.0 | 11.4 | 29.6 |
| Sumner | Chromosomal | 13 | 13.0 | 6.9 | 22.2 |
| Tipton | Total Cases | 130 | 334.0 | 279.1 | 396.6 |
| Tipton | Central Nervous System | 8 | 20.6 | 8.9 | 40.5 |
| Tipton | Eye and Ear | 1 | 2.6 | 0.1 | 14.3 |
| Tipton | Cardiovascular | 64 | 164.4 | 126.6 | 210.0 |

**Table 9. Tennessee County Birth Defects Rates by Diagnostic Categories
2004-2008**

| County | Birth Defect | Count¹ | Rate² | LL³ | UL⁴ |
|---------------|------------------------|--------------------------|-------------------------|-----------------------|-----------------------|
| Tipton | Orofacial | 3 | 7.7 | 1.6 | 22.5 |
| Tipton | Gastrointestinal | 20 | 51.4 | 31.4 | 79.4 |
| Tipton | Genitourinary | 29 | 74.5 | 49.9 | 107.0 |
| Tipton | Musculoskeletal | 10 | 25.7 | 12.3 | 47.3 |
| Tipton | Chromosomal | 5 | 12.8 | 4.2 | 30.0 |
| Trousdale | Total Cases | 13 | 280.8 | 149.5 | 480.1 |
| Trousdale | Central Nervous System | 3 | 64.8 | 13.4 | 189.4 |
| Trousdale | Cardiovascular | 3 | 64.8 | 13.4 | 189.4 |
| Trousdale | Gastrointestinal | 2 | 43.2 | 5.2 | 156.0 |
| Trousdale | Genitourinary | 4 | 86.4 | 23.5 | 221.2 |
| Trousdale | Musculoskeletal | 1 | 21.6 | 0.6 | 120.3 |
| Unicoi | Total Cases | 52 | 559.1 | 417.6 | 733.3 |
| Unicoi | Central Nervous System | 2 | 21.5 | 2.6 | 77.7 |
| Unicoi | Eye and Ear | 1 | 10.8 | 0.3 | 59.9 |
| Unicoi | Cardiovascular | 20 | 215.1 | 131.4 | 332.1 |
| Unicoi | Orofacial | 5 | 53.8 | 17.5 | 125.5 |
| Unicoi | Gastrointestinal | 13 | 139.8 | 74.4 | 239.0 |
| Unicoi | Genitourinary | 7 | 75.3 | 30.3 | 155.1 |
| Unicoi | Musculoskeletal | 3 | 32.3 | 6.7 | 94.3 |
| Unicoi | Chromosomal | 2 | 21.5 | 2.6 | 77.7 |
| Union | Total Cases | 52 | 415.0 | 309.9 | 544.2 |
| Union | Central Nervous System | 4 | 31.9 | 8.7 | 81.7 |
| Union | Cardiovascular | 27 | 215.5 | 142.0 | 313.5 |
| Union | Orofacial | 5 | 39.9 | 13.0 | 93.1 |
| Union | Gastrointestinal | 8 | 63.8 | 27.6 | 125.8 |
| Union | Genitourinary | 9 | 71.8 | 32.9 | 136.4 |
| Union | Chromosomal | 3 | 23.9 | 4.9 | 70.0 |
| Van Buren | Total Cases | 6 | 209.1 | 76.7 | 455.0 |
| Van Buren | Eye and Ear | 1 | 34.8 | 0.9 | 194.1 |
| Van Buren | Cardiovascular | 1 | 34.8 | 0.9 | 194.1 |
| Van Buren | Orofacial | 1 | 34.8 | 0.9 | 194.1 |
| Van Buren | Gastrointestinal | 1 | 34.8 | 0.9 | 194.1 |
| Van Buren | Musculoskeletal | 2 | 69.7 | 8.4 | 251.7 |
| Van Buren | Chromosomal | 1 | 34.8 | 0.9 | 194.1 |
| Warren | Total Cases | 74 | 278.5 | 218.7 | 349.6 |
| Warren | Central Nervous System | 6 | 22.6 | 8.3 | 49.2 |
| Warren | Cardiovascular | 32 | 120.4 | 82.4 | 170.0 |
| Warren | Orofacial | 5 | 18.8 | 6.1 | 43.9 |

**Table 9. Tennessee County Birth Defects Rates by Diagnostic Categories
2004-2008**

| County | Birth Defect | Count¹ | Rate² | LL³ | UL⁴ |
|---------------|------------------------|--------------------------|-------------------------|-----------------------|-----------------------|
| Warren | Gastrointestinal | 19 | 71.5 | 43.1 | 111.7 |
| Warren | Genitourinary | 12 | 45.2 | 23.3 | 78.9 |
| Warren | Musculoskeletal | 5 | 18.8 | 6.1 | 43.9 |
| Warren | Chromosomal | 3 | 11.3 | 2.3 | 33.0 |
| Washington | Total Cases | 305 | 447.7 | 398.8 | 500.8 |
| Washington | Central Nervous System | 17 | 25.0 | 14.5 | 40.0 |
| Washington | Eye and Ear | 2 | 2.9 | 0.4 | 10.6 |
| Washington | Cardiovascular | 172 | 252.5 | 216.1 | 293.1 |
| Washington | Orofacial | 14 | 20.5 | 11.2 | 34.5 |
| Washington | Gastrointestinal | 46 | 67.5 | 49.4 | 90.1 |
| Washington | Genitourinary | 59 | 86.6 | 65.9 | 111.7 |
| Washington | Musculoskeletal | 16 | 23.5 | 13.4 | 38.1 |
| Washington | Chromosomal | 8 | 11.7 | 5.1 | 23.1 |
| Wayne | Total Cases | 30 | 365.0 | 246.2 | 521.0 |
| Wayne | Central Nervous System | 1 | 12.2 | 0.3 | 67.8 |
| Wayne | Cardiovascular | 13 | 158.2 | 84.2 | 270.4 |
| Wayne | Orofacial | 1 | 12.2 | 0.3 | 67.8 |
| Wayne | Gastrointestinal | 7 | 85.2 | 34.2 | 175.5 |
| Wayne | Genitourinary | 9 | 109.5 | 50.1 | 207.8 |
| Wayne | Musculoskeletal | 3 | 36.5 | 7.5 | 106.7 |
| Wayne | Chromosomal | 1 | 12.2 | 0.3 | 67.8 |
| Weakley | Total Cases | 58 | 336.8 | 255.8 | 435.4 |
| Weakley | Central Nervous System | 2 | 11.6 | 1.4 | 42.0 |
| Weakley | Eye and Ear | 1 | 5.8 | 0.2 | 32.4 |
| Weakley | Cardiovascular | 24 | 139.4 | 89.3 | 207.4 |
| Weakley | Orofacial | 4 | 23.2 | 6.3 | 59.5 |
| Weakley | Gastrointestinal | 16 | 92.9 | 53.1 | 150.9 |
| Weakley | Genitourinary | 11 | 63.9 | 31.9 | 114.3 |
| Weakley | Musculoskeletal | 1 | 5.8 | 0.2 | 32.4 |
| Weakley | Chromosomal | 2 | 11.6 | 1.4 | 42.0 |
| White | Total Cases | 41 | 263.7 | 189.2 | 357.7 |
| White | Central Nervous System | 3 | 19.3 | 4.0 | 56.4 |
| White | Cardiovascular | 18 | 115.8 | 68.6 | 182.9 |
| White | Orofacial | 4 | 25.7 | 7.0 | 65.9 |
| White | Gastrointestinal | 7 | 45.0 | 18.1 | 92.8 |
| White | Genitourinary | 10 | 64.3 | 30.8 | 118.3 |
| White | Musculoskeletal | 2 | 12.9 | 1.6 | 46.5 |
| White | Chromosomal | 1 | 6.4 | 0.2 | 35.8 |

**Table 9. Tennessee County Birth Defects Rates by Diagnostic Categories
2004-2008**

| County | Birth Defect | Count¹ | Rate² | LL³ | UL⁴ |
|---------------|------------------------|--------------------------|-------------------------|-----------------------|-----------------------|
| Williamson | Total Cases | 311 | 298.6 | 266.4 | 333.7 |
| Williamson | Central Nervous System | 15 | 14.4 | 8.1 | 23.8 |
| Williamson | Eye and Ear | 2 | 1.9 | 0.2 | 6.9 |
| Williamson | Cardiovascular | 127 | 122.0 | 101.7 | 145.1 |
| Williamson | Orofacial | 21 | 20.2 | 12.5 | 30.8 |
| Williamson | Gastrointestinal | 38 | 36.5 | 25.8 | 50.1 |
| Williamson | Genitourinary | 102 | 97.9 | 79.9 | 118.9 |
| Williamson | Musculoskeletal | 15 | 14.4 | 8.1 | 23.8 |
| Williamson | Chromosomal | 22 | 21.1 | 13.2 | 32.0 |
| Wilson | Total Cases | 190 | 279.0 | 240.7 | 321.6 |
| Wilson | Central Nervous System | 6 | 8.8 | 3.2 | 19.2 |
| Wilson | Eye and Ear | 3 | 4.4 | 0.9 | 12.9 |
| Wilson | Cardiovascular | 83 | 121.9 | 97.1 | 151.1 |
| Wilson | Orofacial | 14 | 20.6 | 11.2 | 34.5 |
| Wilson | Gastrointestinal | 28 | 41.1 | 27.3 | 59.4 |
| Wilson | Genitourinary | 55 | 80.8 | 60.8 | 105.1 |
| Wilson | Musculoskeletal | 11 | 16.2 | 8.1 | 28.9 |
| Wilson | Chromosomal | 10 | 14.7 | 7.0 | 27.0 |

Source: Tennessee Birth Defects Registry 2004-2008

¹Counts include cases resulting from live births and fetal deaths. ²Per 10,000 live births. ³ 95% confidence interval lower limit. ⁴95 percent confidence interval upper limit. Confidence intervals for 100 or less cases are exact Poisson; otherwise confidence intervals are based on the normal approximation.

Diagnostic data were derived from the Tennessee Hospital Discharge Data System (2004-2009), the Tennessee Death Statistical System (2004-2009) and the Tennessee Fetal Death Statistical System (2004-2008). Live births were derived from the Tennessee Birth Statistical system (2004-2008).

Glossary of Terms

| | | | |
|------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Agensis | Absence of part(s) of the body. Lack of development or failure to develop part(s) of the body. | Chromosome abnormalities | A major group of genetic diseases in which alterations of chromosome number or structure occur and are observable by microscope. |
| Alpha-fetoprotein | A protein produced by the fetus during gestation. The level of this protein can be measured during the pregnancy. The level of this protein is elevated in pregnancies with neural tube defects and may be decreased in pregnancies with Down syndrome. | Cleft lip | The congenital failure of the fetal components of the lip to fuse or join, forming a groove or fissure in the lip. Infants with this condition can have difficulty feeding and may use assistive devices for feeding. This condition is corrected when the infant can tolerate surgery. |
| Amniocentesis | A method of prenatal diagnosis which a small amount of amniotic fluid is withdrawn to obtain fetal cells, which can be tested for the presence of some genetic diseases. | Cleft palate | The congenital failure of the palate to fuse properly forming a grooved depression or fissure in the roof of the mouth. This defect varies in degree of severity. The fissure can extend into the hard and soft palate and into the nasal cavities. Infants with this condition have difficulty feeding, and may use assistive devices for feeding. Surgical correction is begun as soon as possible. Children with cleft palates are at high risk for hearing problems due to ear infections. |
| Anencephalus | Congenital absence of the skull, with cerebral hemispheres completely missing or reduced to small masses attached to the base of the skull. Anencephaly is not compatible with life. | Coarctation of the aorta | Localized narrowing of the aorta. This condition can vary from mild to severe. |
| Aniridia | The complete absence of the iris of the eye or a defect of the iris. | Common truncus arteriosus | A congenital heart defect in which the common arterial trunk fails to divide into pulmonary artery and aorta. |
| Anophthalmia | A developmental defect characterized by complete absence of the eyes, or by the presence of vestigial eyes. | Confidence interval (95%) | The interval that contains the true prevalence (which can only be estimated) 95% of the time. |
| Anotia | A congenital absence of one or both ears. | Congenital | Existing at or dating from birth although the defect may not be recognized at the time of birth. |
| Aortic valve stenosis | A cardiac anomaly characterized by a narrowing or stricture of the aortic valve. | Congenital hip dislocation | Location of the head of the femur (bone of the upper leg) outside its normal location in the cup-shaped cavity formed by the hip bones (acetabulum). |
| Aplasia | Absence of a tissue or organ due to lack of cell proliferation. | Diaphragmatic hernia | A failure of the diaphragm to form completely, leaving a hole. Abdominal organs can protrude through the hole into the chest cavity and interfere with development of the heart and lungs. Usually life-threatening and requires emergent surgery. |
| Atresia | Absence or closure of a normal opening. | Down syndrome (Trisomy 21) | The chromosomal abnormality characterized by an extra copy of chromosome 21. In rare cases this syndrome is caused by translocation. Down syndrome is characterized by moderate to severe retardation, sloping forehead, small ear canals, flat-bridge of the nose and short fingers and toes. Many infants have congenital heart disease. |
| Atrial septal defect | A congenital cardiac malformation in which there are one or several openings in the atrial septum (wall between the right and left atria). Most common type is called ostium secundum defect. | Dysgenesis | Anomalous or disorganized formation of an organ. |
| Biliary atresia | A congenital absence or underdevelopment of one or more of the ducts in the biliary tract. | Dysplasia | Disorganized cell structure or arrangement within a tissue or organ. |
| Bladder exstrophy | Incomplete closure of the anterior wall of the bladder and the abdominal cavity. The upper urinary tract is generally normal. Often associated with anorectal and genital malformations. | | |
| Congenital cataract | An opacity (clouding) of the lens of the eye that has its origin prenatally. | | |
| Choanal atresia or stenosis | A congenital anomaly in which a bony or membranous formation blocks the passageway between the nose and the pharynx. | | |
| Chromosome | Threadlike structure in cells that individual genes are arranged along. | | |

Ebstein anomaly A congenital heart defect in which the tricuspid valve is displaced downward into the right ventricle.

Edwards syndrome See Trisomy 18.

Embryonic period The first eight weeks after fertilization, during which most, but not all, organs are formed.

Encephalocele Herniation of the brain through a defect in the skull.

Endocardial cushion defect In the complete form, a septal defect involving both the upper chambers (atria, atrial septal defect) and lower chambers (ventricles, ventricular septal defect) such that there is a single large atrioventricular septal defect. There are incomplete forms as well.

Epispadias Displacement of the opening of the urethra (urethral meatus) dorsally and proximally (on top and closer to the body) in relation to the tip of the glans of the penis.

Esophageal stenosis or atresia A narrowing or incomplete formation of the esophagus. Usually a surgical emergency. Frequently associated with a Tracheoesophageal Fistula.

Extremely low birth weight Birth weight less than 1,000 grams, regardless of gestational age.

Fetal alcohol syndrome A constellation of physical abnormalities (including characteristic abnormal facial features and growth retardation), and problems of behavior and cognition in children born to mothers who drank alcohol during pregnancy.

Fetal death (stillborn) Death prior to complete expulsion or extraction of an infant or fetus of 500 grams or more, or, in absence of weight, of 22 weeks' gestation or greater; death is indicated by the fact that, after expulsion or extraction, the fetus does not breathe or show any other evidence of life, such as beating of the heart, pulsation of the umbilical cord or definite movement of voluntary muscles (68-3-102).

Fetal period The period from the ninth week after fertilization through delivery.

Fetal ultrasound A diagnostic examination of the fetus using ultrasound (sound waves at a frequency above what is detectable to human hearing).

Fistula An abnormal passage from an internal organ to the body surface or between two internal organs or structures.

Folic acid deficiency A lack of folic acid in the mother's diet which may lead to an increased risk for neural tube defects. Current recommendations from the March of Dimes indicate that women who are or may become pregnant should take a folic acid supplement to decrease the risk of neural tube defect.

Gastroschisis A congenital opening of the abdominal wall with protrusion of the intestines. This condition is surgically treated.

Genetic counseling The delivery of information about the risks, natural history, and management of genetic diseases to patients and/or their families.

Hirschsprung's disease The congenital absence of autonomic ganglia (nerves controlling involuntary and reflexive movement) in the muscles of the colon. This results in immobility of the intestines and may cause obstruction or stretching of the intestines. This condition is repaired surgically in early childhood by the removal of the affected portion of the intestine.

Holocephalus The abnormal accumulation of fluid within the spaces of the brain.

Hydrocephalus The abnormal accumulation of fluid within the skull.

Hyperplasia Overgrowth characterized by an increase in the number of cells of tissue.

Hypoplasia A condition of arrested development in which an organ or part remains below the normal size or in an immature state.

Hypoplastic left heart syndrome Atresia, or a marked hypoplasia, of the aortic valve, atresia or marked hypoplasia for the mitral valve, with hypoplasia of the ascending aorta and underdevelopment of the left ventricle.

Hypospadias A congenital defect in which the urinary meatus (urinary outlet) is on the underside of the penis or on the perineum (area between the genitals and anus). The urinary sphincters are not defective so incontinence does not occur. The condition may be surgically corrected if needed for cosmetic, urologic, or reproductive reasons.

Infant death Death of a live-born infant before 12 months of age.

Live birth Spontaneous delivery of an infant that exhibits signs of life, including a heartbeat, spontaneous breathing, or movement of voluntary muscles. Transient cardiac contractions and fleeting respiratory efforts or gasps are not necessarily considered signs of life by all programs.

Lower limb reduction defects The congenital absence of a portion of the lower limb. There are two general types of defect, transverse and longitudinal. Transverse defects appear like amputations, or like missing segments of the limb. Longitudinal defects are missing rays of the limb (for example, a missing tibia and great toe).

Low birth weight Birth weight less than 2,500 grams, regardless of gestational age.

Malformation A primary morphologic defect resulting from an abnormal developmental process.

Maternal serum screening A diagnostic method that examines the mother's blood serum for indicators of anomalies in the process of fetal development.

Mental retardation A condition of below average intellectual ability (IQ less than 70) that is present from birth or infancy.

| | | | |
|-----------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Microcephaly | Congenital smallness of the head, with corresponding smallness of the brain. | Pulmonary artery anomaly | Abnormality in the formation of the pulmonary artery such as stenosis or atresia. |
| Microphthalmia | The congenital abnormal smallness of one or both eyes. Can occur in the presence of other ocular defects. | Pulmonary valve atresia or stenosis | Failure of formation of the pulmonary valve or a narrowing or obstruction of the pulmonary valve, resulting in obstruction of blood flow from the right ventricle to the pulmonary artery. |
| Microtia | A small or maldeveloped external ear and atretic or stenotic external auditory canal. | Pyloric stenosis | A narrowing of the outlet from the stomach to the small intestine resulting in complete or partial obstruction of the passage of food and gastric contents. |
| Multifactorial | A term used to describe characteristics or diseases that are caused by a combination of multiple genetic and environmental factors. | Rectal and large intestinal atresia/stenosis | Complete or partial occlusion of the lumen of one or more segments of the large intestine and/or rectum. |
| Multiple congenital anomaly | Term used to describe the presence of more than one anomaly at birth. | Reduction defects: lower and upper limbs | The congenital absence of a portion of the lower or upper limbs. There are two general types of defect, transverse and longitudinal. Transverse defects appear like amputations with the complete or partial absence of the arm or leg. Longitudinal defects are missing rays of the limb and may involve the preaxial (thumb or big toe side) or central parts of the arm or leg. |
| Mutagen | Substance that is known to cause a mutation. | Renal agenesis or dysgenesis | The failure, or deviation, of embryonic development of the kidney. |
| Mutations | Alterations in the sequence of DNA. | Spina bifida | An incomplete closure of the vertebral spine (usually posterior) through which spinal cord tissue or membranes (meninges) covering the spine herniated. |
| Neonatal death | Death of a live-born infant within the first 28 days after birth. <i>Early neonatal death</i> refers to death during the first 7 days. <i>Late neonatal death</i> refers to death after 7 days but before 29 days. | Stenosis | A narrowing or constriction the diameter of a bodily passage or orifice. |
| Neonatal (newborn) period | The first 28 days following delivery of a live-born infant. | Stenosis or atresia of the small intestine | A narrowing or incomplete formation of the small intestine obstructing movement through the digestive tract. |
| Neural tube defect | A defect resulting from failure of the neural tube to close in the first month of pregnancy. The major conditions include anencephaly, spina bifida, and encephalocele. | Syndrome | A pattern of multiple primary malformations or defects all due to a single underlying cause (for example, Down syndrome). |
| Obstructive genitourinary defect | Stenosis or atresia of the urinary tract at any level. Severity of the defect depends largely upon the level of the obstruction. Urine accumulates behind the obstruction. | Teratogen | A substance in the environment that can cause a birth defect. |
| Omphalocele | The protrusion of intestines into the umbilicus. The defect is usually closed surgically soon after birth. | Term infant | An infant born after 37 complete weeks and before 42 complete weeks of gestation. |
| Patau Syndrome | See Trisomy 13 | Tetralogy of Fallot | The simultaneous presence of a ventricular septal defect, pulmonic stenosis, a malpositioned aorta that overrides the ventricular septum, and right ventricular hypertrophy. |
| Patent ductus arteriosus | A blood vessel between the pulmonary artery and the aorta. This is normal in fetal life, but can cause problems after birth, particularly in premature infants. | Transposition of the great arteries | A congenital malformation in which the aorta arises from the right ventricle and the pulmonary artery from the left ventricle (opposite of normal), so that the venous return from the peripheral circulation is recirculated without being oxygenated in the lungs. Immediate surgical correction is needed. When this is not associated with other cardiac defects, and not corrected, it is fatal. |
| Periconceptual | At or around the time of conception. | Tricuspid valve atresia or stenosis | A congenital cardiac condition characterized by the absence or constriction of the tricuspid valve. |
| Perinatal | Before, during, or after delivery. The exact time period may vary from 20 to 28 complete weeks of gestation through 7 to 28 days after delivery, depending on the context in which the term is used. | Trisomy | A chromosomal abnormality characterized by one |
| Postnatal | After delivery. | | |
| Postterm infant | An infant born after 42 completed weeks of gestation. | | |
| Prenatal | Before delivery. | | |
| Preterm infant | An infant born before 37 completed weeks of gestation. | | |

more than the normal number of chromosomes. Normally, cells contain two of each chromosome. In trisomy, cells contain three copies of a specific chromosome.

**Trisomy 13
(Patau
syndrome)**

The chromosomal abnormality caused by an extra chromosome 13. Characterized by impaired midline facial development, cleft lip and palate, polydactyly and severe mental retardation. Most infants do not survive beyond 6 months of life.

**Trisomy 18
(Edwards
syndrome)**

The chromosomal abnormality caused by an extra copy of chromosome 18. It is characterized by mental retardation, growth retardation, low-set ears, skull malformation and short digits. Survival for more than a few months is rare.

**Trisomy 21
Ventricular
Septal Defect**

See Down Syndrome.
A congenital cardiac malformation in which there are one or several openings in the ventricular system (Muscular and fibrous wall between the right and left ventricle or right and left lower chambers of the heart).

**Very Low Birth
Weight**

Birthweight less than 1,500 grams, regardless of gestational age.

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