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Incidence and Pattern of Lethal Congenital Anomalies in South Dakota, 2006-2013

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In 2012, South Dakota ranked 50th in the US in infant mortality and reducing infant mortality is a public health priority in South Dakota. Congenital anomalies are the most common cause of infant death and represent about one fourth of the total infant deaths between 2006 and 2013 in South Dakota (**Table 1**).

Table 1. Congenital Anomaly-related Infant Deaths, South Dakota, 2006-2013

	2006	2007	2008	2009	2010	2011	2012	2013	Total
Anomaly-related Infant Deaths (#)	28	24	24	18	21	17	29	18	179
Total Infant Deaths (#)	82	79	100	80	83	75	104	80	683
Anomaly-related Infant Deaths (%)	34%	30%	24%	23%	25%	23%	28%	23%	26%

Data from South Dakota Vital Records, 2006-2013

We used information from vital records (birth and death certificates) to describe the incidence and pattern of major congenital anomalies in South Dakota among infant deaths. Congenital anomalies are defined as congenital malformations, deformations and chromosomal abnormalities and are coded as Q00 - Q99 according to ICD-10-CM Coding System.

Incidence and Trends over Time

Between 2006 and 2013 South Dakota had higher mortality rates due to congenital anomalies than what was observed nationally (p=0.004) (**Figure 1**). There was no significant trend between 2006 and 2013. The mortality rate from congenital anomalies among American Indian infants was not significantly different than the mortality rate among White infants (**Figure 2**; p=0.09).

Figure 1. U.S. and South Dakota Infant Mortality Rates Due to Congenital Anomalies, 2006-2013

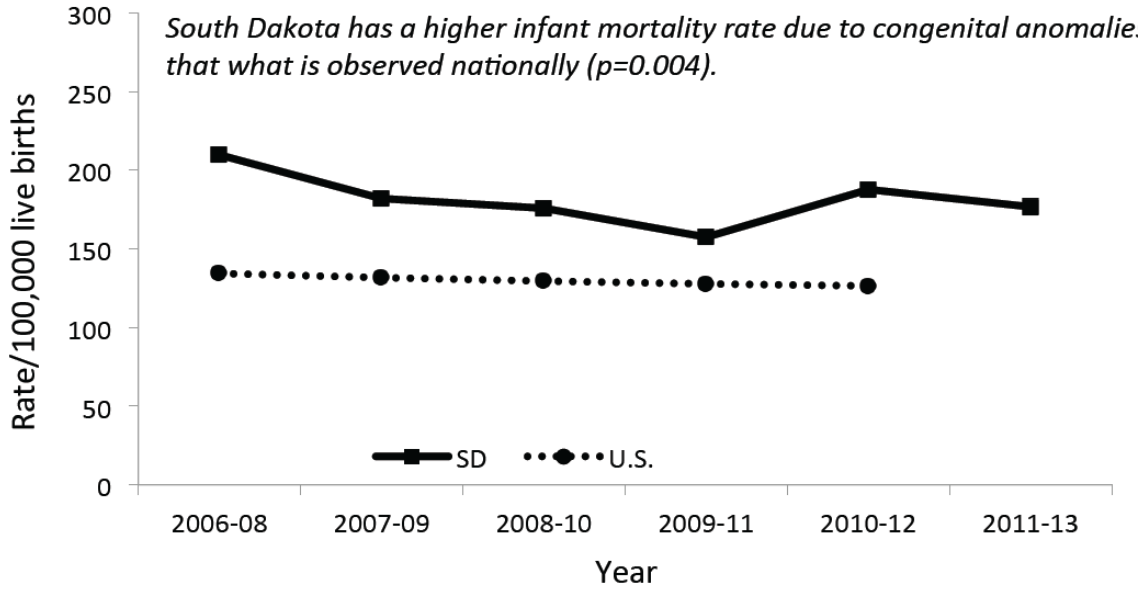
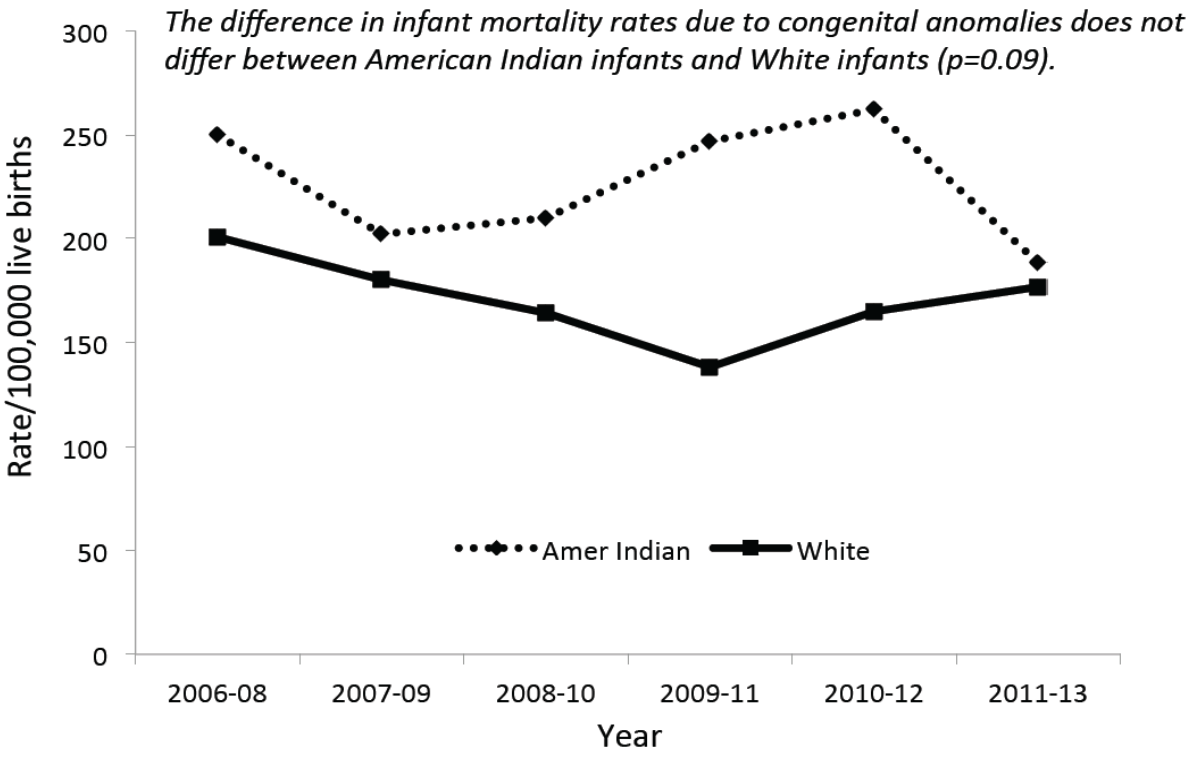


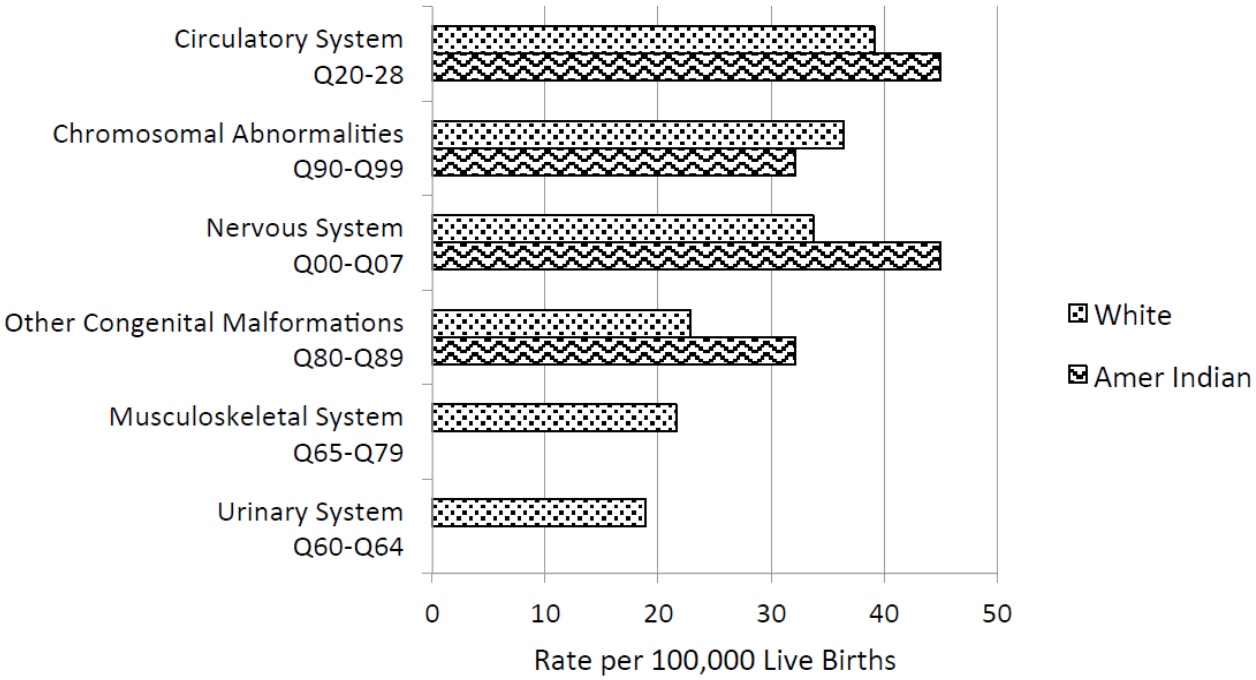
Figure 2. Infant Mortality Rates Due to Congenital Anomalies by Race, South Dakota, 2006-2013



Main Classes of Lethal Congenital Anomalies

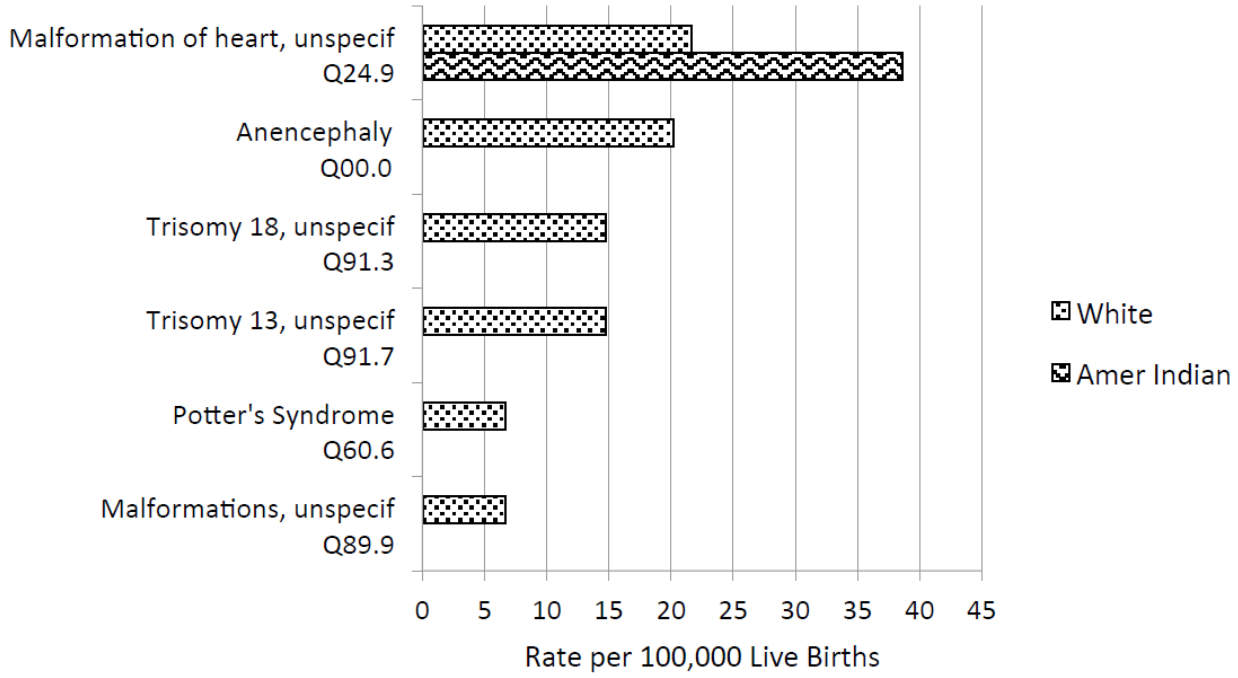
The incidence rates for the top five classes of congenital anomalies are shown in **Figure 3**. Congenital anomalies of the circulatory system accounted for 21.2% of all anomaly-related deaths, chromosomal abnormalities accounted for 20.1%, and anomalies of the nervous system accounted for 19.0%. The two most common anomalies were congenital malformations of the heart (12.8% of all anomalies) and anencephaly (9.5%) (**Figure 4**).

Figure 3. Classes of Lethal Congenital Anomalies in South Dakota, 2006-2013 (data not shown if n<5



Among American Indians, the top classes of lethal congenital anomalies were circulatory system and nervous system, while among Whites the top classes of congenital anomalies were circulatory system and chromosomal abnormalities (**Figure 3**). For both races, the most common anomaly was congenital malformations of the heart (**Figure 4**)

Figure 4. Top Six Lethal Congenital Malformations in South Dakota, 2006-2013 (data not shown if n<5)



Risk Factors Associated with the Occurrence of a Lethal Congenital Anomaly

Although more than half of all congenital anomalies do not have a specific cause, certain factors can increase the chances of having a baby with congenital anomalies. We determined whether there were variables recorded on the birth certificate records that were associated with an increased risk of having an infant with a lethal congenital anomaly.

Pre-pregnancy diabetes, having inadequate prenatal care, and young maternal age (<20 years) were associated with increased risk of a lethal congenital anomaly with relative risks (95% CI) of 7.18 (3.54-14.6), 7.99 (3.97-16.1), and 1.65 (1.01-2.69) respectively (**Table 2**). Smoking during or 3 months prior to pregnancy, race, and infant sex were not associated with the risk of a lethal congenital anomaly. Maternal conditions not associated with the risk of a lethal congenital anomaly included maternal obesity or underweight prior to pregnancy, gestational diabetes, and hypertension (both pre-pregnancy and gestational) (**Table 2**).

Table 2. Relative Risks (95% confidence interval) for Congenital Anomaly-Related Infant Deaths, South Dakota, 2006-2012

Risk Factor	Relative Risk
Maternal Age (years)	
< 20	**1.65 (1.01 - 2.69)**
20-29	*-- reference --*
30-39	1.37 (0.97 - 1.92)
≥ 40	1.74 (0.64 - 4.75)
Race	
American Indian	1.37 (0.93 - 2.02)
White	*-- reference --*
Other race	1.39 (0.77 - 2.52)
Smoking During or 3 Months Prior to Pregnancy	
Yes	1.12 (0.79 - 1.58)
No	*-- reference --*
Infant Sex	
Female	0.98 (0.72 - 1.33)
Male	*-- reference --*
Adequacy of Prenatal Care Utilization[1]	
Inadequate	**3.93 (2.47 - 6.25)**
Intermediate	0.91 (0.46 - 1.79)
Adequate	*-- reference --*
Adequate Plus	**3.12 (1.96 - 4.96)**
Maternal Conditions[2]	
Mother Obese Prior to Pregnancy	1.35 (0.95 - 1.92)
Mother Underweight Prior to Pregnancy	1.88 (0.95 - 3.72)
Diabetes Prior to Pregnancy Present	**7.18 (3.54 - 14.6)**
Gestational Diabetes Present	0.50 (0.19 - 1.36)
Hypertension (Any Type) Present	0.59 (0.26 - 1.34)
Pre-pregnancy Hypertension Present	0.55 (0.08 - 3.93)
Gestational Hypertension Present	0.66 (0.27 - 1.61)

1 Based on Kotelchuck's INDEXSUM, which combines when prenatal care was started and the % of expected visits attended.

2 Relative risks were calculated using the absence of the condition as the reference population. Confidence intervals that do not contain 1.0 are significant (bolded)

Recommendations

Receiving early and adequate prenatal care, keeping blood glucose in the target range both before and during the pregnancy for a woman with pre-pregnancy diabetes, and avoiding teen pregnancy are three things that may reduce the risk of a lethal congenital malformation.