How to Interpret Health Data

Information and limitations of the health data:

Mortality and death rates are calculated by taking the number of deaths in any given category, dividing it by the total number of individuals in that category, and multiplying by 1,000 or 100,000 (whatever number is chosen).

$$\frac{\text{Total death}}{\text{Population Base}} \times 1{,}000$$

A percentage is calculated using the same formula only multiplied by 100.

As the population base becomes smaller, as it does in many counties in South Dakota, statistical variation becomes more prominent and more prone to anomalies. For example, let's say a county has 2 infants die out of 85 live births. If we divide 2 by 85 and multiply by 1,000 we get an infant mortality rate of 24 per 1,000. If the next year only 1 infant dies out of 85 live births, the infant mortality rate would be 12. This so-called large decrease is a result of statistical variation and the magnitude of the drop is exaggerated because of the use of a base of 1,000.

$$\frac{\text{Infant deaths}}{\text{Population Base}} \times 1{,}000 \qquad \frac{2}{85} \times 1{,}000 = 0.0235 \times 1{,}000 = 24 \text{ per } 1{,}000$$

In an attempt to minimize chance variations five-year averages are used to minimize chance variations. Despite these precautions, in the most sparsely populated counties, using 5 year averages will still not reduce chance variation significantly for some of the indicators due to the small number of events. A rate or percent is not calculated for those counties where the event number is below 3.

The standard error (SE) of a rate is used in health statistics when studying or comparing rates. The SE defines a rate's variability and can be used to calculate a confidence interval (CI) to determine the actual variance of a rate 95% of the time. Rates for two different populations are considered to be significantly different when their confidence intervals do not overlap.

The standard error and confidence intervals are calculated in the following manner. The Aurora County percent of low birth weight babies was 10.8% for 2005-09. This was based on 17 low birth weights out of 158 total live births in the county during the time period 2005-09. The square root of 17 is 4.12. By dividing 10.8% by 4.12, the estimated standard error [SE] of 2.62 is obtained. The estimated SE can then be used to compute a 95% confidence interval [CI] for the rate. The standard formula for determining the 95% CI of a rate is:

$$\text{Rate} \pm (1.96 \times SE) \qquad SE = \frac{S}{\sqrt{N}}$$

For the standard error (SE) equation, S represents the percent (or rate) of events and N the total number of events.

Following this formula, we produce an equation of 10.8 ± (1.96 x 2.62). The result is 10.8 ± 5.1. From this we can calculate the estimated 95% CI to be from 5.6% to 15.9%. It can then be stated, with 95% certainty, that the actual 2005-09 percent of low birth weight babies for Aurora County is between 5.6% and 15.9%.

Aurora County's percent of low birth weight babies is the same as the South Dakota rate. This is because the confidence intervals for Aurora County (5.6% to 15.9%) overlap the state's (6.4% to 6.8%). In other words, Aurora County's percent of low birth weight babies falls within the state's confidence interval.

The percent of women receiving prenatal care during the first trimester for Beadle County (based on 708 women receiving prenatal care during the first trimester for 2005-09 out of 1,156 total live births) is significantly different from South Dakota because the percent of women receiving prenatal care during the first trimester for the county (56.7% to 65.8%) do not overlap the state's (64.6% to 93.0%). In other words, Beadle County's percent of women receiving prenatal care does not fall within the state's confidence interval and the percentages are higher than the state's making Beadle Count's rate worse than the state's average.

The percent of low birth weight babies for Brookings County (based on 76 low birth weight babies for 2005-09 out of 1,868 total live births) is significantly different from South Dakota because the percent of low birth weight babies for Brookings County (3.2% to 5.0%) do not overlap the state (6.4% to 6.8%). In other words, Brookings County percent of low birth weight babies does not fall within the state's confidence interval and the percentages are lower than the state's making Brookings County's rate better than the state's average.