

Tools of the Trade:

CONFIDENCE INTERVALS for an AGE-ADJUSTED RATE

The first step in calculating a confidence interval for an age-adjusted rate is the computation of a standard error (SE) which defines the rate's variability. The usual formula given for computing the standard error of an age-adjusted rate (¹Chiang, 1961) is very complex and not often understood or used by the average health data user. However, the average user can approximate the standard error of an age-adjusted rate with the following less complex formula (²Keyfitz, 1966):

$$SE = R / \text{square root of } N$$

where:

R = (age-adjusted) rate

N = number of events (deaths)

This estimate assumes the rate to be a binomial proportion. As an example, let's use the state's average annual (1994-1996) age-adjusted death rate for suicide of 10.7 to calculate an estimated SE. The rate was based on 4,183 suicides. The square root of 4,183 is 64.68. By dividing the rate of 10.7 by 64.68, one obtains the estimated SE of 0.165.

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:

$$R \pm (1.96 \times SE)$$

Following this formula, for the rate we are using, produces an equation of 10.7 plus or minus (1.96 x 0.165) and the result is 10.7 plus or minus 0.32. Then, by subtracting and adding 0.32 against the original rate of 10.7, a range can be calculated and considered the estimated 95% confidence interval for the state, i.e., 10.38 - 11.02. One could then state, with 95% certainty, that the actual age-adjusted suicide rate for the state during 1994-1996 was between 10.38 and 11.02.

NOTE: The formulas shown above are crude and rather conservative approaches and, in some cases, may not be the most appropriate. The user may wish to utilize more precise and sophisticated calculations performed by computer software such as SPSS or SAS. Consultation with a statistician or other professional familiar with analyzing health statistics may also be a consideration before pursuing any further study.

¹Chiang CL, *Standard Error of the Age-Adjusted Rate*. Vital Statistics Special Reports 1961;47(9).

²Keyfitz N. *Sampling Variance of Standardized Mortality Rates*. Human Biology, 38:309-317, 1966.