Tools of the Trade:

CONFIDENCE INTERVALS and SIGNIFICANCE TESTING for a STANDARDIZED RATIO

After calculating a standardized ratio (see Standardized Mortality Ratio), one can rather easily compute a 95% confidence interval and use it to determine whether there is a significant difference between the number of observed and expected events.

To calculate a 95% confidence interval (CI) for a standardized ratio (SR), use the following formula:

CI = SR ± (1.96 x SE)

where:

SE = SR / square root of **d**
d = number of observed events

A sample calculation follows:

SR = 89.97 (Number of observed events = 260)

SE = 89.97/16.125 = 5.58

1.96 x 5.58 = 10.94

Upper limit CI (95%) = 89.97 + 10.94 = 100.91

Lower limit CI (95%) = 89.97 - 10.94 = 79.03

To determine whether the observed number was significantly different than the expected number, use the following interpretation:

1. If the lower confidence limit is less than 100 and the upper limit is above 100, there is no significant difference between the number of observed events and the number of expected events.

2. If the lower confidence limit is above 100, there is a 95% probability that a significantly higher number of events was observed than expected.

3. If the upper confidence limit is below 100, there is a 95% probability that significantly fewer events were observed than expected.

4. If the range of the confidence interval is very wide, the ratio is probably based on a very small number of observed events and, therefore, any reliable conclusions cannot be made. A "very

wide" range can be defined as 50 or more. These "wide" ranges occur with ratios based on less than 10 observed events. Therefore, **we do not recommend calculating and using confidence intervals to determine significance for any standardized ratio based on less than 10 events** (see Calculating Reliable Rates and Standardized Ratios).

In the sample calculation shown above, the upper confidence limit is barely above 100. Therefore, further analysis may be warranted before designating it as significant. Possibly, testing a rate (see Comparing Rates and Percentages, Testing for Significance Differences) based on the same events may reinforce the results here or it may not. In any case, we recommend further analysis if the result seems like a close call.

NOTE: For more detailed information on sex ratios, see *Epidemiology in Health Services Management* by G. E. Alan Dever, Aspen Systems Corporation, Rockville, Maryland, 1984.