



# Confidence Intervals: How They Work

The following is a description of how to use confidence intervals to determine whether or not two estimates are statistically significantly different.

## How to see if one estimate is significantly higher than the other

1. Determine which estimate is larger.
2. Look at the *lower* limit of the confidence interval associated with that estimate.
3. Compare that to the *upper* limit of the confidence interval associated with the lower estimate.
4. If the *lower* limit is *above* or *higher* than the *upper* limit, then the difference is significant. That is, the larger estimate is significantly higher than the smaller estimate.

## How to see if one estimate is significantly lower than the other

1. Determine which estimate is smaller.
2. Look at the *upper* limit of the confidence interval associated with that estimate.
3. Compare that to the *lower* limit of the confidence interval associated with the higher estimate.
4. If the *upper* limit is *below* (less than) than the *lower* limit, then the difference is significant. That is, the smaller estimate is significantly lower than the larger estimate.

## How to see if estimates are not significantly different

1. Look at the *lower* limit of the confidence interval associated with the estimate.
2. Compare that to the *upper* limit of the confidence interval associated with the other estimate.
3. If the *lower* limit of one estimate is *less* than the *upper* limit of the other estimate, then the confidence intervals overlap and there is no significant difference.



4. If the limits are the same, that is the lower of one estimate equals the upper of another estimate, there may be a significant difference and other statistical tests such as a Chi Square should be conducted.

**Example 1**

%	95% CI	
Estimate	Lower	Upper
68.8	56.3	79.0
45.7	36.2	55.7

Cell 1: 56.3 (Lower CI of 68.8%)  
Cell 2: 55.7 (Upper CI of 45.7%)

  

%	95% CI	
Estimate	Lower	Upper
68.8	56.3	79.0
45.7	36.2	55.7

Cell 1: 55.7 (Upper CI of 45.7%)  
Cell 2: 56.3 (Lower CI of 68.8%)

**Example 2**

%	95% CI	
Estimate	Lower	Upper
85.4	75.7	91.6
81.1	72.4	87.4

Cell 1: 75.7 (Lower CI of 85.4%)  
Cell 2: 87.4 (Upper CI of 81.1%)

  

%	95% CI	
Estimate	Lower	Upper
85.4	75.7	91.6
81.1	72.4	87.4

Cell 1: 87.4 (Upper CI of 81.1%)  
Cell 2: 75.7 (Lower CI of 85.4%)

In Example 1, the top table shows how to find out whether or not a higher estimate is significantly higher and the bottom table shows how to find out whether or not a lower estimate is significantly lower.

In the top table of Example 1, the original estimate of 68.8% is higher than 45.7%, but is it significantly higher? To find out, look at cell 1 (56.3% - the lower confidence limit of the higher estimate), note that it is higher than cell 2 (55.7% - the higher confidence limit of the lower estimate) so the confidence intervals do not overlap. Therefore the prevalence estimates are significantly different.

In the bottom table of Example 1, the original estimate of 45.7% is lower than 68.8%. Look at cell 1 (55.7% - the higher confidence limit of the lower estimate), note that it is lower than cell 2 (56.3% - the lower confidence limit of the higher estimate) so the confidence intervals do not overlap. Therefore the prevalence estimates are significantly different.

In the top table of Example 2, the original estimate of 85.4% is higher than 81.1%. Look at cell 1 (75.7% - the lower confidence limit of the higher estimate), note that it is lower than





cell 2 (87.4% - the higher confidence limit of the lower estimate) so the confidence intervals overlap. Therefore the prevalence estimates are not significantly different.

In the bottom table of Example 2, the original estimate of 81.17% is lower than 85.4%. Look at cell 1 (87.4% - the higher confidence limit of the lower estimate), note that it is higher than cell 2 (75.7% - the lower confidence limit of the higher estimate) so the confidence intervals overlap. Therefore the prevalence estimates are not significantly different.

