Confidence Intervals

Up until now, we have been dealing with point estimates—single numbers that represent the predicted value. But in statistics, predictions are usually given as an interval. The size of the interval is determined by how confident the researcher wants to be in their answer, and how much error can be accepted. A confidence interval starts with the point estimate, and a margin of error that is subtracted from and added to that point estimate. The point estimate minus the margin of error is the lower bound of the confidence interval, and the point estimate plus the margin of error is the upper bound.

1. Using 4,600 as the point estimate number of "excess deaths," if the margin of error was 3,853, calculate the lower and upper bounds of the confidence interval.

2. The margin of error consists of a number of standard deviations multiplied by a standard error. For a 95 percent confidence interval, the number of standard deviations is 1.96. For this study, the standard error was 1,966. Calculate the margin of error.

3. For a 90 percent confidence interval, the number of standard deviations is 1.645. If the researchers had only wanted to be 90 percent confident, what margin of error would they have calculated, using the same standard error as above? What lower and upper bounds does that lead to, using the same point estimate as above?

4. All of our calculations have been based on the fact that the researchers found there had been 38 deaths out of 9,522 people in 3,299 households. But this may be an undercount, as people who lived alone and died would not be counted, since they had no one left in their household to answer the survey. To adjust for this, assume that 5 single-person households in which the person died were added to the survey, meaning that there were 43 deaths out of 9,527 people in 3,304 households. Recalculate the number of "excess deaths" from this new result. Then recalculate the lower and upper bounds of a 95 percent confidence interval centered on this new number.

5. Using appropriate technology, calculate a 95 percent confidence interval for the proportion of deaths in Puerto Rico from September 20 to December 31, 2017. (Remember that the survey found 38 deaths in a sample of 9,522 people.) Calculate the lower bound and the upper bound of number of deaths in Puerto Rico if these proportions held true for the entire population of Puerto Rico, approximately 3,000,000 people. Use the 2016 death rate of 8.82 deaths per 1,000 people to calculate the lower and upper bounds of a confidence interval for the difference between the number of deaths from your estimate and the number of deaths from 2016 levels.