Quiz 7 Solution

Stats 110a
May 24, 2002

Name:
ID:

On April 29, 2002, the L.A. Times published a poll designed to examine residents' attitudes towards the city and their community 10 years after the LA riots.

A random sample of 1163 Los Angeles residents were selected for the poll. Assume they were selected with replacement. (They were not, but the assumption produces a close approximation.)

One of the questions asked was "do you think that Los Angeles is primarily a segregated city -- by that I mean, different racial and ethnic groups each living in their own neighborhods -- or do you think Los angeles is an integrated city -- by that I mean, different racial and ethnic groups living together in mixed neighborhoods?

42% of those surveyed responded "segregated."

Use the normal approximation to find a 95% confidence interval for the true proportion of LA residents who believe that LA is 'segregated'. Show all work.

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> qnorm(c(.025, .05, .10, .975, .95, .99))
[1] -1.959964 -1.644854 -1.281552  1.959964  1.644854
2.326348
```

Let p represent the proportion of all LA residents who would answer 'segregated'. Then this survey attempts to estimate this proportion with p-hat = X/n where X = number in a random sample of LA residents who would answer 'segregated' and n = 1163.

All of the confidence intervals we consider in this class have this form:

Estimator +- constant * (standard –error of estimator).

Here, the estimator is p-hat. The standard error is SD(p-hat) = SD(X/n) = sqrt(p*(1-p)/n). It is very important that you be able to derive that and perform similar derivations.

The constant is determined by the significance level alpha and the distribution of the estimator. Because we're using a 95% confidence interval, alpha = .05, and because we're using the normal approximation, we look up z(.05/2) for the constant. According to the R output, this number is 1.96. (In reality, p-hat follows the binomial distribution, but following the instructions of this problem, we'll approximate the distribution with the normal distribution. This approximation is usually acceptable when np >= 10 and n(1-p) >= 10, conditions which are easily met if the true value of p is anywhere near .42 and n = 1163.)

The standard error is unknown in this problem, but we can still maintain an acceptable approximation by estimating it. Simply substitute p-hat for p. Thus:
SE(p-hat) is approximately sqrt((.42*.58)/1163) = .01447.

Putting the pieces together, our CI is

.42 +- 1.96*(.01447)
.42 +- .02837

(.3916, .4484)
Surveys are often designed so that the margin of error will be approximately 3%, as it is here.