TEACHER

Worksheet: Confidence Intervals for Proportions

1. The paralyzed Veterans of America is a philanthropic organization that relies on contributions. They send free mailing labels and greeting cards to potential donors on their list and ask for voluntary contribution. To test a new campaign they recently sent letters to a random sample of 100,000 potential donors and received 4781 donations. $\hat{p} = \frac{4781}{100000} = .048$ $\hat{q} = .952$

$E = 1.96\sqrt{\frac{(.048)(.952)}{100000}} = .001$

   a) Give a 95% confidence interval for the true proportion of those from their entire mailing list who may donate. (.047, .049)

   b) A staff member thinks that the true rate is 5%. Given the confidence interval you found, do you find that percentage plausible? Since 5% or .05 in not contained in the 95% conf. interval, I do not think its plausable that the true population proportion is 5%.

2. A national health organization warns that 30% of the middle school students nationwide have been drunk. Concerned, a local health agency randomly and anonymously surveys 110 of the middle 1212 middle school students in its city. Only 21 of them report having been drunk. $\hat{p} = \frac{21}{110} = .191$ $\hat{q} = .809$

   a) What proportion of the sample reported having been drunk?

   b) Does this mean that this city's youth are not drinking as much as the national data would indicate? Not necessarily b/c one sample/variability

   c) Create a 95% confidence interval for the proportion of the city's middle school students who have been drunk. (.118, .263)

$E = 1.96\sqrt{\frac{(.191)(.809)}{110}}$

$E = .037$

   d) Is there any reason to believe that the national level of 30% is not true of the middle school students in the city? 30% is outside the interval so yes there is reason to Believe the Nat. Av. is wrong

   e) To keep the margin of error at most 5%, how many middle school students do we need to survey?

$n = \hat{p}\hat{q}\left(\frac{z^*}{E}\right)^2$

$n = (.191)(.809)\left(\frac{1.96}{.05}\right)^2 = 237.4 \Rightarrow 238$ students

3. In a poll taken in March of 2007, Gallup asked 1006 national adults whether they were baseball fans. 36% said they were. A year previously 37% of a smaller size sample had reported being baseball fans.

   a) Find the margin of error for the 2007 poll if we want 90% confidence in our estimate of the percent of national adults who are baseball fans.

$E = 1.645\sqrt{\frac{(.36)(.64)}{1006}}$

$\boxed{E = .025}$

   b) Explain what the margin of error means. The pop proportion is likely not exactly 36%. So we estimate it will be within a range of values (w/90% conf) within 2.5% of 36%

   c) If we wanted to be 99% confident, would the margin of error be larger or smaller? Bigger

   d) Find the margin of error for 99% confidence level.

$E = 2.576\sqrt{\frac{(.36)(.64)}{1006}}$

$\boxed{E = .039}$

Smaller margins of Error correlate to lower conf. levels

e) In general, all other aspects of the situation remain the same; will smaller margins of error produce greater or less confidence in the interval?

f) Do you think there's been a change from 2006 to 2007 in the real proportion of national adults who are baseball fans? NO → 37% is contained in the conf. interval for Both 95% + 99%

4. Several factors are involved in the creation of a confidence interval. Among them are the sample size, the level of confidence, and the margin of error. Which statements are true?
   - ~~a)~~ For a given sample size, higher confidence means a smaller margin of error. NO
   - b) For a specified confidence level, larger samples provide smaller margins of error. ✓
   - c) For a fixed margin of error, larger samples provide a greater confidence.
   - ~~d)~~ For a given confidence level, halving the margin of error requires a sample twice as large.
   - e) For a given sample size reducing the margin of error will mean lower confidence.
   - f) For a certain confidence level, you can get a smaller margin of error by selecting a bigger sample.
   - g) For a fixed margin of error, smaller samples will mean lower confidence.
   - h) For a given confidence level, a sample 9 times as large will make a margin of error one third as big.