

No “Large Conclusions” from “Tiny” Samples: Did the Media Underreact?

In July of 2011, Gene Munster of Piper Jaffray reported the results of a survey in a note to clients. This research was reported throughout the media. Perhaps the fullest description was presented on the CNNMoney website (A service of CNN, Fortune, and Money) in an article entitled “[Survey: iPhone retention 94% vs. Android 47%.](#)”

The article begins with the strong caution:

“It’s only a tiny sample, so large conclusions must not be drawn.”

This caution appears to be a welcome change from the overstating of findings typically found in the media. But has this report understated the importance of the study? Perhaps it is valid to draw some “large conclusions.” Let’s see.

Learning Objectives

State the relationship between sample size and margin of error for proportions.

State the relationship between the proportion in the sample and the margin of error.

Explain the limitations of significance testing in applied statistics.

State the value of confidence intervals on the difference between proportions.

Data

The data were collected by asking people in food courts and baseball stadiums what their current phone was and what phone they planned to buy next. The data were collected in the summer of 2011. Below is a portion of the data:

Current Phone	Stay with Current	Change
iPhone	58	4
Android	17	19

Questions

1. In the sample, a large proportion (.94) of the 62 iPhone users said their next phone would be an iPhone. Is it valid to conclude that the vast majority of iPhone owners in the population sampled plan to buy another iPhone or is the sample size too small to justify this conclusion?
2. Perform a statistical test of the null hypothesis that the proportion of iPhone owners who plan to buy an iPhone is exactly the same as the proportion of Android phone owners who plan to buy an Android phone. Discuss the practical value of testing this hypothesis?
3. Use a statistical method to portray the uncertainty associated with the difference in the proportion planning to stay with an iPhone (0.94) and the proportion planning to stay with an Android phone (0.47).

- Name two reasons the margin of error is smaller for the iPhone than for Android phones.
- Is there anything about the data that suggests that the population sampled (food courts and baseball stadiums) is different from the population of people owning smart phones?

Answers

- The 95% confidence interval runs from 0.85 to 0.97. Even the lower end of the confidence interval (0.85) indicates the vast majority plan to buy another iPhone. Therefore the sample size of 62 iPhone owners is sufficient to justify this conclusion. The CNN article is too cautious in its conclusions. [Confidence interval Calculator](#)

<i>95% confidence interval: no continuity correction</i>			
Lower limit =	<input type="text" value="0.8455"/>	Upper limit =	<input type="text" value="0.9746"/>

- This can be done using either a z test or the equivalent Pearson’s Chi Square, Fisher’s Exact Test, or Logistic regression. The difference is significant ($p < 0.001$) for any of these tests. [Calculator for Chi Square](#)

This test has little practical value since it only leads to the conclusion that the difference is not 0 and does not provide information about the size of the effect.

- A confidence interval on the difference between proportions extends from .28 to .62. [Confidence Interval Calculator](#)

<i>95% confidence interval: no continuity correction</i>			
Lower limit =	<input type="text" value="0.2817"/>	Upper limit =	<input type="text" value="0.6206"/>

- Both the sample size and the proportion are factors. The larger the sample size and the farther the proportion is from 0.5 the smaller the margin of error. The margin of error for iPhone is so much smaller than for Android because (a) its proportion of 0.94 is much farther from 0.5 than is Android’s proportion of 0.47 and (b) the iPhone’s sample size of 62 is much larger than Android’s sample size of 36.
- The [U.S. smartphone market share](#) for Android was larger than for iPhone in the period of the study. In this study there were far more iPhone owners than Android owners.