Chapter 8-Hypothesis Testing

8.1 Last night's hockey game:

a) Null hypothesis: The game was actually an NHL hockey game.
b) On the basis of that null hypothesis I expected that each team would earn somewhere between 0 and 6 points. I then looked at the actual points and concluded that they were way out of line with what I would expect if this were an NHL hockey game. I therefore rejected the null hypothesis. Notice that I haven't drawn a conclusion about what type of game it actually was, because that is not what I set out to test.

8.3 A Type I error would be concluding that I was shortchanged when in fact I was not.

8.5 The rejection region is the set of outcomes for which we would reject the null hypothesis. The critical value would be the minimum amount of change below which I would reject the null. It is the border of the rejection region.

8.7 For the Mode test I would draw a very large number of samples and calculate the mode, range, and their ratio (M). I would then plot the resulting values of M.

8.9 We are constantly testing hypotheses every time we drive. We watch a driver approach a stop sign and test the hypothesis that he will stop. (And we don't start up until we are satisfied that we are not going to reject that null.)

8.11 A sampling distribution is just a special case of a general distribution in which the thing that we are plotting is a statistic which is the result of repeated sampling.

8.13 Hypotheses:

Research hypothesis—Children who attend kindergarten adjust to 1st grade faster than those who do not. *Null hypothesis*—1st-grade adjustment rates are the same for children who did, and did not, attend kindergarten.

Research hypothesis—Sex education in junior high school decreases the rate of pregnancies among unmarried mothers in high school *Null hypothesis*—the rate of pregnancies among unmarried mothers in high school is the same regardless of the presence or absence of sex education in junior high school.

8.15 Rerunning Exercise 8.14 for $\alpha = .01$:

We first have to find the cutoff for $\alpha = .01$ under a normal distribution. The critical value of $z = 2.33$ (one-tailed), which corresponds to a raw score of 53.4. We then find where 53.4 lies relative to the distribution under H_1:

$$z = \frac{X - \mu}{\sigma} = \frac{53.4 - 80}{20} = -1.33$$

From the appendix we find that .9082 of the scores fall above this cutoff. Therefore $\beta = .908$.

8.17 To determine whether there is a true relationship between grades and course evaluations I would find a statistic that reflected the degree of relationship between two variables. (The students will see such a statistic (r) in the next chapter.) I would then calculate the sampling distribution of that statistic in a situation in which there is no relationship between two variables. Finally, I would calculate the statistic for a representative set of students and classes and compare my sample value with the sampling distribution of that statistic.

8.19 Allowances for fourth-grade students:

a) The null hypothesis in this case would be the hypothesis that boys and girls receive the same allowance on average.
b) I would use a two-tailed test because I want to reject the null whenever there is a difference in favor of one gender over the other.
c) I would reject the null whenever the obtained difference between the average allowances were greater than I would be lead to expect if they were paid the same in the population.
d) I would increase the sample size and get something other than a self-report of allowances.

8.21 Hypothesis testing and the judicial system

The judicial system operates in ways similar to our standard logic of hypothesis testing. However, in a court we are particularly concerned with the danger of convicting an innocent person. In a trial the null hypothesis is equivalent to the assumption that the accused person is innocent. We set a very small probability of a Type I error, which is far smaller than we normally do in an experiment. Presumably the jury tries to set that probability as close to 0 as they reasonably can. By setting the probability of a Type I error so low, they knowingly allow the probability of a Type II error (releasing a guilty person) to rise, because that is thought to be the lesser evil.

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