**HW 6: Two Proportion CI, Hypothesis Testing, and RR**

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**Instructions:** Work must be shown to receive full credit. You may work with others on the homework, but you must write and turn in your own copy. **This does not mean that you can simply copy someone else's work!!** Also, make sure your homework is neat, stapled, and all answers are written in complete sentences!! Come and see me if you have any questions.

On problems that require the use of R, PLEASE give me the RELEVANT R code and output to for each problem so I can assess partial credit. I may take off for including unnecessary R output. If one problem refers back to output from another problem, make sure to cite that output in your answer. Incorrect one-sentence answers will get little or no credit.

**NOTE:** If a problem asks you to perform a hypothesis test, make sure to give the hypotheses, test statistic, p-value, and a conclusion in the terms of the problem. Also, if the problem asks you to perform a confidence interval, make sure to interpret the confidence interval.

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**"By Hand" Problems:** For hypothesis tests, you may use R to find the p-value. For confidence intervals, you may use R to find the multiplier.

1. The following table cross classifies a sample (from 1998) of Americans according to their sex and their opinion about the afterlife.

| | | Belief in Afterlife | |
|---|---|---|---|
| | | Yes | No or Undecided |
| Sex | Female | 509 | 116 |
| | Male | 398 | 104 |

   (a) Calculate a 95% confidence interval for the difference in the proportion of women and men who believe in an afterlife (in 1998).

   (b) Interpret the interval in (a).

   (c) Based on this interval, do you feel that men and women differ with regards to belief in an afterlife? Explain.

2. Cocaine addiction is hard to break. Addicts need cocaine to feel any pleasure, so perhaps giving them an antidepressant will help. A 3-year study with 70 randomly selected chronic cocaine addicts compared an antidepressant drug called Desipramine with a placebo. One half of the subjects received each treatment (35 people in each group). In the Desipramine group, 12 addicts reported a relapse while in the placebo group, 18 subjects reported a relapse. Researchers are interested in whether Desipramine is more effective than the placebo (i.e. fewer relapses). Conduct a test that examines the interest of the researchers. Be sure to clearly provide all five steps of our usual hypothesis test write-up.

3. The PACE project at the University of Wisconsin in Madison deals with problems associated with high-risk drinking on college campuses. Based on random samples, the study states that the percentage of UW students who reported binging at least three times within the past two weeks was 42.215% (n=334) in 1999 and 21.234% (n=843) in 2009.

   (a) Compute a 95% confidence interval for the difference in the proportion of students who binge at least three times within the past two weeks between the years of 1999 and 2009.

   (b) Interpret the interval in (a).

   (c) State the hypotheses to test that the proportion of students with high-risk drinking behaviors has changed from 1999 to 2009.

   (d) Based on the confidence interval in (a), do you expect to have some level of evidence for the alternative? Explain.

   (e) Conduct the hypothesis test in (c). to confirm your answer in (d). Be sure to show all work and appropriate write-up of the test.

4. A statistics class conducted an experiment to see if the distance of a toss determined the success of a toss. Students tossed a coin in a cup from either a short distance (3ft) or a long distance (6ft). Each attempt was recorded as a make or miss. The data are summarized below.

| | | Outcome | | |
|---|---|---|---|---|
| | | Made it! | Missed it! | Total |
| Distance | Short | 9 | 9 | 18 |
| | Long | 2 | 17 | 19 |
| | Total | 11 | 26 | 37 |

   (a) Calculate the relative risk of making the toss from a short distance versus a long distance.

   (b) Interpret the relative risk in context.

   (c) Construct a 95% confidence interval for the relative risk.

5. Hearing anecdotal reports that some patients undergoing treatment for the eating disorder anorexia seemed to be responding positively to the antidepressant Prozac, medical researchers conducted an experiment to investigate. They found 93 women being treated for anorexia who volunteered to participate. For one year, 49 randomly selected patients were treated with Prozac and the other 44 were given a placebo. At the end of the year, patients were diagnosed as healthy or relapsed, as summarized the following table:

| | | Diagnosis | | |
|---|---|---|---|---|
| | | Healthy | Relapse | Total |
| Treatment | Prozac | 35 | 14 | 49 |
| | Placebo | 32 | 12 | 44 |
| | Total | 67 | 26 | 93 |

(a) Calculate the relative risk of relapsing on the placebo versus Prozac.

(b) Interpret the relative risk in context.

(c) Construct a 99% confidence interval for the relative risk.

(d) Does the interval suggest a difference in risk of relapse between the drug and placebo? Explain.

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**"R" Problems:**

6. A vaccine to prevent severe rotavirus gastroenteritis (diarrhea) was given to African children withing the first year of life as part of a drug study. The study reported that of the 3298 children randomly assigned the vaccine, 63 got the virus. Of the 1641 children randomly assigned the placebo, 80 got the virus.

   (a) Using `R`, calculate a 99% confidence interval for the relative risk of catching the rotavirus between non-vaccinated and vaccinated children.

   (b) Interpret the interval in (a).

7. In October 2010, the Gallup organization surveyed 1134 American adults and found that 441 had a gun in the home. In October 2009, the Gallup organization had surveyed 1134 American adults and found that 458 had a gun in the home. Suppose a newspaper article has a headline that reads, "Fewer Guns in the Home Now."

   (a) State the hypotheses of the test.

   (b) Using `R`, obtain the test statistic and p-value of the test. (No full write-up needed, just `R` work.)

   (c) Using `R`, find and interpret at 90% confidence interval.