Your Name:

Duration of the Quiz is 30 minutes. There are four problems, worth 20 points. Show all your work for full credit. Books, notes etc. are prohibited.

(1) A newspaper article preceding the 1994 World Cup semifinal match between Italy and Bulgaria stated that "Italy is favored 10–11 to beat Bulgaria, which is rated at 10–3 to reach the final." Suppose this means that the odds that Italy wins are 11/10 and the odds that Bulgaria wins are 3/10. Find the probability that each team wins, and comment.

(2) A statistical analysis that combines information from several studies is called a *meta analysis*. A meta analysis compared aspirin with placebo on incidence of heart attack and of stroke, separately for men and for women (J. Am. Med. Assoc., 295: 306–313, 2006). For the Women's Health Study, heart attacks were reported for 198 of 19,934 taking aspirin and for 193 of 19,942 taking placebo.

   (a) Construct the 2×2 table that cross classifies the treatment (aspirin, placebo) with whether a heart attack was reported (yes, no).

   (b) Estimate the odds ratio. Interpret.

   (c) Find a 95% confidence interval for the population odds ratio for women. Interpret. (As of 2006, results suggested that for women, aspirin was helpful for reducing risk of stroke but not necessarily risk of heart attack.) **Hint:** $z_{0.05} = 1.645$, $z_{0.025} = 1.96$

(3) In the United States, the estimated annual probability that a woman over the age of 35 dies of lung cancer equals 0.001304 for current smokers and 0.000121 for nonsmokers [M. Pagano and K. Gauvreau, *Principles of Biostatistics*, Belmont, CA: Duxbury Press (1993), p. 134].

    (a) Calculate and interpret the difference of proportions and the relative risk. Which is more informative for these data? Why?

    (b) Calculate and interpret the odds ratio. Explain why the relative risk and odds ratio take similar values.

(4) Testing Adverse Drug Reactions – In clinical tests of adverse reactions to the drug Viagra, 7% of the 734 subjects in the treatment group experienced dyspepsia (indigestion), but only 2% of the 725 subjects in the placebo group experienced dyspepsia (based on data from Pfizer Pharmaceuticals).

    (a) At the 5% level of significance, is there sufficient evidence to support the claim that dyspepsia occurs at a higher rate among Viagra users than those who do not use Viagra? **Hint:** $z_{0.05} = 1.645$, $z_{0.025} = 1.96$

    (b) Construct a 95% confidence interval estimate of the difference between the dyspepsia rates for Viagra users and those who took a placebo. **Hint:** $z_{0.05} = 1.645$, $z_{0.025} = 1.96$

    (c) Does the confidence interval contain 0? What does this suggest about the two dyspepsia rates?