STA 6934 – Fall 2002 – Quiz 3

Print Name: _____ SSN: _____

1) A clinical trial was conducted to test the efficacy and safety of Botox. Subjects were assigned at random to receive either Botox or a placebo in a double blind trial. One of the adverse reactions to treatment was the subject's suffering a headache. The following table gives the numbers of subjects by treatment and headache status.

	Headache?		
Treatment	Yes	No	Total
Botox	50	350	400
Placebo	30	170	200
Total	80	520	600

a) What proportion of the subjects in this study suffered a headache?

b) Under the null hypothesis that the true proportion suffering is the same for each treatment, what is the **expected** count for the number suffering headaches that received Botox?

c) What is the contribution to the chi–square statistic for subjects receiving Botox who suffered headaches (cell 1) of the table?

d) The overall chi–square statistic for this test is $X^2_{obs} = 0.72$. Give the rejection region and conclusion for testing whether the probability of suffering a headache is the same (H_0) or differs (H_A) between subjects receiving Botox and placebo, based on $\alpha = 0.05$ significance level.

e) Would the reported P-value for this test be **larger** or **smaller** than 0.05?

2) In a trial to determine a dose/response effect, subjects are given low, medium, or high dose of a drug, and improvement is judged as: none, moderate, large. The following table gives the results from 5 subjects. State which pairs are concordant and which pairs are discordant.

Subject	Dose	Improvement
Jack	Low	Moderate
Jill	High	Large
Jim	Medium	Moderate
Jerry	Low	None
Jane	High	None

3) An insurance provider is interested in the expenditures on elective medical treatment among the firm's insurees. They have 3 plans: Plan A pays for 75% of elective treatment expenditures, Plan B pays 50%, and Plan C pays 25%. They wish to test whether mean elective treatment expenditures differ among the three plans:

$$H_0 : \mu_A = \mu_B = \mu_C \qquad H_A : \text{ Mean expenditures differ among plans}$$

The plan means are given below, based on random samples of $n_i = 10$ insurees per plan, also the mean square error is given.

$$\overline{Y}_A = 750 \quad \overline{Y}_B = 500 \quad \overline{Y}_C = 250 \qquad MSE = 20,000$$

a) Compute the test statistic.

b) Give the appropriate rejection region based on $\alpha = 0.05$ significance level.

c) Do you conclude that the true (population) plan mean expenditures differ? Is the P-value **smaller** or **larger** than 0.05?

d) Obtain simultaneous 95% confidence intervals for $\mu_A - \mu_B$, $\mu_A - \mu_C$, and $\mu_B - \mu_C$. **Note:** $t_{.025/((2)(3)),27} = 2.56$.

e) Based on your answer to e), what can be said about each pair of means (in terms of $>$, $<$, or $=$, where $=$ means not significantly different.

$$\mu_A \quad \mu_B \qquad\qquad \mu_A \quad \mu_C \qquad\qquad \mu_B \quad \mu_C$$

4) For each of the following scenarios give the appropriate (and most powerful) test.

a) Five brands of over the counter pain relievers are compared among a large number of subjects suffering from headaches (Each subject receives only one brand of pain reliever). One hour after taking the pain relievers, subjects self-report the amount of relief by circling one of: None, Slight, Moderate, or Complete.

b) A researcher compares a new drug to treat a very rare and fatal condition. She obtains 20 patients suffering from the condition, randomly assigning 10 each to the new drug and to a placebo. She observes whether or not the patient dies within 12 months of the beginning of treatment.

c) A state health department epidemiologist is interested in whether people who live close to power plants have higher rates of a certain condition than people who do not live close to plants. He believes that this condition may also be associated with household income. He proceeds to obtain odds ratios of disease state by exposure (proximity to power plants), seperately for 3 ranges of household income (low, medium, and high), and pools the odds ratios across income.