Assignment 5

This assignment will give experience with comparing means and analysis of variance and experience with comparing frequencies and chi-square.

1. Gardner et. al. report on weight loss comparisons using four different diets, Atkins, Zone, Learn and Ornish (article attached- JAMA, 7 March 2007, Vol 297, No 9, 969-977).   The following was reported in the abstract for weight loss from baseline after 12 months.

Diet	n*	n**	mean wt loss (kg)	95% Confidence interval (kg)
Atkins	77	68	-4.7	-6.3 to -3.1
Zone	79	61	-1.6	-2.8 to -0.4
Learn	79	61	-2.6	-3.8 to -1.3
Ornish	76	59	-2.2	-3.6 to -0.8

*n at randomization,   **n at 12 months

1a.   Based on the above, in which groups was there a statistically significant ($p < 0.05$) drop in weight from baseline?   Would the corresponding hypothesis test be a paired or unpaired test?

1b.   Compute the standard error of the mean weight loss for each group.

1c. Compute the standard deviation of weight loss for each group. State any assumptions regarding sample size.

1d. The mean difference between Atkins and Zone change at 12 months is $4.7 - 1.6 = 3.1$ kg. Compute a 95% confidence interval for this difference and the t statistic and p value for this difference. Is this consistent with the authors claim in Fig 2 that "the Atkins diet group was significantly different than the Zone diet group at 12 months"?   Does this finding imply that most if not all of those on the Atkins diet lost more weight than those on the Zone diet?

1e. What is meant by "The overall diet group x time interaction was significant ($p <$ 0.001)".   That is, what does this statement say about the mean differences among diet groups over time?   (Calculation not required).

1f. Considering the comparisons of <u>means</u> across diet group and across time, is this comparison best carried out under a factorial ANOVA model or a repeated measure ANOVA model?

1g.   What might be the effect of dropouts at 12 months? Would "baseline carried forward" make the mean difference look more similar (conservative) or more different?

2   The table below shows the relation between presence of a certain gene (with alleles A or B) versus having alcoholism (Sherman et. al. 1993).

Genotype	Alcoholic subjects	Non-alcoholic subjects	pct alcoholic
BB	19	2	90.4%
AB	19	3	86.4%
AA	7	18	28.0%

For this data, a chi-square statistics of $\chi^2 = 25.8$ and p value $p < 0.001$ was computed.

2a. What is the degrees of freedom (df) for this chi-square statistic?

2b. Does this chi-square statistic indicate that the difference between the BB and AB groups is significant at $p < 0.05$?

2c Does $p < 0.001$ imply that the differences among all three genotypes in the percent that are alcoholic are significant at $p < 0.05$?

2d Will the chi-square statistic and its p value remain unchanged if the AB and AA groups are combined?

2e. In a different study using a different dataset, the relation between another gene and alcoholism (yes or no) is investigated.   In this study, the df=4 and the chi-square p value is $p = 0.23$. However, the investigator says that one should compute the p values among all pairwise comparisons and report those that are significant. Comment on whether you think this is appropriate.

3. Theoretical question (no connection to the Gardner paper) – Is it possible for the mean difference between two different and independent groups to be statistically significant at $p < 0.05$ and yet have overlap between the two 95% confidence bounds for each mean? You may assume that the sample sizes and SDs in each group are the same and the sample sizes are large.