STA 312f22: A few extra questions[1]

1. In the lecture "Contingency tables with R," we calculated the X^2 and G^2 tests of association for Pauling's skier data. The point of this question is to make sure you know how to do it by hand using a calculator and the formula sheet. Here is the table.

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Cold            No Cold
Placebo         31 109
Ascorbic Acid   17 122
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   (a) Are the critical values the same for Pearson's X^2 test and the likelihood ratio G^2 test? Give the number or numbers for $\alpha = 0.05$.

   (b) Calculate X^2 with a calculator. Do you reject H_0 at $\alpha = 0.05$? In plain, non-statistical language, what do you conclude?

   (c) Calculate G^2 with a calculator. Do you reject H_0 at $\alpha = 0.05$? In plain, non-statistical language, what do you conclude?

   (d)

2. This is an extended version of a question from Assignment 10. In the *Heart attack data*, a sample of middle-aged men who had heart attacks were classified into three groups. Either they died of the first heart attack, or they died during the next 10 years, or they were still alive 10 years after the first attack. This is the response variable. Potential explanatory variables include age, blood pressure, and family history of heart disease (Yes-No). Let's just consider these for now. For interpretability, make the probability of being alive 10 years later the denominator in each probability ratio.

   (a) Write the multinomial logit model for these data. How many generalized logits (logs of probability ratios) do you have? Of course you must have a regression equation for each one.

   (b) Write the probabilities in terms of the β values in your model.

   (c) Make a table with two rows, one for Family history = Yes, and one for Family history = No. In each row, write *two* probability ratios. Let's call then "relative risks." (The relative risk of dying in a particular way is the probability of dying that way divided by the probability of living.)

   (d) Controlling for age and blood pressure, the relative risk of dying in the first heart attack is _____ times as great for those with a family history of coronary heart disease.

   (e) Controlling for age and blood pressure, the relative risk of dying in the next 10 years after the first heart attack is _____ times as great for those with a family history of coronary heart disease.

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(f) Controlling for age and family history of heart disease, you want to know whether blood pressure is related to outcome. In symbols, what is the null hypothesis?

(g) Controlling for age and blood pressure, you want to know whether family history of heart disease is related to outcome. In symbols, what is the null hypothesis?

(h) This one requires a bit of thought. Controlling for blood pressure, you want to know which is worse in terms of the risk of sudden death from a heart attack: having a family history of heart disease, or being 10 years older. In symbols, what is the null hypothesis?
