

Name Jenny

Student Number \_\_\_\_\_

### STA 441s 2016 Quiz 7

This quiz is based on your analysis of the Heart data. The response variable had three categories:

- Died from first heart attack.
- Died in next 10 years.
- Alive 10 years after entering the study.

Let's call this the *outcome*.

Consider the model with just  $x_1 = \text{Age}$  and  $x_2 = \text{Blood pressure}$  as explanatory variables. In symbols, the model is

$$\ln(\pi_1/\pi_3) = \beta_{0,1} + \beta_{1,1}x_1 + \beta_{2,1}x_2$$

$$\ln(\pi_2/\pi_3) = \beta_{0,2} + \beta_{1,2}x_1 + \beta_{2,2}x_2.$$

1. (5 points) In the "Maximum Likelihood Analysis of Variance," there is a test of age controlling for blood pressure.

- (a) Referring to the model above, give the null hypothesis in symbols.

$$H_0: \beta_{1,1} = \beta_{1,2} = 0$$

- (b) Give the value of the chi-squared test statistic. The answer is a number from your printout. Write the answer in the space below. On your printout, circle the number and write "Question 1b beside it.

7.43

- (c) Do you reject the null hypothesis at  $\alpha = 0.05$ ? Answer Yes or No.

Yes

- (d) Are the results statistically significant? Answer Yes or No.

Yes

- (e) Once you correct for blood pressure, is age related to the outcome? Answer Yes or No.

Yes

2. (5 points) Continuing with the test of age controlling for blood pressure, it is natural to follow up the last test by looking at two additional chi-squared tests.

- (a) Write the two test statistics in the space below. They are numbers on your printout. On your printout, circle the two numbers and write "Question 2a" beside them.

4.41  
4.11

- (b) What is  $\hat{\beta}_{1,1}$ ? Write the number in the space below. On your printout, circle the number and write "Question 2b" beside it.

$$\hat{\beta}_{1,1} = 0.0901$$

- (c) What is  $\hat{\beta}_{1,2}$ ? Write the number in the space below. On your printout, circle the number and write "Question 2c" beside it.

$$\hat{\beta}_{1,2} = 0.145$$

- (d) Write *two* sentences expressing the conclusions from these tests in plain, non-statistical language. Begin each sentence with "Allowing for blood pressure ..."

Allowing for blood pressure, older men are more likely to die from the first heart attack, compared to being alive 10 years later.

Allowing for blood pressure, older men are more likely to <sup>survive the first attack but</sup> die during the next 10 years, compared to being alive 10 years later.

(Go a little easy on these.)

Attach your log file and your results file for the heart data to the quiz paper. Make sure your name and student number are written clearly on both printouts. You may attach all your printouts if you can't separate them easily. The material you attach must include the *complete* log file for the heart data and the *complete* results file for the heart data.

STA441s16 HW 7 Check  
 Question 3: Heart  
 Just Age and Diastolic Blood Pressure

The CATMOD Procedure

Data Summary			
Response	outcome	Response Levels	3
Weight Variable	None	Populations	190
Data Set	HEART	Total Frequency	238
Frequency Missing	1	Observations	238

Maximum Likelihood Analysis	
Maximum likelihood computations converged.	

Maximum Likelihood Analysis of Variance			
Source	DF	Chi-Square	Pr > ChiSq
Intercept	2	17.63	0.0001
age	2	7.43	0.0243
diastol	2	7.77	0.0206
Likelihood Ratio	374	266.47	1.0000

Q1b

Analysis of Maximum Likelihood Estimates					
Parameter	Function Number	Estimate	Standard Error	Chi-Square	Pr > ChiSq
Intercept	1	-7.6634	2.4500	9.78	0.0018
	2	-13.5278	4.1878	10.43	0.0012
age	1	0.0901	0.0429	4.41	0.0357
	2	0.1450	0.0715	4.11	0.0426
diastol	1	0.0219	0.0127	2.97	0.0848
	2	0.0448	0.0178	6.35	0.0117

Q2a

Q11  
Q12