

Homework  
Biostat II  
Assigned 3-15-07

Name \_\_\_\_\_ Last 4 SSN \_\_\_\_\_

Consider the model  $g(x) = B_0 + B_1 \text{ age} + B_2 \text{ ses2dum} + B_3 \text{ ses3dum} + B_4 \text{ sector}$  (page 4 on the printouts).

Write the fitted equation.

$$\hat{p}(Y=1) = \frac{e^{-3.8874 + 0.0297 \text{age} + 0.4088 \text{sesdum2} - 0.3051 \text{sesdum3} + 1.5746 \text{sector}}}{1 + e^{-3.8874 + 0.0297 \text{age} + 0.4088 \text{sesdum2} - 0.3051 \text{sesdum3} + 1.5746 \text{sector}}}$$

- Calculate the odds ratio for a one year increase in age controlling for ses and sector,  
or =  $e^{0.0297} \approx 1.030$
- Interpret this value.  
For a one year increase in age, the odds of disease increase by 3.0%,  
controlling for ses and sector.
- Calculate the natural log of the odds ratio above,  $\ln(\text{or}) = 0.0297$
- Calculate the standard error of the natural log of the odds ratio above,  $\text{se}(\ln(\text{or})) = 0.0135$
- Calculate a 95% Confidence Interval for the odds ratio above.  $(1.003, 1.058)$
- What is the p-value for the likelihood ratio Chi-square test statistic associated with the age risk factor controlling for ses and sector?  $0.023253$
- What is the p-value for the Wald Chi-square test statistic associated with the age risk factor controlling for ses and sector?  $0.0276$
- What is the model's estimate for the probability of disease given that one is 30 years of age in ses group 1 (the reference group for SES), and sector=1 (plug in sector=1 in the equation)?

$0.1944$

$$\hat{p}(Y=1) = \frac{e^{-3.8874 + 0.0297(30) + 0.4088(0) - 0.3051(0) + 1.5746(1)}}{1 + e^{-3.8874 + 0.0297(30) + 0.4088(0) - 0.3051(0) + 1.5746(1)}} \approx 0.1944$$

Conduct the hypothesis test all the interaction terms are not helpful in the model. The full model details are on pages 5-6 and the reduced model details are on page 7.

a.  $H_0: \beta_5 = \beta_6 = \beta_7 = \beta_8 = \beta_9 = 0$

H(a): Not  $H_0$

c. Test statistic =  $7.05828$  df =  $5$

d. Circle one of these statements: P-value less than or equal to 0.05 **P-value greater than 0.05**

e. Conclusion: There (is **is not**) sufficient evidence to suggest that at least one of the <sup>interaction terms</sup> ~~two predictors in~~ question ~~(H<sub>1</sub> vs H<sub>0</sub>)~~ are helpful in the model.

**Suppose that it is concluded that the model:**

$$g(x) = B_0 + B_1 \text{ age} + B_2 \text{ ses2dum} + B_3 \text{ ses3dum} + B_4 \text{ sector is appropriate.}$$

- f. What is the estimate for the odds ratio for a 5-year increase in age keeping ses and sector fixed?  
 $e^{5(0.0297)} \approx 1.160$
- g. Calculate a 95% Confidence Interval for the odds ratio for a 5 year increase in age keeping ses and sector fixed.  
 $(1.016, 1.324)$
- h. What is an estimate for the odds ratio for a 10 year increase in age keeping ses and sector fixed?  
 $e^{10(0.0297)} \approx 1.346$
- i. Calculate a 95% Confidence Interval for the odds ratio for a ten year increase in age keeping ses and sector fixed.  
 $(1.033, 1.753)$