Homework
Applied Logistic Regression

WEEK 3

Exercise 1:

Use the Myopia Study (MYOPIA.dta)

a. Using the results from Week 2, problem 1, part (a) compute 95 percent confidence intervals for the slope coefficient SPHEQ. Write a sentence interpreting this confidence.

$$\hat{\beta}_1 \pm z_{1-\alpha/2}\widehat{SE}\left(\hat{\beta}_1\right) = -3.83 \pm 1.96(.41),$$
$$\text{or } (-4.65, -3.01)$$

If we keep sampling and calculate 100 such intervals in the same way, approximately 95 of them will cover the true value of β_1 . Alternatively, we are 95% confident that true value of β_1 could be as low as -4.63, or as high as -3.03.

b. Use Stata to obtain the estimated covariance matrix. Compute the logit and estimated logistic probability for a subject with SPHEQ = 2. Evaluate the endpoints of the 95 percent confidence intervals for the logit and estimated logistic probability. Write a sentence interpreting the estimated probability and its confidence interval.

To obtain a covariance matrix in Stata, run the regression model and then type "vce" into the command box. You should then see the output below.

```
. vce

Covariance matrix of coefficients of logit model

             | myopic
        e(V) |      spheq       _cons
-------------+------------------------
myopic       |
       spheq |  .17505013
       _cons | -.06338157   .04274638
```

In quickly & efficiently evaluate the endpoints of the confidence interval for the logit for a particular observation, you can use the "lincom" command in Stata. Type "lincom _b[_cons] + _b[spheq]*2" to specify the model and the observation (Note: the observation is SPHEQ = 2, thus we have multiplied the coefficient for SPHEQ by 2 in the lincom command).

```
. lincom _b[_cons]+_b[spheq]*2

 ( 1)  2*[myopic]spheq + [myopic]_cons = 0

------------------------------------------------------------------------------
      myopic |      Coef.   Std. Err.      z    P>|z|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
         (1) |  -7.612222    .699586   -10.88   0.000    -8.983386   -6.241059
------------------------------------------------------------------------------
```

You can then quickly calculate the confidence interval for the probability given adjust spheq=2 by typing “adjust spheq=2, pr ci” into the command box.

```
. adjust spheq=2, pr ci

------------------------------------------------------------------------------
     Dependent variable: myopic     Equation: myopic     Command: logit
 Covariate set to value: spheq = 2
------------------------------------------------------------------------------

-----------------------------------------------
      All |         pr          lb          ub
----------+------------------------------------
          |    .000494    [.000125    .001944]
-----------------------------------------------
     Key:  pr         =  Probability
           [lb , ub]  =  [95% Confidence Interval]
```

Interpretation:
The estimated probability of having myopia for a spherical equivalent refraction score of 2 is 0.0494% on average, and we are 95% confident that this probability could be as low as 0.0125% and as high as 0.1944%.