**CHAPTER 14: REGRESSION WITH A DICHOTOMOUS DEPENDENT VARIABLE: LOGIT MODELS**

**DISCUSSION GROUP QUESTIONS**

1. We are interested in understanding what leads some criminals to get caught by the police. We have information on 100 criminals from an urban neighborhood and collect three pieces of information:

Whether or not the criminal was caught and arrested by the police in the last year

How many crimes the criminal committed in the last year

Whether the criminal has a below average intelligence quotient (IQ<100)

We estimate a linear probability model with getting caught and arrested as our dependent variable and how many crimes the criminal committed in the last year as our only independent variable. We get the following results:

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| **Coefficientsa** | | | | | | |
| Model | | Unstandardized Coefficients | | Standardized Coefficients | t | Sig. |
| B | Std. Error | Beta |
|  | (Constant) | .216 | .097 |  | 2.23 | .028 |
| Number of Crimes | .044 | .011 | .386 | 4.00 | .000 |
|  | | | | | | |

R2 = .15

With these results, answer the following questions:

a. Write out the full regression equation.

b. Interpret the constant.

c. Interpret the slope coefficient.

d. Using an alpha of .05, what is your decision about the null hypothesis: bCrimesCommitted = 0

Explain.

e. Interpret the value of R2.

f. What is the predicted probability of getting caught and arrested for a criminal who has committed 10 crimes in the past year?

g. What is the predicted probability of getting caught and arrested for a criminal who has only committed 1 crime in the past year?

2. We then added a new variable to the model, whether the criminal has a below average IQ, and here are our results:

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| **Coefficientsa** | | | | | | |
| Model | | Unstandardized Coefficients | | Standardized Coefficients | t | Sig. |
| B | Std. Error | Beta |
|  | (Constant) | .104 | .082 |  | 1.268 | .204 |
| Number of Crimes | .019 | .009 | .167 | 2.111 | .048 |
| Criminal has low IQ | .569 | .082 | .571 | 6.939 | .000 |
|  | | | | | | |

R2 = .43

With these results, answer the following questions:

a. Write out the full regression equation.

b. Interpret the slope coefficient for the number of crimes committed in the last year.

c. Interpret the slope coefficient for having a low IQ.

d. Using an alpha of .05, what is your decision about the null hypothesis: bCrimesCommitted = 0

Explain.

e. Using an alpha of .05, what is your decision about the null hypothesis: bLowIQ = 0

Explain.

f. Interpret the value of R2

g. What is the predicted probability of getting caught and arrested for a criminal who committed 10 crimes and has a low IQ?

3. We now estimate a logistic regression model with the same data, first only including the number crimes committed by the criminal as an independent variable. Here are our results:

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| **Variables in the Equation** | | | | | | | |
|  | | B | S.E. | Wald | df | Sig. | Exp(B) |
|  | Number of Crimes | .199 | .054 | 13.581 | 1 | .000 | 1.22 |
| Constant | -1.256 | .460 | 7.455 | 1 | .006 | .285 |

With these results, answer the following questions:

a. Write out the regression equation.

b. Interpret the regression coefficient in terms of the log of the odds of the dependent variable.

c. Interpret the regression coefficient in terms of the percent change in the odds of the dependent variable.

d. Interpret the regression coefficient in terms of the effect on the predicted probability of getting caught and arrested for a criminal that committed 10 crimes last year.

e. Interpret the regression coefficient in terms of the odds multiplier.

f. Using an alpha of .05, what is your decision about the null hypothesis that bCrimesCommitted = 0

Explain.

4. As we did with the linear probability model, we then added a new variable to the model, whether the criminal has a low IQ, and here are our results:

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| **Variables in the Equation** | | | | | | | |
|  | | B | S.E. | Wald | df | Sig. | Exp(B) |
|  | Number of Crimes | .125 | .063 | 3.937 | 1 | .049 | 1.133 |
| Low IQ | 2.763 | .538 | 26.375 | 1 | .000 | 15.847 |
| Constant | -2.076 | .578 | 12.900 | 1 | .000 | .125 |

With these results, answer the following questions:

a. Write out the full regression equation.

b. Interpret each regression coefficient in terms of the log of the odds of the dependent variable.

c. Interpret each regression coefficient in terms of the percent change in the odds of the dependent variable.

d. Using an alpha of .05, what is your decision about the null hypothesis: bCrimesCommitted = 0

Explain.

e. Using an alpha of .05, what is your decision about the null hypothesis: bLowIQ = 0

Explain.

f. What is the predicted probability of getting caught and arrested for a criminal who has committed 1 crime in the last year and does NOT have a low IQ?