test\_s1\_2021

## Question 1)

For the 75 minute duration of this test, I confirm that I will not discuss the content of the test with anyone else. I will not give any assistance to another student taking this test. I will not receive any assistance from any person or tutoring service.

## Question 2)

# a)

where refers to the gender of the victim, 1 if Male, 0 if female AND is the Friday date for the ith day, 1 if the day is NOT Friday the 13th, 0 if Friday the 13th is the total number of person-days over which the deaths occurred for the ith group

# b)

Person.days is an offset. It is essentially transforming the response variable into

So we have logged expected number of deaths per person.days as our response.

# c)

In the model our baseline is Female and Friday

1. let dayOtherFri = 0, genderMale = 1

exp(0.7725)

## [1] 2.165172

On a Friday 13th the death rate for males is about 2.165 times that for females

1. Let Male = 0, Other Fri = 1

(100\*(exp(-0.4789)-1))

## [1] -38.05356

For females, the death rate for other Fridays is about 62% percent of the death rate for Friday 13th.

# d)

The deviance of the Fri13.fit is 0 because it is the saturated model. We know this because this data set has 4 observations and the model has 4 parameters

#e)

Day does not have the same effect for male and female. For females we see the death rate for other Fridays is about 62% percent of the death rate for Friday the 13th

In males we see the rate for other Fridays is about 95% of the death rate for Friday the 13th (calculations below). The effect is the addition of the

This difference is evident in the use of the interaction term: GenderMale:DayOtherFri

100+(100\*(exp(-0.4789+0.4282)-1))

## [1] 95.05638

## Question 3)

# a)

1. Variance for Poisson.fit using formula
2. For quasi-poisson

Variance is equal to 625.888 (Calc Below)

20.63818\*30.32639

## [1] 625.8815

1. for Negative Binomial

mu4 <- 25.69835  
theta <- (5.7626)  
  
varianceNegBin <- mu4 + ((mu4^2)/theta)  
varianceNegBin

## [1] 140.3003

variance is equal to 140.3

# b)

Poisson first

observed <- 19   
expected <- 30.32639  
variance <- 30.32639  
  
#Raw residual  
rawPoisson <- observed - expected  
rawPoisson

## [1] -11.32639

#pearson   
pearsonPoisson <- (observed - expected)/sqrt(variance)  
  
pearsonPoisson

## [1] -2.056748

For poisson regression we have raw residual = -11.32639

AND the pearson residual = -2.056748

Now Negative Binomial

observed <- 19  
expected <- 25.69835  
variance <- varianceNegBin  
  
rawNegBin <- observed - expected  
rawNegBin

## [1] -6.69835

pearsonNegBin <- (observed - expected)/sqrt(variance)  
pearsonNegBin

## [1] -0.5655077

For negative binomial regression we have a raw residual of -6.69835 AND a pearson residual of -0.5655077.

# c)

Which Model do you prefer??