AMS 241 Homework 1 - DP Priors

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Q1

a:

$\hat{\phi} = 1.294 > \frac{\chi^2_{n-p}(.95)}{n-p} = \frac{\chi^2_{73}(.95)}{73} = 1.287$. At the 95% confidence level, we conclude that the there is overdispersion. The variance in the model is higher than that if we do not model overdispersion.

b:

The coefficient for group is significant. The log odds of death in the treatment group is $1 - e^{-.9289} = 60.5\%$ **less** than that of the control group. This is desired as the treatment is supposed to reduce the likelihood of death.

Q2:

a:

The overdispersion parameter is $\hat{\phi} = 0.05602$, which is significant at the .05 α level. We conclude that there is overdispersion. The variance of the parameters in the model is higher that that if we do not model overdispersion.

b:

The expected mean number of deaths in the treatment group is $1 - e^{-.8522} = 57\%$ **less** than that of the control group. This is expected for the same reason in Q1. The effect of group is significant.

Q3:

a:

The overdispersion parameter is $\hat{\phi} = 2.313 > 1.28$, which is significant at the .05 α level. We conclude that there is overdispersion. The variance of the parameters in the model is higher that that if we do not model overdispersion.

b:

The expected mean number of deaths in the treatment group is $1 - e^{-.8754} = 58\%$ **less** than that of the control group. This is expected for the same reason in Q1. The effect of group is significant.

Q4:

a:

The overdispersion parameter is $\hat{\phi} = 1.090 < 1.28$, which is not significant at the .05 α level. We conclude that there is not overdispersion. The variance of the parameters in the model is not significantly higher than that if we do not model overdispersion.

b:

The expected mean number of deaths in the treatment group is $1 - e^{-1.036} = 65\%$ **less** than that of the control group. This is expected for the same reason in Q1. The effect of group is significant.

Q4:

I prefer the quasi-binomial model because we can make inference about the odds of death given a lamb received the treatment. I think this may be more useful than knowing the number of deaths because we can convert odds to probabilities, and use the probabilities to estimates of the number of deaths.