Final Project

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```
df <- read.table("../data/tb.txt",header=T)
```

```
code <- "
  model{
    for(i in 1:134){
      #Core Model
      reactors[i] ~ dpois(mu[i])
      mu[i] <- adar[i]*nu[i]
      log(nu[i]) <- beta.0 + beta.sex*sex[i] + beta.age[age[i]] + beta.type[type[i]]

      #Deviance Calc
      dev[i] <- 2*(reactors[i]*log(reactors[i]/mu[i]) - (reactors[i] - mu[i]))
    }

    tot.dev <- sum(dev[])

    #Priors
    beta.0 ~ dnorm(0, 0.001)
    beta.sex ~ dnorm(0, 0.001)
    for(j in 2:3){beta.age[j] ~ dnorm(0, 0.001)}
    beta.age[1] <- 0
    for(j in 2:4){beta.type[j] ~ dnorm(0, 0.001)}
    beta.type[1] <- 0
  }
" %>% strsplit('\n') %>% unlist

inits <- list(
   beta.0 = 0
  ,beta.sex = 0
  ,beta.age = c(NA, 0, 0)
  ,beta.type = c(NA, 0, 0, 0)
)

params <- c('beta.0','beta.sex','beta.age[2:3]','beta.type[2:4]','tot.dev')
monitor <- c('beta.0','beta.sex','beta.age','beta.type','tot.dev')
build.model(code, df, inits, params, n.chains=2, n.adapt=500, n.iter=25000) %>%
  jagsresults(monitor) %>%
  kable
```

	mean	sd	2.5%	25%	50%	75%	97.5%
beta.0	-11.9672710	0.8373457	-13.9246697	-12.4261210	-11.8859913	-11.3874677	-10.6074502
beta.age[2]	2.9232242	0.8193681	1.6335847	2.3400227	2.8277227	3.3749769	4.8609366
beta.age[3]	2.8584470	0.8124216	1.5769518	2.2794551	2.7598520	3.3056992	4.7798384
beta.sex	-0.3730850	0.1962543	-0.7644178	-0.5043165	-0.3696914	-0.2398655	0.0045671
beta.type[2]	1.0804434	0.2360142	0.6303678	0.9195872	1.0756735	1.2350394	1.5586798
beta.type[3]	0.4518879	0.2398800	-0.0103764	0.2901643	0.4472016	0.6108801	0.9342834
beta.type[4]	0.2834052	0.6592944	-1.1528333	-0.1215389	0.3349939	0.7435898	1.4346188

	mean	sd	2.5%	25%	50%	75%	97.5%
tot.dev	355.4741821	3.8273131	350.0474230	352.6552707	354.7917957	357.5515391	364.6935794

Question 1

Total Deviance is~355. So (a) above 300.

Question 2

`beta.type[2]` has a confidence interval of roughly [0.63, 1.56]. This interval is all positive, suggesting sufficient evidence that Cervids bear increased risk.

Binomial Refactor

```
code %>%
  {.[5] <- "      reactors[i] ~ dnegbin(p[i], theta)"; .} %>%
  append('      p[i] <- theta/(theta + mu[i])',5) %>%
  append('    theta ~ dunif(0,10)',22) %>%
  build.model(df, inits, c(params, 'theta'), n.chains=2, n.adapt=500, n.iter=25000) %>%
  jagsresults(c(monitor,'theta')) %>%
  kable
```

	mean	sd	2.5%	25%	50%	75%	97.5%
beta.0	-11.2290612	1.1616729	-13.5917472	-11.9890633	-11.1906096	-10.4233433	-9.0905449
beta.age[2]	2.3976847	0.9744456	0.6606483	1.7262416	2.3417418	3.0054894	4.4708386
beta.age[3]	2.6446295	0.9559148	0.9302738	1.9901700	2.5802625	3.2368499	4.7066766
beta.sex	-0.0882850	0.4200563	-0.9095378	-0.3699362	-0.0904056	0.1897858	0.7418431
beta.type[2]	0.6067531	0.7266680	-0.8776507	0.1353405	0.6270659	1.1026860	1.9840361
beta.type[3]	0.5208697	0.7161843	-0.9383746	0.0570371	0.5414519	1.0130596	1.8624744
beta.type[4]	0.6675561	1.1786051	-1.7232070	-0.1012227	0.6890151	1.4615321	2.9376708
theta	0.5542671	0.1462496	0.3210886	0.4507076	0.5357425	0.6374779	0.8909711
tot.dev	453.2111230	84.8803091	367.7089239	400.3984533	431.2959959	479.2656085	668.5161174

Question 3

After rephrasing as a negative-binomial model, none of the type variables have sufficient evidence to be considered significant.

Question 4

The posterior mean for theta is ~0.56