You should include a summary of up to 500 hundred words explaining the organization, motivation, logic, and key decisions made in the analysis. You may use materials you may have already provided in your original application.

My thesis focused on examining canine distemper virus in coyotes in the metropolitan area of Chicago. This study is in collaboration with the Urban Coyote Research Project in Chicago. The study was initiated back in the early 2000s to understand how coyotes have become so successful in living in urban areas and gain insight into their interaction with other wildlife, domestic animals, and humans.

The specific aims included:

1. investigating the differences in CDV seroprevalence by age and sex classes,
2. identifying potential outbreak years,
3. determining whether coyote social status (i.e. transient vs. resident) and home range position in the urban landscape influenced individual exposure risk.

Home range position in the urban landscape was assessed in relation to three physical barriers: 1) rivers 2) interstates and 3) railways.

The association between CDV seropositivity and each predictor variable was assessed using binomial generalized linear mixed models (GLMMs) with a logit link function using the lme4 package in the statistical program R.

For the first objective, exploring the association between CDV and age class, sex, and year, we used independent univariable GLMMs. Study site, year, and coyote ID were included as random effects to account for non-independence of observations and repeated measures. For the second objective, exploring the importance of social status and physical barriers, we used multivariable GLMMs. Specifically, we looked at the association between social status and age class in relation to CDV while including year and study site as random effects. For physical barriers, we examined the association between CDV and the 3 barriers namely railways, interstates, and rivers and included study site as a random effect. In each model the variable age class was included because we expected that it was an important variable for CDV seropositivity. The Multi-Model Inference (MuMInn) package was used to perform model selection and model averaging. The coefficient of determination (r2) was used to quantify the variance explained by predictor variables. Since models included random effects, we presented marginal r2 (rm2) and conditional r2  (rc2) values. rm2  represents the variance explained by the predictor variables and rc2 the variance explained by both predictor variables and random effects.

Below are two examples of my coding analysis to examine the association between CDV and the predictor variable, age class using independent univariable GLMMs and looking at the association between age class and social status in relation to CDV using multivariable GLMMs. Unfortunately, because this is still an ongoing research, I am unable to show the raw data.

global <- glmer(CDV.Result ~ Age.Class + (1|Study.Area) +(1|Year),

family = binomial(link = "logit"), data = D)

summary(global)

or <- exp(fixef(global))

conf <- exp(confint(global))

Anova(global)

r.squaredGLMM(global)

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| Predictor | Sample Size | OR [95%CI] | P Value | rm2 | rc2 |
| Adult  Subadult  Pup | 148  129  135 | 1  0.29 [0.17-0.50]  0.17 [0.10-0.30] | Ref  <0.0001  <0.0001 | 0.13 | 0.24 |

m <- glmer(CDV.Result ~ Age.Class + social.status + Age.Class \* social.status + (1|Year)+ (1|Study.Area),

family = binomial(link="logit"),data = D)

summary(m)

or <- exp(fixef(m))

conf <- exp(confint(m))

Anova(m)

r.squaredGLMM(global)

These are the results

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Predictor | OR [95%CI] | P value | rm2 | rC2 |
| age class (subadult) | 0.20 [0.09-0.42] | <0.0001 | 0.21 | 0.32 |
| age class (pup) | 0.08 [0.03-0.17] | <0.0001 |  |  |
| social status (transient) | 0.30 [0.10-0.87] | 0.03 |  |  |
| age class (subadult) \* social status (transient) | 0.51 [0.05-4.50] | 0.20 |  |  |
| age class (pup) \* social status (transient) | 0.35 [0.03-3.64] | 0.06 |  |  |