Stat 341 – Homework 6

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Data

```
data(foxes)
glimpse(foxes)
```

```
## Rows: 116
## Columns: 5
## $ group     <int> 1, 1, 2, 2, 3, 3, 4, 4, 5, 5, 5, 6, 6, 6, 7, 7, 7, 8, 8, 8, ~
## $ avgfood   <dbl> 0.37, 0.37, 0.53, 0.53, 0.49, 0.49, 0.45, 0.45, 0.74, 0.74, ~
## $ groupsize <int> 2, 2, 2, 2, 2, 2, 2, 2, 3, 3, 3, 3, 3, 3, 3, 3, 3, 3, 3, 3, ~
## $ area      <dbl> 1.09, 1.09, 2.05, 2.05, 2.12, 2.12, 1.29, 1.29, 3.78, 3.78, ~
## $ weight    <dbl> 5.02, 2.84, 5.33, 6.07, 5.85, 3.25, 4.53, 4.09, 6.13, 5.59, ~
```

Model Fitting

```
foxes <- foxes |>
  mutate(avgfood_scaled = as.numeric(scale(avgfood)))
```

avgfood + groupsize + area

```
model1 <- quap(
  flist = alist(
    weight ~ dnorm(mu, sigma),
    mu <- b0 + b1 * avgfood + b2 * groupsize + b3 * area,
    b0 ~ dnorm(4,1),
    b1 ~ dnorm(0.5,0.1),
    b2 ~ dnorm(4,0.5),
    b3 ~ dnorm(3,1),
    sigma ~ dnorm(1.5, 2)
  ),
  data = foxes)
```

avgfood + groupsize

```
model2 <- quap(
  flist = alist(
    weight ~ dnorm(mu, sigma),
    mu <- b0 + b1 * avgfood + b2 * groupsize,
    b0 ~ dnorm(4,1),
    b1 ~ dnorm(0.5,0.1),
    b2 ~ dnorm(5,0.5),
```

```
    sigma ~ dnorm(1.5, 2)
  ),
  data = foxes)
```

groupsize + area

```
model3 <- quap(
  flist = alist(
    weight ~ dnorm(mu, sigma),
    mu <- b0 + b1 * groupsize + b2 * area,
    b0 ~ dnorm(4,1),
    b1 ~ dnorm(4,0.5),
    b2 ~ dnorm(3,1),
    sigma ~ dnorm(1.5, 2)
  ),
  data = foxes)
```

avgfood

```
model4 <- quap(
  flist = alist(
    weight ~ dnorm(mu, sigma),
    mu <- b0 + b1 * avgfood,
    b0 ~ dnorm(4,1),
    b1 ~ dnorm(0.5,0.1),
    sigma ~ dnorm(1.5, 2)
  ),
  data = foxes)
```

area

```
model5 <- quap(
  flist = alist(
    weight ~ dnorm(mu, sigma),
    mu <- b0 + b1 * area,
    b0 ~ dnorm(4,1),
    b1 ~ dnorm(3,1),
    sigma ~ dnorm(1.5, 2)
  ),
  data = foxes)
```

Computing the WAIC

```
rethinking::compare(model1, model2, model3, model4, model5, func=WAIC)
```

```
##            WAIC       SE    dWAIC       dSE    pWAIC      weight
## model1 365.0391 14.91315 0.000000        NA 3.988314 0.609144377
## model3 366.2474 14.89198 1.208294 0.8187731 4.030823 0.332922036
## model2 370.7193 14.09699 5.680194 3.9103099 2.970025 0.035586205
## model4 372.7136 13.36817 7.674439 4.8516273 1.908984 0.013129160
## model5 373.4209 13.61601 8.381746 4.3259031 2.766915 0.009218222
```

Explanation

Based on the WAIC results of 5 different models, since the smaller WAIC is the better, model1 is the best out of all the models. This can be concluded that including all three predictors of avgfood, groupsize, and area to see the results of weight is the best than only using one or two predictors.