

Elongation Analyses

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```
knitr::opts_chunk$set(tidy.opts=list(width.cutoff=70), tidy=TRUE)
# code above ensures no text is cut off when knit
```

Loading in Packages and Data

```
knitr::opts_chunk$set(echo = TRUE)
library(patchwork)
library(car)
library(performance)
library(DHARMA)
library(fitdistrplus)
library(gamlss)
library(tidyverse)

polyp_data <- read_csv("/Users/marabohm/Github/Jelly-Data/data/ds2021_polyp_data.csv")
```

Cleaning the Data

```
polyp_clean <- polyp_data %>%
  rename(collection_day = "Data collection day", jar_code = "Jar Code (ex. E1)",
    treatment = Chemical, num_elongated = "Elongation?", num_ruffled = "Ruffled?",
    num_asexual_buds = "Asexual Repro?", total_num = Total) %>%
  mutate(jar_code = as.factor(jar_code), treatment = as.factor(treatment),
    treatment = fct_relevel(treatment, "Control", "Caffeine", "Estradiol",
      "Combo")) %>%
  dplyr::select(collection_day, jar_code, treatment, num_elongated, num_ruffled,
    num_asexual_buds, total_num)
```

Fitting Distributions for Elongation Data

```
fitDist(num_elongated, data = polyp_clean, type = "counts", try.gamlss = T)
# best fit: Negative Binomial type II (AIC = 414.587)
```

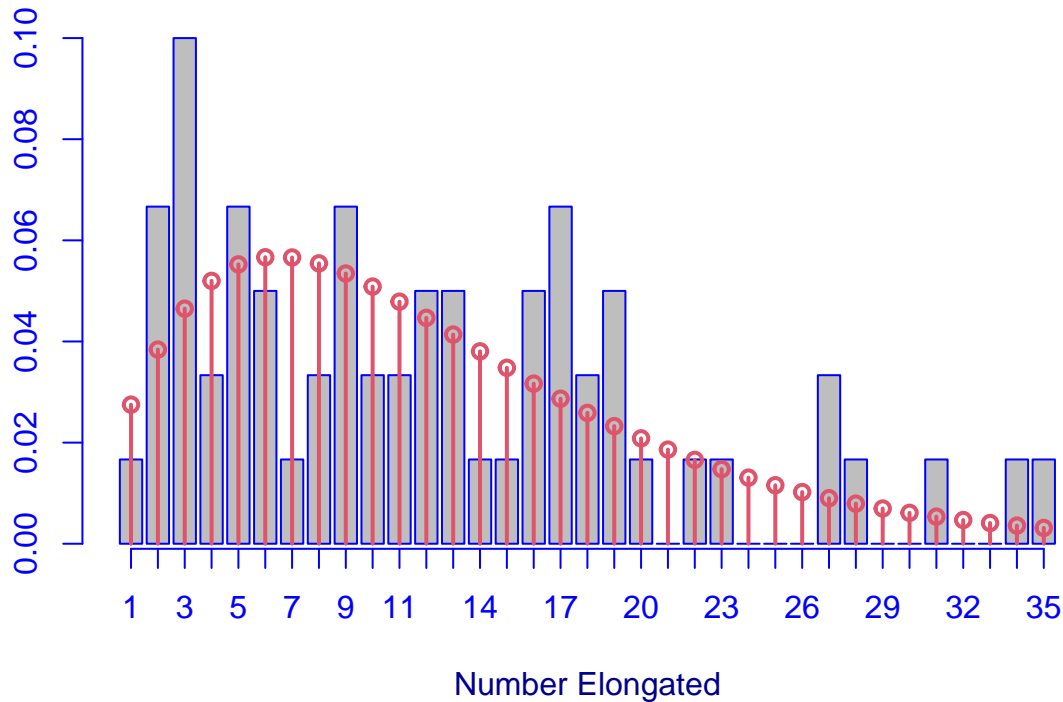
Creating The Elongation Model

```
mod_countwttotal_elongation <- gamlss(num_elongated ~ treatment * collection_day +  
  re(random = ~1 | jar_code) + re(random = ~1 | total_num), family = NBII(),  
  method = RS(), data = polyp_clean, control = gamlss.control(n.cyc = 200))
```

```
## GAMLSS-RS iteration 1: Global Deviance = 326.5503  
## GAMLSS-RS iteration 2: Global Deviance = 315.3428  
## GAMLSS-RS iteration 3: Global Deviance = 316.6887  
## GAMLSS-RS iteration 4: Global Deviance = 316.5585  
## GAMLSS-RS iteration 5: Global Deviance = 316.5898  
## GAMLSS-RS iteration 6: Global Deviance = 316.6333  
## GAMLSS-RS iteration 7: Global Deviance = 316.5941  
## GAMLSS-RS iteration 8: Global Deviance = 316.6303  
## GAMLSS-RS iteration 9: Global Deviance = 316.5979  
## GAMLSS-RS iteration 10: Global Deviance = 316.6278  
## GAMLSS-RS iteration 11: Global Deviance = 316.6011  
## GAMLSS-RS iteration 12: Global Deviance = 316.6257  
## GAMLSS-RS iteration 13: Global Deviance = 316.6037  
## GAMLSS-RS iteration 14: Global Deviance = 316.624  
## GAMLSS-RS iteration 15: Global Deviance = 316.6058  
## GAMLSS-RS iteration 16: Global Deviance = 316.6225  
## GAMLSS-RS iteration 17: Global Deviance = 316.6076  
## GAMLSS-RS iteration 18: Global Deviance = 316.6214  
## GAMLSS-RS iteration 19: Global Deviance = 316.6091  
## GAMLSS-RS iteration 20: Global Deviance = 316.6204  
## GAMLSS-RS iteration 21: Global Deviance = 316.6103  
## GAMLSS-RS iteration 22: Global Deviance = 316.6196  
## GAMLSS-RS iteration 23: Global Deviance = 316.6113  
## GAMLSS-RS iteration 24: Global Deviance = 316.619  
## GAMLSS-RS iteration 25: Global Deviance = 316.6121  
## GAMLSS-RS iteration 26: Global Deviance = 316.6184  
## GAMLSS-RS iteration 27: Global Deviance = 316.6128  
## GAMLSS-RS iteration 28: Global Deviance = 316.618  
## GAMLSS-RS iteration 29: Global Deviance = 316.6133  
## GAMLSS-RS iteration 30: Global Deviance = 316.6176  
## GAMLSS-RS iteration 31: Global Deviance = 316.6138  
## GAMLSS-RS iteration 32: Global Deviance = 316.6173  
## GAMLSS-RS iteration 33: Global Deviance = 316.6142  
## GAMLSS-RS iteration 34: Global Deviance = 316.6171  
## GAMLSS-RS iteration 35: Global Deviance = 316.6145  
## GAMLSS-RS iteration 36: Global Deviance = 316.6169  
## GAMLSS-RS iteration 37: Global Deviance = 316.6147  
## GAMLSS-RS iteration 38: Global Deviance = 316.6167  
## GAMLSS-RS iteration 39: Global Deviance = 316.6149  
## GAMLSS-RS iteration 40: Global Deviance = 316.6166  
## GAMLSS-RS iteration 41: Global Deviance = 316.6151  
## GAMLSS-RS iteration 42: Global Deviance = 316.6165  
## GAMLSS-RS iteration 43: Global Deviance = 316.6155
```

```
histDist(polyp_clean$num_elongated, "NBII", density = T, main = "Count Polyp Elongation Compared to Neg
xlab = "Number Elongated")
```

Count Polyp Elongation Compared to Negative Binomial II Distibutic



```
##
## Family: c("NBII", "Negative Binomial type II")
## Fitting method: "nlminb"
##
## Call: gamlssML(formula = polyp_clean$num_elongated, family = "NBII")
##
## Mu Coefficients:
## [1] 2.504
## Sigma Coefficients:
## [1] 1.662
##
## Degrees of Freedom for the fit: 2 Residual Deg. of Freedom 58
## Global Deviance: 410.587
## AIC: 414.587
## SBC: 418.776
```

```
# summarizing model to determine p-values:
summary(mod_countwttotal_elongation)
```

```
## *****
## Family: c("NBII", "Negative Binomial type II")
```

```
##
## Call:  gamlss(formula = num_elongated ~ treatment * collection_day +
##         re(random = ~1 | jar_code) + re(random = ~1 | total_num),
##         family = NBII(), data = polyp_clean, method = RS(),
##         control = gamlss.control(n.cyc = 200))
##
## Fitting method: RS()
##
## -----
## Mu link function:  log
## Mu Coefficients:
##
##              Estimate Std. Error t value Pr(>|t|)
## (Intercept)      1.09720    0.28047   3.912 0.000269 ***
## treatmentCaffeine -0.17935    0.38941  -0.461 0.647033
## treatmentEstradiol  0.03055    0.37398   0.082 0.935219
## treatmentCombination 0.11280    0.36307   0.311 0.757292
## collection_day      0.31578    0.07282   4.336 6.74e-05 ***
## treatmentCaffeine:collection_day 0.11929    0.09911   1.204 0.234253
## treatmentEstradiol:collection_day 0.10750    0.09556   1.125 0.265833
## treatmentCombination:collection_day 0.14295    0.09252   1.545 0.128455
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## -----
## Sigma link function:  log
## Sigma Coefficients:
##              Estimate Std. Error t value Pr(>|t|)
## (Intercept)  -1.4610    0.9872  -1.48   0.145
##
## -----
## NOTE: Additive smoothing terms exist in the formulas:
## i) Std. Error for smoothers are for the linear effect only.
## ii) Std. Error for the linear terms maybe are not accurate.
## -----
## No. of observations in the fit:  60
## Degrees of Freedom for the fit:  8.35727
##      Residual Deg. of Freedom:  51.64273
##              at cycle:  43
##
## Global Deviance:      316.6155
##              AIC:      333.33
##              SBC:      350.833
## *****
```