GDF15 ELISA Assay for Ketogenic Diet

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1 Purpose

To determine the levels of GDF15 from either ketogenic diet or dexamethasone treatments.

2 Experimental Details

Used the Quantikine kit, used 15 uL serum rather than 50 uL.

3 Raw Data

The input data is calculated from MyAssays from a four parameter logistic regression calculation (https://www.myassays.com/) and annotated with cohort, sex and groups. The equation (solved for concentration) is:

$$Concentration = c\left(\frac{a-d}{y-d}-1\right)^{\frac{1}{b}}$$

These data can be found in **/Users/davebrid/Documents/GitHub/TissueSpecificTscKnockouts/Mouse Data/Ketogenic Diets** in a file named **GDF15 ELISA Results.csv**. This script was most recently updated on **Mon Apr 6 11:01:47 2020**.

4 Analysis

4.1 Ketogenic Diets

We had serum from the two cohorts of ketogenic mice, some with males and females

```
##
##  Shapiro-Wilk normality test
##
## data:  log(subset(kd.data, Sex == "F" & Diet == "CD")$Concentration)
## W = 0.9, p-value = 0.1

##
##  Wilcoxon rank sum test with continuity correction
##
## data:  Concentration by Diet
## W = 8, p-value = 0.07
## alternative hypothesis: true location shift is not equal to 0

##
##  Shapiro-Wilk normality test
##
## data:  subset(kd.data, Sex == "F" & Diet == "CD")$Concentration
## W = 0.9, p-value = 0.2

##
##  Shapiro-Wilk normality test
##
## data:  subset(kd.data, Sex == "F" & Diet == "KD")$Concentration
## W = 0.9, p-value = 0.3

## Levene's Test for Homogeneity of Variance (center = median)
##       Df F value Pr(>F)
## group  1    0.05   0.82
##       11

##
##  Two Sample t-test
##
## data:  Concentration by Diet
## t = -2, df = 11, p-value = 0.06
## alternative hypothesis: true difference in means is not equal to 0
## 95 percent confidence interval:
##  -34.12   1.06
## sample estimates:
## mean in group CD mean in group KD
##             14.6             31.1

##
##  Shapiro-Wilk normality test
##
## data:  subset(kd.data, Sex == "M" & Diet == "CD")$Concentration
## W = 0.9, p-value = 0.5

##
##  Shapiro-Wilk normality test
##
```

```
## data:  subset(kd.data, Sex == "M" & Diet == "KD")$Concentration
## W = 0.9, p-value = 0.1
```

```
## Levene's Test for Homogeneity of Variance (center = median)
##       Df F value Pr(>F)
## group  1    1.87   0.19
##       18
```

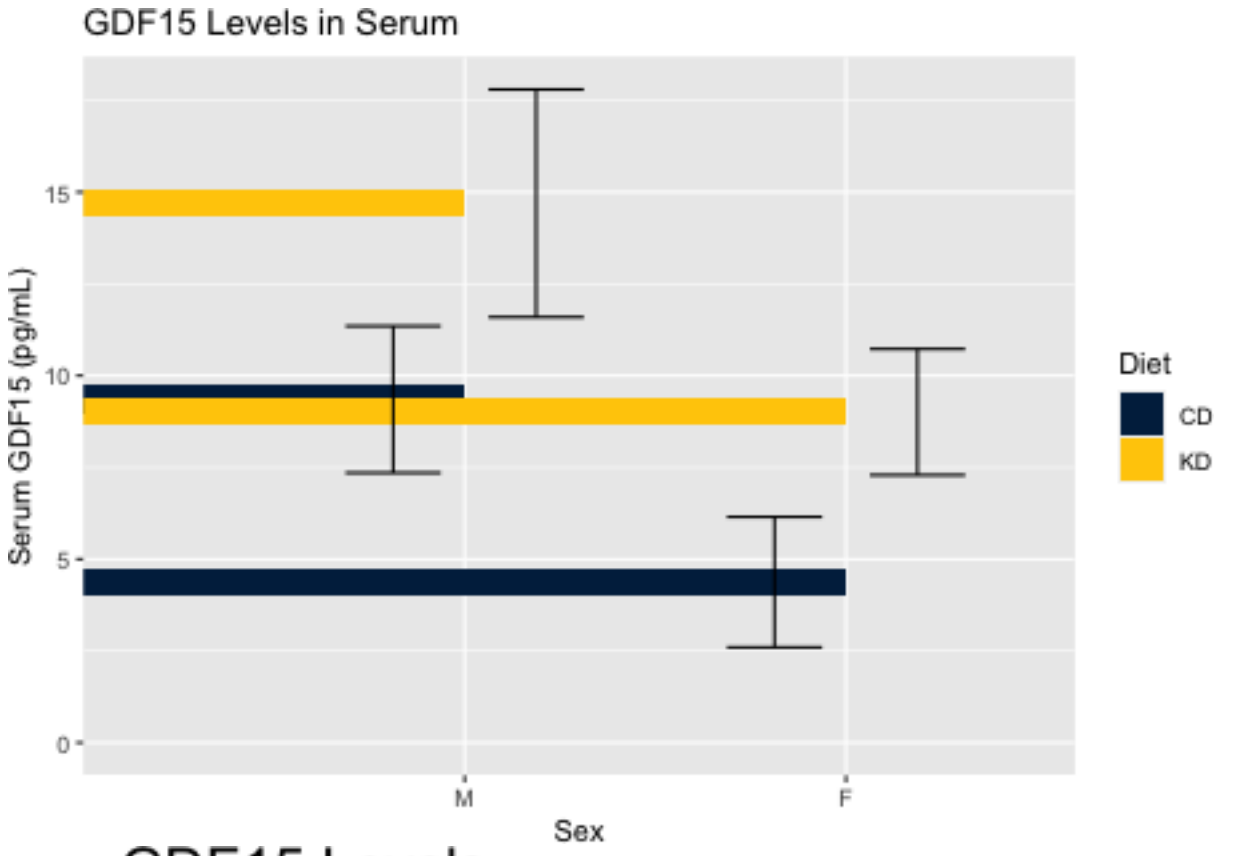
```
##
##  Two Sample t-test
##
## data:  Concentration by Diet
## t = -1, df = 18, p-value = 0.2
## alternative hypothesis: true difference in means is not equal to 0
## 95 percent confidence interval:
##  -49.6  11.4
## sample estimates:
## mean in group CD mean in group KD
##             31.2             50.3
```

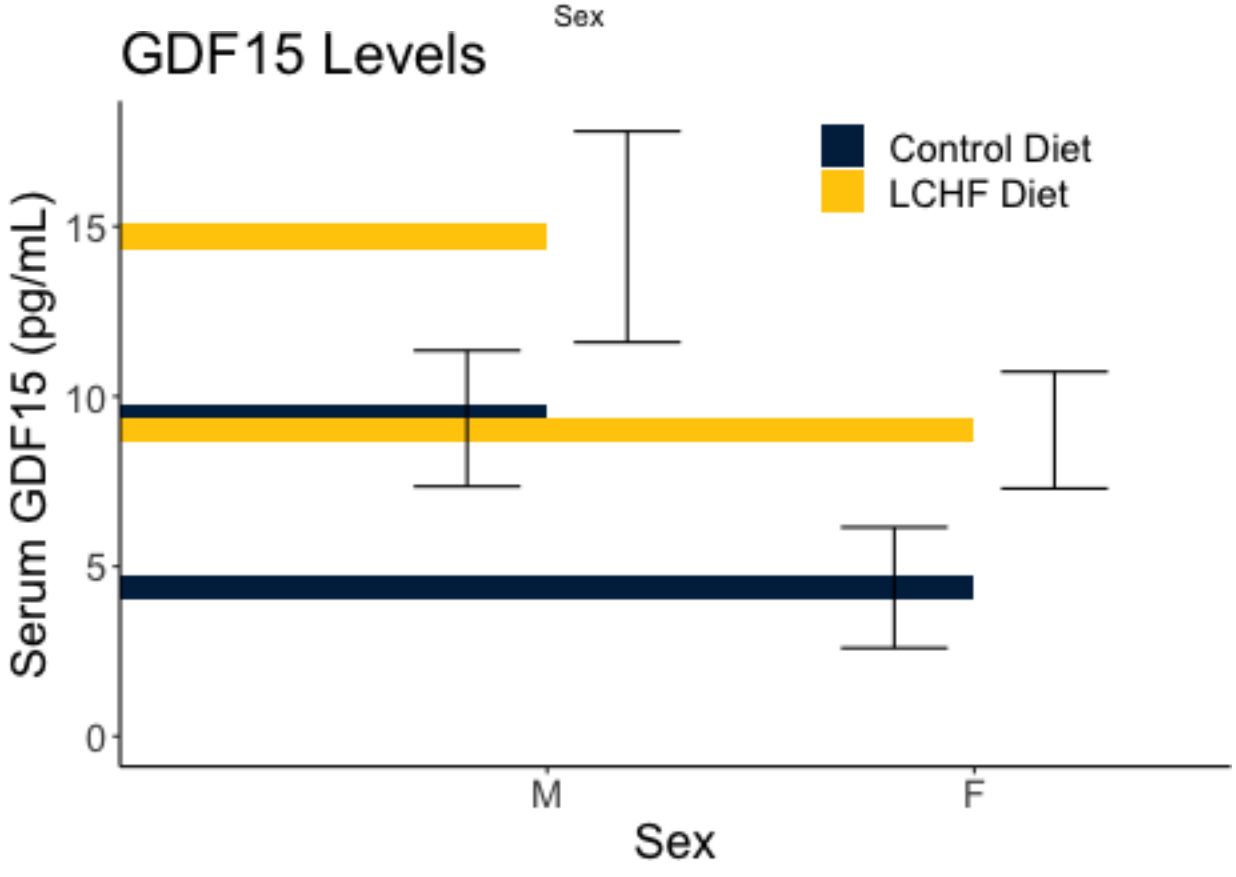
Table 1: Summary statistics for effects of a ketogenic diet

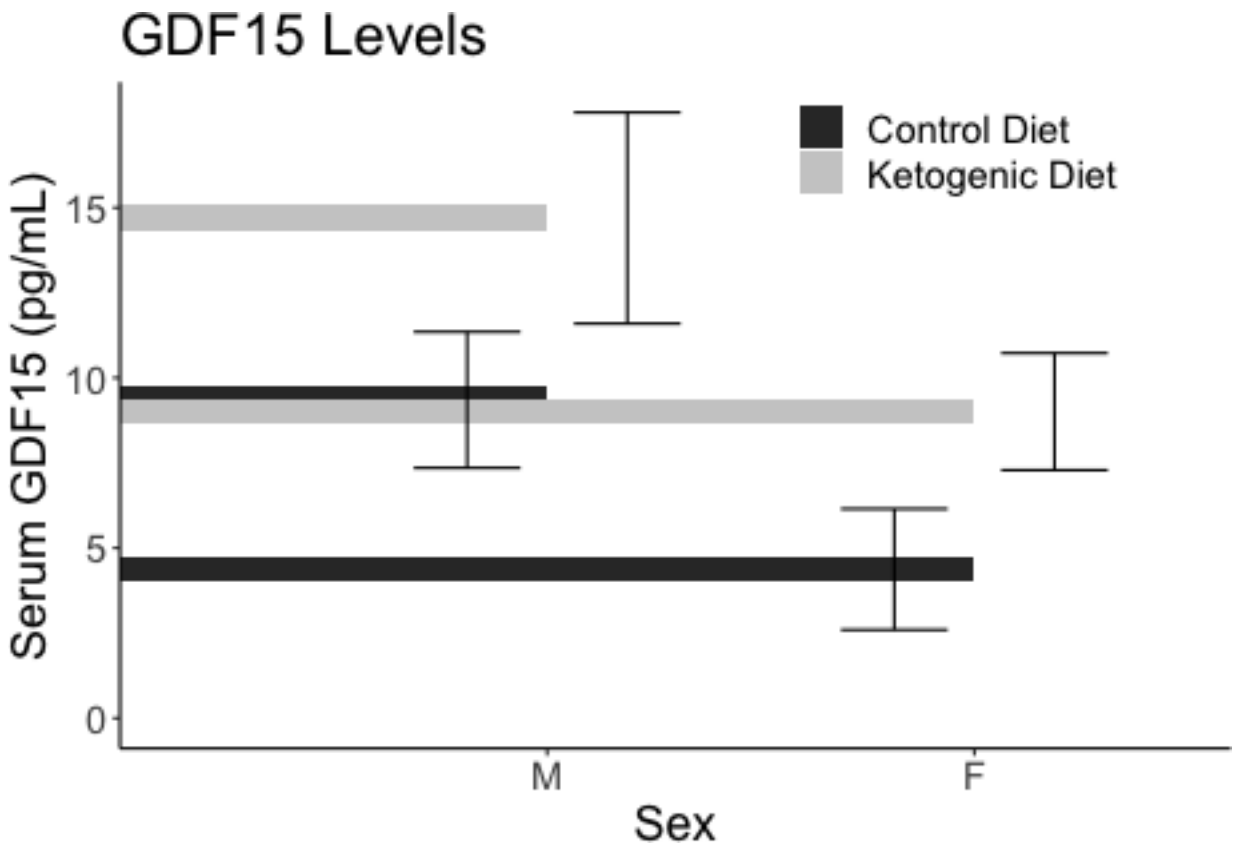
Diet	Sex	GDF15	Error	N
CD	M	9.35	2.00	7
CD	F	4.37	1.78	7
KD	M	14.70	3.10	13
KD	F	9.01	1.72	6

Table 2: ANOVA for effects of sex and ketogenic diet on GDF15 levels

term	estimate	std.error	statistic	p.value
(Intercept)	31.9	8.24	3.87	0.001
SexF	-18.0	9.25	-1.95	0.061
DietKD	18.0	9.15	1.97	0.058


GDF15 Levels in Serum
Serum GDF15 (pg/mL)
15
10
5
0
M
F
Sex
Diet
CD
KD


GDF15 Levels
Serum GDF15 (pg/mL)
15
10
5
0
M
F
Sex
Control Diet
LCHF Diet



We also separated the samples by cohort

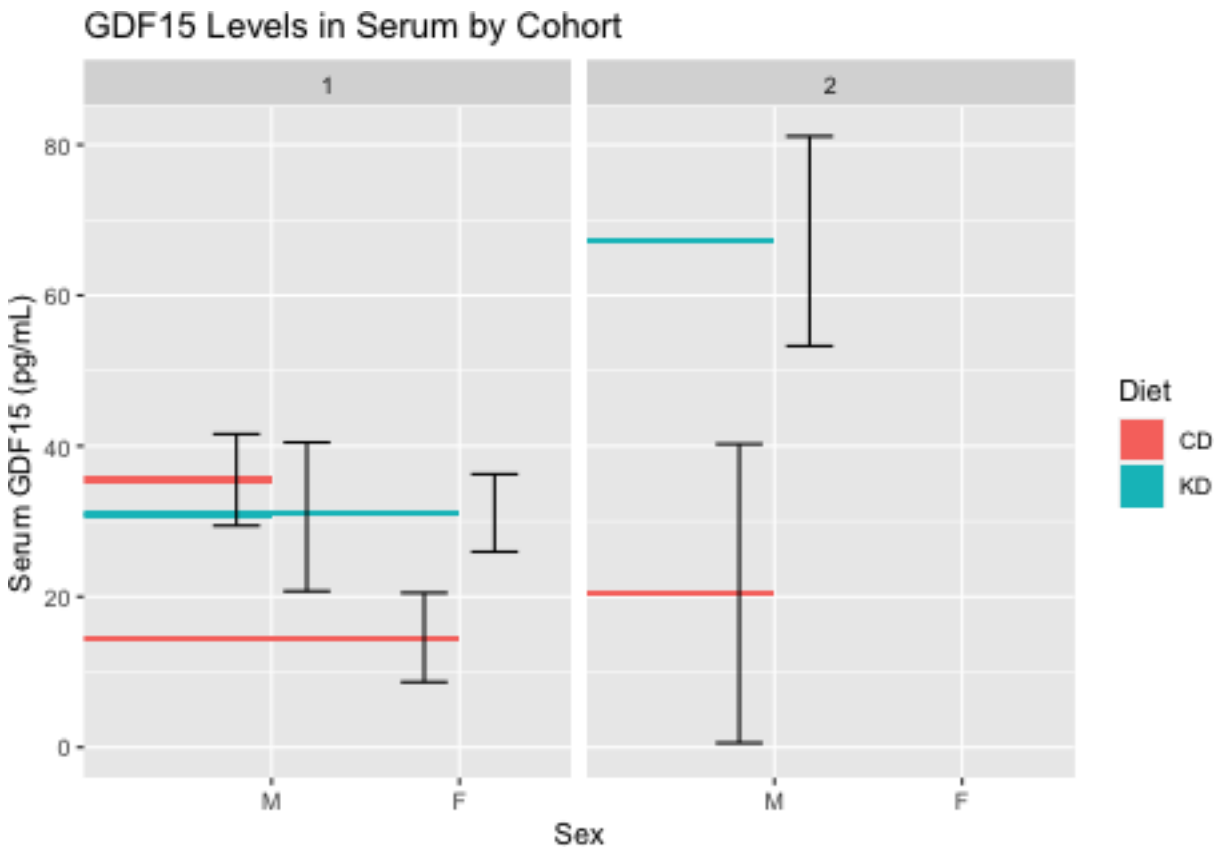
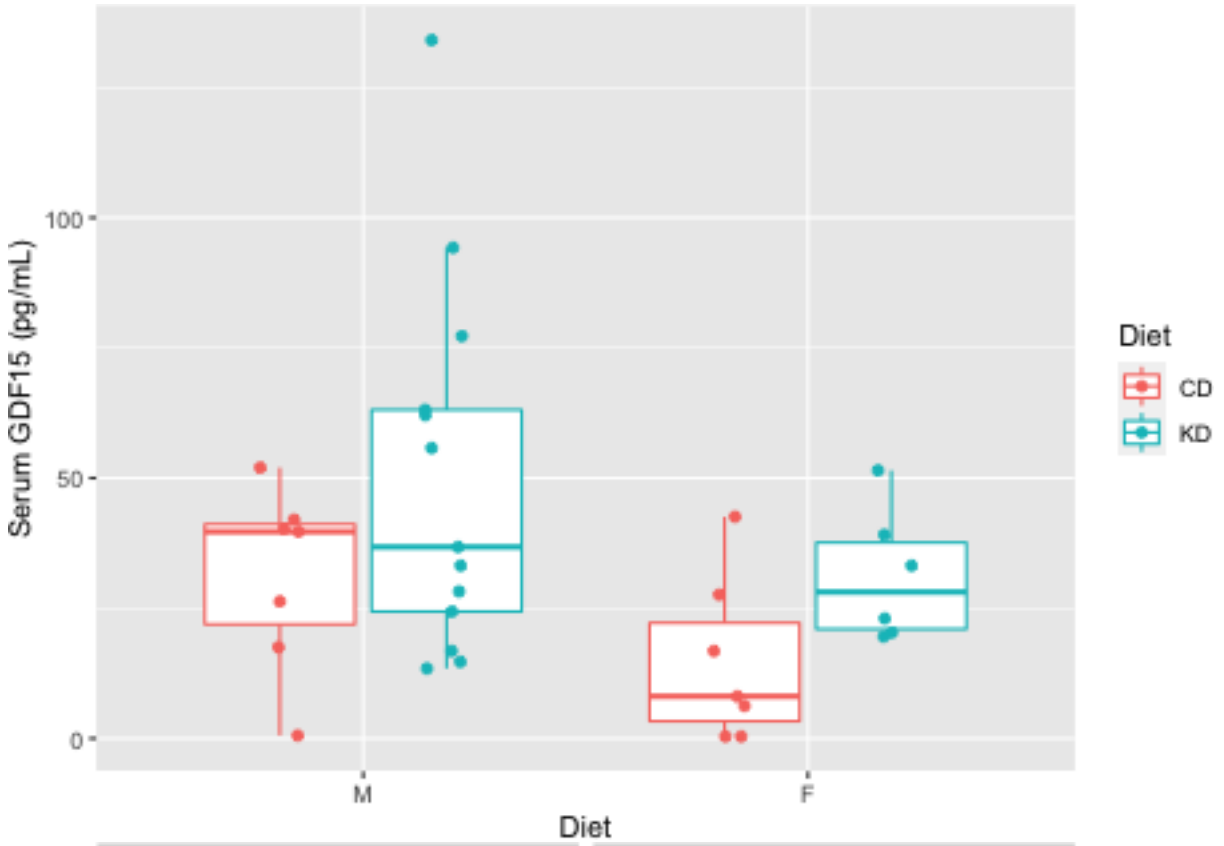
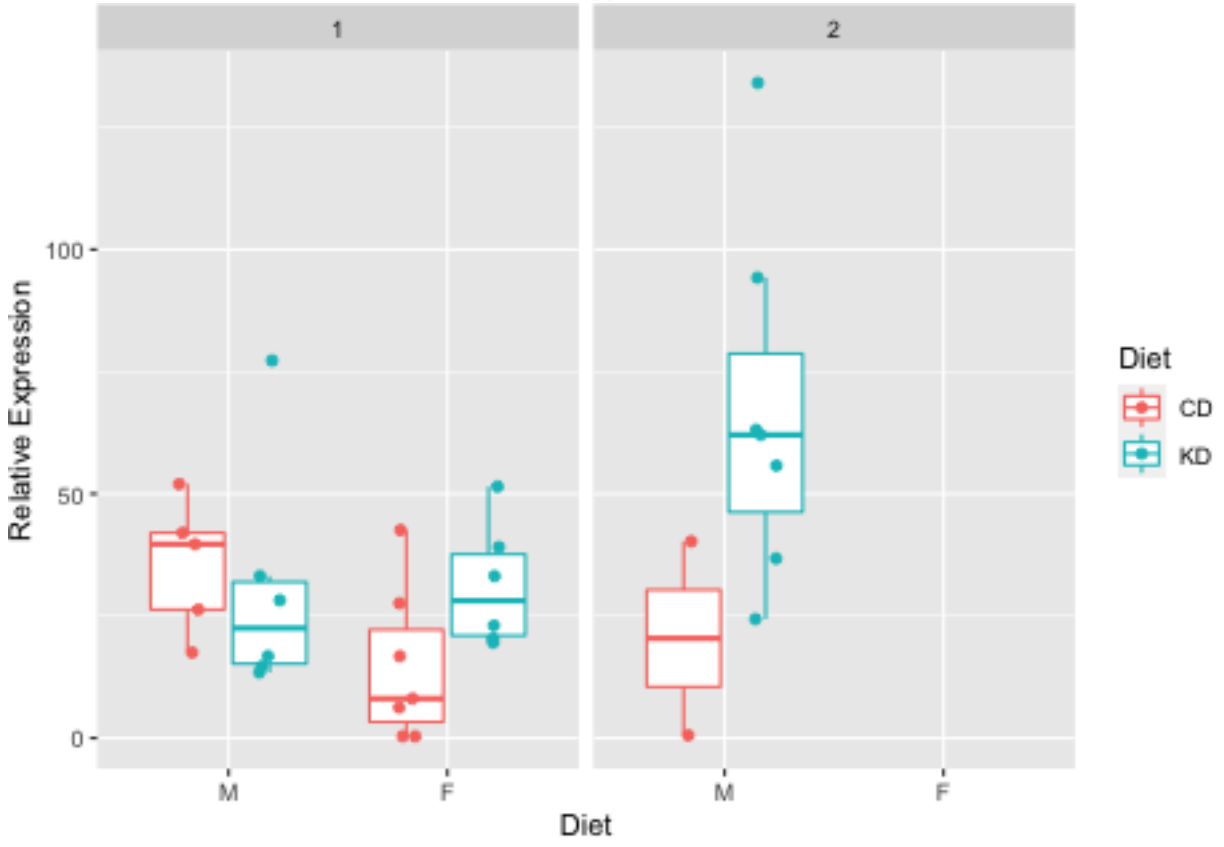


Figure 1: Effects of Ketogenic Diet on GDF15 Levels in Serum, Separated by Cohort


Serum GDF15 (pg/mL)
100
50
0
M
F
Diet
Diet
CD
KD


1
2
Relative Expression
100
50
0
M
F
M
F
Diet
Diet
CD
KD

5 Interpretation

There was a modest increase in serum GDF15 levels in the ketogenic diets for both sexes, inline with the liver RNAseq data. There is no clear effect of fasting on the GDF15 levels across both sexes, diets, and cohorts.

6 Session Information

```
sessionInfo()
```

```
## R version 3.6.3 (2020-02-29)
## Platform: x86_64-apple-darwin15.6.0 (64-bit)
## Running under: macOS Catalina 10.15.3
##
## Matrix products: default
## BLAS:   /Library/Frameworks/R.framework/Versions/3.6/Resources/lib/libRblas.0.dylib
## LAPACK: /Library/Frameworks/R.framework/Versions/3.6/Resources/lib/libRlapack.dylib
##
## locale:
## [1] en_US.UTF-8/en_US.UTF-8/en_US.UTF-8/C/en_US.UTF-8/en_US.UTF-8
##
## attached base packages:
## [1] stats     graphics  grDevices utils     datasets  methods   base
##
## other attached packages:
## [1] ggplot2_3.3.0.9000 broom_0.5.5        car_3.0-7          carData_3.0-3
## [5] forcats_0.5.0      readr_1.3.1        dplyr_0.8.5        tidyr_1.0.2
## [9] knitr_1.28
##
## loaded via a namespace (and not attached):
##  [1] zip_2.0.4         Rcpp_1.0.4        pillar_1.4.3      compiler_3.6.3
##  [5] cellranger_1.1.0  highr_0.8         tools_3.6.3       digest_0.6.25
##  [9] gtable_0.3.0      lattice_0.20-38   nlme_3.1-144      evaluate_0.14
## [13] lifecycle_0.2.0   tibble_2.1.3      pkgconfig_2.0.3   rlang_0.4.5
## [17] openxlsx_4.1.4    magick_2.3        curl_4.3          yaml_2.2.1
## [21] haven_2.2.0       xfun_0.12         rio_0.5.16        withr_2.1.2
## [25] stringr_1.4.0     generics_0.0.2    vctrs_0.2.4       hms_0.5.3
## [29] grid_3.6.3        tidyselect_1.0.0  glue_1.3.2        data.table_1.12.8
## [33] R6_2.4.1          readxl_1.3.1      foreign_0.8-75    rmarkdown_2.1
## [37] farver_2.0.3      purrr_0.3.3       magrittr_1.5      scales_1.1.0
## [41] backports_1.1.5   htmltools_0.4.0   assertthat_0.2.1  abind_1.4-5
## [45] colorspace_1.4-1  labeling_0.3      stringi_1.4.6     munsell_0.5.0
## [49] crayon_1.3.4
```