Chapter 8 And 9

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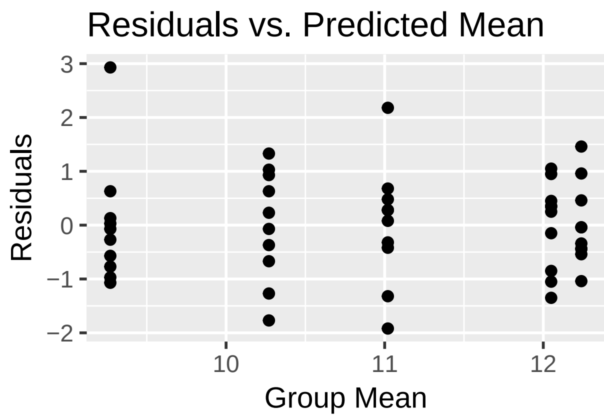
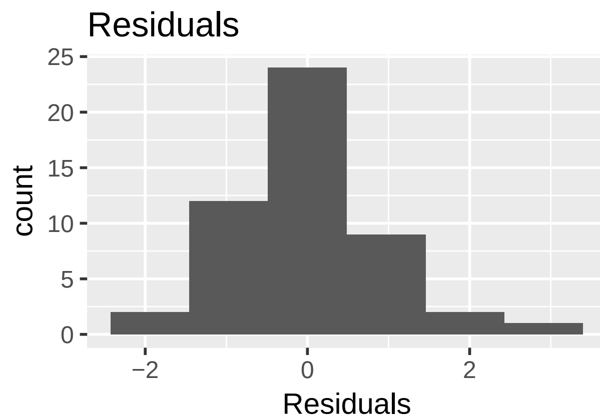
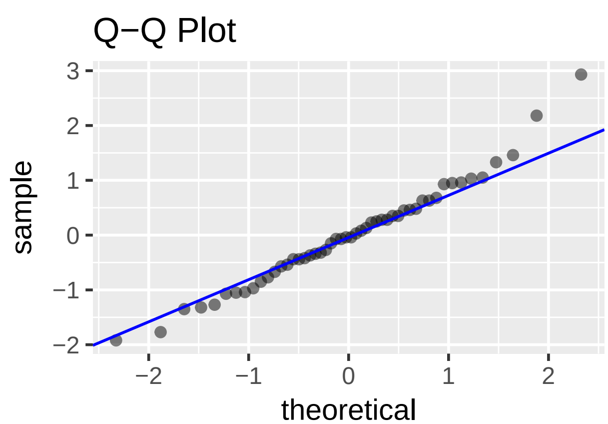
9.13 a) Checking the results from Proc Mixed in order to do ANOVA







9.13 b) Perform ANOVA test on the data: Show ANOVA Table First, then Run the Test

```
anova_mod
```

```
## Call:
##    aov(formula = wt_loss ~ treatment, data = gather_frame)
##
## Terms:
##                 treatment Residuals
## Sum of Squares     61.618    44.207
## Deg. of Freedom         4        45
##
## Residual standard error: 0.9911497
## Estimated effects may be unbalanced
```

```
summary(anova_mod)
```

```
##             Df Sum Sq Mean Sq F value   Pr(>F)
## treatment    4  61.62  15.404   15.68 4.16e-08 ***
## Residuals   45  44.21   0.982
## ---
```

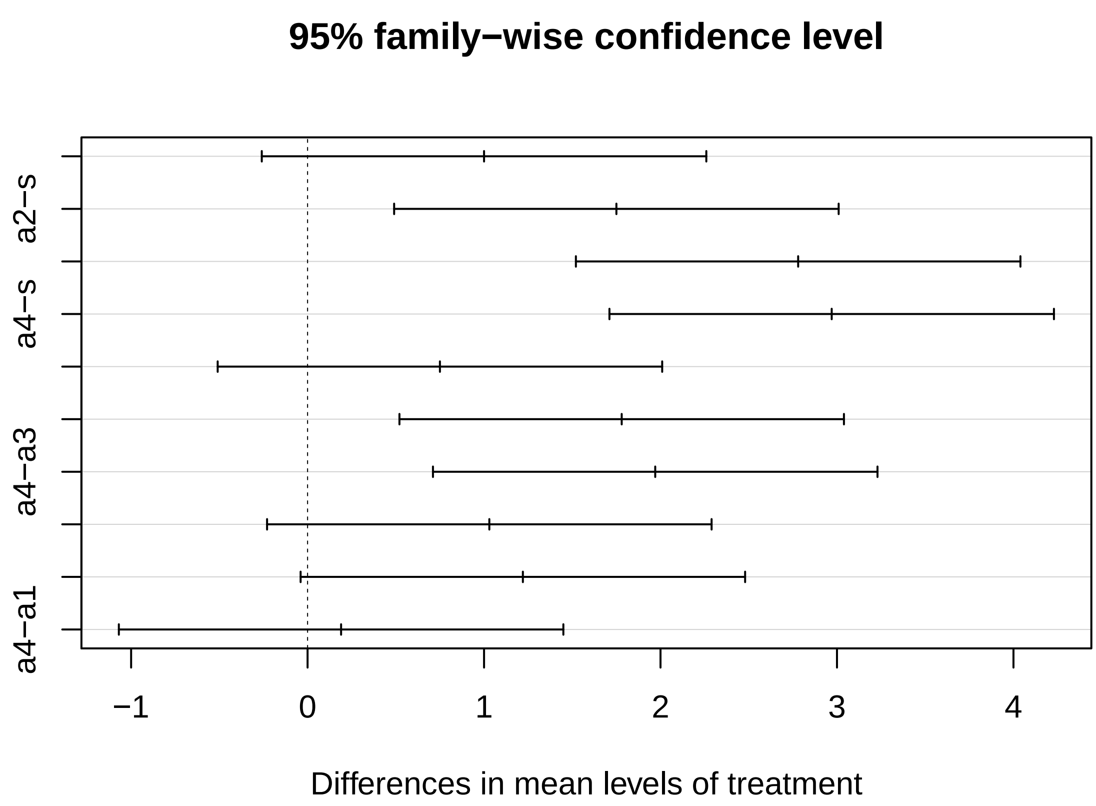
```
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
```

9.13 c) Perform Tukey's W on the significant pairs

```
real_w <- TukeyHSD(anova_mod, ordered = TRUE)
real_w$treatment
```

```
##       diff        lwr      upr        p adj
## a3-s  1.00 -0.2594887 2.259489 1.784060e-01
## a2-s  1.75  0.4905113 3.009489 2.428628e-03
## a1-s  2.78  1.5205113 4.039489 1.200843e-06
## a4-s  2.97  1.7105113 4.229489 2.780828e-07
## a2-a3 0.75 -0.5094887 2.009489 4.490082e-01
## a1-a3 1.78  0.5205113 3.039489 1.980323e-03
## a4-a3 1.97  0.7105113 3.229489 5.243121e-04
## a1-a2 1.03 -0.2294887 2.289489 1.563263e-01
## a4-a2 1.22 -0.0394887 2.479489 6.176067e-02
## a4-a1 0.19 -1.0694887 1.449489 9.927171e-01
```

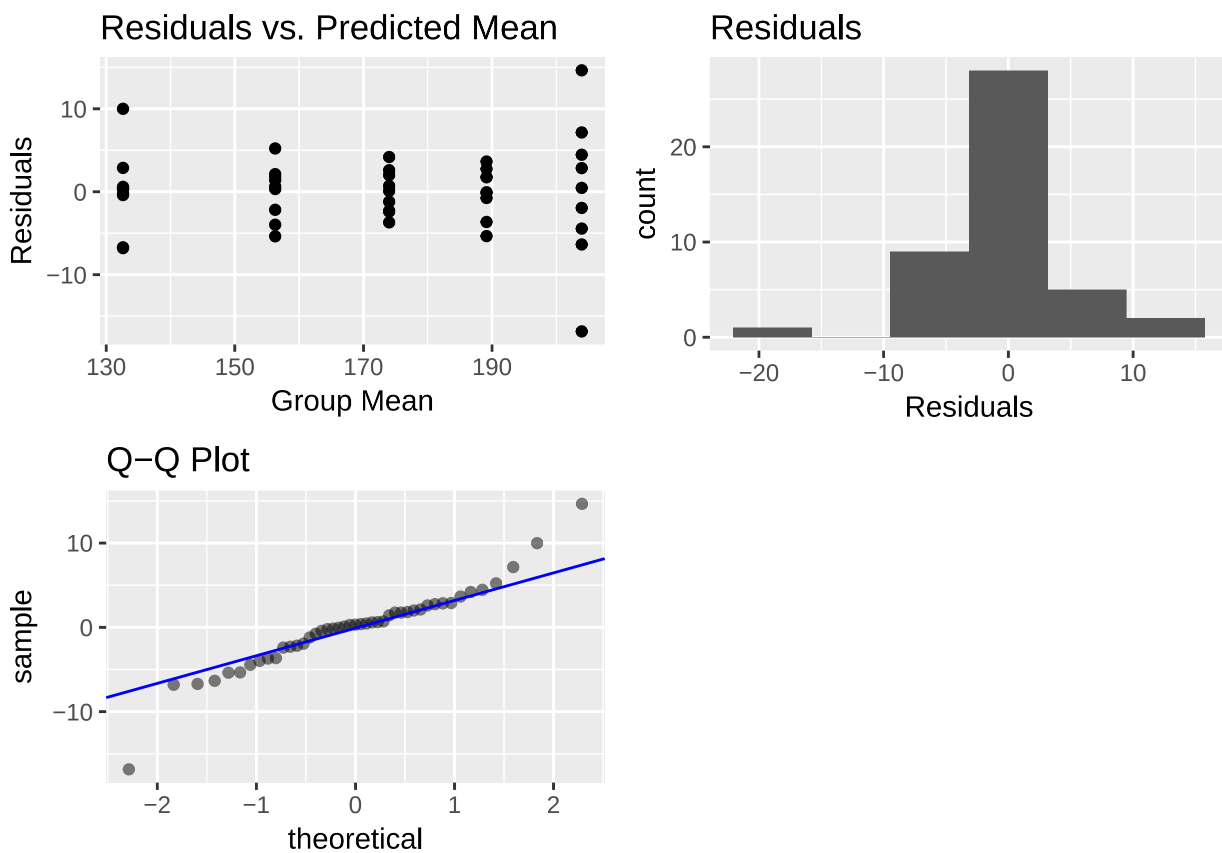
```
plot(real_w)
```



9.13 d) Use Dunnett's to see if any of the new agents have significantly larger mean weights loss as compared to the standard agent. alpha = 0.05

```
##
##   Simultaneous Tests for General Linear Hypotheses
##
## Multiple Comparisons of Means: User-defined Contrasts
##
```

```
##
## Fit: aov(formula = wt_loss ~ treatment, data = gather_frame)
##
## Linear Hypotheses:
##              Estimate Std. Error t value Pr(>|t|)
## a1 - s == 0   2.7800     0.4433   6.272   <0.001 ***
## a2 - s == 0   1.7500     0.4433   3.948   <0.001 ***
## a3 - s == 0   1.0000     0.4433   2.256    0.093 .
## a4 - s == 0   2.9700     0.4433   6.700   <0.001 ***
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
## (Adjusted p values reported -- single-step method)
```



b) Perform an Anova

```
anova_lenses
```

```
## Call:
##    aov(formula = lov ~ Supplier, data = gather_lenses)
##
## Terms:
##                  Supplier Residuals
## Sum of Squares  28024.350  1053.789
## Deg. of Freedom         4        40
##
## Residual standard error: 5.132711
## Estimated effects may be unbalanced
```

```r
summary(anova_lenses)
```

```
##             Df Sum Sq Mean Sq F value Pr(>F)    
## Supplier     4  28024    7006   265.9 <2e-16 ***
## Residuals   40   1054      26                   
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
```

c) Run a Kruskal-Wallis

```r
kw_lenses <- kruskal.test(lov ~ Supplier, data = gather_lenses)
kw_lenses
```

```
## 
##  Kruskal-Wallis rank sum test
## 
## data:  lov by Supplier
## Kruskal-Wallis chi-squared = 41.596, df = 4, p-value = 2.023e-08
```

```r
kw_lenses$statistic
```

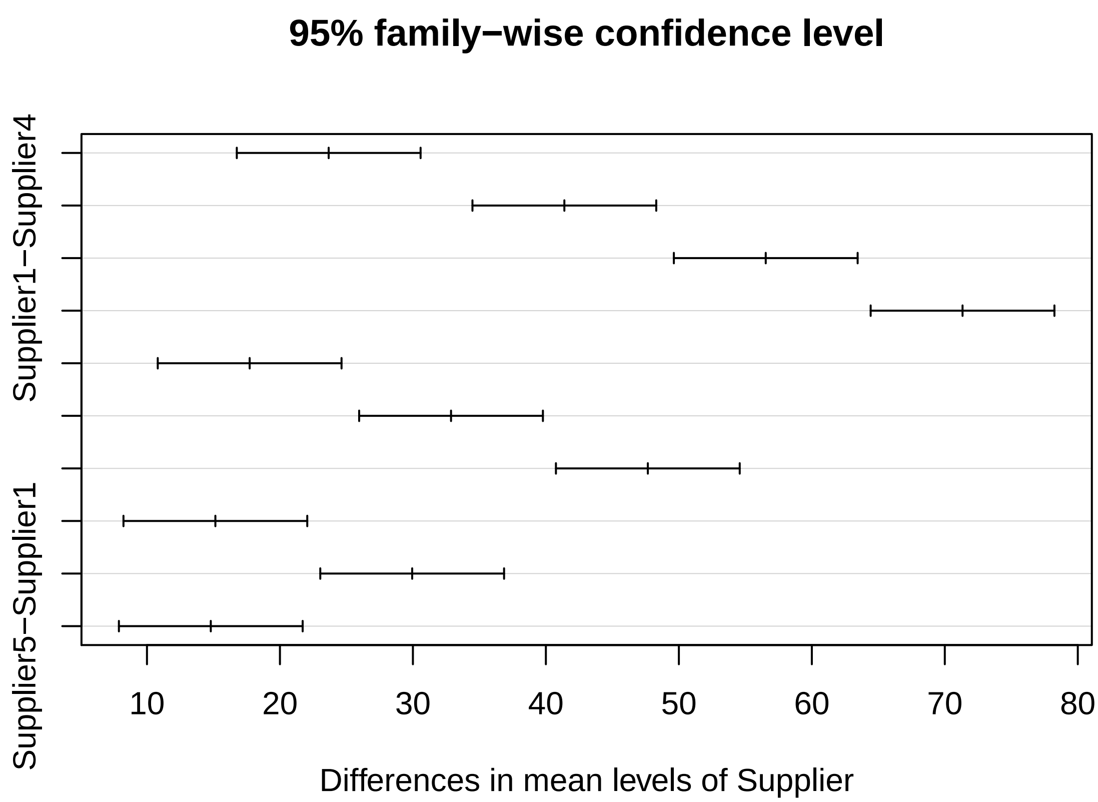
```
## Kruskal-Wallis chi-squared 
##                    41.5963
```

d) Use Tukey's W to find out which pairs are significantly different.

```r
real_lenses <- TukeyHSD(anova_lenses, ordered = TRUE)
real_lenses$treatment
```

```
## NULL
```

```r
plot(real_lenses)
```




```
real_lenses$Supplier
```

```
##                           diff       lwr      upr        p adj
## Supplier3-Supplier4 23.66667 16.756116 30.57722 3.656697e-11
## Supplier2-Supplier4 41.38889 34.478338 48.29944 4.636291e-13
## Supplier1-Supplier4 56.53333 49.622783 63.44388 4.636291e-13
## Supplier5-Supplier4 71.33333 64.422783 78.24388 4.636291e-13
## Supplier2-Supplier3 17.72222 10.811672 24.63277 6.520741e-08
## Supplier1-Supplier3 32.86667 25.956116 39.77722 4.682921e-13
## Supplier5-Supplier3 47.66667 40.756116 54.57722 4.636291e-13
## Supplier1-Supplier2 15.14444  8.233894 22.05499 1.978429e-06
## Supplier5-Supplier2 29.94444 23.033894 36.85499 5.020429e-13
## Supplier5-Supplier1 14.80000  7.889450 21.71055 3.129018e-06
```

f) Run a KW pairwise comparison on the different suppliers to see if there's a difference in variability of power

```
ranks_1 <- c(39,32, 33, 28, 29, 34, 35, 31, 36)
ranks_2 <- c(19, 20, 21, 22, 23, 24, 25, 26, 27)
ranks_3 <- c(10, 11, 12, 13, 14, 15, 16, 17, 18)
ranks_4 <- c(1, 2, 3, 4, 5, 6, 7, 8, 9)
ranks_5 <- c(38, 39, 30, 40, 41, 42, 43, 44, 45)
ranks_table = data.frame(cbind(ranks_1, ranks_2, ranks_3, ranks_4, ranks_5))
colnames(ranks_table) <- c("Ranks_Group1", "Ranks_Group2", "Ranks_Group3", "Ranks_Group4", "Ranks_Group5
```