

13_2_Tukey_Test

Michael Sullivan

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Using Base R

EXAMPLE 3: Tukey's Test

Enter the data into R using the `c(...)` command or load the data into R using `read.csv`. To run ANOVA in R, the data must be in two columns with one column containing the factor or treatment and the other column containing the value of the response variable. Suppose we need to enter the data into R. Proceed as follows:

```
cojet <- c(15.4,12.9,17.2,16.6,19.3)
silistor <- c(17.2,14.3,17.6,21.6,17.5)
cimara <- c(5.5,7.7,12.2,11.4,16.4)
ceramic <- c(11,12.4,13.5,8.9,8.1)

ANOVA_data <- data.frame('Outcome' = c(cojet, silistor, cimara, ceramic), 'Treatment'
= as.factor(rep(c('Cojet', 'Silistor', 'Cimara', 'Ceramic Repair'), each = 5)))

# NOTE: The command "each = 5" means each factor repeats five times.

head(ANOVA_data,n=7)

##      Outcome Treatment
## 1      15.4      Cojet
## 2      12.9      Cojet
## 3      17.2      Cojet
## 4      16.6      Cojet
## 5      19.3      Cojet
## 6      17.2 Silistor
## 7      14.3 Silistor
```

Now run Tukey's Test.

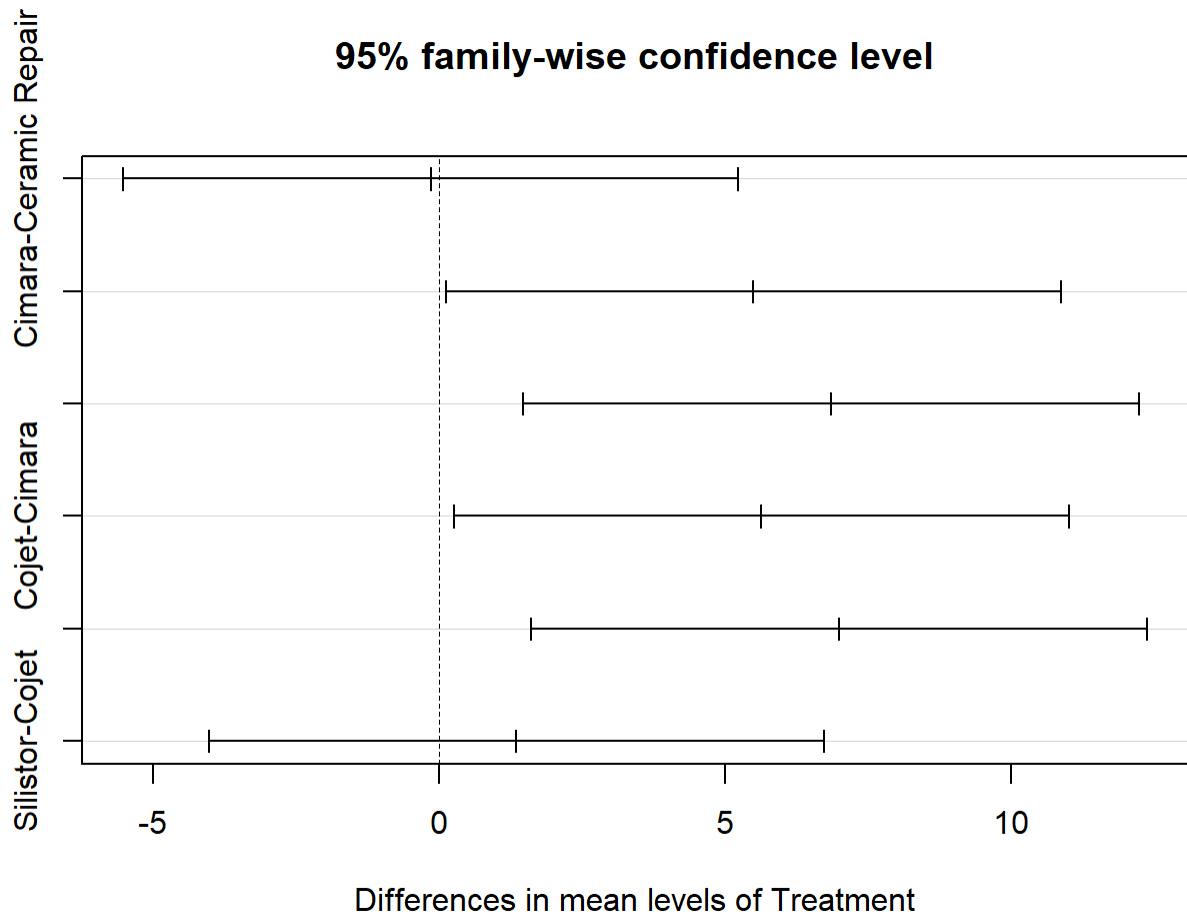
```
aov_object <- aov(Outcome~Treatment,data=ANOVA_data)
TukeyHSD(aov_object,conf.level=0.95)

##      Tukey multiple comparisons of means
##      95% family-wise confidence level
```

```
##
## Fit: aov(formula = Outcome ~ Treatment, data = ANOVA_data)
##
## $Treatment
##           diff      lwr      upr    p adj
## Cimara-Ceramic Repair  -0.14 -5.5184129  5.238413 0.9998452
## Cojet-Ceramic Repair    5.50  0.1215871 10.878413 0.0441472
## Silistor-Ceramic Repair  6.86  1.4815871 12.238413 0.0104582
## Cojet-Cimara            5.64  0.2615871 11.018413 0.0382068
## Silistor-Cimara         7.00  1.6215871 12.378413 0.0089909
## Silistor-Cojet          1.36 -4.0184129  6.738413 0.8863043
```

If you want to plot the results of Tukey's Test, use the following:

```
tukey <- TukeyHSD(aov_object, conf.level=0.95)
plot(tukey)
```



Using Mosaic

Install the Mosaic package, if necessary, using the command

```
install.packages("mosaic")
```

You do not need to run a one-way ANOVA prior to running Tukey's Test with the Mosaic package.

```
library(mosaic)
TukeyHSD(Outcome~Treatment,data=ANOVA_data,conf.level=0.95)
##   Tukey multiple comparisons of means
##     95% family-wise confidence level
##
## Fit: aov(formula = x)
##
## $Treatment
##              diff          lwr          upr      p adj
## Cimara-Ceramic Repair -0.14 -5.5184129  5.238413 0.9998452
## Cojet-Ceramic Repair   5.50  0.1215871 10.878413 0.0441472
## Silistor-Ceramic Repair 6.86  1.4815871 12.238413 0.0104582
## Cojet-Cimara           5.64  0.2615871 11.018413 0.0382068
## Silistor-Cimara        7.00  1.6215871 12.378413 0.0089909
## Silistor-Cojet         1.36 -4.0184129  6.738413 0.8863043
```

If you want to plot the results of Tukey's Test, use the following:

```
tukey <- TukeyHSD(aov_object,conf.level=0.95)
mplot(tukey)
```

95% family-wise confidence level

