

Untitled

Kah Meng Soh

1/29/2022

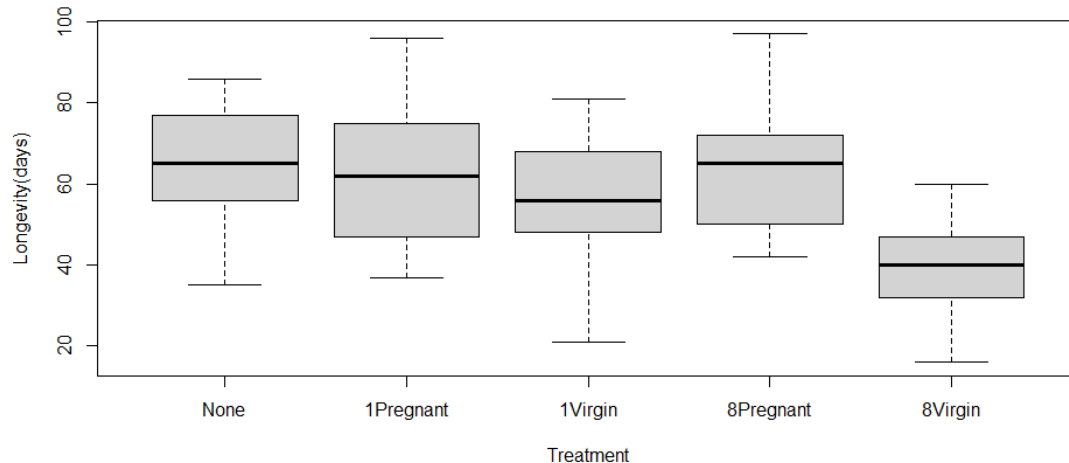
```
data=read.table("http://www.stat.umn.edu/~gary/book/fcdae.data/pr3.2",header=
TRUE)
attach(data)
trt=as.factor(trt)
m=lm(days~trt)
summary(m)

##
## Call:
## lm(formula = days ~ trt)
##
## Residuals:
##      Min       1Q   Median       3Q      Max
## -35.76  -8.76   0.20  11.20  32.44
##
## Coefficients:
##              Estimate Std. Error t value Pr(>|t|)
## (Intercept)   63.360     2.962   21.394 < 2e-16 ***
## trt2          0.200     4.188    0.048  0.962
## trt3          1.440     4.188    0.344  0.732
## trt4         -6.600     4.188   -1.576  0.118
## trt5        -24.640     4.188   -5.883 3.73e-08 ***
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Residual standard error: 14.81 on 120 degrees of freedom
## Multiple R-squared:  0.3121, Adjusted R-squared:  0.2892
## F-statistic: 13.61 on 4 and 120 DF,  p-value: 3.516e-09

#Null hypothesis = all group mean is same, reproductive activity does not
affect longevity
#Alternative hypothesis = some group mean is not same, reproductive activity
does affect longevity
#We see that the p-value of the F score is small at 0.000433 therefore we
have enough evidence to reject null hypothesis and conclude that the mean is
not same.

#Display data as side by side boxplot
None = data$days[which(data$trt==1)]
Pregnant1= data$days[which(data$trt==2)]
Virgin1=data$days[which(data$trt==3)]
Pregnant8=data$days[which(data$trt==4)]
```

```
Virgin8=data$days[which(data$trt==5)]
boxplot(None,Pregnant1,Pregnant8,Virgin1,Virgin8,ylab="Longevity(days)",xlab=
"Treatment",names=c("None","1Pregnant","1Virgin","8Pregnant","8Virgin"))
```



#We see that even the graphical visualization support that the mean is not same, hence reproductive activity does affect the Longevity (days) of male flies

#We know and can calculate from the coefficient of the model that the estimate mean of treatment 1,2,3,4, and 5 is 63.36,63.56,64.8,56.76, and 38.72 respectively, the estimated grand mean is 57.44. Therefore the estimated treatment effect of 1 is 63.36-57.44=5.92.

#For the 95% confidence interval of treatment effect 1.
 anova(m)

```
## Analysis of Variance Table
##
## Response: days
##           Df Sum Sq Mean Sq F value    Pr(>F)
## trt         4  11939  2984.82   13.612 3.516e-09 ***
## Residuals 120   26314    219.28
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
```

#We need the mean square for error which is 219.28

#The t value

```
qt(0.025,120,lower.tail=FALSE)
```

```
## [1] 1.97993
```

```
Lowerboundary = 5.92 - 1.97993*(2.6489)
```

```
Upperboundary = 5.92 + 1.97993*(2.6489)
```

```
CI=c(Lowerboundary,Upperboundary)
CI
```

```
## [1] 0.6753634 11.1646366
```

```
#To create a 95% confidence interval on the contrast  $\mu_1-\mu_4$ , coefficient (1,0,0,-1,0)
```

```
#Point estimate of  $\mu_1-\mu_4$  is 63.36-56.76=6.6
```

```
#T value with 120 df is 1.97993
```

```
#MSE is 219.28, square root of MSE is 14.808
```

```
#Square root of  $\sum(\text{weight}^2/n_i)=(1/25+1/25)^{0.5}= 0.2828$ 
```

```
#Standard Error of Contrast =  $14.808*0.2828=4.1877$ 
```

```
Lowerboundary = 6.6 - 1.97993*(4.1877)
```

```
Upperboundary = 6.6 + 1.97993*(4.1877)
```

```
CI=c(Lowerboundary,Upperboundary)
```

```
CI
```

```
## [1] -1.691353 14.891353
```

```
#To study if longevity of male flies supplied with pregnant companions is different from male flies with virgin companions. Consider the contrast weight coefficient (0,0.5,-0.5,0.5,-0.5)
```

```
#Null hypothesis: Longevity is same:  $(\mu_2+\mu_4)/2 - (\mu_3+\mu_5)/2 = 0$ 
```

```
#Alternative hypothesis: Longevity is not the same  $(\mu_2+\mu_4)/2 - (\mu_3+\mu_5)/2 \neq 0$ 
```

```
#Point estimate of  $(\mu_2+\mu_4)/2 - (\mu_3+\mu_5)/2$  is 8.4
```

```
#T value with 120 df is  $(8.4-0)/(14.808*0.2)=2.8363$ 
```

```
2*pt(2.8363,120,lower.tail=FALSE)
```

```
## [1] 0.005358702
```

```
#The p-value is 0.005358702, therefore we have enough evidence to reject the null hypothesis that the longevity is the same for both group.
```