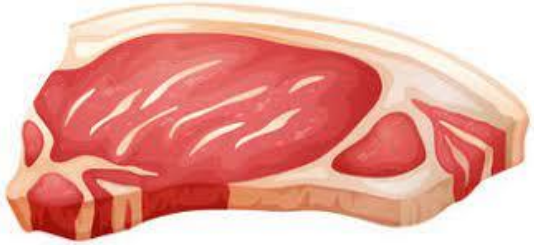
Can pigs benefit from vitamin supplements?

Ethan Scott & Daniel Girvitz



Data

Weight - Weight in Kg

Feed - Cumulated feed intake in Kg

Time - Time (in weeks) in the experiment

Pig - Factor; id of each pig

Evit - Factor; vitamin E dose

Cu - Factor, copper dose

Start - Start weight in experiment, i.e. weight at week 1.

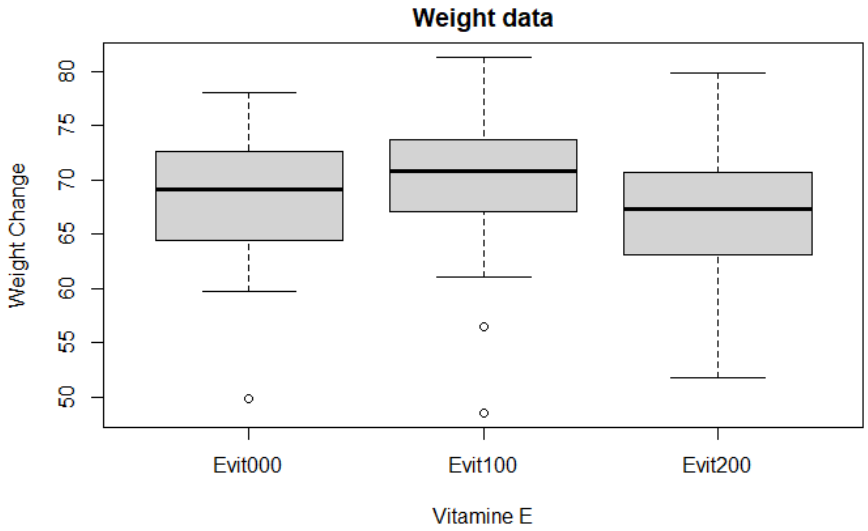
Litter - Factor, id of litter of each pig

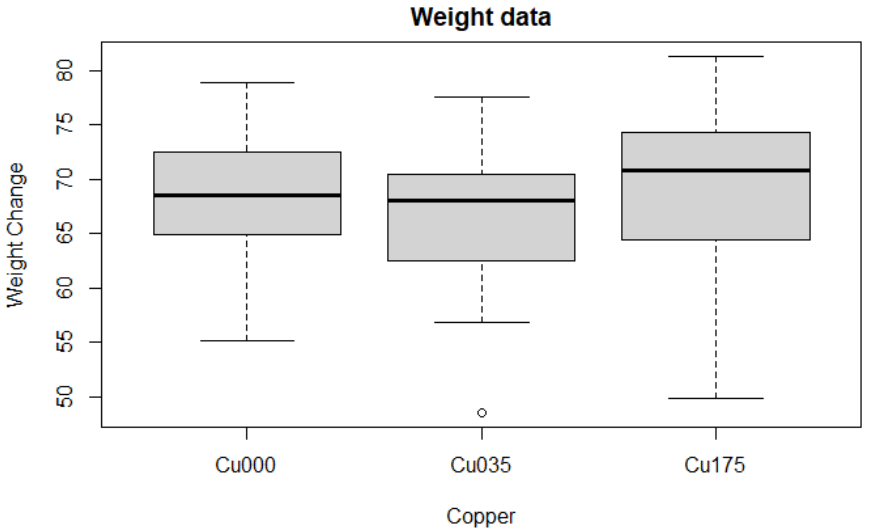
Weight change - change in weight from week 1 to week 11 (week 11 is used as some pigs do not have data for week 12)

Data assumptions

1. Amount of feed (in kg) eaten by pigs is negligible
2. Genetic predispositions among individual pigs and between litters is negligible

Boxplots


Weight data
Weight Change
50
55
60
65
70
75
80
Evit000
Evit100
Evit200
Vitamine E


Weight data
Weight Change
50
55
60
65
70
75
80
Cu000
Cu035
Cu175
Copper

ANOVA

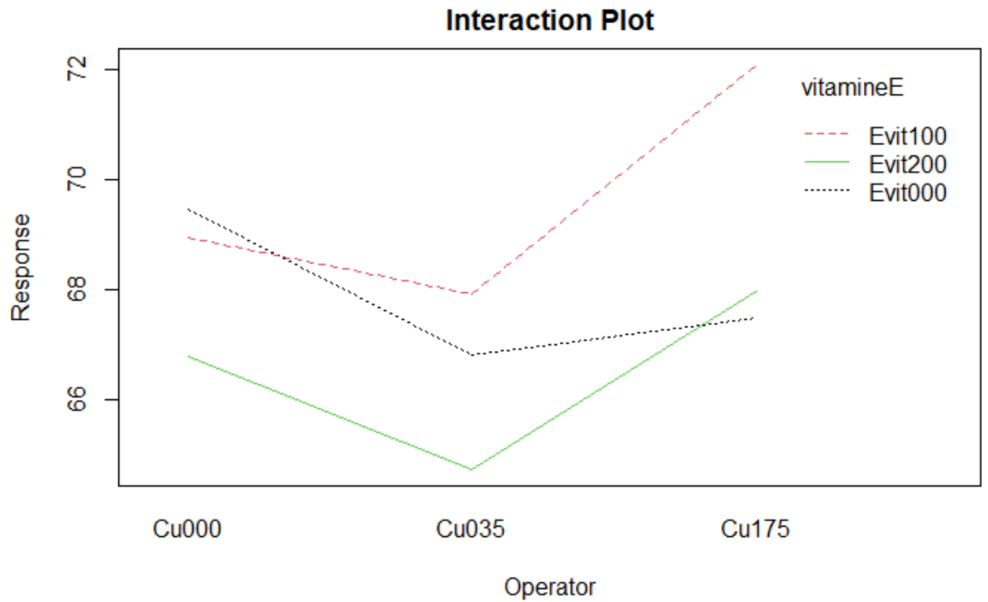
H0: Equality of treatment means
Ha: Inequality of at least one treatment mean

```r
#ANOVA
weight.aov=aov(weight_change~vitamineE+copper+vitamineE:copper)
summary(weight.aov)
```

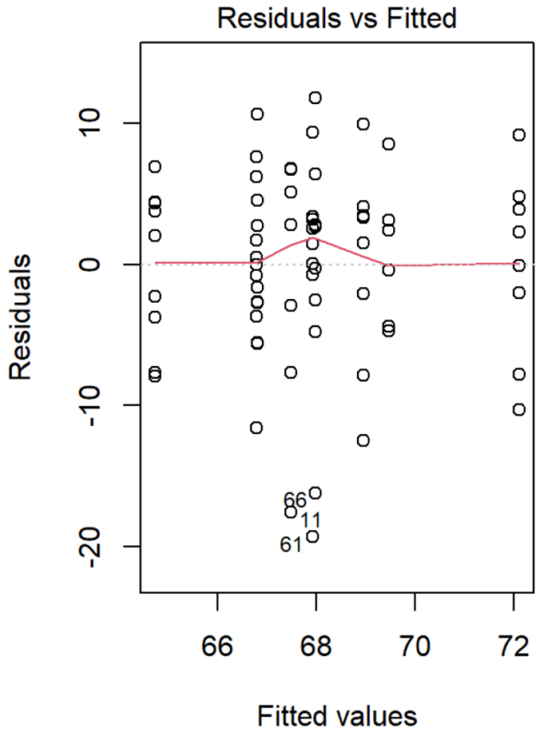
```
                Df Sum Sq Mean Sq F value Pr(>F)
vitamineE        2  127.9   63.94   1.318  0.275
copper           2   94.3   47.16   0.972  0.384
vitamineE:copper 4   55.3   13.83   0.285  0.887
Residuals       63 3055.7   48.50
```

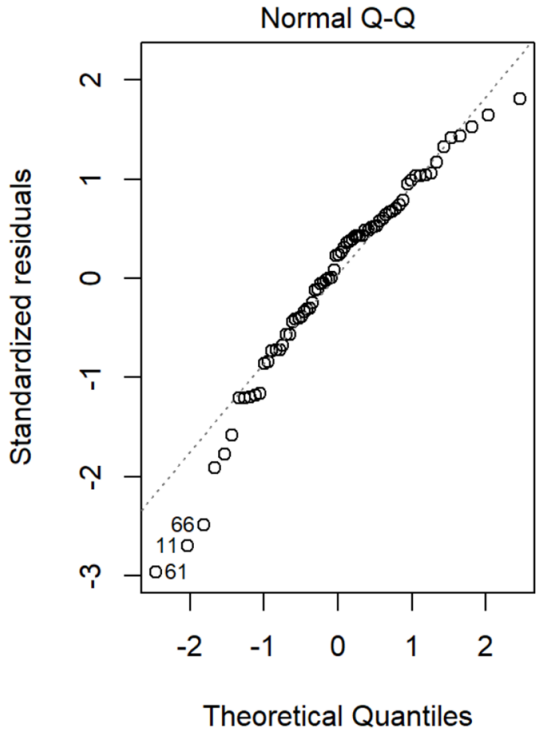
Interactions

```r
interaction.plot(x.factor=copper, trace.factor=vitamineE, response=weight_change,col=1:20,
                 xlab="Operator",
                 ylab="Response",
                 main="Interaction Plot")
```



Diagnostic Plots






```{r}
shapiro.test(weight_change)
```

```
        Shapiro-Wilk normality test

data:  weight_change
W = 0.96921, p-value = 0.07455
```

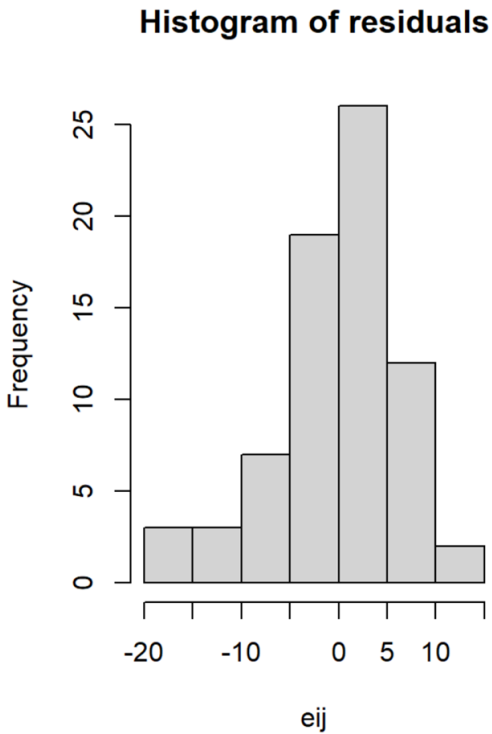
```{r}
library(DescTools)
LeveneTest(weight_change~vitamineE, data=eData)
```

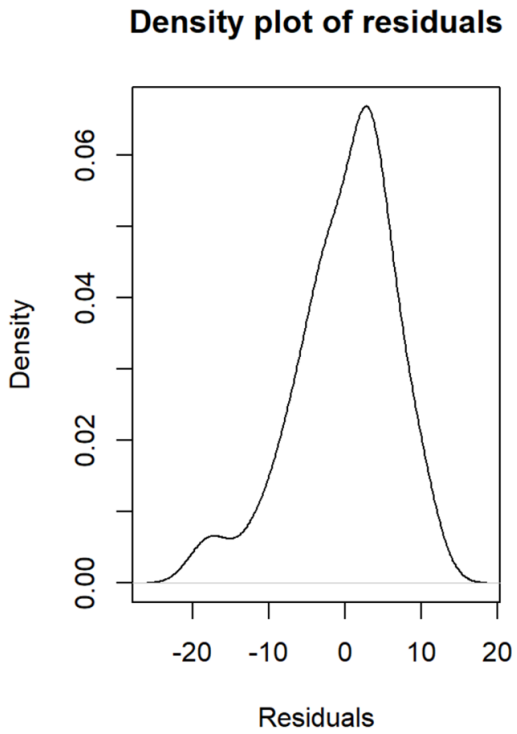
```
Levene's Test for Homogeneity of Variance (center = median)
      Df F value Pr(>F)
group  2  0.0479 0.9533
      69
```

```{r}
LeveneTest(weight_change~copper, data=eData)
```

```
Levene's Test for Homogeneity of Variance (center = median)
      Df F value Pr(>F)
group  2  0.4773 0.6225
      69
```

Residuals






```{r}
shapiro.test(weight_change)
```

```
        Shapiro-Wilk normality test

data:  weight_change
W = 0.96921, p-value = 0.07455
```

Fisher LSD Test

```{r}
PostHocTest(weight.aov, method="lsd")
```

```
  Posthoc multiple comparisons of means : Fisher LSD
    95% family-wise confidence level

$vitamineE
                     diff    lwr.ci    upr.ci   pval
Evit100-Evit000  1.805984 -2.255043 5.8670115 0.3776
Evit200-Evit000 -1.420519 -5.441603 2.6005662 0.4828
Evit200-Evit100 -3.226503 -7.203717 0.7507113 0.1100

$copper
                   diff    lwr.ci   upr.ci   pval
Cu035-Cu000 -1.8693361 -5.890421 2.151749 0.3564
Cu175-Cu000  0.8363921 -3.224635 4.897420 0.6821
Cu175-Cu035  2.7057281 -1.271486 6.682942 0.1788
```

Tukey HSD Test

```r
PostHocTest(weight.aov, method="hsd")
```

```
  Posthoc multiple comparisons of means : Tukey HSD
    95% family-wise confidence level

$vitamineE
                     diff    lwr.ci   upr.ci   pval
Evit100-Evit000  1.805984 -3.071958 6.683926 0.6494
Evit200-Evit000 -1.420519 -6.250483 3.409445 0.7609
Evit200-Evit100 -3.226503 -8.003771 1.550766 0.2443

$copper
                   diff   lwr.ci   upr.ci   pval
Cu035-Cu000 -1.8693361 -6.69930 2.960628 0.6241
Cu175-Cu000  0.8363921 -4.04155 5.714334 0.9110
Cu175-Cu035  2.7057281 -2.07154 7.482996 0.3682
```

Conclusion

We can conclude that there is no significant difference in weight change of the pigs due to the intake of Vitamin E or Copper. In STAT 425 terms, we FTR the null hypothesis (H0) of equality of treatment means.