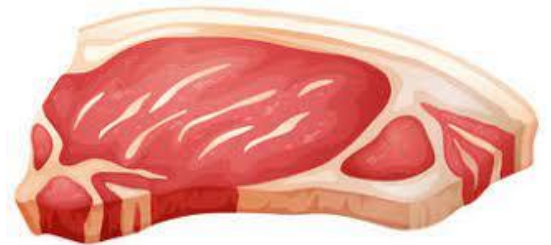


Can pigs benefit from vitamin supplements?

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)

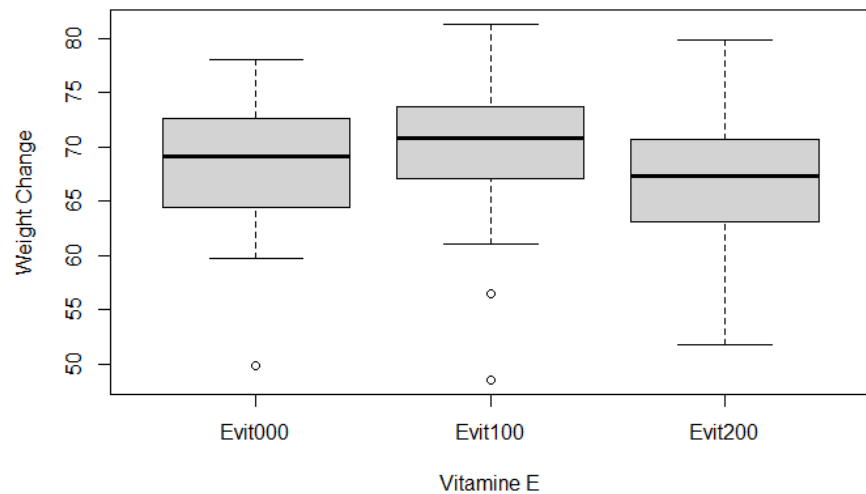


Data assumptions

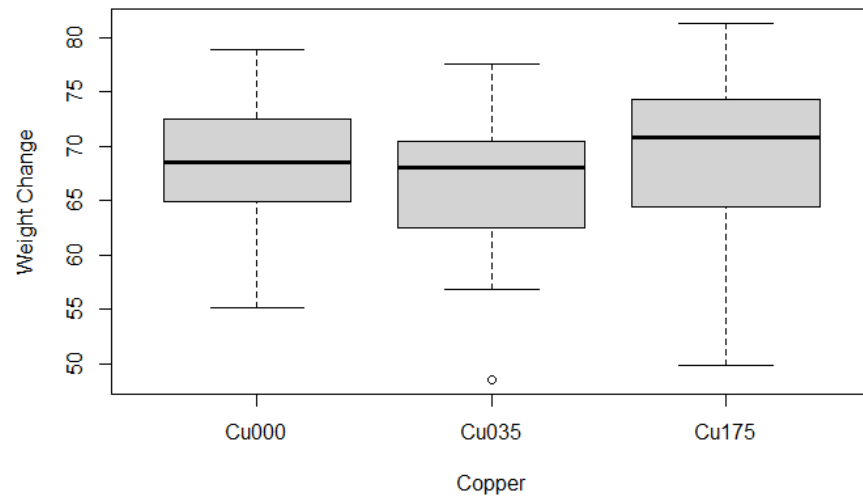
1. Amount of feed (in kg) eaten by pigs is negligible
2. Genetic predispositions among individual pigs and between litters is negligible

Boxplots

Weight data



Weight data



ANOVA

H0: Equality of treatment means

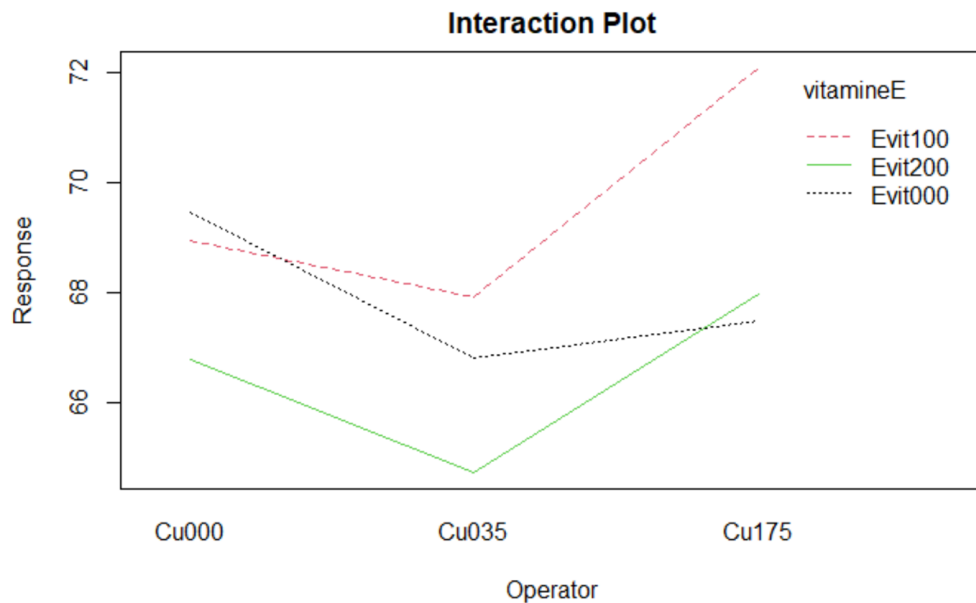
Ha: Inequality of at least one treatment mean

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

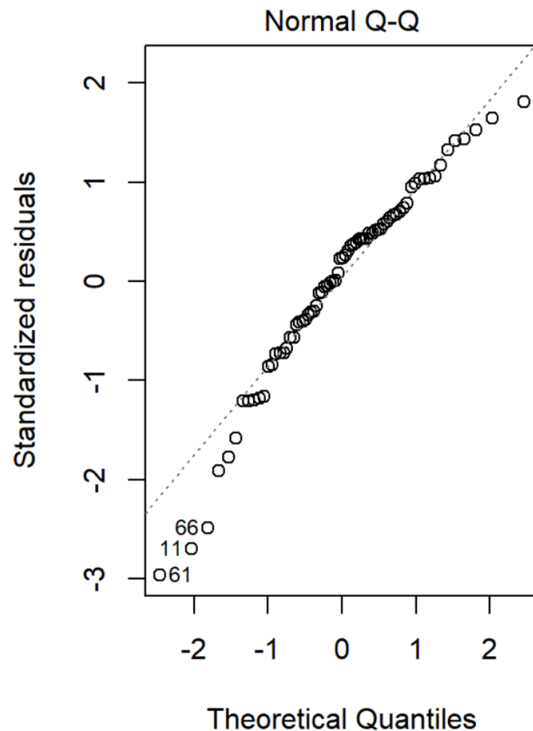
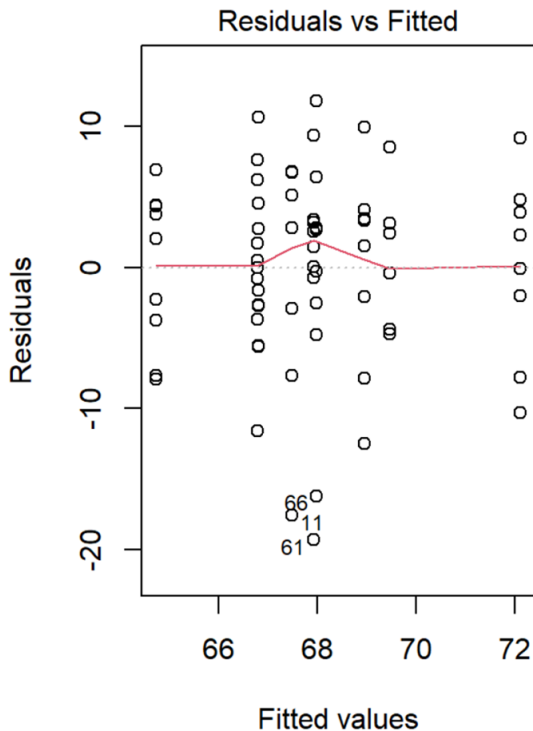
	Df	Sum Sq	Mean Sq	F value	Pr(>F)
vitamineE	2	127.9	63.94	1.318	0.275
copper	2	94.3	47.16	0.972	0.384
vitamineE:copper	4	55.3	13.83	0.285	0.887
Residuals	63	3055.7	48.50		

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		

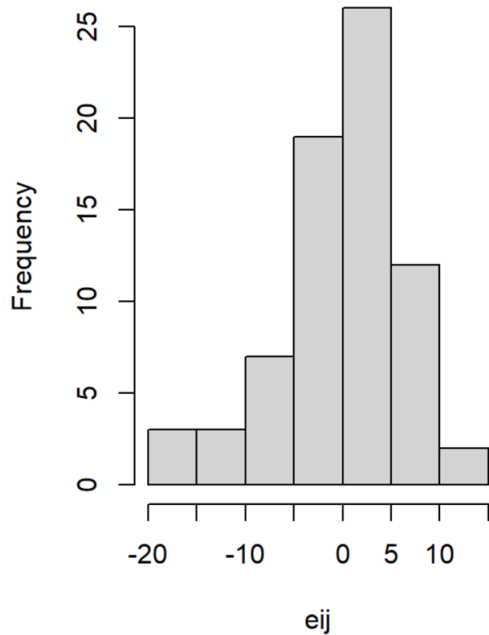
```
{r}  
LeveneTest(weight_change~copper, data=eData)
```

Levene's Test for Homogeneity of Variance (center = median)

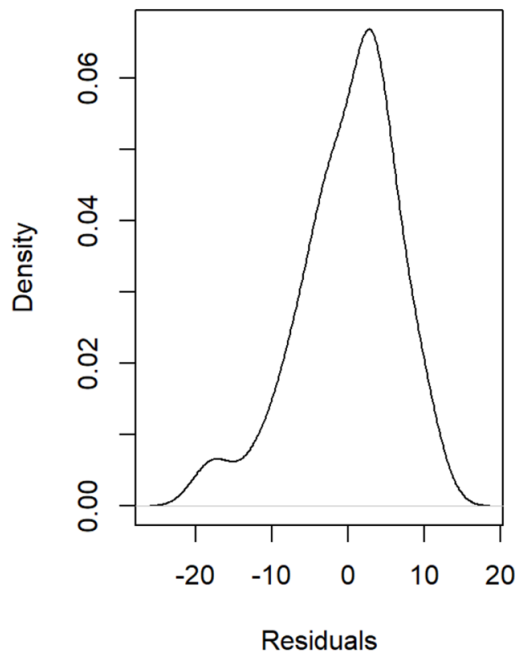
	Df	F value	Pr(>F)
group	2	0.4773	0.6225
	69		

Residuals

Histogram of residuals



Density plot of 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 (H_0) of equality of treatment means.