

MSCI 718 Pair Assignment 1

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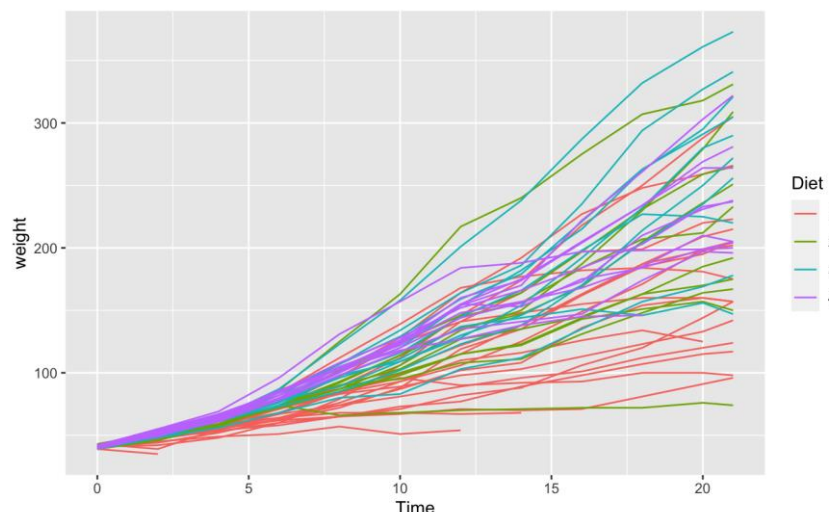
Our friend recently got into raising chickens, and has been trying out 4 different diets on 50 different chicks over a period of 3 weeks. In this assignment, we will identify the effect of the diets on chick weight after 20 days through exploratory data analysis. We will first summarize the data, followed by visualizing and interpreting the relationship between weight and diets, calculating confidence intervals for mean weight at two time spots (Day 0 and Day 20), and finally make conclusions based on the evidence from the analysis.

Data

The dataset describes the weight of early-growth chicks on 4 experimental diets from Day 0 to Day 21 on alternate day intervals, with 578 observations of 4 variables: weight (weight of chicks in grams: from 35 to 373 with a mean of 121.8), Time (number of days since birth: from day 0 up to day 21), which are both numerical data (weight is continuous and Time is an integer), Chick (the unique identifier of each chick: 1 to 50), Diet (the diet received: 1,2,3,4), which are both factors with respective levels. The data comes with no missing values and gaps and thus data cleaning is not required.

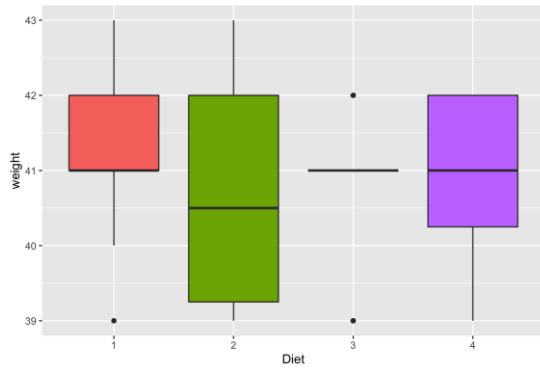
Analysis

Figure 1 shows the change of weights over time for all diets. Visual inspection of the plot indicates that all 4 diets have changed the chicken's weights after 20 days. In particular, Diet 3 chicks generally have a larger increase in weight over time than the other diets, while the increase on Diet 1 chicks are relatively flatter than the others. We then proceed to examine the weight of chicks on Day 0 and Day 20 of the experiment.

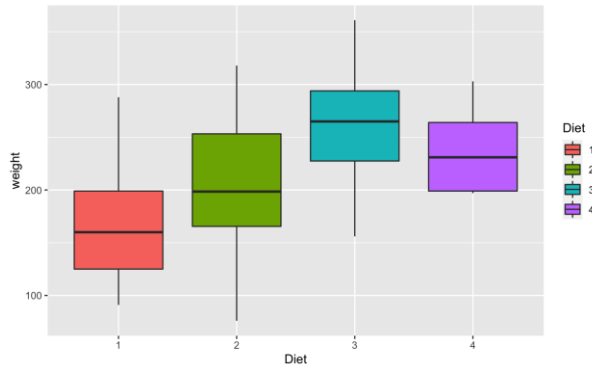


(Figure 1)

Figure 2 shows the boxplot of the weight of the chicks on Day 0 grouped by Diet. This shows the weight distribution of all chicks before they were given any diet. The initial weight of the chicks ranges from 39 to 42 grams. Diet 2 chicks have relatively dispersed weight whilst Diet 3 chicks are less dispersed compared among the 4 diets. The median of all 4 diets are similar, which indicates that it is not likely that there are differences between the 4 groups.



(Figure 2)



(Figure 3)

Figure 3 shows the similar boxplot of the weight of the chicks on Day 20 grouped by Diet, in which all the chicks have gone through 20 days of the experimental diet. Assuming that other environmental conditions were maintained for all chicks across diets, the difference in distributions between Day 0 and Day 20 plot shows the effect of each diet on chicks. The dispersion of weight among the 4 diets are now quite similar. All 4 diets have changed the chicken's weights after 20 days shown in (Figure 7) in Appendix. However, the median of all 4 diets is no longer similar, which indicates that there is likely to be a difference between the 4 groups. Diet 3 has obviously the highest increase among the 4 diets, followed by Diet 4 and Diet 2, and lastly Diet 1. This is similar to the visual observation in Figure 1. We then further examine the interpretation by calculating the confidence intervals of weights on both days.

##	Time	Diet	weight.upper	weight.mean	weight.lower
##					
##	1 0	1	41.9	41.4	40.9
##	2 0	2	41.8	40.7	39.6
##	3 0	3	41.5	40.8	40.1
##	4 0	4	41.8	41	40.2
##	5 20	1	199.	170.	142.
##	6 20	2	256.	206.	155.
##	7 20	3	306.	259.	212.
##	8 20	4	263.	234.	205.

(Figure 5)

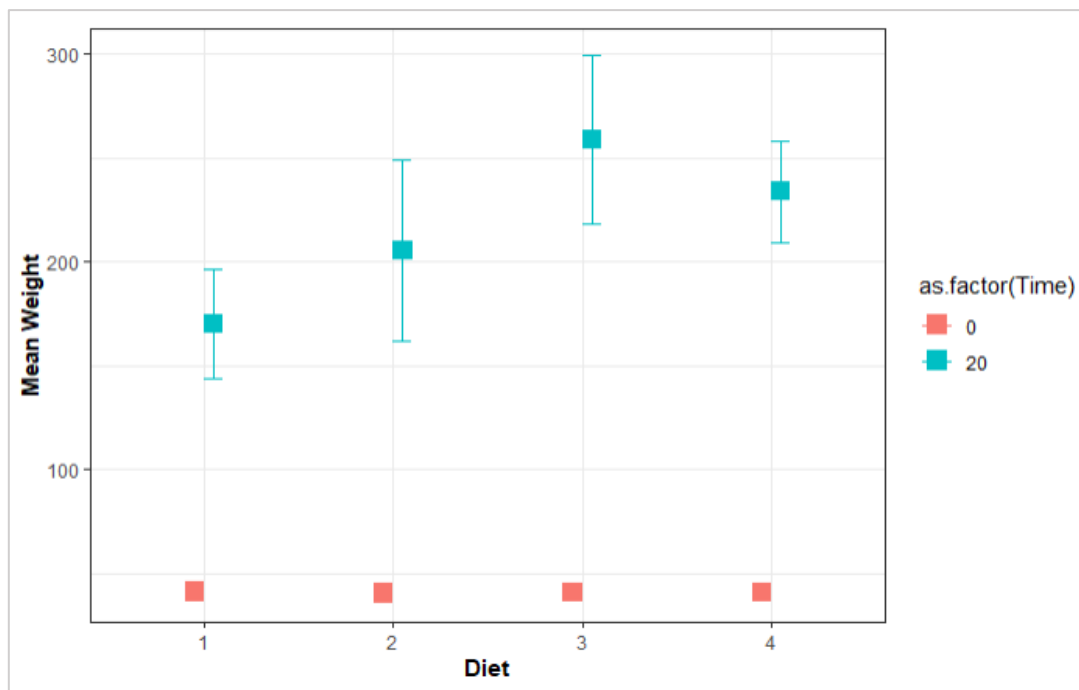
Figure 5 shows the combined table of 95% confidence intervals for mean weight at Day 0 and 20 for each diet. As in line with the above analysis, at a similar weight level on Day 0, chicks on all 4 diets have shown an increase in weight over the 20 days. Diet 3 has the highest increase of mean weight among the 4 diets on Day 20, followed by Diet 4 and Diet 2, and Diet 1. Referring to the line chart (with 95% CI) in (Figure 6) shown in Appendix where diet 1 has the least amount of (mean) weight gain and diet 3 has the highest amount weight gain.

Conclusion

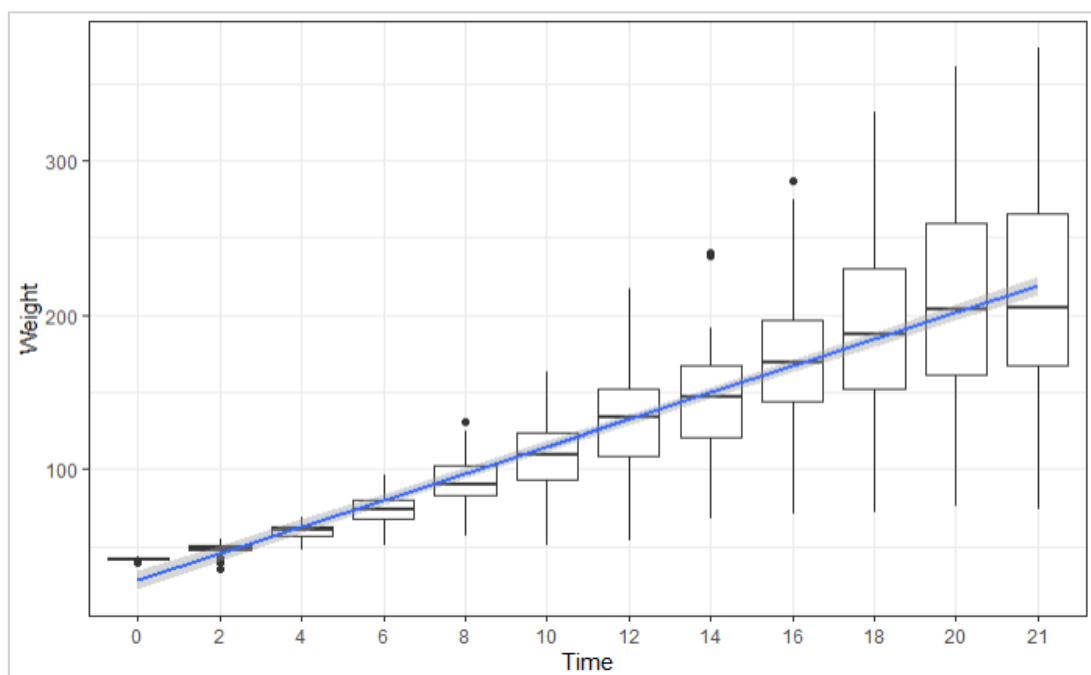
We carried out an exploratory data analysis to summarize the dataset and answer the question of concern. We can conclude that these 4 diets do changed the chicken's weights after 20 days, where the Diet 3 has outperformed the other 3 diets in terms of maximum weight achieved.

Appendix – Working file

A separate .Rmd file has been attached showing the full details of all workings.



(Figure 6)



(Figure 7)