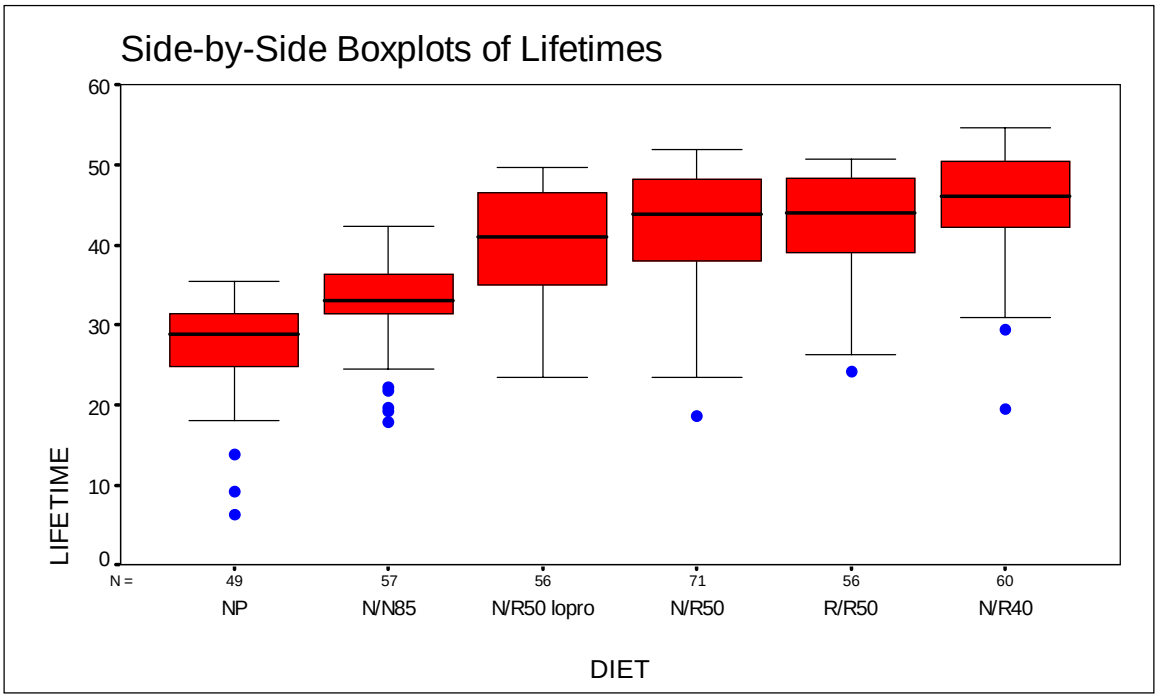
4. Displaying the Lifetimes

Graphical displays of the data can be very helpful for understanding the information contained in the data. We will visualize the effects of diet restriction on lifetimes of the mice by obtaining the side-by-side boxplots for the six treatment groups, and line chart of survival rate over time for the groups.

4.1 SPSS produces the following side-by-side boxplots of lifetimes for the six treatment groups:



The positions of medians indicate that the median life span was shortest for NP mice, longer for N/N85 mice, even longer for N/R50 lopro mice and longest for the three other restricted groups N/R50, R/R50, and N/R40. The same conclusions can be reached about the maximum life span by examining the positions of the upper whiskers in the above boxplots. Therefore, it looks that appropriate dietary restriction of mice can increase mean and maximum life span.

Notice some differences in the variation of the lifetimes for the six groups. The variability is very small for the mice with no diet restrictions (NP) and the mice with normal diet (N/N85), but it is much larger for the remaining four diet

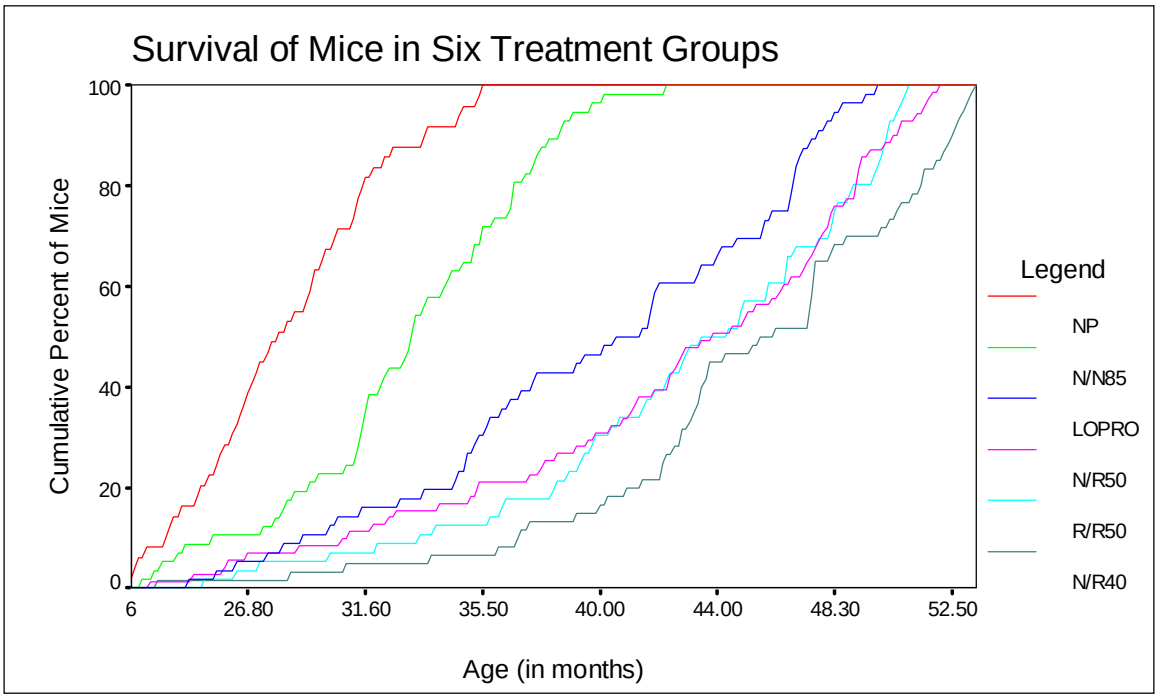
restricted groups. It looks that diet restriction helped to extend the lifetime of some mice in the groups.

The side-by-side boxplots show that the distribution of lifetimes of mice are all negatively skewed. One possible explanation of the pattern is that there is something like an upper bound, a maximum possible lifetime for each group, and healthy mice all tend to get close to it. Unhealthy mice, however, die off sooner and at very different ages.

The severity of dietary restriction increases as we look from the left to the right. We can conclude that as the severity of dietary restriction increased, so did longevity. By comparing the boxplots for N/R50 and R/R50 groups we conclude that reducing the calories before weaning did not further increase longevity for mice subjected to postweaning dietary restrictions.

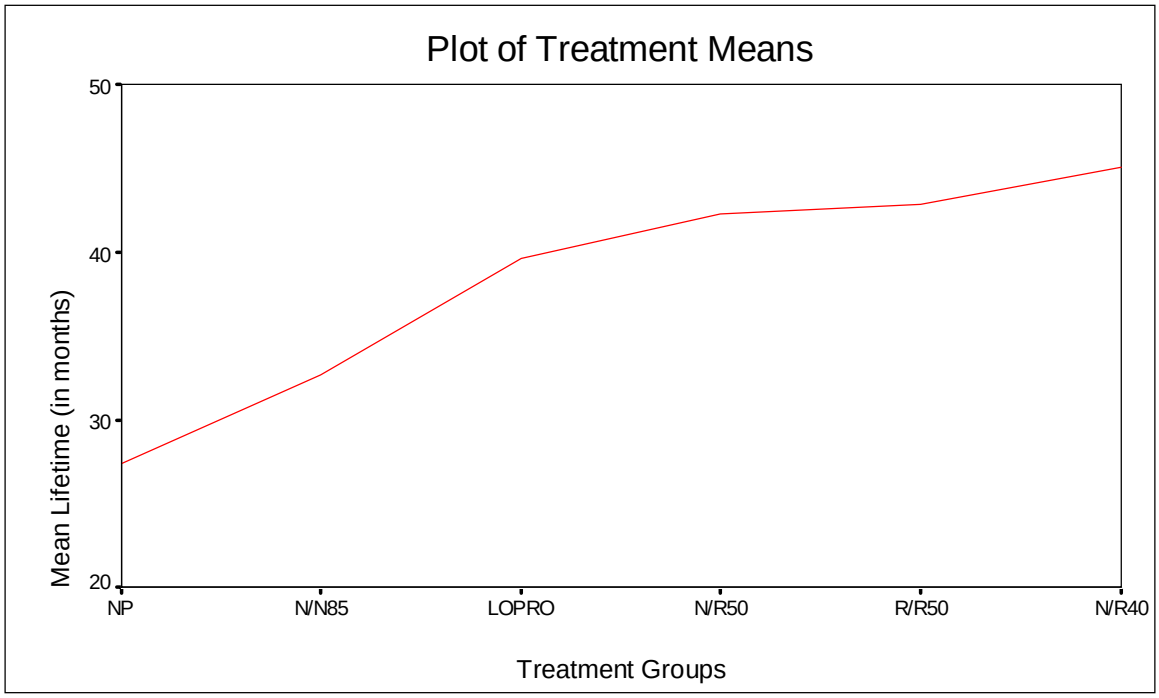
The groups N/R50 and N/R50 lopro differ in the protein content levels after weaning. Comparing the boxplots for the two groups indicates that mice restricted in both calorie and protein intake exhibited shorter median life span than did mice fed the same number of calories of a high protein. Moreover, the spread of life span of mice subjected to lower protein intake was definitely larger.

4.2 We can also compare the six treatment groups by obtaining the line chart of the cumulative survival rate over time in months. The instructions needed to obtain the plot are given in the corresponding *Computer Instructions* module.



The above plot confirms our conclusions reached in Section 4.1. Almost all lines representing different diet regimens are clearly separated. The only overlap is between the lines representing the N/R50 and R/R50 treatment groups. Life span was shortest for NP mice (red line). The flat red line indicates that all mice were dead in this group by the age of 35.5 months. The life span was longer for N/N85 group represented by the green line, and longest for the N/R40 group.

4.3 The following plot displays the means of the six treatment groups.



The average life span increases as the severity of dietary restriction increases. The inclination of the line indicates that there are small differences among all four diet restricted groups (LOPRO, N/R50, R/R50, and N/R40) because the corresponding line segment is almost flat. However, the average life spans for the NP and N/N85 groups are definitely lower than those for the diet restricted groups.

4.4 The effect of diet restriction can also be visualized by obtaining a scatter plot of all observations for the six treatment groups.