Hungry Mice

When laboratory mice (and maybe other animals) are fed a nutritionally adequate but near-starvation diet, they may live longer on average than mice that eat a normal amount of food. In this experiment, mice were randomly assigned to one of six experimental treatments. The dependent variable was how long they lived before dying of old age. The experimental treatments were:

> **NP**: Mice in this group ate as much as they pleased of a non-purified, standard diet for laboratory mice.
>
> **N/N85**: This group was fed normally both before and after weaning. (The slash distinguishes the two periods.) After weaning, the ration was controlled at 85 kcal/wk. This, rather than NP, serves as the control group because caloric intake is held reasonably constant.
>
> **N/R50**: This group was fed a normal diet before weaning and a reduced-calorie diet of 50 kcal/wk after weaning.
>
> **R/R50**: This group was fed a reduced-calorie diet of 50 kcal/wk both before and after weaning.
>
> **N/R50 lopro**: This group was fed a normal diet before weaning, a restricted diet of 50 kcal/wk after weaning, and had dietary protein content decreased with advancing age.
>
> **N/R40**: This group was fed normally before weaning and was given a severely reduced diet of 40 kcal/wk after weaning.

The investigators were not interested in every possible comparison between treatment means. They had *very* specific research questions.

NP	N/N85	N/R50	R/R50	N/R50 lopro	N/R40
μ_1	μ_2	μ_3	μ_4	μ_5	μ_6

Writing a contrast of the treatment means as

$$c = a_1\mu_1 + a_2\mu_2 + a_3\mu_3 + a_4\mu_4 + a_5\mu_5 + a_6\mu_6$$

Give the coefficients of the contrast you would test to answer each of the following questions. In each case you will test the null hypothesis that the contrast equals zero.

1) Do control mice have the same average lifetimes as laboratory mice?

a_1	a_2	a_3	a_4	a_5	a_6

2) Does reducing calorie intake from 85 to 50 kcal per week increase average life-span?

a_1	a_2	a_3	a_4	a_5	a_6

3) Is there an effect of pre-weaning diet restriction?

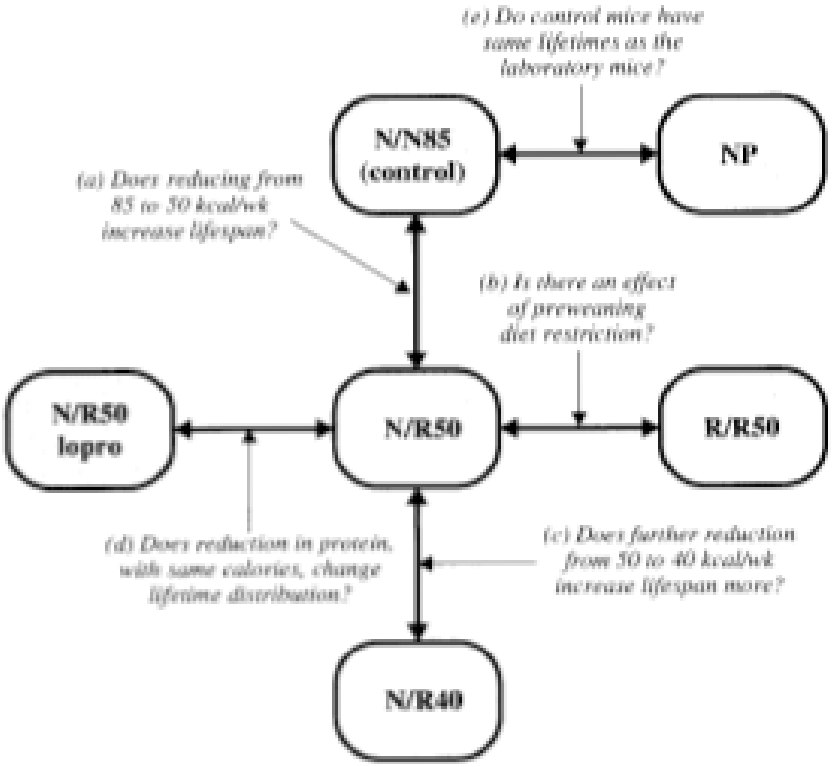
a_1	a_2	a_3	a_4	a_5	a_6

4) Does further restriction from 50 to 40 kcal per week further increase average life-span?

a_1	a_2	a_3	a_4	a_5	a_6

5) Does reduction in protein, with the same calories, change average life length?

a_1	a_2	a_3	a_4	a_5	a_6



My Answers

NP	N/N85	N/R50	R/R50	N/R50 lopro	N/R40
μ_1	μ_2	μ_3	μ_4	μ_5	μ_6

Do control mice have the same average lifetimes as laboratory mice?

a_1	a_2	a_3	a_4	a_5	a_6
1	-1	0	0	0	0

Does reducing calorie intake from 85 to 50 kcal per week increase average life-span?

a_1	a_2	a_3	a_4	a_5	a_6
0	1	-1	0	0	0

Is there an effect of pre-weaning diet restriction?

a_1	a_2	a_3	a_4	a_5	a_6
0	0	1	-1	0	0

Does further restriction from 50 to 40 kcal per week further increase average life-span?

a_1	a_2	a_3	a_4	a_5	a_6
0	0	1	0	0	-1

Does reduction in protein, with the same calories, change average life length?

a_1	a_2	a_3	a_4	a_5	a_6
0	0	0	1	-1	0

What's the most promising multiple comparison method? Why?