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Homework 6

1. In this experiment, the dependent variable is the number of insects that died, and the independent variable is the insecticide type. There are 72 total observations in this experiment.
2. The Mean Sq for spray is the between-groups variance, and the Mean Sq for the residuals is the within-groups variance.
3. 533.8/15.4 = 34.67. this is larger than 1, so it could be considered statistically significant in terms of ANOVA. I'm not sure if the null hypothesis can or can't be rejected without knowing the p(>F).
4. From a dataset of 12, we lose 1 degrees of freedom (df) for calculating the grand mean. Among the 6 group means, only 5 can vary freely.
   So, the df between groups is 5 and the df of within groups is 6 -> 5+6 =11. This is 1 less than the total number of observations because we must account for the degrees of freedom of the grand mean.
5. The results of InsectResults ($F(5,6) = 34.7 < .05$) show that the p-value of the F-statistic is <2e-16, which is statistically significant for a chosen alpha level of 0.05. Seeing that the F-value is 34.7, we can reject the null hypothesis that all 6 groups were sampled from the same population. This means that the kind of insecticide used likely has an effect on insect deaths.
6. Results:
   2. Quantiles for each variable:

	2.5%	25%	50%	75%	97.5%
mu	8.561	9.183	9.504	9.815	10.417
spray-A	2.715	4.128	4.824	5.527	6.832
spray-B	3.564	4.937	5.620	6.318	7.601
spray-C	-9.200	-7.825	-7.114	-6.438	-5.104
spray-D	-6.484	-5.133	-4.411	-3.733	-2.370
spray-E	-7.851	-6.492	-5.793	-5.089	-3.687
spray-F	4.808	6.203	6.895	7.607	8.957
sig2	11.401	14.138	15.878	17.878	22.773
g_spray	0.825	1.662	2.507	3.959	11.336

   Bayes factor analysis
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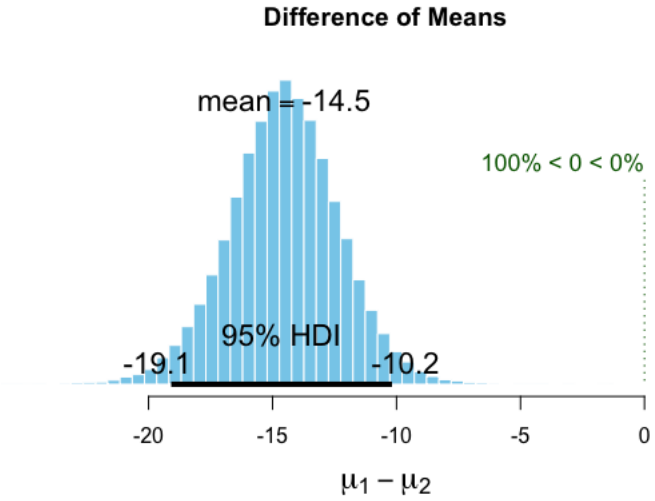
   [1] spray : 1.506706e+14 ±0%

   interpretation:
   At 10,000 iterations, the grand mean is 9.5 insect deaths per insecticide. Spray A, B, and F have positive HDIs, with median deviations of 4.8, 5.6, and 6.9 respectively with

no overlap. Sprays C, D, and E are all negative with no overlaps among each other or with 0. Based on HDIs, Sprays A, B, and F kill more insects than sprays C, D, and E. The null hypothesis is that no one insecticide is better than any other in the group, and the alternative hypothesis is that not all insecticides are as effective as any other in the group. With a ratio of 1.506706e+14:1 in favor of the alternative hypothesis. According to the rules of thumb provided by Kass and Raftery (1995), any odds ratio in excess of 150:1 is considered very strong evidence. This result confirms previous evidence suggesting support for an alternative hypothesis of credible differences among the group means.



7. The results of the Bayesian t-test shows that the difference of means for Spray C and Spray F is about -14.5. This suggests that spray C kills 14.5 less insects than spray F.