STAT 110: Practice Problem 18 Solutions
Fall 2017

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1. The Bayley Scales of Infant Development yield scores on two indices – the Psychomotor Development Index (PDI) and the Mental Development Index (MDI). These can be used to assess a child's level of function in each of these areas at approximately one year of age. **Among healthy infants, both indices have a mean value of 100.** As part of the study assessing the development and neurologic status of children who have undergone reparative heart surgery during the first three months of life, the Bayley Scales were administered to a random sample of 144 one-year-old infants born with congenital heart disease.

   The file **PDI_MDI.JMP** contains data collected on the following variables:

   - PDI = psychomotor development index
   - MDI = mental development index

   Research Question: Is there evidence that children born with congenital heart disease who undergo reparative heart surgery during the first three months of life have a mean **PDI** score **less than 100** (which is the mean for healthy infants)?

   a. Use JMP to find both the mean and the standard deviation of the PDI scores. Enter these values in the following table.

Variable	Mean	Standard Deviation
PDI	**94.78**	**15.85**

   b. Is the t-test an appropriate analysis procedure for these data? Hint: Check the normality assumption behind the t-test for a single mean.

   Yes. Since the sample size is quite large (much larger than 30), the normality assumption is met and the t-test is an appropriate procedure to use for testing this hypothesis.

   c. Set up the null and alternative hypotheses to test the research question.

   H_o: $\mu = 100$

   H_a: $\mu < 100$

d. Find the p-value to test the research question.

p-value: **< .0001**

e. Write a conclusion to address the research question in the context of the problem.

The study provides evidence that children born with congenital heart disease who undergo reparative heart surgery during the first three months of life have a mean PDI score less than 100 (which is the mean for healthy infants)

f. Use JMP to find the 95% CI for the mean PDI score for children born with congenital heart disease who undergo reparative heart surgery during the first three months of life.

Lower endpoint: **92.16**
Upper endpoint: **97.40**

g. Interpret the confidence interval from part f in the context of the problem.

We are 95% certain that the true mean PDI of all children born with congenital heart disease who undergo reparative heart surgery during the first three months of life is somewhere between 92.16 and 97.40.

h. Does this interval agree with your conclusion given in part e? Explain your reasoning.

Yes. Since the entire confidence interval sits below 100, we have confidence that the true mean is less than 100 (which agrees with the results of the hypothesis test).