

Answer on Question #43711 – Math - Statistics and Probability

The Bayley Scales of Infant Development yield scores on two indices--the Psychomotor Development Index (PDI) and the Mental Development Index (MDI)--which can be used to assess a child's level of functioning in each of these areas at approximately one year of age. Among normal healthy infants, both indices have a mean value of 100. As part of a 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 sample of one-year-old infants with congenital heart disease. The data contained in the data set heart. PDI scores are saved under the variable name pdi while MDI scores are saved under mdi. Use the treatment=1 group a. At the 0.05 level of significance, test the null hypothesis that the mean PDI score for children born with congenital heart disease who undergo reparative heart surgery during the first three months of life is equal to 100, the mean score for healthy children. Use a two-sided test. What is the p-value? What do you conclude?

Remark. There should be the file with data. These results are obtained for the data from the internet.

We suppose that we have a sample of $n = 143$ one-year-old infants born with congenital heart disease. We suppose that $\bar{x}_{pdi} = 94.78322$ (mean) and $s_{pdi} = 15.85104$ (standard deviation).

Solution.

The relevant hypotheses here are: $H_0: \mu_{pdi} = 100$ vs $H_a: \mu_{pdi} \neq 100$. The standard deviation is unknown, so we will use a t-test.

The test t statistic equals

$$t = \frac{\bar{x}_{pdi} - \mu_{pdi}}{s_{pdi}/\sqrt{n}} = \frac{94.78322 - 100}{15.85104/\sqrt{143}} \approx 3.9356.$$

For a two-sided test, this corresponds to a p-value of 0.0001 (the test in the center from the Stata output above). We can reject H_0 , as the p-value is less than 0.05. Hence the mean PDI score for children born with congenital heart disease who undergo reparative heart surgery during the first 3 months of life is different from 100. It is less than 100.