

Difference Between Means - CI Solutions

Heart disease patients often experience coronary artery spasms. One theory proposes that the compound serotonin may play a role in causing these spasms. In a preliminary study designed to investigate the connection between serotonin and coronary artery spasms a sample of 50 artery sections were obtained postmortem from patients that had died due to heart disease. Another 35 artery sections were obtained from patients who had died from other causes. Output 1 lists some of the summary statistics for this study.

Output 1: Descriptive statistics for the coronary artery study

Descriptive Statistics: Disease, Control

Variable	N	Mean	Median	TrMean	StDev	SE Mean
Disease	50	3741	3733	3747	1006	142
Control	35	5506	5442	5505	943	159

Variable	Minimum	Maximum	Q1	Q3
Disease	1755	5672	3087	4548
Control	3506	7589	4795	6177

- 1) What is the total degrees of freedom in this study?

$$Df = Df_1 + Df_2 = 49 + 34 = 83$$

- 2) What is the point estimate for the true difference in serotonin levels between subjects with heart disease and those in the control group. Be sure to specify the direction of your difference

$$\bar{x}_c - \bar{x}_d = 5506 - 3741 = 1765$$

- 3) At a confidence level of 95%, what is the associated ME for the difference in serotonin levels between subjects with heart disease and those in the control group?

$$t = 1.990$$

$$1.990 \sqrt{\frac{1006^2}{50} + \frac{943^2}{35}} = 1.990 \sqrt{45647.8} = 425.2$$

- 4) Use the values obtained in problems 3 and 4 to construct a 95% CI for the difference in serotonin levels between subjects with heart disease and those in the control group.

$$95\% \text{ CI} = 1765 \pm 425 = (1340, 2190)$$

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- 5) Interpret the CI developed in problem 4. Is there evidence that one group may have higher average serotonin levels than the other? If so which one? Defend your answer.

We are 95% confident that the true difference between average serotonin levels in patients with heart disease versus those in a control group is between 1340 and 2190. Furthermore, the control group has higher levels of serotonin. Figure 1 is a CI diagram for this setting. Note that the entire confidence interval is positive. Since we found our point estimate by taking $\bar{x}_c - \bar{x}_d$ we can say that the control group probably has, on average, higher serotonin levels than the group with heart disease. If 0 were contained in the interval then it is possible that both groups have, on average, equal levels of serotonin.

Figure 1: Interval graphic for the difference between average serotonin levels in controls versus patients with heart disease

