One Sample t interval for μ_d

February 12, 2022

1. Teenagers spend, on average, approximately 5 hours online every day. Do parents realize how many hours their children are spending online? A family psychologist conducted a study to find out. A random sample of 10 teenagers were selected. Each teenager was given a Chromebook and free internet for 6 months, the parents of each teenager were asked how many hours per day they think their child spent online during this time frame. Here are the results:

Teen	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**
Actual time spent online	5.9	6.2	4.7	8.2	6.4	3.8	2.9	7.1	5.2	5.8
Parent Perception	2.5	3	3	3.5	1.5	2	2	3	2.5	3
Difference										

   (a) Make a dotplot of the difference in time spent online for each teenager and their parents perception.

   (b) Construct and interpret a 90% confidence interval for the true mean difference in time spent online. (actual − parent perception)

Solution: State: μ_d: the true mean difference in time spent online. Our sample mean is $\overline{x} = 3.02$, our sample standard deviation is $s_d = 1.32$.
Plan: We would like to conduct a one sample t-interval for μ_d. Check conditions:

- Random: Random sample of 10 teenagers is clearly stated.
- Here 10 is clearly less than 10 percent than the population of all students.
- Here the CLT will not apply, but the dotplot has no strong skew or outliers so we may assume that $\overline{x}_d$ is normally distributed

Do:

$$\begin{aligned} \text{Point Estimate} &\pm \text{Margin of Error} \\ \overline{x}_d &\pm t^\star \frac{s_d}{\sqrt{n}} \\ 3.02 &\pm 1.833 \frac{1/32}{\sqrt{10}} \end{aligned}$$

Our confidence interval is $(2.25, 3.79)$.

Conclude: We are 90% confidence that the interval from 2.25 to 3.79 hours captures the true mean difference in time spent online between a teens actual time and their parents perceived time.