Research Methodology and Statistics (MSC 502)
Session: Monsoon Semester, 2022-2023

Interval Estimation

1. A sample of size 20 was collected and the sample mean and standard deviation are estimated as $\bar{x}$ =9.8525 and s = 0.0965. Find 95% CI for the mean.

2. A manufacturer produces piston rings for an automobile engine. It is known that ring diameter is approximately normally distributed and as a standard deviation σ = 0.001 mm. A random sample of 15 rings has a mean diameter of $\bar{x}$ = 74.036 mm. Construct a 90% two-sided CI.

3. The life in hours of a light bulb is known to be approximately normally distributed with σ = 25 hours. A random sample of 40 bulbs has a mean life of $\bar{x}$ =1014 hours.
   (a) Construct a 95% two-sided CI on the mean life.
   (b) Construct a 95% one-sided lower CI of the mean life.

4. The following result shows the investigation of the haemoglobin level of hockey players (in g/dl).

   15.3 16.0 14.4 16.2 16.2 14.9 15.7 14.6 15.3 17.7
   16.0 15.0 15.7 16.2 14.7 14.8 14.6 15.6 14.5 15.2

   (a) Find the 90% two-sided CI on the mean haemoglobin level.
   (b) Also construct 90% Upper CI on the mean haemoglobin level.

5. The Salk polio vaccine experiment in 1954 focused on the effectiveness of the vaccine in combating paralytic polio. Because it was felt that without a control group of children there would be no sound basis for evaluating the efficacy of the Salk vaccine, the vaccine was administered to one group, and a placebo (visually identical to the vaccine but known to have no effect) was administered to a second group. For ethical reasons, and because it is suspected that knowledge of vaccine administration would affect subsequent diagnosis, the experiment was conducted in double-blind fashion. That is, neither the subjects nor the administrators knew who received the vaccine and who received placebo. The actual data for this experiment are as follows:

   Placebo group: n = 201299 110 cases of polio observed
   Vaccine group: n = 200745 33 cases of polio observed.

   a. Find a 95% two-sided CI on the proportions of children in the two groups who contracted paralytic polio.
   b. What conclusions can you draw from the CI in part (a).