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Lecture 7a: Practice Problem Solutions

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A study was performed on a representative sample of 258 intravenous drug users (IVDUs). Of particular interest to the researchers were factors which may influence the risk of contracting tuberculosis amongst IVDUs.* Ninety-seven of the study subjects admitted to sharing needles to shoot drugs. Of these ninety-seven, twenty-four had a positive tuberculin test result. The other 161 subjects denied having shared needles—of these 161 subjects, 28 had a positive tuberculin test result.

Using these study results, construct a 95% confidence interval for the difference in the proportion of tuberculosis infected IVDUs who shared needles as compared to IVDUs who did not share needles.

First, compute the sample proportions:

\[
\hat{p}_{\text{shared}} = \frac{24}{97} \approx 0.247
\]

\[
\hat{p}_{\text{not shared}} = \frac{28}{161} \approx 0.174
\]

So: \( \hat{p}_{\text{shared}} - \hat{p}_{\text{not shared}} \approx 0.247 - 0.174 = 0.073 \)
Now for the estimated standard error:

\[ SE(\hat{p}_{\text{shared}} - \hat{p}_{\text{not shared}}) = \sqrt{\frac{\hat{p}_{\text{shared}} \times (1 - \hat{p}_{\text{shared}})}{n_{\text{shared}}} + \frac{\hat{p}_{\text{not shared}} \times (1 - \hat{p}_{\text{not shared}})}{n_{\text{not shared}}}} \]

\[ = \sqrt{\frac{.247 \times .753}{97} + \frac{.174 \times .826}{161}} \]

\[ \approx 0.053 \]

Now for the 95% CI:

\[ \hat{p}_{\text{shared}} - \hat{p}_{\text{not shared}} \pm 2 \times SE(\hat{p}_{\text{shared}} - \hat{p}_{\text{not shared}}) \]

\[ = .073 \pm .106 \]

\[ = (-0.033, 0.179) \]