

Module 3: Using Statistics for Benchmarking and Comparison

Common Measures Training
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Comparison: Two Questions

- Comparing two samples of one population, over time
 - Are we confident performance changed?
 - How much did performance change?
- Comparing two samples from two different states
 - Are we confident performance is different?
 - How much difference is there?

Key Concepts for Comparison

- "Statistical Significance" / Significant Difference
- Confidence Interval of a Difference
- Minimum Detectable Difference

“Statistical Significance”

- **Important ERP Question:** Did facility performance change between the baseline and the post-certification inspections?
- **Population improvement?** If we observed an improvement between the first sample and the second sample, are we confident there was an improvement in the overall population?
 - Remember, both the first and second samples’ point estimates have error associated with them



“Statistical Significance”

- **“Statistical significance”** means we are confident there was an improvement in the population
- **Other differences.** Concept also applies when comparing results from two states
 - Are they *significantly different*?



Understanding Differences

- Difference = proportion or quantity. E.g.,
 - Proportion:
 - 40% compliance in Round 1
 - 60% compliance in Round 2
 - Difference = 20%
 - Mean:
 - 300 pounds average waste generation in State A
 - 400 pounds average waste generation in State B
 - Difference = 100 pounds
- Outcome measures, indicator scores and certification accuracy can have differences, too



Confidence Intervals for Differences

- Just like single sample observations, **observed differences have error** associated with them
- Confidence interval reflects that error.
E.g.,
 - We are *95% confident* that compliance **increased 20% (+/-7%)**
 - We are *95% confident* that average waste generation is **75-125 pounds lower** in State A than in State B

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Is the Difference Significant?

Two ways to understand if the difference is significant

- **Formal hypothesis test**
 - Less flexible
 - Test must be defined pre-sample
- Or **confidence interval of the difference...**

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Confidence Interval of the Difference

Confidence interval of the difference contains zero?

- Difference is 10% +/- 7% (95% conf.)
 - 95% confidence that difference is between 3% and 17% (excludes zero)
 - Difference is statistically significant
- Difference is 10% +/- 11% (95% conf.)
 - 95% confidence that difference is between -1% and 21% (could be zero)
 - Difference is not statistically significant

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Minimum Detectable Difference

= How large a change in performance you need to see for it to be "statistically significant"

- Important concept in sample planning
- Depends on population size and sample size for each sample
- Smaller detectable difference = larger sample size



Minimum Detectable Difference

- Think about what level of change would drive decision-making
 - Worthwhile to design samples to detect a 2% change?
 - Is it different for practical purposes?
 - Would you do anything differently than if you thought there was no change?



Tour of the Spreadsheet Tools

Two-sample sheets in Sample Planner and Results Analyzer.



For more information...

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