Jumping into Statistics: Introduction to Study Design and Statistical Analysis for Medical Research Using JMP Pro Statistical Software

WINTER/SPRING 2021
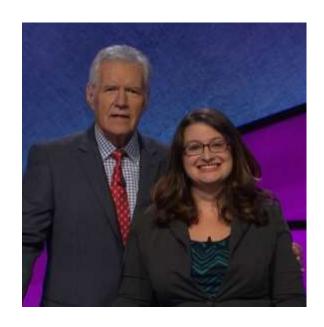
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Meet the Instructors

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Course Objectives

- Review fundamentals of study design and research methodology

- Understand how to choose best statistical test for your research question

- Practice basic statistical analysis use JMP Pro Software

Course Topics

- Asking a Good Research Question

- Life Cycle of Research and Scientific Method

- Study Design

- Data types and Database Construction

- Descriptive Statistics

- Data Visualization

- Population and Sample, Probability, Statistical Inference

- How to Chose Correct Statistical Method and Run Some Analyses
  - T-tests, ANOVA, Non-Parametric
  - Chi-square, odds ratio, relative risk
  - Regression and Correlation
  - Survival Analysis
  - Test Diagnostics (e.g. sensitivity, specificity, etc.)

- Comparing Statistical Modeling and Machine Learning

How to Ask a Good Research Question

1/13/2021

Why is it important?

- Identify gaps in knowledge

- Focus your research

- Develop testable objectives and hypotheses

A good research question should essentially be a guide to your project

How to formulate a good research question?

- **FINER** → overarching framework
  - Feasible, Interesting, Novel, Ethical, Relevant

- **PICO(T)** → operationalize (testable)
  - Population, Intervention, Comparison, Outcome, (Timing)

Complimentary methods

Feasible	• Sample size, expertise, time and money • Manageable Scope
Interesting	• Intrigues investigators, peers, community
Novel	• Confirms, refutes, or extends previous findings
Ethical	• Likely approved by IRB/IACUC
Relevant	• To scientific knowledge, clinical/health policy, future research

Population
- Who are your patients?
- Gender, age, ethnicity, medical history

Intervention
- Studying effect of what?
- Drug, procedure, behavior, condition, risk factor exposure

Comparison
- What is comparison/control group?
- Placebo, no treatment, standard of care, no exposure

Outcome
- Measure that may be affected by intervention?
- Disease occurrence, progression, improvement, mortality, efficacy

Timing
- Over what time frame will study take place?

Summary Tips

- Perform thorough literature review

- Examine current trends and technological advances in topic

- Seek input from experts, colleagues, mentors, and collaborators to refine ideas

- Use FINER to develop research question

- Focus question with PICOT to develop testable question

- Develop research hypothesis (later lecture)

- Develop clear, well-defined primary and secondary (if needed) aims

- Before beginning study, re-review to ensure question and objectives are answerable, feasible, and relevant

References

Farrugia P, Petrisor BA, Farrokhyar F, Bhandari M. Research questions, hypotheses and objectives. Canadian journal of surgery. 2010 Aug;53(4):278.

JMP Pro!

https://software.ufl.edu/