Collaboration: A Mathematical and Medical Partnership

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with thanks to Greenville Health System and Drs. Liz Bouzarth, Kevin Hutson, and Tom Lewis of the Furman Mathematics Department
My research partners for the summer
Kate Causey, Danny Rivers, and Jordan Brown’s first surgical observation at Greenville Health System (GHS)
Goals

- Learn
- Analyze
- Communicate
- Discern
Hospital Overview

• Regional Hospital

• University of South Carolina Medical School Greenville

• Upsides:
  • Particular type of patient
  • Opportunities for students like me

• Downsides:
  • Little data sharing
  • Few overworked statisticians
  • Pre-existing datasets
Steps in a Study

1. Formulate Question
2. Design Experiment
3. Test
What question are we trying to answer?
1. Formulate Question

- **Hepatocellular Carcinoma (HCC)**
- Cure: liver transplant or surgery
- Ineligible?
  - Four Treatments
- Question: Of four treatments, which has the best outcome?
• Question: Of four treatments, which has the best outcome?

• BUT!

• How do we define “best outcome?”
  • Survival
  • Days of survival
  • Days of survival past median survival

• OR Tumor Size Change
  • Shrink (positive)
  • None (positive)
  • Grow (negative)
When we don’t get to ask the question, we make do with what we have.
1. Formulate Question
2. Design Experiment
3. Test

- Hepatocellular Carcinoma
2. Design Experiment

- Pre-Existing data
- Database Design
- Binary Data
- Unknown data
- White, white, or Caucasian
1. Formulate Question
   • Hepatocellular Carcinoma

2. Design Experiment
   • Database design

3. Test
3. Test

- Neonatal Intensive Care Unit
- Research Question:
  - Which babies are at risk?
- 210 babies, 1035 days
3. Test

Classification and Regression Tree
3. Test

200 college students
(100 prefer salty snacks and 100 prefer sweet)

120 students
GPA > 2.8
(85 salty and 35 sweet)

80 students
GPA ≤ 2.8
(15 salty and 65 sweet)
3. Test

• Data Points:
  • Birth Weight
  • Size for Gestational Age (Small, Medium, Large)
  • Gestational Age
  • Glucose Infusion Rate (GIR)

• To determine outcome:
  • Glucose tolerant or intolerant

• Goal: iPhone app to aid clinicians
Summary

1. Formulate Question
   - Hepatocellular Carcinoma

2. Design Experiment
   - Database design

3. Test
   - NICU
What did I learn?

- Communication is KEY
  - I often served as the bridge between the math and the medicine.
Thank You

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  • Dr. Kevin Hutson, Ph.D.
  • Dr. Tom Lewis, Ph.D.

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• Furman Engaged Organizers
Thank you for coming! Questions?