

BIOSTATISTICS SHORT COURE

- **Instructor:** Lili Zhao lili.zhao@corewellhealth.org
- **Nine Lecture** on Thursday 5-6:30pm
 - (45min lecture + 45min R)
- **Course materials:**
<https://github.com/yungcleee/Corewell>
- **Install R and RStudio:** if you are using CHE/Beaumont property, you will contact IT (Malik, Crawford: 947-886-0132)
- **Online R compiler:**
<https://www.mycompiler.io/online-r-compiler>

My Experience

- Collaboration. I have collaborated with researchers in various disease areas, including Cancer, Cardiology, Pathology, Cirrhosis, Neurology, Endocrinology, Obstructive Sleep Apnea, Pulmonary Diseases, Infectious Diseases, Diabetes, and Surgery
- Teaching. I have taught the On Job/On Campus (**OJOC**) program at U of M for 3 cohorts (2016-2021). OJOC is a 20-month program offering training in clinical trial design and advanced biostatistics

What is Biostatistics?

- **Statistics** is the science of data
- **Biostatistics** is the application of statistics to a wide range of topics in biology

Topics to Cover I

- **Summary statistics**
 - mean/median/quantiles/standard deviation/frequency (%)
- **Compare two groups (or > 2 groups):**
 - t-test (independent or paired) and non-parametric counterparts, chi-squared/Fisher's exact
- **Concepts** confidence interval and p-value

Plan to finish these topics after 4 lectures. Students can interpret Table I in medical papers after completion of this part

Topics to Cover II

- **Regression methods** when outcome is *continuous, binary, and time-to-event*
 - (multiple) linear regression, logistic regression, Cox regression
- **Concepts** Association (OR and HR)/Confounding/interaction

Plan to finish these topics after 4 lectures. Students can interpret main results in medical papers after completion of this part

Topics to Cover III

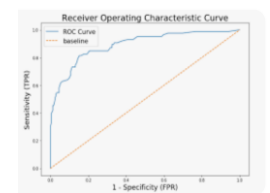
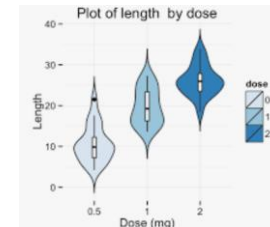
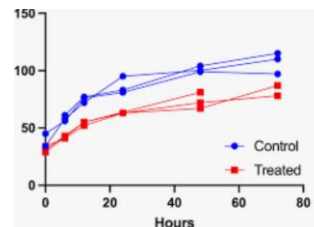
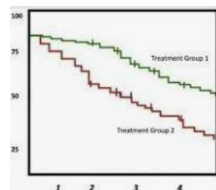
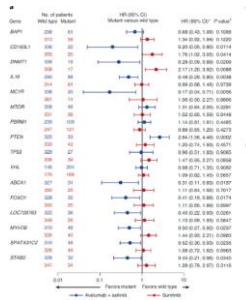
- **Study design:** Clinical trials, Case-control, and Cohort study.
 - **Clinical trials:**
 - (blocked/stratified) randomization, study endpoints, analysis plan, sample size calculation (type I error & power)
 - interim analysis and non-inferiority trials (Optional)

Plan to teach these topics in one lecture. Students learn important concepts to design a simple study after completion of this part

Graphs to Learn

- Graphs

for example: boxplot, spaghetti plot, Kaplan-Meier curve, forest plot, and ROC curve



Students can interpret some figures in clinical research papers and make simple ones on their own

After the Course

Students should be able to

- Design a study to answer a simple research question and test the hypothesis
- Understand main results in papers published in medical journals
- Develop quantitative thinking
- Know how to talk to statisticians