

Washington University in St. Louis
School of Medicine, Division of Biostatistics
GEMS Training Program

SUMMER 2009

Workshop Title: “Statistics Primer”

Designed by: David Dixon and C. Charles Gu

Instructor: Gang Shi

Office hours: After class from 4:30 p.m. - 6:00 p.m. or by appointment
(gang@wubios.wustl.edu) (314-362-3643)

Days & Times:

June 30th, 1:00 pm - 4:30 pm;
July 1st and 2nd, 9:00 am - 4:30 pm
(Lunch Break from 11:30 a.m. - 1:00 p.m.)

Textbook: Introductory Statistics, fifth edition, by Thomas H. Wonnacott and Ronald J. Wonnacott

Goals of the Mini-Course: The mini-course is intended to review some of the basics in probability theory and applied statistics. The purpose is to help our new students with a smooth start in their future course work.

Lecture materials:

Provided by instructor

Prerequisites:

None

Daily Schedule:

9:00 a.m. - 10:00 a.m. - Lecture
10:00 a.m. - 10:15 a.m. - Break
10:15 a.m. - 11:30 a.m. - Lecture
11:30 a.m. - 1:00 p.m. - Lunch Break
1:00 p.m. - 2:30 p.m. - Problem Solving Demonstration
2:30 p.m. - 2:45 p.m. - Break
2:45 p.m. - 4:30 p.m. - Group Problem Solving and Discussion

Topics Included:

1. Basic Probability Theory

- Introduction of the mini-course and its outline
- Experiments, sample space, events, definition of probability
- Law of complementary events, additive probability laws, mutually exclusive events
- Conditional probability, independent events, multiplicative probability laws
- Bayes' Rule, prior probability, posterior probability
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- Chapter 3

2. Discrete and Continuous Distributions

- Random variables, expected value, variance, standard deviation
- Probability distribution, pdf, cdf
- Discrete random variables, e.g. binomial distribution
- Continuous random variables, e.g. normal distribution
- Covariance and correlation
- Chapters 4 and 5

3. Hypothesis Testing and Maximum Likelihood

- Hypothesis testing rationale
- Null hypothesis, Alternative Hypothesis
- Types of errors, p-values, power
- Conducting tests, test statistics, e.g. z-test, t-test
- The likelihood function and the log likelihood function (TBD)
- The likelihood principle, maximum likelihood estimators (MLE) (TBD)
- MLE of sample mean, MLE of binomial probability (TBD)
- Chapters 9 and 18