Math 414: Statistical Methods in Epidemiology   (4-0-4)
March 7, 2018

Catalog Description: Examines the methods used in epidemiologic research, including the design of epidemiologic studies and the collecting and analysis of epidemiological data. Prerequisite: MATH 361 or instructor's consent.

Course Objectives: After completing this course, students will be able to:

1. Demonstrate knowledge of history and evolution of epidemiology.

2. Calculate and interpret statistical measures for health.

3. Recognize and correct for bias, confounding, moderators, mediators, and covariates.

4. Practice methods of data collection, visualization, and reporting in epidemiology .

5. Create a proposal for studying a health outcome.

Learning Outcomes and Performance Criteria

1. Demonstrate knowledge of history and evolution of epidemiology.
   Core Criteria:

   (a) Identify major events and characters in the history of epidemiology.
   (b) Identify the progression of thought and fallacies within the history of epidemiology .
   (c) Discuss origins and classifications of epidemiologic study designs.
   (d) Apply the epidemiologic triad and Koch postulates or Hill criteria in assessing causality.

   Additional Criteria:

   (a) Investigate modern methods of surveillance and tools in epidemiologic practice.

2. Calculate and interpret statistical measures for health.
   Core Criteria:

   (a) Compute sensitivity, specificity, validity, positive predictive value, negative predictive value, and reliability of a diagnostic test by hand and with technology.
   (b) Perform ROC, AOC, Threshold analysis for a proposed diagnostic measure.
   (c) Compute and interpret standard rates, ratios, and proportions for epidemiology .
   (d) Apply odds ratios as approximations for risk ratios as appropriate.
   (e) Identify the appropriate measures for common epidemiological designs.
   (f) Identify levels of data hierarchy.

3. Recognize and correct for bias, confounding, moderators, mediators, and covariates.
   Core Criteria:

   (a) Recognize and differentiate between bias, confounding, moderators, mediators, and covariates.
   (b) Differentiating between information and selection bias.
   (c) Apply standard methods to adjust for confounding.

    (d) Apply stratified analysis to detect effect modifiers.

    (e) Apply regression methods to detect and test for mediators, moderators, and confounders.

    (f) Draw a causal diagram.

4. Practice methods of data collection, visualization, and reporting in epidemiology .
   Core Criteria:

    (a) Calculate sample size for a cross-sectional or cohort study.

    (b) Produce and interpret epicurves.

    (c) Produce and interpret Kaplan-Meier plots.

5. Create a proposal for studying a health outcome.
   Core Criteria:

    (a) Produce a method section for a proposal.

    (b) Create an appropriate data-collection form.

   Additional Criteria:

    (a) Produce a literature review for the proposed study with proper references.