TUSM MED I Epidemiology/Biostatistics Exemption Policy - 2017

Students who fulfill the following criteria may apply for a course exemption:

1. Have taken a course in epidemiology and a course in biostatistics within the last 3 years. The Course Director will judge the appropriateness of the courses.
2. Have written a critique of a published epidemiologic or clinical study as part of their course work or program.

Students who believe they are eligible for an exemption must do the following:

1. Inform the Course Director, Dr. Olaf Dammann, by email that they wish to apply for an exemption. This email must be sent to Dr. Dammann no later than August 4, 2017. Dr. Dammann's email address is olaf.dammann@tufts.edu.
2. Attach a transcript showing the courses and grades achieved.
3. Attach course descriptions.
4. Attach a copy of the study critique.
5. Students will take an exam on August 9, 2017 (note: this date is subject to change). The exam content will be based on the learning objectives from the course syllabus (below). Students must score at least 70% on the exam.

Dr. Dammann will then notify the students if they have been granted an exemption. Pending notification from Dr. Dammann, students must comply with the course work.

Learning objectives for Med I Epidemiology & Biostatistics

1 – Introduction to Epidemiology

1. Describe in general terms how the discipline of epidemiology is applied to medical sciences and its uses in clinical and community medicine, and public health
2. Explain the "population perspective" and its relevance to clinical practice
3. Define the natural history of disease and why it is important to consider this in evaluating epidemiologic studies seen in medical journal articles
4. Define the following terms:
    a. risk factor/exposure/predictor/determinant
    b. outcome/endpoint/event
    c. association versus causal association
5. Explain the Bradford Hill criteria for causal associations
6. Define, calculate and contrast prevalence and incidence rates
7. Explain how to calculate population incidence and cumulative incidence
8. Describe the relations among prevalence, incidence and disease duration
9. Define epidemic, pandemic, endemic, case fatality rate, and mortality rate
10. Describe the types of epidemiologic study designs seen in the medical literature in the following terms:
    a. observational versus intervention
    b. descriptive versus analytic
11. Describe what a cross-sectional study design is, as well as its strengths and limitations

2 – Descriptive Statistics and the Normal Distribution

1. Distinguish between types of data
2. List appropriate data presentation options for various data types
3. Describe the strengths and limitations of various descriptive statistics
4. Explain the concept of skewness and its applications to discrete and continuous distributions
5. Describe the special aspects of the normal distribution
6. Calculate z-scores and describe their application

3 – Sampling and Confidence Intervals

1. Explain how a histogram can be read as a probability distribution
2. Explain the importance of sampling in statistics
3. Explain how sample means can have distributions
4. Describe the behavior of distributions of sample means and the Central Limit Theorem
5. Calculate and interpret a confidence interval for a mean
6. List three things that affect the width of a confidence interval

4 – Hypothesis Testing and Inferential Statistics

1. Perform the key steps in hypothesis testing
2. Explain the concept of α (alpha)
3. Describe in general terms how the p-value is calculated
4. Correctly define and interpret the p-value
5. Distinguish between type I and type II errors
6. Explain the relationships among sample size, power, type I and type II error
7. Describe the concept of power as it relates to study conclusions
8. Explain when it is appropriate to use a chi-square test
9. Interpret the results from a chi-square test
10. Explain when it is appropriate to use a two-sample t-test
11. Interpret the results from a two-sample t-test
12. Describe the uses of analysis of variance and explain the issue of multiple comparisons
13. Define the following terms: **hypothesis testing, null hypothesis, alternative hypothesis, type I error, type II error, p-value, power, chi square test, t-test, analysis of variance**

5 – Screening and Medical Diagnostics

1. Explain the objectives of a screening program
2. Define and calculate sensitivity, specificity and predictive values
3. Describe the impact of disease prevalence in determining predictive values
4. Define the likelihood ratio in clinical decision making

6 – Clinical Trials

1. Explain the steps for conducting a randomized controlled trial
2. Describe the issues to consider in selection of participants / generalizability
3. Explain how and why randomization is performed
4. Define the purpose of a control (placebo) arm
5. Explain what is meant by ‘intention-to-treat analysis’

6. Explain why randomized trials are registered
7. Explain differential loss to follow-up bias and how to mitigate it
8. Define, calculate and interpret the relative risk
9. Define and calculate absolute risk
10. Define, calculate and explain the concepts of number needed to treat/harm.
11. Explain how to set up and use a four-fold (2 x 2) table
12. Explain why subgroup analyses are conducted
13. Define and interpret the concept of effect modification

7 – Cohort Studies

1. Explain when it is appropriate/feasible to use a cohort study design
2. Identify a cohort study in the literature
3. Describe the issues to consider in selecting exposed and comparison groups
4. Differentiate between a retrospective and prospective cohort study design
5. Describe the strength and weaknesses of the prospective and retrospective cohort study
6. Explain bias, selection bias, random and non-random misclassification bias
7. Explain how to calculate and interpret the odds ratio in a cohort study
8. Define the concept of the attributable (excess) risk and its calculation.
9. Explain how relative risk and attributable risk convey different information.

8 – Confounding and Effect Modification

1. Distinguish the concepts of external and internal validity
2. Define the term confounding
3. Describe the characteristics of a confounding variable
4. Explain what study design features are used to avoid confounding
5. Distinguish between confounding and effect modification (interaction)

9 – Regression and Time-to-Event Analysis

1. Explain when correlation analysis is used and interpret correlation results
2. Explain when regression analysis is used and interpret regression results
3. List the differences between logistic and linear regression
4. Explain how multivariate regression techniques deal with confounding
5. Interpret a time-to-event survival curve and the corresponding logrank test
6. Explain when Cox proportion hazards regression analysis is used
7. Define the following terms: **correlation, simple linear regression, multiple linear regression, coefficient of determination, logistic regression, time-to-event survival analysis**

10 – Case-Control Studies

1. Explain when it is appropriate/feasible to use a case-control study design
2. Describe the issues in the selection of cases and control in a case-control study
3. Calculate and interpret the odds ratio in a case-control study
4. Explain the limitations of the odds ratio as a measure of association
5. Define and explain the effect of selection bias and recall bias
6. Describe the strength and weaknesses of the case-control study design