

EPIB - EPIDEMIOLOGY AND BIOSTATISTICS

EPIB463 Introduction to Programming in R (3 Credits)

An introduction to basic programming in R; including principles, data analysis tasks such as the calculation of summary statistics and the creation of graphs; and the implementation of statistical analysis concepts such as T-tests, ANOVA and correlation.

Prerequisite: EPIB315.

Jointly offered with: EPIB695.

Credit Only Granted for: EPIB463 or EPIB695.

EPIB489 Special Topics in Epidemiology or Biostatistics (1-6 Credits)

Special topics in epidemiology or biostatistics.

Repeatable to: 6 credits if content differs.

EPIB610 Foundations of Epidemiology (3 Credits)

Introduction to the discipline of epidemiology and its applications to health issues and practices. Basic epidemiologic concepts and methods will be covered.

Prerequisite: EPIB300; or equivalent undergraduate statistics or biostatistics course with a grade of C- or higher; or a score of 70% or higher on EPIB300 placement exam.

Credit Only Granted for: EPIB610 or HLTH720.

Formerly: HLTH720.

EPIB611 Intermediate Epidemiology (3 Credits)

Analysis of epidemiologic methods as applied to epidemiologic research, analysis of bias, confounding, effect modification issues, overview of design, implementation, and analysis of epidemiologic studies.

Prerequisite: Minimum grade of B- in EPIB610.

EPIB612 Epidemiologic Study Design (3 Credits)

Application of epidemiologic study designs, analytic methods used for analysis of cohort, case-control, cross-sectional, and clinical trials research.

Prerequisite: Minimum grade of B- in EPIB611.

EPIB620 Chronic Disease Epidemiology (3 Credits)

Overview of prevalence and risk factors for major chronic diseases. Discussion of methodological issues unique to specific chronic disease.

Prerequisite: Must have completed or be concurrently enrolled in SPHL602; or EPIB610.

EPIB622 Social Determinants of Health (3 Credits)

Overview of the major social variables that affect public health, including socioeconomic status, poverty, income distribution, race, social networks/support, community cohesion, psychological stress, gender, and work and neighborhood environment.

Prerequisite: Must have completed or be concurrently enrolled in SPHL602; or EPIB610.

EPIB624 Genetic in Public Health (3 Credits)

Emerging role of genetics in public health; overview of basic tenets of human genetics; examination of how public health practices and research are influenced by genetics and ethical issues specific to genetics.

Prerequisite: EPIB610.

EPIB627 Epidemiologic Methods for Primary Research (3 Credits)

Students are provided with the knowledge and skills needed to design and implement epidemiological research studies and to collect primary data. Presents an overview of types of research designs, sampling methodologies, measurement issues, questionnaire design, and guidelines for recruiting and interacting with participants. This foundation of knowledge is applied to group assignments, which apply the steps involved in the primary data collection process. Goals include: (a) achieving competence in designing and implementing studies based on scientifically sound epidemiological research methods; and (b) gaining the ability to critically evaluate health research and epidemiological studies.

Prerequisite: EPIB610; or permission of instructor.

Credit Only Granted for: EPIB600 or EPIB627.

Formerly: EPIB660.

EPIB630 Epidemiologic Methods in Sexual and Reproductive Health Research (3 Credits)

Examination of epidemiologic methods (quantitative and qualitative) for collecting and analyzing data on sexual and reproductive health. The emphasis will be to introduce students to the appropriate methods used for challenging and sensitive research topics such as sexual behavior, HIV/STI, drug use, sexual abuse.

Prerequisite: Must have completed or be concurrently enrolled in SPHL602; or EPIB610.

EPIB633 Health Survey Design and Analysis (3 Credits)

An overview of types of survey research designs, questionnaire design, measurement issues, and techniques for recruiting and interacting with participants. Students will discuss and implement a variety of health survey analysis techniques, including how to utilize SAS statistical software to estimate descriptive statistics and implement regression models, while accounting for complex survey designs.

Prerequisite: SPHL602 or EPIB610; or permission of Instructor.

Recommended: EPIB697.

EPIB634 Applied Data Analysis in Social Epidemiology and Behavioral Health (3 Credits)

Focuses on the application of factor analysis, mediation analysis using path analytic model, and structural equation model in social epidemiology and behavioral health. Application of these analytical methods using SAS.

Prerequisite: EPIB610 and EPIB650; or permission of instructor.

EPIB635 Applied Multilevel Modeling in Health Research (3 Credits)

Multilevel modeling is a popular analytic technique in health research that collects data from participants at hierarchic levels, e.g., residents nested in neighborhoods, and patients in hospitals. The course covers topics in multilevel modeling including two- and three-level multilevel linear modeling, logistic regression model, modeling with ordered and nominal outcomes, as well as strategies for model building. This course focuses on the application of multilevel modeling, rather than mathematics. The instructor uses a step-by-step approach to teach this course with real-world examples. The course begins with an overview of the feature of multilevel data then transitions to the analytic foundations of multilevel models. Later lectures cover the use of multilevel modeling to predict the occurrence of an outcome (prediction model) and estimate the exposure-outcome association by controlling potential confounding and assessing interactions (association model).

Prerequisite: Working knowledge of fundamental statistical concepts, regression modeling, and SAS programming.

EPIB637 Social Epidemiologic Methods in Health Equity Research (3 Credits)

Provides students with the knowledge and skills to design and implement social epidemiology studies related to investigating health inequities. Presents an overview of drivers of health inequities (e.g., racism, socioeconomic status) and conceptual and methodological challenges in empirically investigating these social determinants of health including issues related to confounding, selection bias, measurement error, and evaluation of mechanisms. Covers methodological approaches that can be used to address these challenges including instrumental variable analyses, difference-in-differences, mediation analyses using inverse odds ratio weighting, and qualitative analyses. This knowledge will be applied to exploring research questions of your choice. The course will foster a co-learning environment and recognize the value and strength of interdisciplinary perspectives. Curiosity and critical thinking are encouraged and supported.

Prerequisite: Minimum grade of B- in SPHL602 or EPIB610; or permission of instructor.

EPIB642 Obesity Epidemiology: Hormones and Cancer (3 Credits)

An overview of the epidemiology, prevention and treatment of obesity with a focus on associations with cancer and hormonal mechanisms. This course will integrate public health disciplines including epidemiological methods, molecular biology, behavior and clinical science to discuss the causes and consequences of obesity, particularly cancer.

Prerequisite: SPHL602 or EPIB610; or equivalent .

Restriction: Must be in an SPHL program; or must have permission of the instructor.

EPIB643 Lifecourse Epidemiology: Methods, Pathways, and Applications for Healthier Lives (3 Credits)

Through lectures, readings, class exercises and discussion, this class provides a critical survey of Lifecourse epidemiology and its application to the public's health. In this class we will systematically survey both seminal and current literature on lifecourse epidemiology along with key related topics ranging from cellular to societal function. We consider the debates and controversies that ensued following publication of many of the groundbreaking papers and the subsequent revisions and evolution of the field in the context of these controversies. The second half of the class surveys the current state of science of Lifecourse epidemiology. We conclude this course by focusing on the growing literature on paternal influences within the Lifecourse perspective as well as opportunities for promoting health over the generations.

Prerequisite: Minimum grade of B- in SPHL602 or EPIB610; or equivalent.

Restriction: Must be in a program within the Department of Epidemiology and Biostatistics; or must have permission from the Department of Epidemiology and Biostatistics.

EPIB650 Biostatistics I (3 Credits)

Basic statistical concepts and procedures for Public Health. Focuses on applications, hands-on-experience, and interpretations of statistical findings.

Prerequisite: EPIB300; or equivalent undergraduate statistics or biostatistics course with a grade of C- or higher; or a score of 70% or higher on EPIB placement exam.

Credit Only Granted for: EPIB650, HLTH651, or HLTH688B.

Formerly: HLTH651 and HLTH688B.

EPIB651 Applied Regression Analysis (3 Credits)

An introduction to important statistical methods used in public health research, including nonparametric hypothesis testing, ANOVA, simple and multiple linear regression, logistic regression, and categorical data analysis.

Prerequisite: Minimum grade of B- in EPIB650.

Recommended: EPIB697 or previous experience working with SAS is highly recommended.

EPIB652 Categorical Data Analysis (3 Credits)

Methods for analysis of categorical data as applied to public health research, including contingency tables, logistic regression, multivariate logit models, loglinear models, and models for matched-pairs.

Prerequisite: EPIB651.

Recommended: EPIB697 or previous experience working with SAS is highly recommended.

EPIB653 Applied Survival Data Analysis (3 Credits)

Overview of statistical methods for analyzing censored survival data, including the Kaplan-Meier estimator, the log-rank test, Cox PH model.

Prerequisite: EPIB651.

EPIB655 Longitudinal Data Analysis (3 Credits)

Statistical models for drawing scientific inferences from longitudinal data, longitudinal study design, repeated measures and random effects to account for experimental designs that involve correlated responses, handling of missing data.

Prerequisite: EPIB651.

EPIB656 Applied Bayesian Data Analysis (3 Credits)

The theory and practical application of Bayesian statistical methods in the field of public health and related areas. A variety of models will be discussed including linear regression, multilevel model, generalized linear model, generalized linear mixed model.

Prerequisite: EPIB652 or STAT700; or permission of instructor.

EPIB660 Analysis of National Health Survey Data (3 Credits)

Provides background on how features such as stratification, clustering, and unequal sample selection probabilities can invalidate the assumptions underlying traditional statistical techniques, those implicitly assuming a simple random sampling with replacement design. Application using the SURVEY family of SAS/STAT procedures (Version 9.4 or later).

Prerequisite: EPIB650; or permission from Instructor.

Recommended: EPIB697.

EPIB661 Applied Multivariate Data Analysis (3 Credits)

Multivariate analysis targets data with simultaneous measurements on many variables and studies the relationship between these variables. This course introduces important multivariate analysis methods used in public health research. Topics include multivariate regression analysis, multivariate analysis of variance (MANOVA), principal component analysis (PCA), factor analysis, discriminant analysis (classification), clustering analysis, canonical correlation analysis (CCA) and correspondence analysis (CA).

Prerequisite: Must have completed EPIB651 or permission of instructor.

Recommended: Previous experience with at least one statistical software package (e.g. SAS, R, STATA). SAS is the main software package used for demonstration in class.

EPIB663 SAS Programming (3 Credits)

Learn how to analyze and summarize data using SAS. The course begins by introducing the students to basic SAS programming and data manipulation techniques. More advanced themes, such as preliminary data analysis and graphs, are explored later in the semester. Finally, the class covers the implementation of several advanced statistical concepts in SAS, including T-tests, ANOVA, non-parametric tests, regression and normality tests.

Credit Only Granted for: EPIB698E or EPIB663.

Formerly: EPIB698E.

EPIB664 Missing Data Analysis (3 Credits)

Missing data is a common problem in almost all scientific fields. Students will learn the different patterns and mechanisms of missing data, common procedures to handle missingness including weighting procedure, imputation-based procedure and model-based procedure. Useful and popular imputation methods and tools will be introduced. Numerous real data examples will be included to help students understand and solve the real world problem with missing data for different study designs.

Prerequisite: Minimum grade of B- in EPIB650 and EPIB651; or permission of instructor.

Recommended: Previous experience with at least one statistical software (e.g. SAS, R, STATA).

EPIB670 Molecular Epidemiology of Infectious Diseases (2 Credits)

Molecular epidemiology is a discipline that uses molecular microbiology tools to study the distribution and determinants of diseases in human and animal populations. This course will provide a comprehensive overview and detailed discussion of the core molecular approaches and recent technological advances that are and can be used to investigate the etiology, transmission, and control of infectious diseases in veterinary medicine and public health. Theoretical and practical aspects of various molecular biology methods will be discussed in the context of epidemiological studies of infectious diseases including both bacterial and viral infections of veterinary and zoonotic significance. Lecture topics will cover the principles and application of various molecular techniques to problems of infectious diseases; population and evolutionary genetics of pathogenic microorganisms; data analysis and interpretation. Lecture materials will also be supported with practical data analysis, literature review discussions, which will be student-driven that will critique relevant manuscripts via group discussions in the classroom.

Cross-listed with: VMSC670.

Credit Only Granted for: VMSC670 or EPIB670.

Additional Information: Students planning to take this course are expected to have had some backgrounds in infectious diseases and molecular biology.

EPIB672 Public Health Informatics (3 Credits)

A basic overview of Informatics and its application in a public health setting. The major goal is for students to understand the basic tools and building blocks needed to utilize this technology in order to improve their professional productivity

Cross-listed with: HLTH672.

Restriction: Instructor permission is required for students not enrolled in a degree seeking program in the School of Public Health.

Credit Only Granted for: HLTH670 or HLTH672 or EPIB672.

Formerly: HLTH670.

EPIB674 Statistical Foundations of Machine Learning in Public Health: From Classical to Deep Learning (3 Credits)

This graduate-level course in machine learning focuses on modern techniques for analyzing complex and massive data sets. Emphasis is placed on applications, computational methods, and the theoretical foundations of machine learning.

Prerequisite: EPIB650 and EPIB651 or equivalent. This requirement can be met through other relevant courses or experience, with the consent of the instructor.

Additional Information: Familiarity with R and some experience with Python is expected.

EPIB684 Epidemiologic Research Using Healthcare Databases (3 Credits)

Teaches students how to use health data, like electronic health records (EHR), hospital discharge records, and administrative claims (e.g., Medicare), for epidemiologic studies. Students will gain an understanding of how health data are generated through healthcare utilization and claims for reimbursement sent to payors from physicians, hospitals, and pharmacies. Students will also learn about coding nomenclature, including ICD-10-CM diagnosis codes, ICD-10-CM and CPT procedure codes, and medication coding systems. Students will be given access to a sample of health data to learn how to identify patient populations, identify comorbidities and other measures of health and healthcare utilization, and conduct studies on healthcare utilization and outcomes. Students will also learn about current hot topics in health data, including common data models, how social determinants of health can impact health data and introduce bias, risk prediction and AI, and data linkage.

Prerequisite: A minimum grade of B- in EPIB610; or equivalent; and a minimum grade of B- in EPIB697; or previous programming experience in SAS through other courses and/or activities with permission from the instructor.

EPIB685 Causal Inference in Epidemiology (3 Credits)

Public health and epidemiologic research are largely focused on asking causal questions (e.g., "Does X cause disease Y?"); however, most observational studies do not have appropriate study designs and analytic approaches to generate causal conclusions. This course will introduce students to causal inference fundamentals and methodology, with a focus on how to generate and analyze data to make causal inferences. This course will review the differences between association and causation, how to develop causal research questions, the underlying assumptions needed for causal inference, and how to design and analyze studies with causal questions. Applied examples and hands-on exercises will be used throughout the course to help students master the concepts.

Prerequisite: Minimum grade of B- in EPIB611 or equivalent; and minimum grade of B- in EPIB651 or equivalent; or permission from instructor.

Recommended: EPIB612 or equivalent and previous programming experience through coursework (e.g., EPIB695, EPIB697) or other activities.

EPIB689 Advanced Topics in Epidemiology or Biostatistics (1-6 Credits)

Special topics in epidemiology or biostatistics.

Repeatable to: 6 credits if content differs.

EPIB695 Introduction to R for Health Data Analysis (3 Credits)

A hands-on introduction to the statistical package R for health data management and analysis. The first part of the course focuses on basic and essential data manipulation and visualization using R. The second part emphasizes the use of R in statistical analyses, including summarization, correlation, chi-squared test, t-tests, ANOVA, simple and multiple regression. Students will also learn fundamental R language programming to perform user-defined calculations. No previous knowledge of R or of statistical analysis are assumed.

Jointly offered with: EPIB463.

Credit Only Granted for: EPIB463 or EPIB695.

EPIB697 Public Health Data Management (3 Credits)

This course is designed to provide students with the expertise needed to effectively manage research data using SAS as the statistical programming language.

Restriction: Must be in a program within the Maryland School of Public Health .

EPIB698 Special Topics in Epidemiology and Biostatistics (1-3 Credits)

Open to master or doctoral students who desire to pursue special topics in Epidemiology and Biostatistics.

EPIB740 Advanced Methods in Epidemiology (3 Credits)

In-depth investigation of epidemiologic methods for making causal inferences and solving complex methodological problems. Multivariate models emphasized.

Prerequisite: EPIB650, EPIB610, EPIB612, EPIB651, and EPIB611.

EPIB741 Association Models for Cohort and Cross-Sectional Studies (3 Credits)

The first part of a two-course advanced methods series specifically designed for doctoral students in epidemiology. This course focuses on implementing analytical strategies guided by epidemiologic principles for data analysis, with an emphasis on association modeling techniques tailored for cohort and cross-sectional studies. Key topics include model specification, effect estimation, confounding control, and the assessment of interaction and mediation effects. The course covers applied multivariate regression models, such as log-binomial regression, robust Poisson regression, the Cox proportional hazards models, and propensity-score models. Detailed procedures are provided for model specification, assessment of model assumptions, selection of alternative models, estimation of effects, and interpretation of findings from association models.

Prerequisite: EPIB612; or permission of instructor .

EPIB742 Association Models for Case-Control and Ecological Studies (3 Credits)

The second part of a two-course advanced methods series specifically designed for doctoral students in epidemiology. EPIB742 emphasizes the implementation of analytical strategies rooted in epidemiologic principles for data analysis. The course focuses on specific association modeling techniques for analyzing data from traditional, matched, and population-based case-control studies, case-crossover studies, and ecological studies. Key topics include model specification, effect estimation, control of confounding, and assessment of interaction effects. The curriculum covers applied multivariate regression models such as traditional logistic regression, conditional logistic regression, conditional Cox proportional hazards regression, and weighted Cox regression models. Additionally, the course introduces spline techniques for analyzing dose-response data. Detailed procedures for model specification, assessment of model assumptions, selection of alternative models, effect estimates, and interpretation of findings from association models are thoroughly explored.

Prerequisite: EPIB741.

EPIB778 Practical Experience in Public Health (1-3 Credits)

Practice experience providing an opportunity to apply previously acquired knowledge and skills in a health or allied health organization. Setting of the practice experience will depend upon the student's background and career goals.

Prerequisite: Permission of SPHL-Department of Epidemiology and Biostatistics.

Restriction: Must be enrolled in the Master of Public Health program in Biostatistics or Epidemiology.

Repeatable to: 3 credits.

EPIB786 Capstone Project in Public Health (3 Credits)

Capstone experience providing opportunity to apply knowledge and skills to a specific public health problem or issue. Completion of project relevant to public health under the direction of an advisor.

Prerequisite: Permission of SPHL-Epidemiology & Biostatistics department.

Restriction: Must be enrolled in the Master of Public Health program in Biostatistics or Epidemiology.

EPIB788 Critical Readings in Epidemiology and Biostatistics (1-3 Credits)

Open to doctoral students to discuss critical readings in Epidemiology and Biostatistics.

Prerequisite: Must have completed or be concurrently enrolled in EPIB610.

Restriction: Must be enrolled in the Epidemiology PhD program (EPID).

Repeatable to: 6 credits if content differs.

EPIB798 Independent Study (1-6 Credits)

Master or doctoral students who desire to pursue special research problems under the direction of a faculty member of the department may register for 1-6 hours of credit under this number.

Prerequisite: Permission of SPHL-Epidemiology & Biostatistics department.

Repeatable to: 9 credits if content differs.

EPIB799 Master's Thesis Research (1-6 Credits)**EPIB898 Pre-Candidacy Research (1-8 Credits)****EPIB899 Doctoral Dissertation Research (1-8 Credits)**