

Statistical Models In Epidemiology

This book is designed to be a practical study in infectious disease dynamics. The book offers an easy to follow implementation and analysis of mathematical epidemiology. The book focuses on recent case studies in order to explore various conceptual, mathematical, and statistical issues. The dynamics of infectious diseases shows a wide diversity of pattern. Some have locally persistent chains-of-transmission, others persist spatially in 'consumer-resource metapopulations'. Some infections are prevalent among the young, some among the old and some are age-invariant. Temporally, some diseases have little variation in prevalence, some have predictable seasonal shifts and others exhibit violent epidemics that may be regular or irregular in their timing. Models and 'models-with-data' have proved invaluable for understanding and predicting this diversity, and thence help improve intervention and control. Using mathematical models to understand infectious disease dynamics has a very rich history in epidemiology. The field has seen broad expansions of theories as well as a surge in real-life application of mathematics to dynamics and control of infectious disease. The chapters of Epidemics: Models and Data using R have been organized in a reasonably logical way: Chapters 1-10 is a mix and match of models, data and statistics pertaining to local disease dynamics; Chapters 11-13 pertains to spatial and spatiotemporal dynamics; Chapter 14 highlights similarities between the dynamics of infectious disease and parasitoid-host dynamics; Finally, Chapters 15 and 16 overview additional statistical methodology useful in studies of infectious disease dynamics. This book can be used as a guide for working with data, models and 'models-and-data' to understand epidemics and infectious disease dynamics in space and time.

Since the publication of the second edition, many new Bayesian tools and methods have been developed for space-time data analysis, the predictive modeling of health outcomes, and other spatial biostatistical areas. Exploring these new developments, Bayesian Disease Mapping: Hierarchical Modeling in Spatial Epidemiology, Third Edition provides an up-to-date, cohesive account of the full range of Bayesian disease mapping methods and applications. In addition to the new material, the book also covers more conventional areas such as relative risk estimation, clustering, spatial survival analysis, and longitudinal analysis. After an introduction to Bayesian inference, computation, and model assessment, the text focuses on important themes, including disease map reconstruction, cluster detection, regression and ecological analysis, putative hazard modeling, analysis of multiple scales and multiple diseases, spatial survival and longitudinal studies, spatiotemporal methods, and map surveillance. It shows how Bayesian disease mapping can yield significant insights into georeferenced health data. The target audience for this text is public health specialists, epidemiologists, and biostatisticians who need to work with geo-referenced health data.

The concepts of epidemiology, the science that uses statistical methods to investigate associations between risk factors and disease outcomes in human populations, are developed using examples involving real data from published studies. The relevant statistical methods are developed systematically to provide an integrated approach to observational and experimental studies. After covering basic measurement, study design, and study credibility issues, the author continues with basic statistical methods and techniques for adjusting risk estimates for confounders. Statistical models including logistic regression and the proportional hazards model for survival analysis are explained in detail in the following chapters, concluding with an explanation of the general methods for determining the sample size and power requirements for an epidemiological study. Taking advantage of the power, accessibility and user-friendliness of modern computer packages, the author uses a variety of interesting data sets and graphical displays to illustrate the methods. Epidemiological Research Methods will be of interest to students and research workers who need to learn and appreciate modern approaches to the subject. Without unnecessary emphasis on mathematics or theory, the book will enable the reader to gain a greater level of understanding of the underlying methods than is normally provided in books on epidemiology.

Highly praised for its broad, practical coverage, the second edition of this popular text incorporated the major statistical models and issues relevant to epidemiological studies. Epidemiology: Study Design and Data Analysis, Third Edition continues to focus on the quantitative aspects of epidemiological research. Updated and expanded, this edition

Mathematical and Statistical Estimation Approaches in Epidemiology

Study Design and Data Analysis, Third Edition

Statistical Thinking in Epidemiology

Statistical Models

Spatio-Temporal Methods in Environmental Epidemiology

The second edition of this standard text guides biomedical researchers in the selection and use of advanced statistical methods and the presentation of results to clinical colleagues. It assumes no knowledge of mathematics beyond high school level and is accessible to anyone with an introductory background in statistics. The Stata statistical software package is again used to perform the analyses, this time employing the much improved version 10 with its intuitive point and click as well as character-based commands. Topics covered include linear, logistic and Poisson regression, survival analysis, fixed-effects analysis of variance, and repeated-measure analysis of variance. Restricted cubic splines are used to model non-linear relationships. Each method is introduced in its simplest form and then extended to cover more complex situations. An appendix will help the reader select the most appropriate statistical methods for their data. The text makes extensive use of real data sets available at <http://biostat.mc.vanderbilt.edu/dupontwd/wdtdtext/>.

Statistical ideas have been integral to the development of epidemiology and continue to provide the tools needed to interpret epidemiological studies. Although epidemiologists do not need a highly mathematical background in statistical theory to conduct and interpret such studies, they do need more than an encyclopedia of "recipes." Statistics for Epidemiology achieves just the right balance between the two approaches, building an intuitive understanding of the methods most important to practitioners and the skills to use them effectively. It develops the techniques for analyzing simple risk factors and disease data, with step-by-step extensions that include the use of binary regression. It covers the logistic regression model in detail and contrasts it with the Cox model for time-to-incidence data. The author uses a few simple case studies to guide readers from elementary analyses to more complex regression modeling. Following these examples through several chapters makes it easy to compare the interpretations that emerge from varying approaches. Written by one of the top biostatisticians in the field, Statistics for Epidemiology stands apart in its focus on interpretation and in the depth of understanding it provides. It lays the groundwork that all public health professionals, epidemiologists, and biostatisticians need to successfully design, conduct, and analyze epidemiological studies.

Written by a biostatistics expert with over 20 years of experience in the field, Bayesian Methods in Epidemiology presents statistical methods used in epidemiology from a Bayesian viewpoint. It employs the software package WinBUGS to carry out the analyses and offers the code in the text and for download online. The book examines study designs that

This lively and engaging book explains the things you have to know in order to read empirical papers in the social and health sciences, as well as the techniques you need to build statistical models of your own. The discussion in the book is organized around published studies, as are many of the exercises. Relevant journal articles are reprinted at the back of the book. Freedman makes a thorough appraisal of the statistical methods in these papers and in a variety of other examples. He illustrates the principles of modelling, and the pitfalls. The discussion shows you how to think about the critical issues - including the connection (or lack of it) between the statistical models and the real phenomena. The book is written for advanced undergraduates and beginning graduate students in statistics, as well as students and professionals in the social and health sciences.

Statistical Models in Epidemiology

Teaching Epidemiology

Statistical Models in Epidemiology, the Environment, and Clinical Trials

Epidemics

Complex Population Dynamics

Epidemiologic studies provide research strategies for investigating public health and scientific questions relating to the factors that cause and prevent ailments in human populations. Statistics in Epidemiology: Methods, Techniques and Applications presents a comprehensive review of the wide range of principles, methods and techniques underlying prospective, retrospective and cross-sectional approaches to epidemiologic studies. Written for epidemiologists and other researchers without extensive backgrounds in statistics, this new book provides a clear and concise description of the statistical tools used in epidemiology. Emphasis is given to the application of these statistical tools, and examples are provided to illustrate direct methods for applying common statistical techniques in order to obtain solutions to problems. Statistics in Epidemiology: Methods, Techniques and Applications goes beyond the elementary material found in basic epidemiology and biostatistics books and provides a detailed account of techniques:

Environmental epidemiology is the study of the environmental causes of disease in populations and how these risks vary in relation to intensity and duration of exposure and other factors like genetic susceptibility. As such, it is the basic science upon which governmental safety standards and compensation policies for environmental and occupational exposure are based. Profusely illustrated with examples from the epidemiologic literature on ionizing radiation and air pollution, thistext provides a systematic treatment of the statistical challenges that arise in environmental health studies and the use epidemiologic data in formulating public policy, at a level suitable for graduate students and epidemiologic researchers. After a general overview of study design and statistical methods for epidemiology generally, the book goes on to address the problems that are unique to environmental health studies, special-purpose designs like two-phase case-control studies and countermatching, statistical methods for modeling exposure-time-response relationships, longitudinal and time-series studies, spatial and ecologic methods, exposure measurement error, interactions, and mechanistic models. It also discusses studies aimed at evaluating the public health benefits of interventions to improve the environment, the use of epidemiologic data to establish environmental safety standards and compensation policy, and concludes with emerging problems in reproductive epidemiology, natural and man-made disasters like globalwarming, and the global burden of environmentally caused disease. No other book provides such a broad perspective on the methodological challenges in this field at a level accessible to both epidemiologists and statisticians.

The book is a comprehensive, self-contained introduction to the mathematical modeling and analysis of disease transmission models. It includes (i) an introduction to the main concepts of compartmental models including models with heterogeneous mixing of individuals and models for vector-transmitted diseases, (ii) a detailed analysis of models for important specific diseases, including tuberculosis, HIV/AIDS, influenza, Ebola virus disease, malaria, dengue fever and the Zika virus, (iii) an introduction to more advanced mathematical topics, including age structure, spatial structure, and mobility, and (iv) some challenges and opportunities for the future. There are exercises of varying degrees of difficulty, and projects leading to new research directions. For the benefit of public health professionals whose contact with mathematics may not be recent, there is an appendix covering the necessary mathematical background. There are indications which sections require a strong mathematical background so that the book can be useful for both mathematical modelers and public health professionals.

Analytic procedures suitable for the study of human disease are scattered throughout the statistical and epidemiologic literature. Explanations of their properties are frequently presented in mathematical and theoretical language. This well-established text gives readers a clear understanding of the statistical methods that are widely used in epidemiologic research without depending on advanced mathematical or statistical theory. By applying these methods to actual data, Selvin reveals the strengths and weaknesses of each analytic approach. He combines techniques from the fields of statistics, biostatistics, demography and epidemiology to present a comprehensive overview that does not require computational details of the statistical techniques described. For the Third Edition, Selvin took out some old material (e.g. the section on rarely used cross-over designs) and added new material (e.g. sections on frequently used contingency table analysis). Throughout the text he enriched existing discussions with new elements, including the analysis of multi-level categorical data and simple, intuitive arguments that exponential survival times cause the hazard function to be constant. He added a dozen new applied examples to illustrate such topics as the pitfalls of proportional mortality data, the analysis of matched pair categorical data, and the age-adjustment of mortality rates based on statistical models. The most important new feature is a chapter on Poisson regression analysis. This essential statistical tool permits the multivariable analysis of rates, probabilities and counts.

Bayesian Methods in Epidemiology

Methods, Techniques and Applications

Principles, Methods and Applications

Statistical Models for Proportions and Probabilities

Bayesian Disease Mapping

Longitudinal studies of health outcomes and their risk factors are increasingly important source of knowledge in epidemiology,, public health and clinical medicine. However, many of the statistical procedures suited to the analysis of findings from these studies have emerged only recently. This book brings together the most important of these developments.

Methods for making inferences from data about one or more probabilities and proportions are a fundamental part of a statistician 's toolbox and statistics courses. Unfortunately many of the quick, approximate methods currently taught have recently been found to be inappropriate. This monograph gives an up-to-date review of recent research on the topic and presents both exact methods and helpful approximations. Detailed theory is also presented for the different distributions involved, and can be used in a classroom setting. It will be useful for those teaching statistics at university level and for those involved in statistical consulting.

This volume, representing a compilation of authoritative reviews on a multitude of uses of statistics in epidemiology and medical statistics written by internationally renowned experts, is addressed to statisticians working in biomedical and epidemiological fields who use statistical and quantitative methods in their work. While the use of statistics in these fields has a long and rich history, explosive growth of science in general and clinical and epidemiological sciences in particular have gone through a sea of change, spawning the development of new methods and innovative adaptations of standard methods. Since the literature is highly scattered, the Editors have undertaken this humble exercise to document a representative collection of topics of broad interest to diverse users. The volume spans a cross section of standard topics oriented toward users in the current evolving field, as well as special topics in much need which have more recent origins. This volume was prepared especially keeping the applied statisticians in mind, emphasizing applications-oriented methods and techniques, including references to appropriate software when relevant. · Contributors are internationally renowned experts in their respective areas · Addresses emerging statistical challenges in epidemiological, biomedical, and pharmaceutical research · Methods for assessing Biomarkers, analysis of competing risks · Clinical trials including sequential and group sequential, crossover designs, cluster randomized, and adaptive designs · Structural equations modelling and longitudinal data analysis

This selection of papers encompasses recent methodological advances in several important areas, such as multivariate failure time data and interval censored data, as well as innovative applications of the existing theory and methods. Using a rigorous account of statistical forecasting efforts that led to the successful resolution of the John-Manville asbestos litigation, the models in this volume can be adapted to forecast industry-wide asbestos liability. More generally, because the models are not overly dependent on the U.S. legal system and the role of asbestos, this volume will be of interest in other product liability cases, as well as similar forecasting situations for a range of insurable or compensational events. Throughout the text, the emphasis is on the iterative nature of model building and the uncertainty generated by lack of complete knowledge of the injury process. This uncertainty is balanced against the court's need for a definitive settlement, and how these opposing principles can be reconciled. A valuable reference for researchers and practitioners in the field of survival analysis.

Statistics for Epidemiology

Statistical Models and Causal Inference

Applications of Regression Models in Epidemiology

Statistical Analysis of Epidemiologic Data

Impacts and Bayesian Adjustments

This book examines statistical methods and models used in the fields of global health and epidemiology. It includes methods such as innovative probability sampling, data harmonization and encryption, and advanced descriptive, analytical and monitoring methods. Program codes using R are included as well as real data examples. Contemporary global health and epidemiology involves a myriad of medical and health challenges, including inequality of treatment, the HIV/AIDS epidemic and its subsequent control, the flu, cancer, tobacco control, drug use, and environmental pollution. In addition to its vast scales and telescopic perspective; addressing global health concerns often involves examining resource-limited populations with large geographic, socioeconomic diversities. Therefore, advancing global health requires new epidemiological design, new data, and new methods for sampling, data processing, and statistical analysis. This book provides global health researchers with methods that will enable access to and utilization of existing data. Featuring contributions from both epidemiological and biostatistical scholars, this book is a practical resource for researchers, practitioners, and students in solving global health problems in research, education, training, and consultation. Mathematical and Statistical Estimation Approaches in Epidemiology compiles theoretical and practical contributions of experts in the analysis of infectious disease epidemics in a single volume. Recent collections have focused in the analyses and simulation of deterministic and stochastic models whose aim is to identify and rank epidemiological and social mechanisms responsible for disease transmission. The contributions in this volume focus on the connections between models and disease data with emphasis on the application of mathematical and statistical approaches that quantify model and data uncertainty. The book is aimed at public health experts, applied mathematicians and scientists in the life and social sciences, particularly graduate or advanced undergraduate students, who are interested not only in building and connecting models to data but also in applying and developing methods that quantify uncertainty in the context of infectious diseases. Chowell and Brauer open this volume with an overview of the classical disease transmission models of Kermack-McKendrick including extensions that account for increased levels of epidemiological heterogeneity. Their theoretical tour is followed by the introduction of a simple methodology for the estimation of, the basic reproduction number, R_0 . The use of this methodology is illustrated, using regional data for 1918-1919 and 1968 in uenza pandemics.

This book deals with the mathematical aspects of survival analysis and reliability as well as other topics, reflecting recent developments in the following areas: applications in epidemiology; probabilistic and statistical models and methods in reliability; models and methods in survival analysis, longevity, aging, and degradation; accelerated life models; quality of life; new statistical challenges in genomics. The work will be useful to a broad interdisciplinary readership of researchers and practitioners in applied probability and statistics, industrial statistics, biomedicine, biostatistics, and engineering.

"Finally, this constructive approach that proceeds from the lower level of the individual contribution of the experimental units to the global level of the population is applied to sample size determination for comparative studies when, in the compared groups, there is attrition due to noncompliance to the specific regimen. This attrition reduces the apparent treatment effect in the analysis. This presentation constitutes a foundation for a more general and elegant solution to the problem." --

Nonlinear Modeling in Ecology, Epidemiology, and Genetics

Statistical Models and Methods for Biomedical and Technical Systems

A Simple Introduction to the Analysis of Complex Data

Statistical Models for Longitudinal Studies of Health

Biostatistics and Computer-based Analysis of Health Data using Stata

This book discusses systematically treatment on the development of stochastic, statistical and state space models of the HIV epidemic and of HIV pathogenesis in HIV-infected individuals, and presents the applications of these models. The book is unique in several ways: (1) it uses stochastic difference and differential equations to present the stochastic models of the HIV epidemic and HIV pathogenesis; in this sense, the deterministic models are considered as special cases when the numbers of different type of people or cells are very large (2) it provides, a critical analysis of deterministic and statistical models in the literature; (3) it develops state space models by combining stochastic models and statistical models; and (4) it provides a detailed discussion on the pros and cons of the different modeling approaches. This book is the first to introduce state space models for the HIV epidemic. It is also the first to develop stochastic models and state space models for the HIV pathogenesis in HIV-infected individuals.

While biomedical researchers may be able to follow instructions in the manuals accompanying the statistical software packages, they do not always have sufficient knowledge to choose the appropriate statistical methods and correctly interpret their results. Statistical Thinking in Epidemiology examines common methodological and statistical problems in the use of correlation and regression in medical and epidemiological research: mathematical coupling, regression to the mean, collinearity, the reversal paradox, and statistical interaction. Statistical Thinking in Epidemiology is about thinking statistically when looking at problems in epidemiology. The authors focus on several methods and look at them in detail: specific examples in epidemiology illustrate how different model specifications can imply different causal relationships amongst variables, and model interpretation is undertaken with appropriate consideration of the context of implicit or explicit causal relationships. This book is intended for applied statisticians and epidemiologists, but can also be very useful for clinical and applied health researchers who want to have a better understanding of statistical thinking. Throughout the book, statistical software packages R and Stata are used for general statistical modeling, and Amos and Mplus are used for structural equation modeling.

Teaching epidemiology requires skill and knowledge, combined with a clear teaching strategy and good pedagogic skills. The general advice is simple: if you are not an expert on a topic, try to enrich your background knowledge before you start teaching. Teaching Epidemiology, third edition helps you to do this, and by providing the world-expert teacher's advice on how best to structure teaching gives a unique insight in to what has worked in their hands. The book will help you plan your own tailored teaching program. The book is a guide to new teachers in the field at two levels: those teaching basic courses for undergraduates, and those teaching more advanced courses for students at postgraduate level. Each chapter provides key concepts and a list of key references. Subject specific methodology and disease specific issues (from cancer to genetic epidemiology) are dealt with in details. There is also a focused chapter on the principles and practice of computer-assisted learning.

David A. Freedman presents a definitive synthesis of his approach to statistical modeling and causal inference in the social sciences.

A Dialogue with the Social Sciences

Epidemiological Research Methods

Models and Data using R

Epidemiology

Modern Methods for Epidemiology

This book combines applied and theoretical approaches to the analysis of epidemiologic issues. It goes beyond elementary material to deal with real problems generated by disease data, and delves into less usual areas such as the analysis of spatial distributions, survival data, proportional hazards regression, and "computer-intensive" approaches to statistical estimation. Each method discussed in the text is illustrated with examples which include complete sets of data. Using actual data demonstrates the strengths and weaknesses of different analytic approaches in describing a disease process. The goal of the book is to allow the reader to develop a clear understanding of analytic approaches to problems in epidemiologic data analysis without relying on sophisticated mathematics and advanced statistical theory. For the Second Edition a new chapter on the analysis of matched data has been added. This covers both discrete and continuous outcomes and explains both the classic analytic approach and the conditional logistic regression model. New sections have also been added on contingency table data, misclassification, and additive models underlying tabular data. In all the chapters there are new applications and other revisions that make this Second Edition a clearer and more helpful

exposition of the way statistical tools are used to analyze epidemiologic data.

Mismeasurement of explanatory variables is a common hazard when using statistical modeling techniques, and particularly so in fields such as biostatistics and epidemiology where perceived risk factors cannot always be measured accurately. With this perspective and a focus on both continuous and categorical variables, Measurement Error and Misclassification

This volume of the Biostatistics and Health Sciences Set focuses on statistics applied to clinical research. The use of Stata for data management and statistical modeling is illustrated using various examples. Many aspects of data processing and statistical analysis of cross-sectional and experimental medical data are covered, including regression models commonly found in medical statistics. This practical book is primarily intended for health researchers with basic knowledge of statistical methodology. Assuming basic concepts, the authors focus on the practice of biostatistical methods essential to clinical research, epidemiology and analysis of biomedical data (including comparison of two groups, analysis of categorical data, ANOVA, linear and logistic regression, and survival analysis). The use of examples from clinical trials and epidemiological studies provide the basis for a series of practical exercises, which provide instruction and familiarize the reader with essential Stata packages and commands. Provides detailed examples of the use of Stata for common biostatistical tasks in medical research. Features a work program structured around the four previous chapters and a series of practical exercises with commented corrections. Includes an appendix to help the reader familiarize themselves with additional packages and commands. Focuses on the practice of biostatistical methods that are essential to clinical research, epidemiology, and analysis of biomedical data. A one-stop guide for public health students and practitioners learning the applications of classical regression models in epidemiology. This book is written for public health professionals and students interested in applying regression models in the field of epidemiology. The academic material is usually covered in public health courses including (i) Applied Regression Analysis, (ii) Advanced Epidemiology, and (iii) Statistical Computing. The book is composed of 13 chapters, including an introduction chapter that covers basic concepts of statistics and probability. Among the topics covered are linear regression model, polynomial regression model, weighted least squares, methods for selecting the best regression equation, and generalized linear models and their applications to different epidemiological study designs. An example is provided in each chapter that applies the theoretical aspects presented in that chapter. In addition, exercises are included and the final chapter is devoted to the solutions of these academic exercises with answers in all of the major statistical software packages, including STATA, SAS, SPSS, and R. It is assumed that readers of this book have a basic course in biostatistics, epidemiology, and introductory calculus. The book will be of interest to anyone looking to understand the statistical fundamentals to support quantitative research in public health. In addition, this book: • Is based on the authors' course notes from 20 years teaching regression modeling in public health courses • Provides exercises at the end of each chapter • Contains a solutions chapter with answers in STATA, SAS, SPSS, and R • Provides real-world public health applications of the theoretical aspects contained in the chapters. Applications of Regression Models in Epidemiology is a reference for graduate students in public health and public health practitioners. ERICK SUÁREZ is a Professor of the Department of Biostatistics and Epidemiology at the University of Puerto Rico School of Public Health. He received a Ph.D. degree in Medical Statistics from the London School of Hygiene and Tropical Medicine. He has 29 years of experience teaching biostatistics. CYNTHIA M. PÉREZ is a Professor of the Department of Biostatistics and Epidemiology at the University of Puerto Rico School of Public Health. She received an M.S. degree in Statistics and a Ph.D. degree in Epidemiology from Purdue University. She has 22 years of experience teaching epidemiology and biostatistics. ROBERTO RIVERA is an Associate Professor at the College of Business at the University of Puerto Rico at Mayaguez. He received a Ph.D. degree in Statistics from the University of California in Santa Barbara. He has more than five years of experience teaching statistics courses at the undergraduate and graduate levels. MELLISSA N. MARTÍNEZ is an Account Supervisor at Havas Media International. She holds an MPH in Biostatistics from the University of Puerto Rico and an MSBA from the National University in San Diego, California. For the past seven years, she has been performing analyses for the biomedical research and media advertising fields.

Statistical Methods for Global Health and Epidemiology

Mathematical Models in Epidemiology

Statistical Methods in Spatial Epidemiology

Statistics in Epidemiology

Forecasting Product Liability Claims

This collection of review articles is devoted to the modeling of ecological, epidemiological and evolutionary systems. Theoretical mathematical models are perhaps one of the most powerful approaches available for increasing our understanding of the complex population dynamics in these natural systems. Exciting new techniques are currently being developed to meet this challenge, such as generalized or structural modeling, adaptive dynamics or multiplicative processes. Many of these new techniques stem from the field of nonlinear dynamics and chaos theory, where even the simplest mathematical rule can generate a rich variety of dynamical behaviors that bear a strong analogy to biological populations.

This self-contained account of the statistical basis of epidemiology has been written for those with a basic training in biology. No previous knowledge of the subject is assumed and mathematics is deliberately kept at a manageable level. Based on a highly successful course, this book explains the essential statistics for all epidemiologists.

Teaches Students How to Perform Spatio-Temporal Analyses within Epidemiological Studies Spatio-Temporal Methods in Environmental Epidemiology is the first book of its kind to specifically address the interface between environmental epidemiology and spatio-temporal modeling. In response to the growing need for collaboration between statisticians and environmental epidemiologists, the book links recent developments in spatio-temporal methodology with epidemiological applications. Drawing on real-life problems, it provides the necessary tools to exploit advances in methodology when assessing the health risks associated with environmental hazards. The book's clear guidelines enable the implementation of the methodology and estimation of risks in practice. Designed for graduate students in both epidemiology and statistics, the text covers a wide range of topics, from an introduction to epidemiological principles and the foundations of spatio-temporal modeling to new research directions. It describes traditional and Bayesian approaches and presents the theory of spatial, temporal, and spatio-temporal modeling in the context of its application to environmental epidemiology. The text includes practical examples together with embedded R code, details of specific R packages, and the use of other software, such as WinBUGS/OpenBUGS and integrated nested Laplace approximations (INLA). A supplementary website provides additional code, data, examples, exercises, lab projects, and more. Representing a major new direction in environmental epidemiology, this book—in full color throughout—underscores the increasing need to consider dependencies in both space and time when modeling epidemiological data. Students will learn how to identify and model patterns in spatio-temporal data as well as exploit dependencies over space and time to reduce bias and inefficiency.

Handbook of Spatial Epidemiology explains how to model epidemiological problems and improve inference about disease etiology from a geographical perspective. Top epidemiologists, geographers, and statisticians share interdisciplinary viewpoints on analyzing spatial data and space-time variations in disease incidences. These analyses can provide important information that leads to better decision making in public health. The first part of the book addresses general issues related to epidemiology, GIS, environmental studies, clustering, and ecological analysis. The second part presents basic statistical methods used in spatial epidemiology, including fundamental likelihood principles, Bayesian methods, and testing and nonparametric approaches. With a focus on special methods, the third part describes geostatistical models, splines, quantile regression, focused clustering, mixtures, multivariate methods, and much more. The final part examines special problems and application areas, such as residential history analysis, segregation, health services research, health surveys, infectious disease, veterinary topics, and health surveillance and clustering. Spatial epidemiology, also known as disease mapping, studies the geographical or spatial distribution of health outcomes. This handbook offers a wide-ranging overview of state-of-the-art approaches to determine the relationships between health and various risk factors, empowering researchers and policy makers to tackle public health problems.

Hierarchical Modeling in Spatial Epidemiology, Third Edition

Epidemiology and Medical Statistics

Stochastic Modeling of AIDS Epidemiology and HIV Pathogenesis

Statistical Analysis of Human Growth and Development

Epidemiology and Modeling in the Manville Asbestos Case

While biomedical researchers may be able to follow instructions in the manuals accompanying the statistical software packages, they do not always have sufficient knowledge to choose the appropriate statistical methods and correctly interpret their results. Statistical Thinking in Epidemiology examines common methodological and statistical problems

Highly praised for its broad, practical coverage, the second edition of this popular text incorporated the major statistical models and issues relevant to epidemiological studies.

Epidemiology: Study Design and Data Analysis, Third Edition continues to focus on the quantitative aspects of epidemiological research. Updated and expanded, this edition shows students how statistical principles and techniques can help solve epidemiological problems. New to the Third Edition New chapter on risk scores and clinical decision rules New chapter on computer-intensive methods, including the bootstrap, permutation tests, and missing value imputation New sections on binomial regression models, competing risk, information criteria, propensity scoring, and splines Many more exercises and examples using both Stata and SAS More than 60 new figures After introducing study design and reviewing all the standard methods, this self-contained book takes students through analytical methods for both general and specific epidemiological study designs, including cohort, case-control, and intervention studies. In addition to classical methods, it now covers modern methods that exploit the enormous power of contemporary computers. The book also addresses the problem of determining the appropriate size for a study, discusses statistical modeling in epidemiology, covers methods for comparing and summarizing the evidence from several studies, and explains how to use statistical models in risk forecasting and assessing new biomarkers. The author illustrates the techniques with numerous real-world examples and interprets results in a practical way. He also includes an extensive list of references for further reading along with exercises to reinforce understanding. Web Resource A wealth of supporting material can be downloaded from the book's CRC Press web page, including: Real-life data sets used in the text SAS and Stata programs used for examples in the text SAS and Stata programs for special techniques covered Sample size spreadsheet

Spatial epidemiology is the description and analysis of the geographical distribution of disease. It is more important now than ever, with modern threats such as bio-terrorism making such analysis even more complex. This second edition of Statistical Methods in Spatial Epidemiology is updated and expanded to offer a complete coverage of the analysis and application of spatial statistical methods. The book is divided into two main sections: Part I introduces basic definitions and terminology, along with map construction and some basic models. This is expanded upon in Part II by applying this knowledge to the fundamental problems within spatial epidemiology, such as disease mapping, ecological analysis, disease clustering, bio-terrorism, space-time analysis, surveillance and infectious disease modelling. Provides a comprehensive overview of the main statistical methods used in spatial epidemiology. Updated to include a new emphasis on bio-terrorism and disease surveillance. Emphasizes the importance of space-time modelling and outlines the practical application of the method. Discusses the wide range of software available for analyzing spatial data, including WinBUGS, SaTScan and R, and features an accompanying website hosting related software. Contains numerous data sets, each representing a different approach to the analysis, and provides an insight into various modelling techniques. This text is primarily aimed at medical statisticians, researchers and practitioners from public health and epidemiology. It is also suitable for postgraduate students of statistics and epidemiology, as well professionals working in government agencies.

Routine applications of advanced statistical methods on real data have become possible in the last ten years because desktop computers have become much more powerful and cheaper. However, proper understanding of the challenging statistical theory behind those methods remains essential for correct application and interpretation, and rarely seen in the medical literature.

Modern Methods for Epidemiology provides a concise introduction to recent development in statistical methodologies for epidemiological and biomedical researchers. Many of these methods have become indispensable tools for researchers working in epidemiology and medicine but are rarely discussed in details by standard textbooks of biostatistics or epidemiology. Contributors of this book are experienced researchers and experts in their respective fields. This textbook provides a solid starting point for those who are new to epidemiology, and for those looking for guidance in more modern statistical approaches to observational epidemiology. Epidemiological and biomedical researchers who wish to overcome the mathematical barrier of applying those methods to their research will find this book an accessible and helpful reference for self-learning and research. This book is also a good source for teaching postgraduate students in medical statistics or epidemiology.

A Case Study in Air Pollution and Health

The Maximum Entropy Principle as a Basis for Statistical Models in Epidemiology

Statistical Methods for Environmental Epidemiology with R

Statistical Modeling for Biomedical Researchers

Handbook of Spatial Epidemiology

This IMA Volume in Mathematics and its Applications STATISTICAL MODELS IN EPIDEMIOLOGY, THE ENVIRONMENT, AND CLINICAL TRIALS is a combined proceedings on "Design and Analysis of Clinical Trials" and "Statistics and Epidemiology: Environment and Health." This volume is the third series based on the proceedings of a very successful 1997 IMA Summer Program on "Statistics in the Health Sciences." I would like to thank the organizers: M. Elizabeth Halloran of Emory University (Biostatistics) and Donald A. Berry of Duke University (Institute of Statistics and Decision Sciences and Cancer Center Biostatistics) for their excellent work as organizers of the meeting and for editing the proceedings. I am grateful to Seymour Geisser of University of Minnesota (Statistics), Patricia Grambsch, University of Minnesota (Biostatistics); Joel Greenhouse, Carnegie Mellon University (Statistics); Nicholas Lange, Harvard Medical School (Brain Imaging Center, McLean Hospital); Barry Margolin, University of North Carolina-Chapel Hill (Biostatistics); Sandy Weisberg, University of Minnesota (Statistics); Scott Zeger, Johns Hopkins University (Biostatistics); and Marvin Zelen, Harvard School of Public Health (Biostatistics) for organizing the six weeks summer program. I also take this opportunity to thank the National Science Foundation (NSF) and the Army Research Office (ARO), whose financial support made the workshop possible. Willard Miller, Jr.

As an area of statistical application, environmental epidemiology and more specifically, the estimation of health risk associated with the exposure to environmental agents, has led to the development of several statistical methods and software that can then be applied to other scientific areas. The statistical analyses aimed at addressing questions in environmental epidemiology have the following characteristics. Often the signal-to-noise ratio in the data is low and the targets of inference are inherently small risks. These constraints typically lead to the development and use of more sophisticated (and potentially less transparent) statistical models and the integration of large high-dimensional databases. New technologies and the widespread availability of powerful computing are also adding to the complexities of scientific investigation by allowing researchers to fit large numbers of models and search over many sets of variables. As the number of variables measured increases, so do the degrees of freedom for inferring the association between a risk factor and an outcome of interest. We have written this book, in part, to describe our experiences developing and applying statistical methods for the estimation for air pollution health effects. Our experience has convinced us that the application of modern statistical methodology in a reproducible manner can bring to bear substantial benefits to policy-makers and scientists in this area. We believe that the methods described in this book are applicable to other areas of environmental epidemiology, particularly those areas involving spatial/temporal exposures.

This book aims to give a self-contained account of the statistical basis of epidemiology. The book is intended primarily for students enrolled for a masters degree in epidemiology, clinical epidemiology, or biostatistics, and should be suitable both as the basis for a taught course and for private study. No previous knowledge is assumed, and the mathematical level has been chosen to suit readers whose basic training is in biology. The most important concept in statistics is the probability model. All statistical analysis of data is based on probability models, even though these may not be explicit. Only by fully understanding the model can one fully understand the analysis. In showing how to use models in epidemiology the authors have chosen to emphasize the role of likelihood. This is an approach to statistics which is both simple and intuitively satisfying, and has the additional advantage that it requires the model and its parameters to be made explicit, even in the simplest situations.

Statistical Analysis of Human Growth and Development is an accessible and practical guide to a wide range of basic and advanced statistical methods that are useful for studying human growth and development. Designed for nonstatisticians and statisticians new to the analysis of growth and development data, the book collects methods scattered through

Statistical Methods in Environmental Epidemiology

Theory and Practice

Measurement Error and Misclassification in Statistics and Epidemiology