Dynamic Models Of Infectious Diseases Volume 1 Vector Borne Diseases

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Analysis of Infectious Disease Problems (Covid-19) and Their Global Impact Praveen Agarwal 2021 This edited volume is a collection of selected research articles discussing the analysis of infectious diseases by using mathematical modelling in recent times. Divided into two parts, the book gives a general and country-wise analysis of Covid-19. Analytical and numerical techniques for virus models are presented along with the application of mathematical modelling in the analysis of their spreading rates and treatments. The book also includes applications of fractional differential equations as well as ordinary, partial and integrodifferential equations with optimization methods. Probability distribution and their bio-mathematical applications have also been studied. This book is a valuable resource for researchers, scholars, biomathematicians and medical experts.

A Historical Introduction to Mathematical Modeling of Infectious Diseases Ivo M. Foppa 2016-10-18 A Historical Introduction to Mathematical Modeling of Infectious Diseases: Seminal Papers in Epidemiology offers step-by-step help on how to navigate the important historical papers on the subject, beginning in the 18th century. The book carefully, and critically, guides the reader through seminal writings that helped revolutionize the field. With pointed questions, prompts, and analysis, this book helps the non-mathematician develop their own perspective, relying purely on a basic knowledge of algebra, calculus, and statistics. By learning from the important moments in the field, from its conception to the 21st century, it enables readers to mature into competent practitioners of epidemiologic modeling. Presents a refreshing and in-depth look at key historical works of mathematical epidemiology Provides all the basic knowledge of mathematics readers need in order to understand the fundamentals of mathematical modeling of infectious diseases Includes questions, prompts, and answers to help apply historical solutions to modern day problems

Proceedings of the Future Technologies Conference (FTC) 2021, Volume 2 Kohei Arai 2021-11-03 This book covers a wide range of important topics including but not limited to Technology Trends, Computing, Artificial Intelligence, Machine Vision, Communication, Security, e-Learning, and Ambient Intelligence and their applications to the real world. The sixth Future Technologies Conference 2021 was organized virtually and received a total of 531 submissions from academic pioneering researchers, scientists, industrial engineers, and students from all over the world. After a double-blind peer review process, 191 submissions have been selected to be included in these proceedings. One of the meaningful and valuable dimensions of this conference is the way it brings together a large group of technology geniuses in one venue to not only present breakthrough research in future technologies, but also to promote discussions and debate of relevant issues, challenges, opportunities and research findings. We hope that readers find the book interesting, exciting, and inspiring; it provides the state-of-the-art intelligent methods and techniques for solving real-world problems along with a vision of the future research.

Frontiers in Mathematical Biology Simon A. Levin 2013-03-13 From a mathematical point of view, physiologically structured population models are an underdeveloped branch of the theory of infinite dimensional dynamical systems. We have called attention to four aspects: (i) A choice has to be made about the kind of equations one extracts from the predominantly verbal arguments about the basic assumptions, and subsequently uses as a starting point for a rigorous mathematical analysis. Though differential equations are easy to formulate (different mechanisms don't interact in infinites imal time intervals and so end up as separate terms in the equations) they may be hard to interpret rigorously as infinitesimal generators. Integral equations constitute an attractive alternative. (ii) The ability of physiologically structured population models to increase our un derstanding of the relation between mechanisms at the i-level and phenomena at the p-level will depend strongly on the development of dynamical systems lab facilities which are applicable to this class of models. (iii) Physiologically structured population models are ideally suited for the for mulation of evolutionary questions. Apart from the special case of age (see Charlesworth 1980, Yodzis 1989, Caswell 1989, and the references given there) hardly any theory exists at the moment. This will, hopefully, change rapidly in the coming years. Again the development of appropriate software may turn out to be crucial.

The Population Dynamics of Infectious Diseases: Theory and Applications Roy M. Anderson 2013-11-22 Since the beginning of this century there has been a growing interest in the study of the epidemiology and population dynamics of infectious disease agents. Mathematical and statistical methods have played an important role in the development of this field and a large, and sophisticated, literature exists which is concerned with the theory of epidemiological processes in popu lations and the dynamics of epidemie and endemie disease phenomena. Much ofthis literature is, however, rather formal and abstract in character, and the field has tended to become rather detached from its empirical base. Relatively little of the literature, for example, deals with the practical issues which are of major concern to public health workers. Encouragingly, in recent years there are signs of an increased awareness amongst theoreticians of the need to confront predictions with observed epidemiological trends, and to pay elose attention to the biological details of the interaction between host and disease agent. This trend has in part been stimulated by the early work of Ross and Macdonald, on the transmission dynamics of tropical parasitic infections, but a further impetus has been the recent advances made by ecologists in blending theory and observation in the study of plant and animal populations.

Infectious Disease Epidemiology Ibrahim Abubakar 2016-04-07 Infectious Disease Epidemiology is a concise reference guide which provides trainees and practicing epidemiologists with the information that they need to understand the basic concepts necessary for working in this specialist area. Divided into two sections, part one comprehensively covers the basic principles and methods relevant to the study of infectious disease epidemiology. It is organised in order of increasing complexity, ranging from a general introduction to subjects such as mathematical modelling and sero-epidemiology. Part two examines key major infectious diseases that are of global significance. Grouped by their route of transmission for ease of reference, they include diseases that present a particular burden or a high potential for causing mortality. This practical guide will be essential reading for postgraduate students in infectious disease epidemiology, health protection trainees, and practicing epidemiologists.

Computational Intelligence and Security Yue Hao 2006-06-18 The two volume set LNAI 3801 and LNAI 3802 constitute the refereed proceedings of the annual International Conference on Computational Intelligence and Security, CIS 2005, held in Xi'an, China, in December 2005. The 338 revised papers presented - 254 regular and 84 extended papers - were carefully reviewed and selected from over 1800 submissions. The first volume is organized in topical sections on learning and fuzzy systems, evolutionary computation, intelligent agents and systems, intelligent information retrieval, support vector machines, swarm intelligence, data mining, pattern recognition, and applications. The second volume is subdivided in topical sections on cryptography and coding, cryptographic

protocols, intrusion detection, security models and architecture, security management, watermarking and information hiding, web and network applications, image and signal processing, and applications.
Mathematical Epidemiology Fred Brauer 2008-04-30 Based on lecture notes of two summer schools with a mixed audience from mathematical sciences, epidemiology and public health, this volume offers a comprehensive introduction to basic ideas and techniques in modeling infectious diseases, for the comparison of strategies to plan for an anticipated epidemic or pandemic, and to deal with a disease outbreak in real time. It covers detailed case studies for diseases including pandemic influenza, West Nile virus, and childhood diseases. Models for other diseases including Severe Acute Respiratory Syndrome, fox rabies, and sexually transmitted infections are included as applications. Its chapters are coherent and complementary independent units. In order to accustom students to look at the current literature and to experience different perspectives, no attempt has been made to achieve united writing style or unified notation. Notes on some mathematical background (calculus, matrix algebra, differential equations, and probability) have been prepared and may be downloaded at the web site of the Centre for Disease Modeling (www.cdm.yorku.ca).
Dynamic Models of Infectious Diseases Vadrevu Sree Hari Rao 2013-12-16 Though great advances in public health are witnessed world over in recent years, infectious diseases, besides insect vector-borne infectious diseases remain a leading cause of morbidity and mortality. Control of the epidemics caused by the non-vector borne diseases such as tuberculosis, avian influenza (H5N1) and cryptococcus gattii, have left a very little hope in the past. The advancement of research in science and technology has paved way for the development of new tools and methodologies to fight against these diseases. In particular, intelligent technology and machine-learning based methodologies have rendered useful in developing more accurate predictive tools for the early diagnosis of these diseases. In all these endeavors the main focus is the understanding that the process of transmission of an infectious disease is nonlinear (not necessarily linear) and dynamical in character. This concept compels the appropriate quantification of the vital parameters that govern these dynamics. This book is ideal for a general science and engineering audience requiring an in-depth exposure to current issues, ideas, methods, and models. The topics discussed serve as a useful reference to clinical experts, health scientists, public health administrators, medical practioners, and senior undergraduate and graduate students in applied mathematics, biology, bioinformatics, and epidemiology, medicine and health sciences.
Modern Infectious Disease Epidemiology Alexander Krämer 2010-01-23 Hardly a day goes by without news headlines concerning infectious disease threats. Currently the spectre of a pandemic of influenza A|H1N1 is raising its head, and heated debates are taking place about the pro's and con's of vaccinating young girls against human papilloma virus. For an evidence-based and responsible communication of infectious disease topics to avoid misunderstandings and overreaction of the public, we need solid scientific knowledge and an understanding of all aspects of infectious diseases and their control. The aim of our book is to present the reader with the general picture and the main ideas of the subject. The book introduces the reader to methodological aspects of epidemiology that are specific for infectious diseases and provides insight into the epidemiology of some classes of infectious diseases characterized by their main modes of transmission. This choice of topics bridges the gap between scientific research on the clinical, biological, mathematical, social and economic aspects of infectious diseases and their applications in public health. The book will help the reader to understand the impact of infectious diseases on modern society and the instruments that policy makers have at their disposal to deal with these challenges. It is written for students of the health sciences, both of curative medicine and public health, and for experts that are active in these and related domains, and it may be of interest for the educated layman since the technical level is kept relatively low.
Progress in Industrial Mathematics at ECMI 2018 István Faragó 2019-11-22 This book explores mathematics in a wide variety of applications, ranging from problems in electronics, energy and the environment, to mechanics and mechatronics. The book gathers 81 contributions submitted to the 20th European Conference on Mathematics for Industry, ECMI 2018, which was held in Budapest, Hungary in June 2018. The application areas include: Applied Physics, Biology and Medicine, Cybersecurity, Data Science, Economics, Finance and Insurance, Energy, Production Systems, Social Challenges, and Vehicles and Transportation. In turn, the mathematical technologies discussed include: Combinatorial Optimization, Cooperative Games, Delay Differential Equations, Finite Elements, Hamilton-Jacobi Equations, Impulsive Control, Information Theory and Statistics, Inverse Problems, Machine Learning, Point Processes, Reaction-Diffusion Equations, Risk Processes, Scheduling Theory, Semidefinite Programming, Stochastic Approximation, Spatial Processes, System Identification, and Wavelets. The goal of the European Consortium for Mathematics in Industry (ECMI) conference series is to promote interaction between academia and industry, leading to innovations in both fields. These events have attracted leading experts from business, science and academia, and have promoted the application of novel mathematical technologies to industry. They have also encouraged industrial sectors to share challenging problems where mathematicians can provide fresh insights and perspectives. Lastly, the ECMI conferences are one of the main forums in which significant advances in industrial mathematics are presented, bringing together prominent figures from business, science and academia to promote the use of innovative mathematics in industry.
Operational Research for Emergency Planning in Healthcare: Volume 2 Navonil Mustafee 2016-01-26 This book presents a selection of studies that have applied Operational Research methods to improve emergency planning in healthcare, to include both A&E and public health emergencies like epidemic and natural disasters. The studies have delved into qualitative Operational Research like Problem Structuring, Critical Systems Thinking, Soft Systems Methodology, and Qualitative System Dynamics, and also quantitative techniques such as Monte Carlo Simulation, Discrete-event Simulation, and System Dynamics. These techniques have been applied for review and assessment of emergency services, for policy formulation and for facilitating broader public engagement in emergency preparedness and response. Furthermore, this book presents rigorous reviews on the applications of Operational Research in the wider healthcare context. This volume focuses mainly on emergency planning at the strategic level, whereas volume 1 focuses on planning at the operational level. The OR Essentials series presents a unique cross-section of high quality research work fundamental to understanding contemporary issues and research across a range of Operational Research (OR) topics. It brings together some of the best research papers from the highly respected journals of the Operational Research Society, also published by Palgrave Macmillan.
Rivers of the Sultan Faisal H. Husain 2021-03-05 The Tigris and Euphrates rivers run through the heart of the Middle East and merge in the area of Mesopotamia known as the "cradle of civilization." In their long and volatile political history, the sixteenth century ushered in a rare era of stability and integration. A series of military campaigns between the Mediterranean Sea and the Persian Gulf brought the entirety of their flow under the institutional control of the Ottoman Empire, then at the peak of its power and wealth. Rivers of the Sultan tells the history of the Tigris and Euphrates during the early modern period. Under the leadership of Sultan Süleyman I, the rivers became Ottoman from mountain to ocean, managed by a political elite that pledged allegiance to a single household, professed a common religion, spoke a lingua franca, and received orders from a central administration based in Istanbul. Faisal Husain details how Ottoman unification institutionalized cooperation among the rivers' dominant users and improved the exploitation of their waters for navigation and food production. Istanbul harnessed the energy and resources of the rivers for its security and economic needs through a complex network of forts, canals, bridges, and shipyards. Above all, the imperial approach to river management rebalanced the natural resource disparity within the Tigris-Euphrates basin. Istanbul regularly organized shipments of grain, metal, and timber from upstream areas of surplus in Anatolia to downstream areas of need in Iraq. Through this policy of natural resource redistribution, the Ottoman Empire strengthened its presence in the eastern borderland region with the Safavid Empire and fended off challenges to its authority. Placing these world historic bodies of water at its center, Rivers of the Sultan reveals intimate bonds between state and society, metropole and periphery, and nature and culture in the early modern world.
Pandemics and Emerging Infectious Diseases Robert Dingwall 2013-06-21 Infectious disease pandemics are a rising threat in our globalizing world. This agenda-setting collection provides international analysis of the pressing sociological concerns they confront us with, from cross-border coordination of public health governance to geopolitical issues of development and social equity. Focuses on vital sociological issues raised by resurgent disease pandemics Detailed analysis of case studies as well as broader, systemic factors Contributions from North America, Europe and Asia provide international perspective Bold, agenda-setting treatment

of a high-profile topic

Infectious Diseases and Our Planet Miranda I. Teboh-Ewungkem 2021-01-15 This book features recent research in mathematical modeling of indirectly and directly transmitted infectious diseases in humans, animals, and plants. It compiles nine not previously published studies that illustrate the dynamic spread of infectious diseases, offering a broad range of models to enrich understanding. It demonstrates the capability of mathematical modeling to capture disease spread and interaction dynamics as well as the complicating factors of various evolutionary processes. In addition, it presents applications to real-world disease control by commenting on key parameters and dominant pathways related to transmission. While aimed at early-graduate level students, the book can also provide insights to established researchers in that it presents a survey of current topics and methodologies in a constantly evolving field.

Quantitative Methods for Investigating Infectious Disease Outbreaks Ping Yan 2019-08-16 This book provides a systematic treatment of the mathematical underpinnings of work in the theory of outbreak dynamics and their control, covering balanced perspectives between theory and practice including new material on contemporary topics in the field of infectious disease modelling. Specifically, it presents a unified mathematical framework linked to the distribution theory of non-negative random variables; the many examples used in the text, are introduced and discussed in light of theoretical perspectives. The book is organized into 9 chapters: The first motivates the presentation of the material on subsequent chapters; Chapter 2-3 provides a review of basic concepts of probability and statistical models for the distributions of continuous lifetime data and the distributions of random counts and counting processes, which are linked to phenomenological models. Chapters 4 focuses on dynamic behaviors of a disease outbreak during the initial phase while Chapters 5-6 broadly cover compartment models to investigate the consequences of epidemics as the outbreak moves beyond the initial phase. Chapter 7 provides a transition between mostly theoretical topics in earlier chapters and Chapters 8 and 9 where the focus is on the data generating processes and statistical issues of fitting models to data as well as specific mathematical epidemic modeling applications, respectively. This book is aimed at a wide audience ranging from graduate students to established scientists from quantitatively-oriented fields of epidemiology, mathematics and statistics. The numerous examples and illustrations make understanding of the mathematics of disease transmission and control accessible. Furthermore, the examples and exercises, make the book suitable for motivated students in applied mathematics, either through a lecture course, or through self-study. This text could be used in graduate schools or special summer schools covering research problems in mathematical biology.

Trends in Infectious Diseases Shailendra K. Saxena 2014-04-23 This book gives a comprehensive overview of recent trends in infectious diseases, as well as general concepts of infections, immunopathology, diagnosis, treatment, epidemiology and etiology to current clinical recommendations in management of infectious diseases, highlighting the ongoing issues, recent advances, with future directions in diagnostic approaches and therapeutic strategies. The book focuses on various aspects and properties of infectious diseases whose deep understanding is very important for safeguarding human race from more loss of resources and economies due to pathogens.

An Introduction to Infectious Disease Modelling Emilia Vynnycky 2010-05-13 Mathematical models are increasingly being used to examine questions in infectious disease control. Applications include predicting the impact of vaccination strategies against common infections and determining optimal control strategies against HIV and pandemic influenza. This book introduces individuals interested in infectious diseases to this exciting and expanding area. The mathematical level of the book is kept as simple as possible, which makes the book accessible to those who have not studied mathematics to university level. Understanding is further enhanced by models that can be accessed online, which will allow readers to explore the impact of different factors and control strategies, and further adapt and develop the models themselves. The book is based on successful courses developed by the authors at the London School of Hygiene and Tropical Medicine. It will be of interest to epidemiologists, public health researchers, policy makers, veterinary scientists, medical statisticians and infectious disease researchers.

Infectious Diseases of Humans Roy M. Anderson 1992-08-27 This book deals with infectious diseases -- viral, bacterial, protozoan and helminth -- in terms of the dynamics of their interaction with host populations. The book combines mathematical models with extensive use of epidemiological and other data. This analytic framework is highly useful for the evaluation of public health strategies aimed at controlling or eradicating particular infections. Such a framework is increasingly important in light of the widespread concern for primary health care programs aimed at such diseases as measles, malaria, river blindness, sleeping sickness, and schistosomiasis, and the advent of AIDS/HIV and other emerging viruses. Throughout the book, the mathematics is used as a tool for thinking clearly about fundamental and applied problems having to do with infectious diseases. The book is divided into two parts, one dealing with microparasites (viruses, bacteria and protozoans) and the other with macroparasites (helminths and parasitic arthropods). Each part begins with simple models, developed in a biologically intuitive way, and then goes on to develop more complicated and realistic models as tools for public health planning. The book synthesizes previous work in this rapidly growing field (much of which is scattered between the ecological and the medical literature) with a good deal of new material.

Dynamic Models of Infectious Diseases Vadrevu Sree Hari Rao 2012-11-07 Despite great advances in public health worldwide, insect vector-borne infectious diseases remain a leading cause of morbidity and mortality. Diseases that are transmitted by arthropods such as mosquitoes, sand flies, fleas, and ticks affect hundreds of millions of people and account for nearly three million deaths all over the world. In the past there was very little hope of controlling the epidemics caused by these diseases, but modern advancements in science and technology are providing a variety of ways in which these diseases can be handled. Clearly, the process of transmission of an infectious disease is a nonlinear (not necessarily linear) dynamic process which can be understood only by appropriately quantifying the vital parameters that govern these dynamics.

Infectious Disease Modeling Xinzhi Liu 2017-02-25 This volume presents infectious diseases modeled mathematically, taking seasonality and changes in population behavior into account, using a switched and hybrid systems framework. The scope of coverage includes background on mathematical epidemiology, including classical formulations and results; a motivation for seasonal effects and changes in population behavior, an investigation into term-time forced epidemic models with switching parameters, and a detailed account of several different control strategies. The main goal is to study these models theoretically and to establish conditions under which eradication or persistence of the disease is guaranteed. In doing so, the long-term behavior of the models is determined through mathematical techniques from switched systems theory. Numerical simulations are also given to augment and illustrate the theoretical results and to help study the efficacy of the control schemes.

An Introduction to Mathematical Epidemiology Maia Martcheva 2015-10-20 The book is a comprehensive, self-contained introduction to the mathematical modeling and analysis of infectious diseases. It includes model building, fitting to data, local and global analysis techniques. Various types of deterministic dynamical models are considered: ordinary differential equation models, delay-differential equation models, difference equation models, age-structured PDE models and diffusion models. It includes various techniques for the computation of the basic reproduction number as well as approaches to the epidemiological interpretation of the reproduction number. MATLAB code is included to facilitate the data fitting and the simulation with age-structured models.

Modeling and Dynamics of Infectious Diseases Zhien Ma 2009 This book provides a systematic introduction to the fundamental methods and techniques and the frontiers of ? along with many new ideas and results on ? infectious disease modeling, parameter estimation and transmission dynamics. It provides complementary approaches, from deterministic to statistical to network modeling; and it seeks viewpoints of the same issues from different angles, from mathematical modeling to statistical analysis to computer simulations and finally to concrete applications.

Mathematical Tools for Understanding Infectious Disease Dynamics Odo Diekmann 2012-11-18 Mathematical modeling is critical to our understanding of how infectious diseases spread at the individual and population levels. This book gives readers the necessary skills to correctly formulate and analyze mathematical models in infectious disease epidemiology, and is the first treatment of the subject to integrate deterministic and stochastic models and methods. Mathematical Tools for Understanding Infectious Disease Dynamics fully explains how to translate biological assumptions into mathematics to construct useful and consistent models, and how to use the biological interpretation and mathematical reasoning to analyze these models. It shows how to relate models to data through statistical inference, and how to gain important

insights into infectious disease dynamics by translating mathematical results back to biology. This comprehensive and accessible book also features numerous detailed exercises throughout; full elaborations to all exercises are provided. Covers the latest research in mathematical modeling of infectious disease epidemiology Integrates deterministic and stochastic approaches Teaches skills in model construction, analysis, inference, and interpretation Features numerous exercises and their detailed elaborations Motivated by real-world applications throughout *Modeling Infectious Diseases in Humans and Animals* Matt J. Keeling 2011-09-19 For epidemiologists, evolutionary biologists, and health-care professionals, real-time and predictive modeling of infectious disease is of growing importance. This book provides a timely and comprehensive introduction to the modeling of infectious diseases in humans and animals, focusing on recent developments as well as more traditional approaches. Matt Keeling and Pejman Rohani move from modeling with simple differential equations to more recent, complex models, where spatial structure, seasonal "forcing," or stochasticity influence the dynamics, and where computer simulation needs to be used to generate theory. In each of the eight chapters, they deal with a specific modeling approach or set of techniques designed to capture a particular biological factor. They illustrate the methodology used with examples from recent research literature on human and infectious disease modeling, showing how such techniques can be used in practice. Diseases considered include BSE, foot-and-mouth, HIV, measles, rubella, smallpox, and West Nile virus, among others. Particular attention is given throughout the book to the development of practical models, useful both as predictive tools and as a means to understand fundamental epidemiological processes. To emphasize this approach, the last chapter is dedicated to modeling and understanding the control of diseases through vaccination, quarantine, or culling. Comprehensive, practical introduction to infectious disease modeling Builds from simple to complex predictive models Models and methodology fully supported by examples drawn from research literature Practical models aid students' understanding of fundamental epidemiological processes For many of the models presented, the authors provide accompanying programs written in Java, C, Fortran, and MATLAB In-depth treatment of role of modeling in understanding disease control

Dynamical Modeling and Analysis of Epidemics

Dynamic Models of Infectious Diseases Vadrevu Sree Hari Rao 2012-11-07 Despite great advances in public health worldwide, insect vector-borne infectious diseases remain a leading cause of morbidity and mortality. Diseases that are transmitted by arthropods such as mosquitoes, sand flies, fleas, and ticks affect hundreds of millions of people and account for nearly three million deaths all over the world. In the past there was very little hope of controlling the epidemics caused by these diseases, but modern advancements in science and technology are providing a variety of ways in which these diseases can be handled. Clearly, the process of transmission of an infectious disease is a nonlinear (not necessarily linear) dynamic process which can be understood only by appropriately quantifying the vital parameters that govern these dynamics.

Software Tools and Algorithms for Biological Systems Hamid Arabnia 2011-03-23 “Software Tools and Algorithms for Biological Systems" is composed of a collection of papers received in response to an announcement that was widely distributed to academicians and practitioners in the broad area of computational biology and software tools. Also, selected authors of accepted papers of BIOCOMP’09 proceedings (International Conference on Bioinformatics and Computational Biology: July 13-16, 2009; Las Vegas, Nevada, USA) were invited to submit the extended versions of their papers for evaluation.

The Opioid Epidemic and Infectious Diseases E- Book Brianna L. Norton 2020-10-25 Offering timely guidance on the junction of the opioid crisis and infectious diseases, this practical handbook by Dr. Brianna L. Norton provides concise yet comprehensive coverage of a growing patient population. Infectious disease specialists are increasingly seeing patients who previously used opiods and now use intravenous drugs. Many challenges are unique to this patient population, including new and growing infections such as hepatitis C, endocarditis, HIV, and hepatitis B. The Opioid Epidemic and Infectious Diseases is an up-to-date, real-world guide that covers the scope of the problem, management guidelines, and much more. Describes the new landscape of the opioid crisis in the U.S. and its intersection with infectious diseases, including epidemiology, Opioid Use Disorder (OUD) and rural America, and more. Offers practical guidance on (OUD) and infectious co-morbidities like hepatitis C, STDs, endocarditis, HIV, and hepatitis B. Covers prevention, treatment, and harm reduction. Discusses OUD, infectious diseases, and the criminal justice system. Consolidates today’s available information and guidance into a single, convenient resource.

Operations Research and Health Care Margaret L. Brandeau 2006-04-05 In both rich and poor nations, public resources for health care are inadequate to meet demand. Policy makers and health care providers must determine how to provide the most effective health care to citizens using the limited resources that are available. This chapter describes current and future challenges in the delivery of health care, and outlines the role that operations research (OR) models can play in helping to solve those problems. The chapter concludes with an overview of this book – its intended audience, the areas covered, and a description of the subsequent chapters. KEY WORDS Health care delivery, Health care planning HEALTH CARE DELIVERY: PROBLEMS AND CHALLENGES 3 1.1 WORLDWIDE HEALTH: THE PAST 50 YEARS Human health has improved significantly in the last 50 years. In 1950, global life expectancy was 46 years [1]. That figure rose to 61 years by 1980 and to 67 years by 1998 [2]. Much of these gains occurred in low- and middle-income countries, and were due in large part to improved nutrition and sanitation, medical innovations, and improvements in public health infrastructure.

Wildlife and Emerging Zoonotic Diseases: The Biology, Circumstances and Consequences of Cross-Species Transmission James E. Childs 2007-07-23 This volume offers an overview of the processes of zoonotic viral emergence, the intricacies of host/virus interactions, and the role of biological transitions and modifying factors. The themes introduced here are amplified and explored in detail by the contributing authors, who explore the mechanisms and unique circumstances by which evolution, biology, history, and current context have contrived to drive the emergence of different zoonotic agents by a series of related events.

Dynamic Models of Infectious Diseases V. Sree Hari Rao 2013-11-30 Though great advances in public health are witnessed world over in recent years, infectious diseases, besides insect vector-borne infectious diseases remain a leading cause of morbidity and mortality. Control of the epidemics caused by the non-vector borne diseases such as tuberculosis, avian influenza (H5N1) and cryptococcus gattii, have left a very little hope in the past. The advancement of research in science and technology has paved way for the development of new tools and methodologies to fight against these diseases. In particular, intelligent technology and machine-learning based methodologies have rendered useful in developing more accurate predictive tools for the early diagnosis of these diseases. In all these endeavors the main focus is the understanding that the process of transmission of an infectious disease is nonlinear (not necessarily linear) and dynamical in character. This concept compels the appropriate quantification of the vital parameters that govern these dynamics. This book is ideal for a general science and engineering audience requiring an in-depth exposure to current issues, ideas, methods, and models. The topics discussed serve as a useful reference to clinical experts, health scientists, public health administrators, medical practioners, and senior undergraduate and graduate students in applied mathematics, biology, bioinformatics, and epidemiology, medicine and health sciences.

Population Dynamics and Infectious Diseases in Asia Adrian Sleigh 2006 Initially stimulated by a scholarly workshop convened in Singapore in late 2004, and written over the subsequent 18 months, this volume considers the potentially lethal pattern of infectious disease emergence in Asia. It studies linkages to changes in patterns of human activity, including but not limited to shifts in the distribution and concentration of human settlements and the patterns of movement within and between them. It explores the causes and consequences of infectious agents in the region historically and examines such newly emergent natural biological threats as SARS and avian influenza.Drawing on a range of disciplinary perspectives, the book contains analyses rooted in the social, physical and biological sciences as well as works which span these fields. Among the issues considered are the ways in which changes in our natural and built environment, social and economic pressures, shifting policies and patterns of collaboration in responding to disease impact upon our approach to and success in containing serious threats.Infection control has moved beyond the province of clinical experts, epidemiologists and microbiologists, into the mathematics of epidemic prevention and control, as well as the overall physical and human ecology and historical contexts of emerging infections. Not only does such a broad approach enable appreciation of complex forces driving growing epidemic risks in Asia today, it also reveals the importance and relevance of population dynamics, as well as the global urgency of alleviating unsatisfactory health conditions in Asia. The topic and the broad approach has international appeal beyond the region as many of these forces operate throughout the world.

Mathematical Models of Infectious Diseases and Social Issues

Shah, Nita H. 2020-06-26 When deadly illness spreads through a population at a rapid pace, time may be of the essence in order to save lives. Using mathematics as a language to interpret assumptions concerning the biological and population mechanics, one can make predictions by analyzing actual epidemiological data using mathematical tests and results. Mathematical models can help us understand the right disease status and predict the effects of the disease on populations, which can help limit the spread and devastation of the illness. Mathematical Models of Infectious Diseases and Social Issues is a collection of innovative research that examines the dynamics of diseases and their effect on populations. Featuring coverage of a broad range of topics including deterministic models, environmental pollution, and social issues, this book is ideally designed for diagnosticians, clinicians, healthcare providers, pharmacists, government health officials, policymakers, academicians, researchers, and students.

Modeling the Interplay Between Human Behavior and the Spread of Infectious Diseases Piero Manfredi 2013-01-04 This volume summarizes the state-of-the-art in the fast growing research area of modeling the influence of information-driven human behavior on the spread and control of infectious diseases. In particular, it features the two main and inter-related “core” topics: behavioral changes in response to global threats, for example, pandemic influenza, and the pseudo-rational opposition to vaccines. In order to make realistic predictions, modelers need to go beyond classical mathematical epidemiology to take these dynamic effects into account. With contributions from experts in this field, the book fills a void in the literature. It goes beyond classical texts, yet preserves the rationale of many of them by sticking to the underlying biology without compromising on scientific rigor. Epidemiologists, theoretical biologists, biophysicists, applied mathematicians, and PhD students will benefit from this book. However, it is also written for Public Health professionals interested in understanding models, and to advanced undergraduate students, since it only requires a working knowledge of mathematical epidemiology.

Handbook of Medical and Healthcare Technologies Borko Furht 2013-11-20 This book equips readers to understand a complex range of healthcare products that are used to diagnose, monitor, and treat diseases or medical conditions affecting humans. The first part of the book presents medical technologies such as medical information retrieval, tissue engineering techniques, 3D medical imaging, nanotechnology innovations in medicine, medical wireless sensor networks, and knowledge mining techniques in medicine. The second half of the book focuses on healthcare technologies including prediction hospital readmission risk, modeling e-health framework, personal Web in healthcare, security issues for medical records, and personalized services in healthcare. The contributors are leading world researchers who share their innovations, making this handbook the definitive resource on these topics. Handbook of Medical and Healthcare Technologies is intended for a wide audience including academicians, designers, developers, researchers and advanced-level students. It is also valuable for business managers, entrepreneurs, and investors within the medical and healthcare industries.

Dynamic Models of Infectious Diseases Vadrevu Sree Hari Rao 2014-12-13 Despite great advances in public health worldwide, insect vector-borne infectious diseases remain a leading cause of morbidity and mortality. Diseases that are transmitted by arthropods such as mosquitoes, sand flies, fleas, and ticks affect hundreds of millions of people and account for nearly three million deaths all over the world. In the past there was very little hope of controlling the epidemics caused by these diseases, but modern advancements in science and technology are providing a variety of ways in which these diseases can be handled. Clearly, the process of transmission of an infectious disease is a nonlinear (not necessarily linear) dynamic process which can be understood only by appropriately quantifying the vital parameters that govern these dynamics.

Analyzing and Modeling Spatial and Temporal Dynamics of Infectious Diseases Dongmei Chen 2014-12-01 Features modern research and methodology on the spread of infectious diseases and showcases a broad range of multi-disciplinary and state-of-the-art techniques on geo-simulation, geo-visualization, remote sensing, metapopulation modeling, cloud computing, and pattern analysis Given the ongoing risk of infectious diseases worldwide, it is crucial to develop appropriate analysis methods, models, and tools to assess and predict the spread of disease and evaluate the risk. Analyzing and Modeling Spatial and Temporal Dynamics of Infectious Diseases features mathematical and spatial modeling approaches that integrate applications from various fields such as geo-computation and simulation, spatial analytics, mathematics, statistics, epidemiology, and health policy. In addition, the book captures the latest advances in the use of geographic information system (GIS), global positioning system (GPS), and other location-based technologies in the spatial and temporal study of infectious diseases. Highlighting the current practices and methodology via various infectious disease studies, Analyzing and Modeling Spatial and Temporal Dynamics of Infectious Diseases features: Approaches to better use infectious disease data collected from various sources for analysis and modeling purposes Examples of disease spreading dynamics, including West Nile virus, bird flu, Lyme disease, pandemic influenza (H1N1), and schistosomiasis Modern techniques such as Smartphone use in spatio-temporal usage data, cloud computing-enabled cluster detection, and communicable disease geo-simulation based on human mobility An overview of different mathematical, statistical, spatial modeling, and geo-simulation techniques Analyzing and Modeling Spatial and Temporal Dynamics of Infectious Diseases is an excellent resource for researchers and scientists who use, manage, or analyze infectious disease data, need to learn various traditional and advanced analytical methods and modeling techniques, and become aware of different issues and challenges related to infectious disease modeling and simulation. The book is also a useful textbook and/or supplement for upper-undergraduate and graduate-level courses in bioinformatics, biostatistics, public health and policy, and epidemiology.

Mathematical Analysis of Infectious Diseases Praveen Agarwal 2022-06-10 Mathematical Analysis of Infectious Diseases updates on the mathematical and epidemiological analysis of infectious diseases. Epidemic mathematical modeling and analysis is important, not only to understand disease progression, but also to provide predictions about the evolution of disease. One of the main focuses of the book is the transmission dynamics of the infectious diseases like COVID-19 and the intervention strategies. It also discusses optimal control strategies like vaccination and plasma transfusion and their potential effectiveness on infections using compartmental and mathematical models in epidemiology like SI, SIR, SICA, and SEIR. The book also covers topics like: biodynamic hypothesis and its application for the mathematical modeling of biological growth and the analysis of infectious diseases, mathematical modeling and analysis of diagnosis rate effects and prediction of viruses, data-driven graphical analysis of epidemic trends, dynamic simulation and scenario analysis of the spread of diseases, and the systematic review of the mathematical modeling of infectious disease like coronaviruses. Offers analytical and numerical techniques for virus models Discusses mathematical modeling and its applications in treating infectious diseases or analyzing their spreading rates Covers the application of differential equations for analyzing disease problems Examines probability distribution and bio-mathematical applications

Infectious Diseases in Primates Charles Nunn 2006-04-27 Recent progress in the field of wildlife disease ecology demonstrates that infectious disease plays a crucial role in the lives of wild animals. Parasites and pathogens should be especially important for social animals in which high contact among individuals increases the potential for disease spread. As one of the best studied mammalian groups, primates offer a unique opportunity to examine how complex behaviours (including social organization) influence the risk of acquiring infectious diseases, and the defences used by animals to avoid infection. This book explores the correlates of disease risk in primates, including not only social and mating behaviour but also diet, habitat use, life history, geography and phylogeny. The authors examine how a core set of host and parasite traits influence patterns of parasitism at three levels of biological organization: among individuals, among populations, and across species. A major goal is to synthesize, for the first time, four disparate areas of research: primate behavioural ecology, parasite biology, wildlife epidemiology, and the behavioural and immune defences employed by animals to counter infectious disease. Throughout, the authors provide an overview of the remarkable diversity of infectious agents found in wild primate populations. Additional chapters consider how knowledge of infectious diseases in wild primates can inform efforts focused on primate conservation and human health. More generally, this book identifies infectious disease as an important frontier in our understanding of primate behaviour and ecology. It highlights future challenges for testing the links between host and parasite traits, including hypotheses for the effects of disease on primate social and mating systems.