Andersson, Håkan; **Britton, Tom**
Stochastic epidemic models and their statistical analysis. (English) Zbl 0951.92021
Lecture Notes in Statistics. 151. New York, NY: Springer. ix, 137 p. (2000).

Deterministic epidemic models have received considerable attention in the literature [see, e.g., *R.M. Anderson* and *R.M. May*, Infectious diseases of humans; dynamics and control. (1991)]. The authors present stochastic epidemic models and methods for their statistical analysis such as coupling, diffusion approximation, random graphs, likelihood theory for counting processes, martingales, the EM-algorithm and MCMC. The text is divided into two distinct but related parts : modelling and estimation.

The first part consists of eight chapters describing the spread of viral or bacterial infections with a person-to-person transmission mechanism. Diseases that belong to this category include measles, chickenpox, mumps, rubella, STD's. The first chapter is introductory in nature comparing the merits of deterministic and stochastic epidemic models. Chapter 2 deals with SIR epidemic models and Chapter 3 presents the coupling method, an approximation procedure using branching processes. Chapter 4 studies the final size of SIR epidemics and Chapter 5 extends the results for the entire epidemic process using diffusion theory. Chapters 6 and 7 discuss multitype models and heterogeneous populations. The latter are characterized by random graphs. Chapter 8 is concerned with endemic diseases.

The second part, consisting of 4 chapters, considers statistical questions relating to the models and their parameters, given that an epidemic outbreak has been observed [*N.G. Becker* and *T. Britton*, J. R. Stat. Soc., Ser. B 61, No. 2, 287-307 (1999; Zbl 0913.62102)]. Chapters 9 and 10 focus on the SIR epidemic model. Chapter 9 deals with statistical analysis of epidemics that can be observed completely, whereas Chapter 10 treats partial data. Chapter 11 deals with preventive measures. The interpretation of relevant model parameters is useful to health authorities for the implementation of preventive measures. This important question is discussed in Chapter 12.

This monograph has emanated from lectures given by the authors. It is suitable for a one-semester course. It is self-instructive and may be read by anyone interested in epidemiology, applied probability and statistics. This work is a valuable addition to the existing line of books on epidemiology.

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MSC:

92D30	Epidemiology
92-02	Research exposition (monographs, survey articles) pertaining to biology
62P10	Applications of statistics to biology and medical sciences; meta analysis
62-01	Introductory exposition (textbooks, tutorial papers, etc.) pertaining to statistics

Cited in **221** Documents

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