Survival and Event History Analysis: A Process Point of View (Statistics for Biology and Health)

Odd Aalen, Ornulf Borgan, Hakon Gjessing
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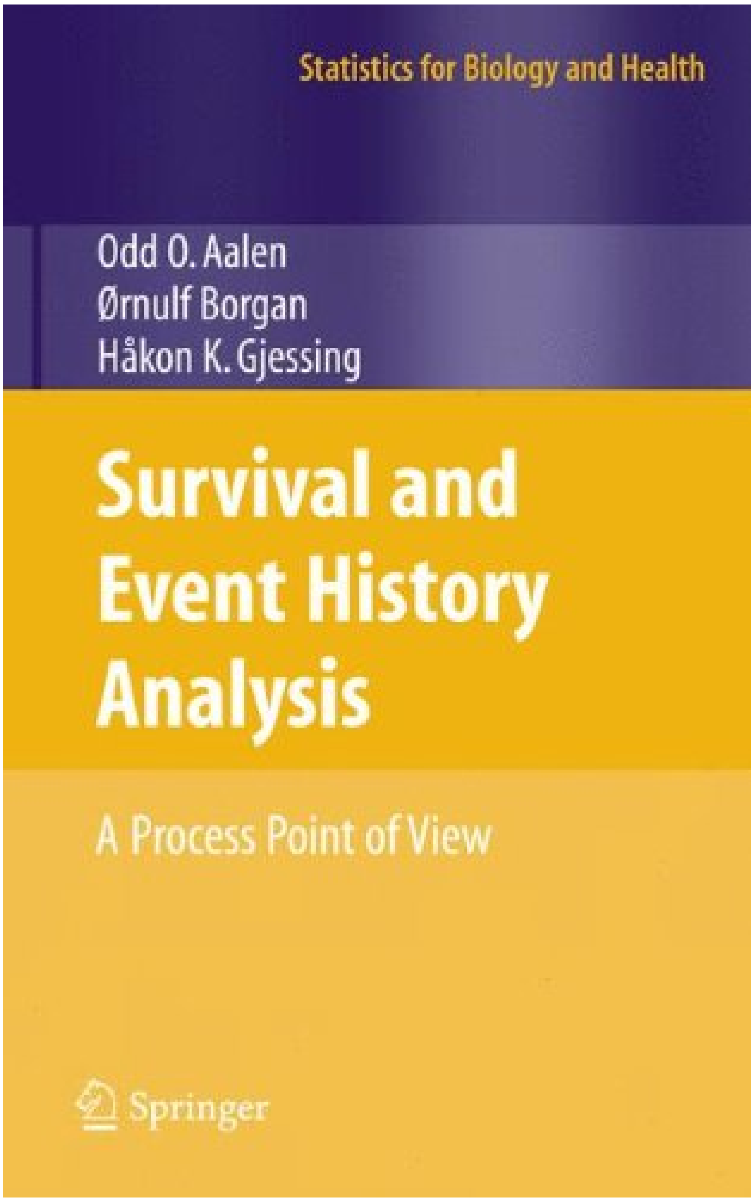

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Odd Aalen, Ornulf Borgan, Hakon Gjessing : Survival and Event History Analysis: A Process Point of View (Statistics for Biology and Health) before purchasing it in order to gage whether or not it would be worth my time, and all praised Survival and Event History Analysis: A Process Point of View (Statistics for Biology and Health):

3 of 3 people found the following review helpful. Both explains and expoundsBy Dr. Lee D. CarlsonSurvival and Event History AnalysisSurvival analysis and the theory of competing risks have found extensive application in the financial and medical fields, and the literature on these applications is vast. For analysts who want to apply these techniques to these fields, broaden their application to others, or who need a rigorous understanding of them, assimilating this literature can be an arduous task. There are many books that have appeared in the last two decades that are very helpful in acquiring the needed understanding, but this one is unusual in that it is able to articulate on both the theoretical and the applied, and do so in a way that does not trivialize the subject. Readers will find an inclusion of many examples drawn mostly from the authors geographic location, and also discussions of the mathematical formalism that makes it intuitively clear why some of the formalisms are deployed.For example, of utmost importance in survival analysis is that of censored data, and it only takes the author 2 pages to begin discussing how to handle this kind of data, wherein they motivate the difference between survival analysis and ordinary statistical analysis when it comes to censoring data. They then move right into the definition of the hazard rate, which is is rather straightforward, but newcomers to the field may confuse it with an ordinary probability, but it is not since it can essentially be any nonnegative function even though it is defined as a conditional probability. Some texts have referred to it as a probability rate. The authors give many examples that illustrate the many complexities that the hazard rate can exhibit, and of crucial importance in some of these examples is the actual shape of the hazard rate. The reviewer can attest to a few applications (such as in data networks) where it is also of interest to compare the shape or slope of the hazard rate as the observation time increases.Some of the more widely used survival models are discussed, such as the Cox proportional hazard model, and additive regression models. The reason for the popularity of these models lies in the use of observable variables or covariates to model differences between individuals. The authors show how to extend these models to take into account unobservable heterogeneities between individuals by using frailty models, wherein the hazard rate of an individual is changed by simply multiplying by a frailty variable. The topic of informative censoring is not discussed in the book, but readers who are at the level of sophistication to be able to appreciate this topic can find ample discussion of it in the literature. Multistate models can be used for the case that individuals can experience more than one type of event, which are better known as competing risks. The authors show how to modify the hazard rate to take into account competing risks, and caution the reader in remembering the difference between the cumulative incidence function and the cumulative cause-specific hazard.This book sets itself from others on the subject in its coverage on stochastic processes and their connection with event history analysis. An excellent motivation for martingales is given that makes their understanding readily apparent to readers who may have only encountered formal definitions in their prior exposure to the research literature. This is readily apparent in the authors discussion of sigma algebras of events and the notion of adaptation to the time evolution of families of these sigma algebras. The authors discussion is very lucid as compared to what a reader might find by perusing other literature on this topic, in particular in the area of financial modeling. Along these same lines, the martingale property is shown to be resilient to some transformations that act on processes with this property. The authors discuss the concept of an optional stopping time as an illustration of this, in that the martingale property is left intact under optional stopping. Most importantly, they connect optional stopping with censoring, and set the analysts mind at ease in showing that the martingale property will remain intact and therefore unbiased estimates can occur.Another stumbling block to those learning it for the first time, due in part to the formal nature of most treatments of it in the research literature, is that of the Doob decomposition. The authors explain this as essentially a decomposition of an arbitrary stochastic process into one that is dependent on the past, and one that reflects what is novel or unanticipated if compared to past experience. To experts in probability theory and the theory of stochastic processes such a description may seem trivial or imprecise, but for those who really want to understand the subject, and do so outside the constraints of formal reasoning, the authors intuitive discussion is very helpful and considerably shortens the time to learn the important ideas.Of fundamental importance in applying survival analysis are the nonparametric estimators of the cumulative hazard rate going by the names of the Nelson-Aelen and Kaplan-Meier estimators. These two techniques are widely used, sometimes in contexts where they should not be, but they do give back-of-the-envelope estimates that can serve as a guide in lieu of more refined approaches. The authors, interestingly, view the Nelson-Aelen estimator as the more fundamental of the two techniques, and so begin with it. They also show that the estimator for the variance of the Nelson-Aalen estimator is approximately normal distributed and so one can speak meaningfully about confidence intervals and percentiles. The properties of the Kaplan-Meier estimator, which of the two is the most familiar to analysts, is shown also to be approximately normally distributed for large samples, and interestingly shown in one of the exercises to be equal to 1 (empirical cumulative distribution function) when there is no censoring. The reviewer has successfully applied both of these techniques to packet drops in data networks, an area that has not yet seen significant application of survival analysis.4 of 4 people found the following review helpful. ABG is very useful and welcome book in Survival AnalysisBy Prabhanjan TattarProf. Aalen's PhD thesis, as already mentioned in Prof. Chernick's review, is the beginning of the counting process approach to survival analysis. In a certain way, this book by Prof. Aalen has been long overdue and it is really welcomed in the year 2008. The two classic books which have been around since the early 1990's are Fleming and Harrington (1991) "Counting Processes and Survival Analysis"

and Andersen, Borgan, Gill, and Keiding (1993) "Statistical Models Based on Counting Processes". The later work is simply known as ABGK. In a fitting way, Prof. Aalen's book will be henceforth referred as ABG.Chapters 1-5 have been written in a very transparent way. The first chapter is precise to the point of introducing the essential concepts through clear illustrations and examples. The stochastic process approach and how it is useful for event history data is the discussion of Chapter 2. The nonparametric approach in survival analysis is well documented and the use of Nelson-Aalen estimator for estimating cumulative hazard function, the Kaplan-Meier estimator of the survival function, the nonparametric tests for one- and k-sample, and finally the popular Aalen-Johansen estimator for transition probability matrix of a nonhomogeneous Markov process have been well written in Chapter 3. A bit of digression here. Prof. Nelson proposed the cumulative hazard function estimator in 1969, IIRC, and it was again invented by Prof. Aalen in the counting process approach in 1975. However, both of them met for the first time in 2002. What makes the counting process approach work is the elegant development of the asymptotics which otherwise would be very terse.Semi-parametric regression model (the relative risk model of which a particular case is the famous Cox proportional hazards model) and nonparametric regression model (the Aalen's additive linear hazards model) are two approaches for regression problems in survival analysis. For the latter model, the reader may also refer the brilliant work of Martinussen and Schieke (2006), while the former model is almost prevalent in any book on survival analysis. While these two models are discussed in Chapter 4, the parametric regression models are considered in chapter 5, and IIRC Prof. Borgan had developed the parametric regression models under the counting process approach in one of his 1980's papers.I will update the review after reading rest of the chapters and would certainly recommend the ABG book for any person working in the domain of survival analysis and clinical trials. The "Exercises" are especially very useful for the student to further append his skills. My review is late by 5 years and the reason is that I got my hands on this book a year back.16 of 18 people found the following review helpful. Aalen covers multivariate survival and fraility models using the counting process approachBy Michael R. ChernickAalen in his PhD thesis and later writing connected the theory of survival analysis with the theory of counting processes. In this book he and his coauthors take the counting process point of view to develop the theory of multivariate survival analysis and fraility models. They also deal with the difficult subject of causality. Hougaard was the first to write a serious text on multivariate survival analysis. This text adds to that literature encompassing Cox models Kaplan-Meier estimates, recurrent events, univariate and multivariate fraility and theory from stochastic processes that is applicable to survival and event history analysis.As with all of Aalen's work this book is highly theoretical and requires mathematical sophistication. For research statisticians particularly those in biostatistics this is an important addition to the literature and is worth reading.

The aim of this book is to bridge the gap between standard textbook models and a range of models where the dynamic structure of the data manifests itself fully. The common denominator of such models is stochastic processes. The authors show how counting processes, martingales, and stochastic integrals fit very nicely with censored data. Beginning with standard analyses such as Kaplan-Meier plots and Cox regression, the presentation progresses to the additive hazard model and recurrent event data. Stochastic processes are also used as natural models for individual frailty; they allow sensible interpretations of a number of surprising artifacts seen in population data. The stochastic process framework is naturally connected to causality. The authors show how dynamic path analyses can incorporate many modern causality ideas in a framework that takes the time aspect seriously. To make the material accessible to the reader, a large number of practical examples, mainly from medicine, are developed in detail. Stochastic processes are introduced in an intuitive and non-technical manner. The book is aimed at investigators who use event history methods and want a better understanding of the statistical concepts. It is suitable as a textbook for graduate courses in statistics and biostatistics.

From the reviews: "The book is intended as a text for biostatistics graduate students. It will fill that role excellently. It will expose them to ideas they are unlikely to encounter in depth in a standard curriculum and is precisely the sort of book to inspire theses and other research projects. Prerequisites include exposure to stochastic processes and basic survival analysis, as well as the mathematical statistics that the standard graduate program provides. Each chapter contains relevant probability theory and data analyses and concludes with a set of exercises.... With its comprehensive and up-to-date bibliography, and extensive index, it is also ideal for self-study. The book has Springers high quality with pleasing typesetting and good margins." (Patricia Grambsch, Biometrics, June 2009, 65) "typifies the authors interest in understanding the mechanisms that underlie developments over times, as does the brilliant chapter on causality. In summary, Aalen, Borgan, and Gjessing have managed to write a book which is both practical and thought-provoking, wide-ranging yet focused, and above all, accessible. It will be around for a long time." (Robin Henderson, Significance, September 2009) "Readership: Practicing statisticians as well as theoreticians interested in survival analysis. Also suitable for a graduate course. Very well written. Aalen, Borgan and Gjessing have written a new book which is also likely to have a profound influence on the subject, possibly both from the classical and Bayesian point of view . The book is based on point processes . Deep facts about these processes as well as martingales and stochastic integrals are introduced and used throughout with clarity and intuitive insight." (Jayanta K. Ghosh, International Statistical , Vol. 77 (3), 2009) This book intends to distinguish itself by presenting a broad and comprehensive view of stochastic processes which are useful for the analysis of survival data and, more generally, of event histories, i.e. series of occurrences of events over time. In conclusion, this is an excellent book which will be useful to researchers in several fields due to the broad interest of the presented methodologies . (Bruno Betr, Mathematical s, Issue 2010 b) Inspired by the spread of survival and event history analysis to fields beyond biostatistics and by the increasing complexity of high-quality data structures, the authors have written an elegant text that bridges theory and applications and balances technical detail with pedagogical simplicity. The book moves beyond other textbooks on the topic of survival and event history analysis by using a stochastic processes framework to develop models for events repeated over time or related among individuals. Overall, the book is masterfully written and a welcome addition to the bookshelf of anyone doing either applied modeling or methodological research in survival or event history analysis. (Journal of the American Statistical Association, Vol. 105, No. 489)From the Back CoverTime-to-event data are ubiquitous in fields such as medicine, biology, demography, sociology, economics and reliability theory. Recently, a need to analyze more complex event histories has emerged. Examples are individuals that move among several states, frailty that makes some units fail before others, internal time-dependent covariates, and the estimation of causal effects from observational data. The aim of this book is to bridge the gap between standard textbook models and a range of models where the dynamic structure of the data manifests itself fully. The common denominator of such models is stochastic processes. The authors show how counting processes, martingales, and stochastic integrals fit very nicely with censored data. Beginning with standard analyses such as Kaplan-Meier plots and Cox regression, the presentation progresses to the additive hazard model and recurrent event data. Stochastic processes are also used as natural models for individual frailty; they allow sensible interpretations of a number of surprising artifacts seen in population data. The stochastic process framework is naturally connected to causality. The authors show how dynamic path analyses can incorporate many modern causality ideas in a framework that takes the time aspect seriously. To make the material accessible to the reader, a large number of practical examples, mainly from medicine, are developed in detail. Stochastic processes are introduced in an intuitive and non-technical manner. The book is aimed at investigators who use event history methods and want a better understanding of the statistical concepts. It is suitable as a textbook for graduate courses in statistics and biostatistics. Odd O. Aalen is professor of medical statistics at the University of Oslo, Norway. His Ph.D. from the University of California, Berkeley in 1975 introduced counting processes and martingales in event history analysis. He has also contributed to numerous other areas of event history analysis, such as additive hazards regression, frailty, and causality through dynamic modeling. rnulf Borgan is professor of statistics at the University of Oslo, Norway. Since his Ph.D. in 1984 he has contributed extensively to event history analysis. He is co-author of the monograph Statistical Models Based on Counting Processes, and is editor of Scandinavian Journal of Statistics. Hkon K. Gjessing is professor of medical statistics at the Norwegian Institute of Public Health and the University of Bergen, Norway. Since his Ph.D. in probability in 1995, he has worked on a broad range of theoretical and applied problems in biostatistics.