

a discussion of how conditions and changes in the registration may affect the statistics, following the authors' own recommendation, mentioned above. Even though the authors write in the introduction that the main stress is on the 1990s, some of the diagrams cover a period back to the beginning of the 20th century, or even earlier. Examples are the stillbirth rates and infant mortality rates, which are shown since 1905, and the general fertility rate since 1830. The different coverage back in time of the various variables gives an impression of how the public authorities' wish for information has changed and how more and more aspects of individuals' lives have been subject to registration.

The chapter on 'Fertility control and fetal loss in early pregnancy' is a good example of the informative and readable form of the chapters. In 26 pages (pp. 89–114) we are taken by the hand of the authors through a century with women trying to avoid unwanted pregnancies with – fortunately – less and less health risk. The first part of the chapter deals with contraception and abortion before statistics were established in the field, the next part describes the existing data and, subsequently, the needs for and the problems in obtaining data on the areas which are presently not covered by statistics – involuntary infertility and the menopause are discussed. Finally, the impact on fertility trends in the country by induced abortion and the problems in interpreting trends in induced abortion are discussed.

The trends and findings presented in the chapters illustrate the value of a registration including variables either well known for or suspected of affecting, for example, a birth outcome. At the same time the book illustrates how an increased knowledge of a field can be reached by applying different sources with data at the individual level or at a more aggregate level. It is not necessary to register all analytically interesting variables directly in relation to the event in question for elucidation or monitoring purposes as long as a possibility of combining data is secured. In my home country, Denmark, much research is based on linked data sets retrieved from the national registers

that include individual-level information on each member of the resident population. *Birth Counts* illustrates how valuable results can be obtained and that various aspects of an area can be sufficiently elucidated without the possibility of linking each and every variable at the individual level. However, monitoring conducted by health authorities, for example, of the birth prevalence of congenital malformations, will be more beneficial if the individual identification is kept in order to facilitate a follow-up.

The authors' aims with the second edition of *Birth Counts* are important, as any interpretation of data, in order to analyse time trends within one country or in comparisons between regions or countries, needs to include knowledge of the applied definitions and delimitations, and possible basis of diagnosis and coverage.

The book has been produced in co-operation between the National Perinatal Epidemiology Unit, the Government Statistical Service and the National Health Services and both the authors of the book worked in the National Perinatal Epidemiology Unit at various stages of the production of the book. Bearing this in mind, this book also reflects the value of a research unit being close to data, and using and analysing them currently. With the richness of registered data and available information on various aspects of individuals' lives, a utilization of data in close relation to governmental offices has proven to be a fruitful path.

In conclusion, the book fulfils its purpose. It is furthermore exemplary in an awareness of definitions, data quality and validity in international comparisons, something that is unfortunately not always remembered.

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3. APPLIED LOGISTIC REGRESSION. 2nd edn. David W. Hosmer and Stanley Lemeshow. Wiley, New York, 2000. No. of pages: xii+373. Price: £60.95. ISBN 0-471-35632-8

This is the second edition of a book which first appeared in 1989 and was reviewed in *Statistics in Medicine* that same year [1]. When the first edition was published it was the first book

dedicated solely to logistic regression analysis though several other texts had some coverage of the topic. In the decade which has passed since then, several new books have appeared with detailed treatment of logistic regression. These include Kleinbaum [2], dealing only with logistic regression, Cox and Snell [3] and Collett [4], dealing with binary data in general, and Woodward [5] and Rothman and Greenland [6] treating the topic as a part of a broader text on epidemiology. Also, the available standard software to analyse logistic regression models has gone through a remarkable development during this period.

Compared to the first edition of Hosmer and Lemeshow's book, the second edition has been expanded with about 65 pages including topics like analysis of complex survey designs, of ordered categorical data and of correlated binary data, and exact methods and sample size considerations. Also the examples section and the chapter on goodness-of-fit techniques for the logistic model have been expanded.

The book still takes the linear regression model as the starting point, rather than contingency tables analysis, and it still contains eight chapters. Chapter 1 gives a short introduction to the model with a single explanatory variable and introduces a series of examples used throughout the book. The data for these examples are available via the web. The second chapter discusses inference in the multiple (or 'multivariable') model with a detailed description of the interpretation of the estimates for various types of explanatory variables (binary, categorical, continuous) in chapter 3. This chapter also discusses confounding and interaction and compares with classical Mantel-Haenszel techniques for stratified analysis. The next two chapters on model building strategies and goodness-of-fit assessment (the latter of which has been extended compared to the first edition) are in a way the core of the book which makes it different from other texts on logistic regression. Here, the authors' practical experience and their own contributions to the methodology make the text very interesting reading. From these chapters I would also like to emphasize the short section 4.5 on numerical problems which I found very

useful. Chapters 6 and 7 deal with the analysis of data which are not obtained by simple random sampling. This includes data from matched and unmatched case-control studies and a new section on complex sample survey designs. The final chapter is a typical 'miscellaneous' section with parts dealing with multinomial or ordinal data, with correlated data, or with exact methods. These sections are, however, very useful and treat topics which may not be covered in all other texts on logistic regression analysis.

In conclusion, in spite of the fact that this is the second edition, and in spite of the fact that there are now several books available which deal with logistic regression analysis, the additions to the first edition of the book by Hosmer and Lemeshow are very useful and it remains an extremely valuable text for everyone working or teaching in fields like epidemiology.

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4. MULTILEVEL MODELLING OF HEALTH STATISTICS. A. H. Leyland and H. Goldstein (eds), Wiley, Chichester, 2001. No. of pages: xvii+217. Price \$95.00. ISBN 0-471-99890-7

This book is dominated by one particular approach to multilevel modelling – the MLwiN approach. This is hardly surprising, since most of the contributors are affiliated with the Multilevel Models

2nd edn. David W. Hosmer and Stanley Lemeshow. Wiley, New York, 2000. No. of pages: xii+373. Price: £60.95. Regression Modeling of Time to Event Data. David W. Hosmer and Stanley Le July 2000. Statistics in Medicine. Robin Henderson. Read more.

Article. Applied logistic regression. D. W. Hosmer and S. Lemeshow, Wiley, New York, 1989. No. of pages: xiii July 1991. Statistics in Medicine. Applied Logistic Regression, Third Edition emphasizes applications in the health sciences and handpicks topics that best suit the use of modern statistical software. The book provides readers with state-of-the-art techniques for building, interpreting, and assessing the performance of LR models. New and updated features include: Applied Logistic Regression Third Edition. David w. hosmer, jr. Professor of Biostatistics (Emeritus) Division of Biostatistics and Epidemiology Department of Public Health School of Public Health and Health Sciences University of Massachusetts Amherst, Massachusetts. STANLEY LEMESHOW Dean, College of Public Health Professor of Biostatistics College of Public Health The Ohio State University Columbus, Ohio. Applied Logistic Regression, Third Edition. David W. Hosmer, Jr., Stanley Lemeshow, and Rodney X. Sturdivant. © 2013 John Wiley & Sons, Inc. Published 2013 by John Wiley & Sons, Inc.

1.2 introduction to the logistic regression model Example 1: Table 1.1 lists the age in years (AGE), and presence or absence of evidence of significant coronary heart disease (CHD) for 100 subjects in a hypothetical study of risk factors for heart disease. Applied Logistic Regression Second Edition DAVID W. HOSMER University of Massachusetts Amherst, Massachusetts STANLEY LEMESHOW The Ohio State University Columbus, Ohio A Wiley-Interscience Publication JOHN WILEY & SONS, INC. New York · Chichester · Weinheim · Brisbane · Singapore · Toronto. Jr., Stanley Lemeshow. 2nd ed. p. cm. Includes bibliographical references and index. CONTENTS 1 Introduction to the Logistic Regression Model 1 Introduction, 1 1.2 Fitting the Logistic Regression Model, 7 1.3 Testing for the Significance of the Coefficients, 11 1.4 Confidence Interval Estimation, 17 1.5 Other Methods of Estimation, 21 1.6 Data Sets, 23 1.6.1 The ICU Study, 23 1.6.2 The Low Birth Weight Study, 25.

Applied Logistic Regression, Third Edition emphasizes applications in the health sciences and handpicks topics that best suit the use of modern statistical software. The book provides readers with state-of-the-art techniques for building, interpreting, and assessing the performance of LR models. New and updated features include: A chapter on the analysis of correlated outcome data. A wealth of additional material for topics ranging from Bayesian methods to assessing model fit. A Comparison of Logistic Regression and Stratified Analysis for 2 × 2 Tables. Exercises. Model-Building Strategies and Methods for Logistic Regression. Introduction. Purposeful Selection of Covariates. 2nd ed. © Springer, 2015. 597 p. (Springer Series in Statistics).