Total Survey Error in Practice

Editors:
Paul P. Biemer, Edith de Leeuw, Stephanie Eckman, Brad Edwards, Frauke Kreuter, Lars E. Lyberg, N. Clyde Tucker, and Brady T. West
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Edited by

Paul P. Biemer
RTI International and University of North Carolina

Edith de Leeuw
Utrecht University

Stephanie Eckman
RTI International

Brad Edwards
Westat

Frauke Kreuter
Joint Program in Survey Methodology, University of Mannheim, Institute for Employment Research (Germany)

Lars E. Lyberg
Inizio

N. Clyde Tucker
American Institutes for Research

Brady T. West
University of Michigan and Joint Program in Survey Methodology
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Notes on Contributors

Manfred Antoni
Research Data Centre (FDZ)
Institute for Employment Research (IAB)
Nuremberg
Germany

Christopher Antoun
Center for Survey Measurement
U.S. Census Bureau
Suitland, MD
USA

Reg Baker
Marketing Research Institute International
Ann Arbor, MI
USA

Stefan Bender
Research Data and Service Centre
Deutsche Bundesbank
Frankfurt am Main
Germany

Grant Benson
Survey Research Center
University of Michigan
Ann Arbor, MI
USA

Heather Bergdahl
Process Department
Statistics Sweden
Stockholm
Sweden

Marcus E. Berzofsky
Division for Statistics and Data Science
RTI International
Research Triangle Park, NC
USA

Paul P. Biemer
Social, Statistical, and Environmental Sciences
RTI International
Research Triangle Park, NC
Odum Institute for Research in Social Science
University of North Carolina
Chapel Hill, NC
USA

Paul Burton
Survey Research Center
University of Michigan
Ann Arbor, MI
USA

Christine Bycroft
Statistics New Zealand
Wellington
New Zealand

Jennifer Hunter Childs
Research and Methodology Directorate
U.S. Census Bureau
Washington, DC
USA

Sue Connor
Westat
Rockville, MD
USA
Notes on Contributors

Frederick G. Conrad
Survey Research Center
University of Michigan
Ann Arbor, MI
Joint Program in Survey Methodology
University of Maryland
College Park, MD
USA

Mick P. Couper
Survey Research Center
University of Michigan
Ann Arbor, MI
Joint Program in Survey Methodology
University of Maryland
College Park, MD
USA

Edith de Leeuw
Department of Methodology and Statistics
Utrecht University
Utrecht
The Netherlands

Stephanie Eckman
Survey Research Division
RTI International
Washington, DC
USA

Brad Edwards
Westat
Rockville, MD
USA

Barbara Felderer
Collaborative Research Center SBF 884
“Political Economy of Reforms”
University of Mannheim
Mannheim
Germany

Jamie Griffin
Survey Research Center
University of Michigan
Ann Arbor, MI
USA

Heidi Guyer
Survey Research Center
University of Michigan
Ann Arbor, MI
USA

Kristen Cibelli Hibben
Survey Research Center
University of Michigan
Ann Arbor, MI
USA

Daniela Hochfellner
Center for Urban Science and Progress
New York University
New York, NY
USA

Anders Holmberg
Statistics Norway
Oslo
Norway

Joop Hox
Department of Methodology and Statistics
Utrecht University
Utrecht
The Netherlands

Yuli Patrick Hsieh
Survey Research Division
RTI International
Chicago, IL
USA

Frost Hubbard
Survey Solutions Division
IMPAQ International
Columbia, MD
USA

Andrew L. Hupp
Survey Research Center
University of Michigan
Ann Arbor, MI
USA
Joost Kappelhof  
Department of Education, Minorities, and Methodology  
Institute for Social Research/SCP  
The Hague  
The Netherlands

Alan F. Karr  
Center of Excellence for Complex Data Analysis  
RTI International  
Research Triangle Park, NC  
USA

Jennifer Kelley  
Institute for Social and Economic Research  
University of Essex  
Colchester  
UK

Meena Khare  
National Center for Health Statistics  
Centers for Disease Control and Prevention  
Hyattsville, MD  
USA

Yumi Kim  
Department of Research Methods  
Market Strategies International  
Livonia, MI  
USA

Antje Kirchner  
Department of Sociology  
University of Nebraska-Lincoln  
Lincoln, NE  
Survey Research Division  
RTI International  
Research Triangle Park, NC  
USA

Thomas Klausch  
Department for Epidemiology and Biostatistics  
VU University Medical Center  
Amsterdam  
The Netherlands

Frauke Kreuter  
Joint Program in Survey Methodology  
University of Maryland  
College Park, MD  
USA  
Department of Sociology  
University of Mannheim  
Mannheim  
Statistical Methods Group  
Institute for Employment Research (IAB)  
Nuremberg  
Germany

John LaFrance  
Market Strategies International  
Livonia, MI  
USA

Thomas Laitila  
Department of Research and Development Statistics Sweden  
Department of Statistics  
Örebro University School of Business  
Örebro  
Sweden

JiaoJiao Li  
Market Strategies International  
Livonia, MI  
USA

Karin Lindgren  
Process Department Statistics Sweden  
Stockholm  
Sweden

Peter J. Lugtig  
Institute for Social and Economic Research  
University of Essex  
Colchester  
UK  
Department of Methodology and Statistics  
Utrecht University  
Utrecht  
The Netherlands
Notes on Contributors

Lars E. Lyberg
Inizio
Stockholm
Sweden

Peter Lynn
Institute for Social and Economic Research
University of Essex
Colchester
UK

Aaron Maitland
Westat
Rockville, MD
USA

Aigul Mavletova
Department of Sociology
National Research University Higher School of Economics
Moscow
Russia

Peter Ph. Mohler
University of Mannheim
Mannheim
Germany

William D. Mosher
Bloomberg School of Public Health
Johns Hopkins University
Baltimore, MD
USA

Mary H. Mulry
Research and Methodology Directorate
U.S. Census Bureau
Washington, DC
USA

Joe Murphy
Survey Research Division
RTI International
Chicago, IL
USA

Elizabeth M. Nichols
Research and Methodology Directorate
U.S. Census Bureau
Washington, DC
USA

Anders Norberg
Process Department
Statistics Sweden
Stockholm
Sweden

Daniel L. Oberski
Department of Methodology and Statistics
Utrecht University
Utrecht
The Netherlands

Beth-Ellen Pennell
Survey Research Center
University of Michigan
Ann Arbor, MI
USA

Gregg Peterson
Survey Research Center
University of Michigan
Ann Arbor, MI
USA

Vicki J. Pineau
NORC at the University of Chicago
Chicago, IL
USA

Joseph W. Sakshaug
Cathie Marsh Institute for Social Research
University of Manchester
Manchester
UK

Department of Statistical Methods
Institute for Employment Research (IAB)
Nuremberg
Germany
Michael F. Schober  
Department of Psychology  
New School for Social Research  
New York, NY  
USA

James A. Singleton  
National Center for Immunization and Respiratory Diseases  
Centers for Disease Control and Prevention  
Atlanta, GA  
USA

Benjamin Skalland  
NORC at the University of Chicago  
Chicago, IL  
USA

Philip J. Smith  
National Center for Immunization and Respiratory Diseases  
Centers for Disease Control and Prevention  
Atlanta, GA  
USA

Diana Maria Stukel  
FHI 360  
Washington, DC  
USA

Can Tongur  
Process Department  
Statistics Sweden  
Stockholm  
Sweden

Roger Tourangeau  
Westat  
Rockville, MD  
USA

Dennis Trewin  
Former Australian Statistician  
Australian Bureau of Statistics  
Canberra  
Australia

James Wagner  
Survey Research Center  
University of Michigan  
Ann Arbor, MI  
Joint Program in Survey Methodology  
University of Maryland  
College Park, MD  
USA

Brady T. West  
Survey Research Center  
University of Michigan  
Ann Arbor, MI  
Joint Program in Survey Methodology  
University of Maryland  
College Park, MD  
USA

Kirk M. Wolter  
NORC at the University of Chicago  
Chicago, IL  
USA

Gelaye Worku  
Department of Statistics  
Stockholm University  
Stockholm  
Sweden

Yingfu Xie  
Process Department  
Statistics Sweden  
Stockholm  
Sweden

H. Yanna Yan  
Survey Research Center  
University of Michigan  
Ann Arbor, MI  
USA

Ting Yan  
Methodology Unit  
Westat  
Rockville, MD  
USA
Notes on Contributors

David Yankey
National Center for Immunization and Respiratory Diseases
Centers for Disease Control and Prevention
Atlanta, GA
USA

Wei Zeng
NORC at the University of Chicago
Chicago, IL
USA

Zhen Zhao
National Center for Immunization and Respiratory Diseases
Centers for Disease Control and Prevention
Atlanta, GA
USA
Preface

*Total survey error* (TSE) refers to the accumulation of all errors that may arise in the design, collection, processing, and analysis of survey data. In this context, a survey error can be defined as any error contributing to the deviation of an estimate from its true parameter value. Survey errors arise from misspecification of concepts, sample frame deficiencies, sampling, questionnaire design, mode of administration, interviewers, respondents, data capture, missing data, coding, and editing. Each of these error sources can diminish the accuracy of inferences derived from the survey data. A survey estimate will be more accurate when bias and variance are minimized, which occurs only if the influence of TSE on the estimate is also minimized. In addition, if major error sources are not taken into account, various measures of margins of error are understated, which is a major problem for the survey industry and the users of survey data.

Because survey data underlie many public policy and business decisions, a thorough understanding of the effects of TSE on data quality is needed. The TSE framework, the focus of this book, is a valuable tool for understanding and improving survey data quality. The TSE approach summarizes the ways in which a survey estimate may deviate from the corresponding parameter value. Sampling error, measurement error, and nonresponse error are the most recognized sources of survey error, but the TSE framework also encourages researchers not to lose sight of the less commonly studied error sources, such as coverage error, processing error, and specification error. It also highlights the relationships between errors and the ways in which efforts to reduce one type of error can increase another, resulting in an estimate with more total error. For example, efforts to reduce nonresponse error may unintentionally lead to measurement errors, or efforts to increase frame coverage may lead to greater nonresponse.

This book is written to provide a review of the current state of the field in TSE research. It was stimulated by the first international conference on TSE that was held in Baltimore, Maryland, in September 2015 (http://www.TSE15.org). Dubbed TSE15, the conference had as its theme, “Improving Data Quality in the Era of Big Data.” About 140 papers were presented at the conference which was attended by approximately 300 persons. The conference itself was the culmination of a series of annual workshops on TSE called the International TSE Workshops (ITSEWs) which began in 2005 and still continue to this day. This book is an edited volume of 25 invited papers presented at the 2015 conference spanning a wide range of topics in TSE research and applications.

TSE15 was sponsored by a consortium of professional organizations interested in statistical surveys—the American Association of Public Opinion Research (AAPOR), three sections of the American Statistical Association (Survey Research Methods, Social Statistics, and Government Statistics), the European Survey Research Association (ESRA), and the World Association of Public Opinion Research (WAPOR). In addition, a number of organizations offered financial support for the conference and this book. There were four levels of contributions. Gallup,
Inc. and AC Nielsen contributed at the highest level. At the next highest level, the contributors were NORC, RTI International, Westat, and the University of Michigan (Survey Research Center). At the third level were Mathematica Policy Research, the National Institute of Statistical Sciences (NISS), and Iowa State University. Finally, the Council of Professional Associations on Federal Statistics (COPAFS) and ESOMAR World Research offered in-kind support. We are deeply appreciative of the sponsorship and support of these organizations which made the conference and this book possible.

Stephanie Eckman (RTI International) and Brad Edwards (Westat) cochaired the conference and the organizing committee, which included Paul P. Biemer (RTI International), Edith de Leeuw (Utrecht University), Frauke Kreuter (University of Maryland), Lars E. Lyberg (Inizio), N. Clyde Tucker (American Institutes for Research), and Brady T. West (University of Michigan). The organizing committee also did double duty as coeditors of this volume. Paul P. Biemer led the editorial committee.

This book is divided into five sections, each edited, primarily, by three members of the editorial team. These teams worked with the authors over the course of about a year and were primarily responsible for the quality and clarity of the chapters. The sections and their editorial teams were the following.

Section 1: The Concept of TSE and the TSE Paradigm (Editors: Biemer, Edwards, and Lyberg). This section, which includes Chapters 1 through 4, provides conceptual frameworks useful for understanding the TSE approach to design, implementation, evaluation, and analysis and how the framework can be extended to encompass new types of data and their inherent quality challenges.

Section 2: Implications for Survey Design (Editors: De Leeuw, Kreuter, and Eckman). This section includes Chapters 5 through 11 and provides methods and practical applications of the TSE framework to multiple-mode survey designs potentially involving modern data collection technologies and multinational and multicultural survey considerations.

Section 3: Data Collection and Data Processing Applications (Editors: Edwards, Eckman, and de Leeuw). This section includes Chapters 12 through 15 and focuses on issues associated with applying the TSE framework to control costs and errors during data collection activities.

Section 4: Evaluation and Improvement (Editors: West, Biemer, and Tucker). This section includes Chapters 16 through 21 and describes a range of statistical methods and other approaches for simultaneously evaluating multiple error sources in survey data and mitigating their effects.

Section 5: Estimation and Analysis (Editors: Kreuter, Tucker, and West). This section includes Chapters 22 through 25 which deal with issues such as the appropriate analysis of survey data subject to sampling and nonsampling errors, potential differential biases associated with data collected by mixed modes and errors in linking records, and reducing these errors in modeling, estimation, and statistical inferences.

The edited volume is written for survey professionals at all levels, from graduate students in survey methodology to experienced survey practitioners wanting to imbue cutting-edge principles and practices of the TSE paradigm in their work. The book highlights use of the TSE framework to understand and address issues of data quality in official statistics and in social, opinion, and market research. The field of statistics is undergoing a revolution as data sets get bigger (and messier), and understanding the potential for data errors and the various means to control and prevent them is more important than ever. At the same time, survey organizations are challenged to collect data more efficiently without sacrificing quality.

Finally, we, the editors, would like to thank the authors of the chapters herein for their diligence and support of the goal of providing this current overview of a dynamic field of research.
We hope that the significant contributions they have made in these chapters will be multiplied many times over by the contributions of readers and other methodologists as they leverage and expand on their ideas.

Paul P. Biemer
Edith de Leeuw
Stephanie Eckman
Brad Edwards
Frauke Kreuter
Lars E. Lyberg
N. Clyde Tucker
Brady T. West