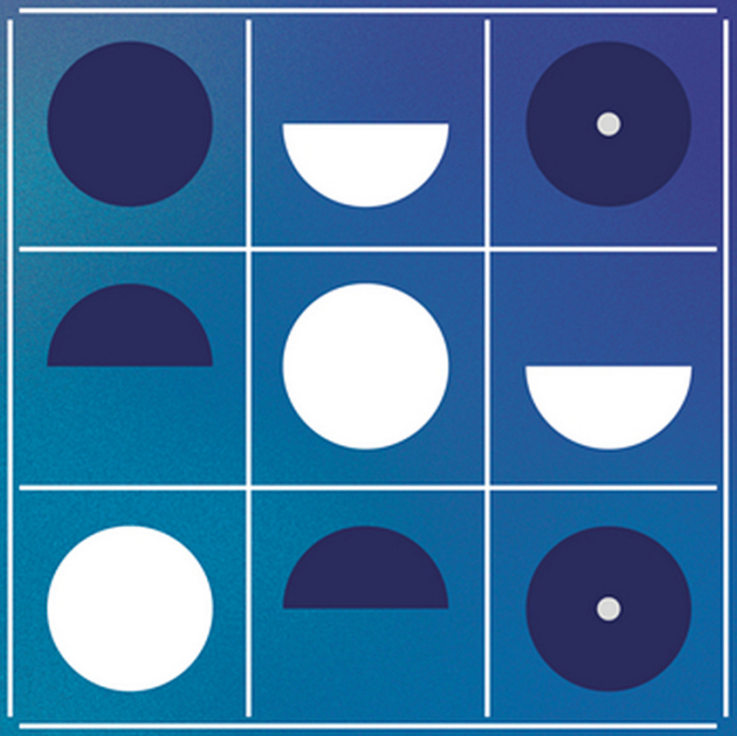
Wiley Series in Survey Methodology

Total Survey Error in Practice



Editors:
Paul P. Biemer, Edith de Leeuw, Stephanie Eckman, Brad Edwards,
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Total Survey Error in Practice

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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.

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