

M. N. MURTHY. *Sampling Theory and Methods*. Statistical Publishing Society, 1967. xxiv + 684 pp. \$10.00.

Review by TORE DALENIUS

*University of Stockholm*

When reviewing a book, the reviewer is likely to face a difficult task: he may have to strike a balance between two conflicting demands, viz. the demand for swiftness, and the demand for comprehensiveness and accuracy. This task would prove to be especially difficult, if the book to be reviewed is large, or technical.

Dr. Murthy's *Sampling Theory and Methods* is both large and (at least in places) technical. Thus, it would be a long time before a comprehensive and accurate review would be available. In the interest of directing attention to Dr. Murthy's book at an early point of time, I have chosen to prepare what—in a certain respect—may be looked upon as a premature review.

Dr. Murthy's professional abode is the Indian Statistical Institute. In the last few decades, this agency has played an impressive role in the development of sampling theory and methods; and their applications; it suffices to mention that Professor P. C. Mahalanobis, one of the great pioneers in this area, has been and still is the leader of the institute. Dr. Murthy is head of the design, training and research division in the department of the National Sample Survey, a huge program for data collection and analysis undertaken by the institute.

In the preface, Dr. Murthy presents the objectives of his book as follows: "This book attempts to give an up-to-date account of the theoretical framework and the methodology of sampling from finite populations with particular attention to methods currently practised and to those having potentialities of wide application. It is intended to serve a two-fold purpose: primarily as a text book for students at the universities as well as in institutions imparting professional training in statistics, and as a work of reference for instructors, research scholars and professional workers in statistical surveys."

The material that makes up the book, and its organization, is evident from the following list of chapter headings:

- |  |  |
|--|--|
| 1. Need for sample survey              | 9. Multi-stage sampling                  |
| 2. Concepts, definitions and notations | 10. Method of ratio estimation           |
| 3. Simple random sampling              | 11. Difference and regression estimators |
| 4. Sample selection and sample size    | 12. Self-weighting design                |
| 5. Systematic sampling                 | 13. Non-sampling errors                  |
| 6. Varying probability sampling        | 14. Planning of sample surveys           |
| 7. Stratified sampling                 | 15. National sample survey               |
| 8. Cluster sampling                    | 16. Family living surveys                |

In addition, there is a sizeable bibliography (more than 60 pages) and also three appendices.

Approximately three quarters of the book are devoted to the sampling theory and methods associated with the three basic design operations: the construction of (a hierarchy of) sampling units, the selection of a sample of such units (at each stage of the hierarchy), and the estimation of some population characteristic; as is the case in most textbooks, this population characteristic is the mean per element in the population, or some aggregate ("total"). The remaining quarter of the book is devoted to chapters on non-sampling errors, planning of sample surveys, and illustrative examples.

By way of evaluating Dr. Murthy's book, I want to present some broad observations. (1) The book comprises much the same material that is found in a variety of textbooks published in the last two decades.

(2) In addition, the book contains some material which for obvious reasons is missing in (at least the early editions of) the forerunners. Some examples are as follows: (i) Estimation of the mean based on the distinct units "in a simple random sample of  $n$  units selected with replacement." (This terminology is Dr. Murthy's; a more satisfactory terminology had been "in a sample of  $n$  units, selected with equal probability and with replacement after each draw"). (ii) Lahiri's method for "pps selection," that is selection with probabilities proportional to some measure of size. (iii) Murthy's unordered estimator. (iv) The use of "multiple auxiliary variables" in ratio estimation.

The list of such examples can easily be extended. The four examples quoted illustrate Dr. Murthy's endeavour to give an "up-to-date account of the theoretical framework and the methodology of sampling from finite populations ..."

(3) There are, on the other hand, certain 'modern' contributions which are only touched upon, or even not dealt with at all. Three such examples will be given: (i) The criticism launched by Godambe, Hanurav and others of the "classical" theory of sampling from a finite population. (ii) The discussion of the concept of sufficiency as applied to sampling from a finite population by, e.g., Basu and Pathak. (iii) The neo-Bayesian approach as advocated by e.g. Ericson.

A possible conjecture why these contributions are not dealt with in Dr. Murthy's book is his objective of restricting the content to "methods currently practised." In view of the present state of the controversy over the topics just mentioned (and especially the first and the third topic), Dr. Murthy can hardly be criticised for his choice of material included in his book.

(4) Throughout the book, Dr. Murthy illustrates the sampling theory and methods by *realistic* examples. These examples, which to a large extent are taken from surveys carried out by the Indian Statistical Institute, are elaborated in sufficient detail to make them easily understood, irrespective of the (lack of) familiarity of the reader with India's geography, governmental system etc.

(5) The style is generally good. Some readers may, however, get annoyed by such abbreviations as "SRS WOR", "STSWR", "PPSWR" etc., in addition to the established ones (like "SRS").

(6) The number of errors and/or misprints seems to be very low. (Incidentally

errors and misprints are good examples of "rare items." The problem of how to estimate the frequency of "rare items" is only touched upon). Dr. Murthy has himself prepared an errata sheet. Detecting errors etc. is, of course, subject to coverage error, as evidenced by this errata sheet. To prove the reviewer's case, one example is given. On p. 614, "Hansen, M. H. and Marks, E. S." are quoted as authors of a certain important paper; this paper is written by "Hanson, R. H. and Marks, E. S."

At the beginning of this review, I said that I have chosen to prepare what may prove to be a 'premature' review. This statement reflected two things: (i) Dr. Murthy's book is in the nature of a *textbook*. Just as "the test of the pie is in eating it," the test of a textbook ought to be in teaching a course, based on the textbook. (ii) I have *not* had the opportunity of testing Dr. Murthy's book in the preferred way just mentioned.

Nonetheless, by way of summarizing my impressions, I venture to state that Dr. Murthy's book will no doubt prove to come up to the high expectations that I have, in view of the documented competence of its author.