



European Conference on Quality in Official Statistics

Rome, 8-11 July 2008

Training course

SMALL AREA ESTIMATION

Instructor

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Course Design

There is a growing demand to produce reliable estimates of various socio-economic and health characteristics at both national and sub-national levels. However, data availability at the sub-national (small area) level from a survey is often limited by cost and thus analysts must make the best possible use of all available information. The course begins with a history of small-area estimation and different uses of small-area statistics in both public and private sectors. This full-day course provides an introduction to important concepts in small estimation and outlines various approaches for estimating different small area parameters. Topics include standard design-based methods, various traditional indirect methods and the state-of-the-art small-area estimation methods that use mixed models. The course is not designed to provide an in-depth study of any topic, but to provide an overview of small-area estimation. Formulas will be presented wherever necessary to explain some of the advanced topics but without any derivations. Data analyses using a few real life examples will be presented. The course is intended for survey practitioners. The prerequisite is knowledge of multiple linear regression and analysis of variance techniques.

Outline

1. Introduction
 - a. Uses of small area statistics.
 - b. Different data sources for producing small area estimates.
 - c. A few real life applications.
2. Design-based estimation.
 - a. Direct estimation.
 - b. Modified direct estimation.
 - c. Various sampling design issues.
3. Traditional indirect methods.
 - a. Synthetic methods.
 - b. Composite methods.

4. Mixed models.
 - a. Relevance of mixed models in small area estimation.
 - b. Area specific versus unit specific mixed models.
 - c. Linear mixed models and Generalized linear mixed models.
5. Implementation of a mixed model
 - a. Empirical best prediction method.
 - b. Hierarchical Bayes method.
 - c. Strategies to protect model-based methods from possible model failure.

Learning Outcomes

- Understand why standard design-based methods may fail to provide reliable small area estimates.
- Learn how standard designs may be adapted to address small area issues.
- Learn differences between mixed models and regression models and why mixed models are more suited in small area estimation.
- Learn model-based small area methods and how to make them robust against possible model failure.
- Learn how to do small area analyses using real life data sets.

Presenter

Dr. Partha Lahiri is Professor of the Joint Program in Survey Methodology (JPSM) at the University of Maryland at College Park, and an Adjunct Research Professor of Institute of Social Research, University of Michigan, Ann Arbor. Prior to coming to Maryland, Dr. Lahiri was the Milton Mohr Distinguished Professor of Statistics at the University of Nebraska-Lincoln. His research interests include small-area estimation, resampling methods, record linkage, and multi-level modeling. Dr. Lahiri's work has been widely published in leading journals such as the *Journal of the American Statistical Association*, *Annals of Statistics* and *Survey Methodology*. Dr. Lahiri has served on a number of advisory committees, including the U.S. Census Advisory committee. He is a Fellow of the American Statistical Association and the Institute of Mathematical Statistics.

Course Text and Materials

There is no text book for the course. The course will be based on the presenter's lecture notes.