AN INTRODUCTION TO SMALL AREA ESTIMATION METHODS
(ON-LINE COURSE MARCH-MAY SESSION, 2016)

Webpage for the course
Course materials will be posted on the following JPSM Moodle website:

http://jpsmonline.umd.edu

You will need an enrollment key to access the above website.

It is the student’s responsibility to check the website for additional readings, homework, and other important information. We will mainly follow class lecture notes to be posted on the JPSM Moodle website on a regular basis. We, however, recommend the following book for your benefit:


Lectures
This is an on-line course. The students will have access to lectures on-line. Each week students are required to watch the on-line lectures before attending the discussion session.

Discussions
Each week we will hold a discussion session to discuss the on-line lectures and to solve problems. We will follow the JPSM class schedule.

We will use a software called BlueJeans so students can access the classroom live from a remote site. Detailed information on BlueJeans and passcode will be provided before the start of the class.

Instructors
Dr. Partha Lahiri, Joint Program in Survey Methodology (JPSM), University of Maryland, College Park; Phone: 301-314-5903; FAX 301-314-7912; Email: plahiri@umd.edu

Prerequisites:
The course is intended for survey practitioners and should be accessible to graduate students and early career researchers. An undergraduate level course in mathematical statistics and applied regression analysis are required. If you are unsure about your qualifications for the course, please contact us.
Course Outline
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 will begin with a history of small-area estimation and different uses of small-area statistics in both public and private sectors. This course will provide an introduction to the main concepts and issues in small estimation and describes 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 both Bayesian and empirical best prediction methods. Monte Carlo simulation results and data analysis using available statistical software will be presented.

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. Traditional Indirect Methods
   a. Synthetic methods
   b. Composite Methods
3. Model-based methods
   a. Relevance of mixed models in small area estimation.
   b. Area specific versus unit specific mixed models.
4. Implementation of a mixed model
   a. Empirical best prediction (EBP) method.
   b. Hierarchical Bayes method.
5. Case Studies

Learning Outcomes
- Understand why standard design-based methods may fail to provide reliable small area estimates.
- Learn differences between mixed models and regression models and why mixed models are more suited in small area estimation.
- Learn how to conduct small area analyses using complex survey data.

Grading:
The course grade will be based on five homework assignments. Assignments will be given out as appropriate throughout the session, and will generally be due one week after they are assigned. For data analysis, your write-up must be a careful report of your models, methods, interpretations, and conclusions. Include only the relevant parts of your computer output in your report, labeling all plots, variables, and so forth.
**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 the 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 survey sampling, official statistics, and small-area estimation. Dr. Lahiri’s research on small area estimation has been widely published in leading journals such as the *Journal of the American Statistical Association, Annals of Statistics, Biometrika* and *Survey Methodology*. Dr. Lahiri has served on a number of advisory committees, including the U.S. Census Advisory committee and U.S. National Academy panel. Over the years Dr. Lahiri advised various local and international organizations such as the United Nations Development Program, World Bank, Gallup Organization. Dr. Lahiri regularly teaches semester-long small area estimation course at JPSM. In addition, he offered short courses, workshops and a webinar on small area estimation in different countries. Dr. Lahiri is a Fellow of the American Statistical Association and the Institute of Mathematical Statistics and an elected member of the International Statistical Institute.