SURV798B: SMALL AREA ESTIMATION
SPRING, 2015

Meeting time and place:
Monday, 9:30-12:00; 1208 Lefrak Hall. I will follow UMD class schedule. First class: Monday, January 26, last class: Monday, May 11.

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

Office hours:
By appointment (please send me an email to make an appointment)

Target Audience and Prerequisites:
The course is intended for practitioners and should be accessible to Master’s students in survey methodology, statistics, biostatistics and related areas. A prerequisite for this course is a mathematical statistics course at the Master's level (e.g., UMD STAT/SURV 420 or equivalent.) No prior knowledge of R is required. If you are unsure about your qualifications for the course, please contact the instructor.

Webpage for the course:
Course materials will be posted on the JPSM Moodle website: http://jpsmonline.umd.edu (you will need a user id and password to enter the site). Students are asked to print a copy of the notes before coming to the class. 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. The following book is recommended for your benefit:


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 begins with a history of small-area estimation and different uses of small-area statistics in both public and private sectors. This course provides an introduction to important concepts 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. Derivation of formulas will be
presented wherever necessary to explain some of the advanced topics. Monte Carlo simulation results and data analyses using a few real life examples will be presented. The course emphasizes data analysis via modern computer methods and R freeware packages that are introduced and used throughout the course.

**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 model-based and model-assisted small area methods and how to make them robust against possible model failure.
- Learn how to conduct small area analyses using complex survey data.
- Learn freely available software R to compute basic small area statistics.

**Grading:**

Final course grade will be determined using your scores on about eight assignments to be given approximately every other week (90%) and class participation (10%). Students are required to submit a single pdf file of their completed homework on line. The homework problems will include theoretical and applied questions. Assignments will be given out as appropriate throughout the semester, and will generally be due one week after they are assigned. Students should try to do their own work on these problems; I am available for questions, of course. For data analysis, your write-up must be a careful report of your models, methods, interpretations, and conclusions -- as if you were making a final report to a supervisor who has statistical training, but doesn't want to get bogged down in the details. Include only the relevant parts of your computer output in your report, labeling all plots, variables, and so forth. You need not get too carried away -- always substitute prose for output where possible.

**Presenter:**

Dr. Partha Lahiri is Professor of the Joint Program in Survey Methodology (JPSM) at the University of Maryland, 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 Bayesian methods, survey sampling, resampling methods, 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.