AN INTRODUCTION TO SMALL AREA ESTIMATION

SURV 662

3 credits

Term: March 3 – May 26, 2016

Instructor:
Dr. Partha Lahiri; Joint Program in Survey Methodology (JPSM), 1218 Lefrak Hall, University of Maryland, College Park; Email: plahiri@umd.edu

Class Structure and Course Concept:
This is an online course using a flipped classroom design. In this course, you are responsible for watching video recorded lectures and reading the required literature for each unit and then “attending” mandatory weekly one-hour online meetings where students have the chance to discuss the materials from a unit with the instructor.

Although this is an online course where students have more freedom in when they engage with the course materials, students are expected to spend the same amount of time overall on all activities in the course – including preparatory activities (readings, studying), in-class-activities (watching videos, participating in online meetings), and follow-up activities (working on assignments and exams) – as in an on-site course. As a rule of thumb, for each credit offered by a course, students can expect to spend one hour per week on class activities and three hours per week on out-of-class activities over the span of a full 12-week term. This is a 3-credit course that runs for 12 weeks. Hence, the average workload amounts to about 12 hours per week.

Mandatory Weekly Online Meetings:
Thursday, 11 AM - 11:50 AM
First online meeting: Thursday, March 3, 2016, 11 AM-11:50 AM
Last online meeting: Thursday, May 26, 2016, 11 AM-11:50 AM
UMD Spring Break: March 13-20, 2016 [No online meeting on March 17]

Meetings will be held online through BlueJeans. Follow the link to the meeting sessions on the course website on jpsmonline.umd.edu. If video participation via Internet is not possible, arrangements can be made for students to dial in and join the meetings via telephone.

In preparation for the weekly online meetings, students are expected to watch the lecture videos and read the assigned literature before the start of the meeting. In addition, students are encouraged to e-mail
questions about the materials covered in the videos and readings of the week to the instructor (plahiri@umd.edu) before the meetings (deadline for sending questions via e-mail is Thursday, 8AM).

**Overview of the Course:**
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.

**Outline:**
1. Introduction
   a. A few real life applications
   b. Two different classifications of domains
   c. Demand for small area statistics
   d. Different issues in small area estimation
2. Direct Methods
   a. Examples of direct methods
   b. A simulation example
   c. Small area issues at the design stage
   d. Use of auxiliary variables
3. Traditional Indirect Methods
   a. Synthetic methods
   b. Composite Methods
4. Model-based methods
   a. Relevance of mixed models in small area estimation.
   b. Area specific versus unit specific mixed models.
5. Implementation of a mixed model
   a. Empirical best prediction (EBP) method.
   b. Hierarchical Bayes method.
6. 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.
Pre-requisites:
The course is intended for survey practitioners and graduate students. An undergraduate level course in mathematical statistics and an applied regression analysis are required (e.g., STAT 400 and STAT 401 at UMD). If you are unsure about your qualifications for the course, please contact us.

Grading:
Grading will be based on:

- Participation in discussion during the weekly online meetings and submission of questions via e-mail (deadline: Thursday, 8AM before class) demonstrating understanding of the required readings and video lectures (28% of grade)
- 4 homework assignments (worth 18% each)

Late assignments will not be accepted without prior arrangement with the instructors.

Technical Equipment Needs:
The learning experience in this course will mainly rely on the online interaction between students and the instructor during the weekly online meetings. Therefore, we encourage all students in this course to use a standalone Web camera and a headset. Decent quality headsets and web cams are available for less than $20 each. We ask students to refrain from using built-in Web cams and speakers on their desktops or laptops. We know from our experience in previous online courses that this will reduce the quality of video and audio transmission and therefore will decrease the overall learning experience for all students in the course. In addition, we suggest that students use wire connection (LAN), if available, when connecting to the online meetings. Wireless connections (WLAN) are usually less stable and might be dropped.

Academic Conduct:
Clear definitions of the forms of academic misconduct, including cheating and plagiarism, as well as information about disciplinary sanctions for academic misconduct may be found at the University of Maryland Graduate School web site
http://www.graduate.umaryland.edu/policies/misconduct.html

Knowledge of these rules is the responsibility of the student and ignorance of them does not excuse misconduct. The student is expected to be familiar with these guidelines before submitting any written work or taking any exams in this course. Lack of familiarity with these rules in no way constitutes an excuse for acts of misconduct. Charges of plagiarism and other forms of academic misconduct will be dealt with very seriously and may result in oral or written reprimands, a lower or failing grade on the assignment, a lower or failing grade for the course, suspension, and/or, in some cases, expulsion from the university.

Accommodations for Students with Disabilities:
In order to receive services you must contact the Disability Support Services (DSS) office to register in person for services. Please call the office to set up an appointment to register with a DSS counselor. Contact the DSS office at 301.314.7682; http://www.counseling.umd.edu/DSS/.
Course Evaluation:
In an effort to improve the learning experience for students in our online courses, students will be invited to participate in a course evaluation at the end of the course (in addition to the standard university evaluation survey). Participation is entirely voluntary and highly appreciated.

Non-degree Students: How to Enroll
Students who want to take particular courses but are not seeking a degree must be accepted as Advanced Special Students in the University of Maryland Graduate School. Procedures for obtaining Advanced Special Student Status are given in http://www.jpsm.umd.edu/graduate/non-degree-seeking-how-apply).

After being admitted as an Advanced Special Student, you must still register for the class you plan to take. See the instructions for registration (http://www.jpsm.umd.edu/graduate/non-degree-seeking-how-register-classes). Registration for some classes requires permission of the instructor. To obtain permission, contact JPSM at 301-314-7911 or contact the instructor directly.

Short Bio of the Instructor:
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.