Banff International Research Station
for Mathematical Innovation and Discovery

Recent Advances in Survey Sampling Methods
July 25-27, 2014

SCHEDULE

Friday, July 25, 2014

16:00   Check-in begins (Front Desk – Professional Development Centre - open 24 hours). Lecture rooms available after 16:00.

19:30   Informal mixer - gathering in 2nd floor lounge, Corbett Hall

Saturday, July 26, 2014

7:00-9:00   **Breakfast**

9:15-9:30   **Welcome**

9:30-10:15   **Lecture 1**
Jon Rao, Carleton University, Canada
Some Recent Advances in Small Area Estimation: an Appraisal

10:15-10:45   **Coffee Break**, TCPL

10:45-11:30   **Lecture 2**
Wayne Fuller, Iowa State University
Bootstrap Estimators for the Small Area Prediction Mean Squared Error

11:30-1:30   **Lunch**

1:30-2:15   **Lecture 3**

Partha Lahiri, University of Maryland
The role of adjusted residual maximum likelihood estimation
in small area estimation

2:15-3:00   **Lecture 4**
Gauri Datta, University of Georgia
Small Area Estimation With Uncertain Random Effects

3:00-3:30   **Coffee Break**, TCPL

3:30-4:15	**Lecture 5** Mahmoud Torabi, University of Manitoba Spatial generalized linear mixed models in small area estimation
4:15-5:00	**Lecture 6** Jae-Kwang Kim, Iowa State University 2014 Korean local election prediction using small area estimation techniques and mixed-mode survey sampling
5:00-5:15	**Slide Presentation**
6:00-10:00	**Dinner Banquet**, Masala Authentic Indian Cuisine, 229 Bear St, Banff, AB

Sunday, July 27, 2014

7:00-9:00	**Breakfast**
9:00-11:00	**Coffee and Round Table Discussion**
	Checkout by 12 noon.

MEALS

Coffee Breaks: As per daily schedule, in the foyer of the TransCanada Pipeline Pavilion (TCPL) *(included in workshop)*

For meal options at the Banff Centre, there are food outlets on The Banff Centre campus such as Vistas Main Dining Room on the 4th floor of Sally Borden Building (breakfast: 7:00-9:30am; lunch: 11:30am-1:30pm; dinner: 5:30-7:30pm), Le Cafe (ground floor, Sally Borden Building) and the Maclab Bistro (Kinnear Centre).   You will also find a good selection of restaurants in the town of Banff which is a 10-15 minute walk from Corbett Hall.*

MEETING ROOMS

All lectures will be held in the new lecture theater in the TransCanada Pipelines Pavilion (TCPL). LCD projector and blackboards are available for presentations.

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ABSTRACTS

(in alphabetic order by speaker surname)

Speaker: Gauri Datta, University of Georgia
Title: Small Area Estimation With Uncertain Random Effects
Abstract: Random effects models play an important role in model-based small area estimation. Random effects account for any lack of fit of a regression model for the population means of small areas on a set of explanatory variables. In a recent paper, Datta, Hall and Mandal (2011, J. Amer. Statist. Assoc.) showed that if the random effects to account for a lack of fit of a regression model can be dispensed with through a statistical test, then the model parameters and the small area means can be estimated with substantially higher accuracy. The work of Datta et al. (2011) is most useful when the number of small areas, m, is moderately large. For large m, the null hypothesis of no random effects will likely be rejected. Rejection of null hypothesis is usually caused by a few large residuals signifying a departure of the direct estimator (Y_i) from the synthetic regression estimator. As a flexible alternative to the Fay-Herriot random effects model and the approach in Datta et al. (2011), in this paper we consider a mixture model for random effects. It is reasonably expected that small areas with population means explained adequately by covariates have little model error, and the other areas with means not adequately explained by covariates will require a random component added to the regression model. This model is a flexible alternative to the usual random effects model and the data determine the extent of lack of fit of the regression model for a particular small area, and include a random effect if needed. Unlike the Datta et al. (2011) approach which recommends excluding random effects from all small areas if a test of null hypothesis of no random effects is not rejected, the present model is less restrictive. We used this mixture model to estimate poverty ratios for 5- to 17-year old related children for the 50 U.S. states and Washington, DC. This application is motivated by the SAIPE project of the US Census Bureau. We empirically evaluated the accuracy of the direct estimates and the estimates obtained from our mixture model and the Fay-Herriot random effects model. These empirical evaluations and a simulation study, in conjunction with a measure of uncertainty of the new estimates show that they are more accurate than the frequentist and the Bayes estimates resulting from the standard Fay-Herriot model.

Speaker: Wayne Fuller, Iowa State University
Title: Bootstrap Estimators for the Small Area Prediction Mean Squared Error
Abstract: Alternative methods of computing bootstrap estimators of the prediction mean squared error are presented for unit-level small area models. Both linear and nonlinear models are considered. A one-step version of the parametric double bootstrap is constructed and methods of improving the computational efficiency of the bootstrap are illustrated.

Speaker: Jae-Kwang Kim, Iowa State University
Title: 2014 Korean local election prediction using small area estimation techniques and mixed-mode survey sampling.

Abstract: Sponsored by a broadcasting company in Korea (JTBC), we performed a novel application of the mixed-mode survey sampling and small area estimation to obtain the best prediction for the 2014 Korean local election outcomes. In the sampling part, a traditional telephone survey and a smart phone app survey were combined to reduce the coverage error and to control nonresponse error. The sample for smart phone app survey was selected from a voluntary panel sample. The sample selection was based on stratified PPS (Probability Proportional to Size) sampling using the propensity scores which is computed using the demographic information available from Statistics Korea. A data fusion technique was developed to combine the two survey results in a best way. In the prediction part, an area level model was developed using the outcome in the previous election and small area estimation techniques were employed to obtain the best prediction of the election outcome. The actual election outcome show very satisfactory results in Seoul and in other urban areas.

Speaker: Partha Lahiri, University of Maryland
Title: The role of adjusted residual maximum likelihood estimation in small area estimation

Abstract: We first introduce the concept of adjusted residual maximum likelihood estimation using the well-known Fay-Herriot linear mixed model that is frequently used to improve on direct survey estimates for small geographic areas. We then explain how the adjustment factor in the adjusted residual maximum likelihood method can be suitably chosen for producing a class of strictly positive consistent estimates of the unknown variance component, constructing simple second-order unbiased mean square error estimates, improving parametric bootstrap methods, and constructing simple second-order efficient Cox type empirical Bayes confidence intervals for small area means. We discuss various higher-order asymptotic properties of the proposed methods and assess their finite sample properties using Monte Carlo simulations. Finally, the utility of the proposed methodology is illustrated using a real life dataset.

Speaker: J. N. K. Rao, Carleton University
Title: Some Recent Advances in Small Area Estimation: an Appraisal

Abstract: Prasad's JASA 1990 paper had a big impact on the developments in small area estimation. In this talk, I will appraise some recent advances in small area estimation, focusing on the developments after my Wiley book appeared in 2003. Topics to be covered include resampling methods for MSE and confidence interval estimation, benchmarking, measurement errors, robust estimation and efficient estimation of complex small area parameters such as poverty measures.

Speaker: Mahmoud Torabi, University of Manitoba
Title: Spatial generalized linear mixed models in small area estimation

Abstract: In recent years, there has been a growing demand for reliable small area predictors. Small area predictors are generally improved by borrowing information from other areas. These are commonly based on either linear mixed models or generalized linear mixed models (GLMMs). However, there are many situations that the characteristics are related to their locations as well. In this talk, we propose small area models in the class of spatial GLMMs (SGLMMs) to predict characteristics and also to obtain corresponding mean squared prediction errors (MSPEs). We also provide second-order unbiased estimators of MSPE of the characteristics in the class of SGLMMs. The performance of our proposed approach is evaluated through simulation studies and also by a real application.