MATHEMATICA Policy Research

PRESENTATIONS

Joint Statistical Meetings

"Statistics: Making Better Decisions"

August 9–13, 2015 • Seattle, WA

Legend: Washington State Convention Center = CC

Sunday, August 9

Time	Room	Session	Presenter/ Author(s)
▶2:00–3:50 pm	CC-210	**Statistical Inference—Government Statistics Section** **Paper Presentation:** Comparison of Frequentist and Bayesian Methods for Testing Measurement Invariance Between Groups **Abstract:** A key assumption of comparing latent constructs between groups is that the measurement properties of the instrument used to elicit these constructs is invariant. A lack of measurement invariance (MI) indicates that the groups interpret measures differently and simple comparisons of mean scores could confound the results. A common statistical method used for MI testing is multigroup confirmatory factor analysis estimated via frequentist inference (ML or WLS). This traditional approach implies that the variance-covariance structures between the groups are exactly equal. This restrictive assumption often hampers comparison of factor means across groups with different subject or cultural background. A recent Bayesian MI approach (Muthén and Asparouhov 2013) introduced the concept of approximate invariance in which one can reasonably expect some differences across the groups. In the Bayesian MI approach, parameters (factor loadings or intercepts and slopes) are themselves considered variables with a specific distribution defined by empirical or non-empirical priors. Approximate MI allows for small differences (.01-.05 standard deviations) between parameters otherwise constrained as equal in the exact application.	**Dmitriy Poznyak**
	CC-2A	**Mode Effects—Survey Research Methods Section**	**Frank Potter, Chair**

Monday, August 10

Time	Room	Session	Presenter/ Author(s)
▶7:00–8:15 am		**Health Policy Statistics Section A.M. (Roundtable Discussion)**	**Frank Yoon, Organizer**
▶8:30–10:20 am	CC-304	**Student Paper Awards—Health Policy Statistics Section**	**Frank Yoon, Organizer and Chair**
	CC-4C1	**SPEED: Topics in Statistical Methods and Applications, Part 1—Survey Research Methods Section, Section in Marketing, Section on Statistics and the Environment, and Section on Statistics in Epidemiology**	
		Paper Presentation: Current Methods of Weight Trimming in Sample Surveys **Abstract:** In survey sampling practice, unequal sampling weights (the inverse of the selection probabilities) can be both beneficial and deleterious. Extreme variation in the sampling weights can result in excessively large sampling variances when the data and the selection probabilities are not positively correlated. In addition, extreme variation in the weights can result from unplanned subsampling, nonresponse adjustments, or post-stratification. In some survey situations, the survey statistician might impose a trimming strategy for excessively large weights. Because of the weight trimming, the survey statistician will usually expect an increased potential for a bias in the estimate and a decrease in the sampling variance. The ultimate goal of weight trimming is to reduce the sampling variance more than enough to compensate for the possible increase in bias and, thereby, reduce the mean square error. In this presentation, I will discuss current methods to identify the appropriate trimming values and provide guidance on selecting the final trimming level, which might be different from the values the algorithms suggest.	**Frank Potter**
▶10:30 am–12:20 pm	CC612	**Modern Techniques for Handling Missing Data—Survey Research Methods Section**	
		Paper Presentation: Multiple Imputation Using the Weighted Finite Population Bayesian Bootstrap **Abstract:** Accounting for multistage survey sample design features when generating datasets for multiple imputation is a non-trivial task. Thus, multiple imputation often ignores complex sample designs and assumes simple random sampling when generating imputations, even though failing to account for complex sample design features is known to damage inference. Here we extend a recently-developed weighted finite population Bayesian bootstrap procedure (Dong et al. 2014) to generate synthetic populations conditional on complex sample design data that can be treated as simple random samples at the imputation stage, obviating the need to directly model design features for imputation. We develop two forms of this method: one in which probabilities of selection are known at the first and second stage of the design, and the other in which only the final weight based on the product of the two probabilities are known. We show via simulation study that this method has advantages in terms of bias, mean square error, and coverage properties over methods in which sample designs are ignored, with little loss in efficiency even when compared with correct fully parametric models.	Hanzhi Zhou, co-author

Monday, August 10 *(Continued)*

Time	Room	Session	Presenter/ Author(s)
▶11:35 am–12:20 pm		**SPEED: Topics in Statistical Methods and Applications, Part 2—Survey Research Methods Section, Section in Marketing, Section on Statistics and the Environment, and Section on Statistics in Epidemiology** **Paper Presentation:** Current Methods of Weight Trimming in Sample Surveys **Abstract:** In survey sampling practice, unequal sampling weights (the inverse of the selection probabilities) can be both beneficial and deleterious. Extreme variation in the sampling weights can result in excessively large sampling variances when the data and the selection probabilities are not positively correlated. In addition, extreme variation in the weights can result from unplanned subsampling, nonresponse adjustments, or post-stratification. In some survey situations, the survey statistician might impose a trimming strategy for excessively large weights. Because of the weight trimming, the survey statistician will usually expect an increased potential for a bias in the estimate and a decrease in the sampling variance. The ultimate goal of weight trimming is to reduce the sampling variance more than enough to compensate for the possible increase in bias and, thereby, reduce the mean square error. In this presentation, I will discuss current methods to identify the appropriate trimming values and provide guidance on selecting the final trimming level, which might be different from the values the algorithms suggest.	**Frank Potter**
▶12:30–1:50 pm		**Health Policy Statistics Section P.M. (Roundtable Discussion)**	**Frank Yoon, Organizer**
▶2:00–3:50 pm	CC-611	**Important Issues in Clinical Trials, Meta-Analysis and Diagnostic Medicine—Health Policy Statistics Section** **Paper Presentation:** How to Reliably Quantify the Scientific Soundness of Quality Measures? A Monte Carlo Simulation Attempt **Abstract:** Under the Affordable Care Act, there are increasing needs to identify and develop a core set of health care quality measures to improve the quality of care and evaluate the performance of health-related entities across the health care system. Such measure development projects typically request tremendous effort and coordination in planning, development, testing, implementation, and validation, therefore, careful design is required at the planning stage to obtain adequate data to ensure the statistical validity of quality measures and reporting. One key task for measure developers is to reliably quantify the scientific soundness (such as data validity and measure reliability) of these measures using data from test sites and report the results to policy makers. Classic formulae using normal-based assumptions from asymptotic theory may be either difficult to derive under a complex design, or inappropriate under unbalanced data structure in practice. In this talk, we will present a statistical framework and case studies on how Monte Carlo simulations, as an alternative tool, could provide a more transparent guidance on improving scientific rigor and facilitating decision making.	**Fei Xing** Sheng Wang, co-author
▶3:00–4:30 pm		**Committee on Gay and Lesbian Concerns in Statistics Business Meeting**	**Diane Herz, Chair**

Tuesday, August 11

Time	Room	Session	Presenter/ Author(s)
▶7:00–8:15 am		**Health Policy Statistics Section A.M. (Roundtable Discussion)**	**Frank Yoon, Organizer**
▶8:00–9:30 am	CC-Ball-room 6ABC	**ASA President's Address and Founders and Fellows Recognition** **Frank Potter Induction as an ASA Fellow**	
▶8:30–10:20 am	CC-4C1	**SPEED: Health Policy and Mental Health Statistics, Part 1—Health Policy Statistics Section and Mental Health Statistics Section** **Paper Presentation:** Developing Reliability-Adjusted Rates to Profile the Quality of Home- and Community-Based Services Delivered to Medicaid Beneficiaries Using an Empirical Bayes Framework **Abstract:** This paper focuses on a two-stage empirical Bayesian estimator of health care quality applied to count data with a high proportion of zeroes. A two-stage estimator to risk- and reliability-adjust measures is gaining popularity in federal and state policy. The first stage model accounts for differential risk among the patients, creating a risk-adjusted rate that might be subject to large standard errors due to small sample sizes in certain groups; therefore, at the second stage, risk-adjusted rates are pulled toward a prior under a Bayes framework to create a reliability-adjusted rate. We focus on the case in which the quality measure is the count of potentially preventable hospitalizations, for which many Medicaid beneficiaries have zero counts. We compare two likelihood models—normal and negative binomial—to profile state performance on the quality of home- and community-based services Medicaid beneficiaries receive. The model validation and diagnostic show that the three models have similar performance when all states have large sample sizes, but the negative binomial model outperforms the normal model when a subpopulation is considered.	**Sheng Wang** Alex Bohl and Dejene Ayele, co-authors
▶10:30–11:15 am		**SPEED: Health Policy and Mental Health Statistics, Part 2—Mental Health Statistics Section and Health Policy Statistics Section** **Paper Presentation:** Developing Reliability-Adjusted Rates to Profile the Quality of Home- and Community-Based Services Delivered to Medicaid Beneficiaries Using an Empirical Bayes Framework **Abstract:** This paper focuses on a two-stage empirical Bayesian estimator of health care quality applied to count data with a high proportion of zeroes. A two-stage estimator to risk- and reliability-adjust measures is gaining popularity in federal and state policy. The first stage model accounts for differential risk among the patients, creating a risk-adjusted rate that might be subject to large standard errors due to small sample sizes in certain groups; therefore, at the second stage, risk-adjusted rates are pulled toward a prior under a Bayes framework to create a reliability-adjusted rate. We focus on the case in which the quality measure is the count of potentially preventable hospitalizations, for which many Medicaid beneficiaries have zero counts. We compare two likelihood models—normal and negative binomial—to profile state performance on the quality of home- and community-based services Medicaid beneficiaries receive. The model validation and diagnostic show that the three models have similar performance when all states have large sample sizes, but the negative binomial model outperforms the normal model when a subpopulation is considered.	**Sheng Wang** Alex Bohl and Dejene Ayele, co-authors

Tuesday, August 11 *(Continued)*

Time	Room	Session	Presenter/ Author(s)
▶12:30–1:50 pm		**Health Policy Statistics Section P.M. (Roundtable Discussion)** **Paper Presentation:** The Future of Public Use Data **Abstract:** Federal agencies have a long history of releasing data to the public, and they also have a legal obligation to protect the confidentiality of the individuals and organizations from which the data were collected. This roundtable will focus on the tension between federal open data initiatives and the need to protect data from disclosure. I will provide a brief summary of relevant federal legislation and directives, review important concepts in statistical disclosure limitation, discuss the potential threats to confidentiality, and invite speculation about the future of public use data.	**Frank Yoon, Organizer** **John Czajka**
▶2:00–3:50 pm	CC-401	**Data Quality—Survey Research Methods Section**	**Barbara Carlson, Chair**

Wednesday, August 12

Time	Room	Session	Presenter/ Author(s)
▶7:00–8:15 am		**Health Policy Statistics Section A.M. (Roundtable Discussion)**	**Frank Yoon, Organizer**
▶8:30–10:20 am	CC-306	**Modern Statistical Methods for Observational Studies and Survey Data—Health Policy Statistics Section** **Paper Presentation:** Variable Ratio Matching with Fine Balance in a Study of Peer Health Exchange **Abstract:** In observational studies, matched samples are created so that a treated group is similar to a matched control group on observed covariates. Often, matched samples consist of matched pairs. If a pair match fails to make treated and control units sufficiently comparable, alternate strategies include (1) matching a variable number of controls to each treated unit and (2) adopting fine balance constraints. Under fine balance, a nominal covariate is exactly balanced, but individual treated and control units might not be comparable on this variable. We propose a method that allows fine balance constraints while matching treated units to variable numbers of controls, which is not possible using existing network-based matching algorithms. We use the entire number to determine the optimal number of controls for each treated unit. Within entire-number strata, we then apply fine balance constraints. We apply our method in an evaluation of Peer Health Exchange, an intervention in high schools designed to decrease risky health behaviors. We find that pair matching produces unsatisfactory balance, then demonstrate that a variable-ratio match with fine balance outperforms a variable-ratio match alone.	Frank Yoon, co-author
	CC-310	**Online Surveys—Survey Research Methods Section** **Paper Presentation:** Alternative Methods for Inference Based on Nonprobability Samples: A Simulation Study **Abstract:** Online panel research is becoming increasingly popular due to its timeliness and cost-effectiveness. In particular, nonprobability-based or opt-in panels are becoming entrenched in market, medical, and polling research. Although different methods have been proposed to make inference based on nonprobability samples—typically by combining data with a probability sample and through calibration—to date, few, if any, studies have compared the performance of these alternative methods within a common context. Using an extensive simulation study, this paper considers an array of model-based methods for combining nonprobability and probability samples, and compares their inferential properties under different assumptions. We assume a common set of auxiliary variables available for both the nonprobability sample and the probability sample and vary simulation design regarding the data quality of such auxiliary information as well as that of the probability sample. We aim to shed light on the promise of nonprobability-based web panel research by studying the relative reliability and utility of alternative inferential methods.	**Hanzhi Zhou**

Wednesday, August 12 *(Continued)*

Time	Room	Session	Presenter/ Author(s)
▶10:30 am–12:20 pm	CC-3A	**Sirken Award Session**	**John Czajka, Chair**
▶12:30–1:50 pm		**Health Policy Statistics Section—Speaker with Lunch (Roundtable)**	**Frank Yoon, Organizer**
▶2:00–3:50 pm	CC-2B	**JASA, Applications and Case Studies (Invited Session)** **Paper Presentation:** Semiparametric Bayesian Density Estimation with Disparate Data Sources: A Meta-Analysis of Global Childhood Undernutrition **Abstract:** Undernutrition, quantified using height-for-age z-scores, is an important contributor to childhood morbidity and mortality. Because all levels of mild, moderate, and severe undernutrition are of clinical and public health importance, it is of interest to estimate the shape of the z-scores' distributions. We present a finite mixture model that uses data on 4.3 million children to make annual estimates of these distributions for children in each of the world's 141 low- and middle-income countries. We incorporate both individual-level data and aggregated summary statistics from studies whose individual-level data were unavailable. We place a hierarchical Bayesian model on the mixture weights, which allows for nonlinear changes in time, and borrows strength in time, in covariates, and within and across regional country clusters to estimate where data are uncertain or missing. This work addresses three important problems that often arise in the field of global health monitoring. First, data are always incomplete. Second, different data sources commonly use different reporting metrics. Last, distributions, and especially their tails, are often of substantive interest.	**Mariel Finucane**
	CC-2A	**Imputation of Missing Data—Survey Research Methods Section**	**Donsig Jang, Chair**
	CC-3A	**Sample Allocation—Survey Research Methods Section** **Paper Presentation:** Optimal Sampling Fractions for Two-Phase Sampling for Nonresponse in the Real World **Abstract:** Two-phase sampling has been around for decades. It is used to identify subpopulations of interest in the first phase of a survey, from which a random subsample is selected in the second phase for further data collection. It is also used to randomly subsample survey nonrespondents for more intensive followup. In this context, nonrespondents in the frist phase are considered a subpopulation that is identified after data collection efforts have been completed with the initial mode and protocol. Though the more intensive second phase protocol is generally more expensive to implement than the first, it is expected to be more successful; however, budgetary constraints limit how many nonrespondents can be attempted this way. Hansen et al. (1953) provided optimal values for k, the fraction of phase 1 nonrespondents to be subsampled for phase 2 and n, the initial sample size in a two-phase sample with a subsample of proportion k. However, these calculations assume that phase 2 methods result in 100 percent response when in reality that does not often happen. In this paper, I derive new optimum values for n and k under the more realistic scenario in which not all phase 2 attempts result in a response.	**Barbara Carlson**

Thursday, August 13

Time	Room	Session	Presenter/ Author(s)
▶8:30–10:20 am	CC-619	**Tools for Policy: Bayesian Assessments to Support Decision Makers—Health Policy Statistics Section** **Paper Presentation:** Hierarchical Bayesian Evaluation of Health System Change Using Administrative Data **Abstract:** Policymakers are tasked with making decisions under uncertainty. In practice, the frequentist framework for policy evaluation focuses on testing the hypothesis that program impacts are equal to zero. Stakeholders often view the resulting 'thumbs up-thumbs down' inference as restrictive. By contrast, the Bayesian evaluation framework provides intuitive, informative, and probabilistic inference such as "There is a 70 percent chance that the intervention improved the outcome of interest by at least 5 percent." Furthermore, the conventional approach to policy evaluation often tests many hypotheses separately (for example, by outcomes, time periods, geographic regions). By contrast, a Bayesian model can piece together disparate data sources to obtain a more precise impact estimate, reducing the likelihood that important but modest-sized effects go unrecognized for lack of statistical power. In this talk—using data from the evaluation of an initiative of the Affordable Care Act as a motivating example—we will summarize the ways in which Bayesian methods can provide a flexible and powerful tool for policy evaluation, and we will discuss the challenge and trade-offs of the Bayesian approach.	**Mariel Finucane, Organizer** **Randall Brown, Chair** **Frank Yoon** Mariel Finucane, Lauren Vollmer, and Randall Brown, co-authors
▶10:30 am–12:20 pm	CC-614	**New Methods for Survival Analysis—Biometrics Section** **Paper Presentation:** The Historical Cox Model **Abstract:** In this paper, we extend the Cox proportional hazards model to account for densely sampled time-varying covariates as historical functional terms. This approach allows the hazard function at any time t to depend not only on the current value of the time-varying covariate, but also on all previous values. The fundamental idea is to assume a bivariate coefficient function ?(s, t) that estimates a weight function that is applied to the full or partial covariate history up to t, and is allowed to change with t. Estimation is performed by maximizing the penalized partial likelihood, using a likelihood-based information criterion to optimize the smoothing parameter. Methods are applied to a study of in-hospital mortality among patients with acute respiratory distress syndrome in the intensive care unit.	**Jonathan Gellar**