National Institute of Statistical Sciences

ANNUAL REPORT

July 1, 2021 - June 30, 2022

Webinars

Research

Affiliates - Early Career

National Institute of Statistical Sciences

July 1, 2021 ↔ June 30, 2022

From the Leadership…

July 2021 through June 2022 marks a year of change at NISS beginning with the transition from the restrictions imposed by Covid to opportunities for in-person functions as well as virtual events. Approximately every ten or dozen years, NISS reimagines some aspect of itself, keeping its mission fresh, relevant and future-oriented. This has been a year of accomplishments, also a year of culminations, new energies, and beginnings, leaving NISS poised to once again reimagine its role and to move forward in new directions.

NISS is now, irrevocably, a hybrid organization with virtual connections internationally and increased opportunities for in-person connections and engagement as part of the NISS family. NISS media presence continues to grow as webinars, lecture series and career fairs are also available as YouTube videos (110 and counting!).

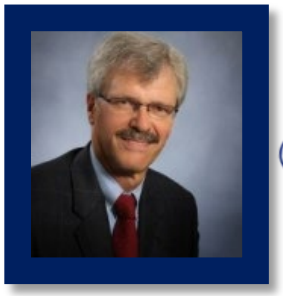
Research is vibrant at NISS with continuing innovation for gathering, analyzing, interpreting and communicating statistical data from the National Agricultural Statistical Services (NASS) in the Department of Agriculture and from the National Center for Education Statistics (NCES) in the Department of Education. For both agencies, the research success of NISS researchers is documented by the articles appearing in refereed journals, by presentations at national/international professional society meetings, and often by agency awards for their contributions.

The 10-year program at NCES ended as of June 30, 2022, with NISS once again receiving a perfect score of "exceptional" in every category of the official rating as a federal contractor. Now NISS awaits the call for proposals for the successor program (PRESTO). NISS contributions culminated in a series of expert panels and directed research that provide the foundation for NCES to reimagine the design process for its multiple surveys holistically. NISS expansion into data visualization, initially requested by NCES to support their reports and data publication, has launched other new projects and potential collaborations for NISS.

NISS emphasis on engagement with junior colleagues is reflected in an energetic Graduate Student Network (GSN) that has grown and continued to organize activities focused on graduate study and experiences. Successful virtual events on soft skills and career planning have been augmented by networking activities. The second annual NISS GSN Conference was held in May 2022. NISS Career Fairs, sponsored by GSN and by Affiliates Committee continue to be among the most widely attended virtual events. The Writing Workshop at JSM was purely virtual for the last time in August 2021, with several participants attending from outside the US.

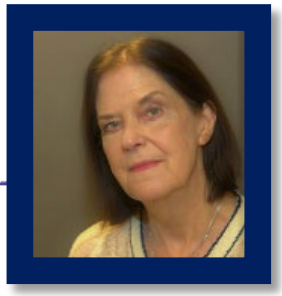
Two new faces at NISS enlarge the contingent of early career researchers. **Haley Jeppson** (PhD, Iowa State University) joined NISS in December 2021 as part of the data visualization team. In April 2022, **Ruiyi Zhang**, (PhD, Florida State University) brought her skills in high-dimensional statistics, computation and AI, adding to the NISS presence at NASS. NISS is fortunate to have been able to recruit both Haley and Ruiyi.

Sadly, NISS also mourns the passing of **Lee Wilkinson**, who was a Trustee, a Senior Mentor, a Committee Chair and a valued friend of NISS over the course of a quarter century. Also, as of this writing, NISS has just lost another long-time friend and partner. **Alan Lee**, who passed away unexpectedly. He had served as NISS CFO for eight years. During that time he contributed far more than just his accounting expertise to the well-being of NISS. Both are missed for their contributions to NISS but even more for their wisdom, their sense of humor, and especially their joy in life expressed through their vibrancy in everything they did.



James L. Rosenberger, PhD
Director

Nell Sedransk, PhD
Director-DC



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NEW AT NISS

NEW STAFF

Ruiyi Zhang | is a Research Associate at NISS, working with the National Agricultural Statistics Service (NASS). She received her Bachelor of Science degree in Mathematics from Nankai University in China and Ph.D. in Statistics from Florida State University. Prior to NISS, she was a postdoctoral fellow at Center for Imaging Science of Johns Hopkins University. Ruiyi's research interests include Computational statistics, Computer Vision, Elastic shape analysis, Functional data analysis, and Nonparametric statistics.

Haley Jeppson | is a new Research Associate at NISS, working on data from the National Center for Education Statistics (NCES). She holds a Bachelor of Arts degree in Mathematics and Studio Arts from the University of Iowa and a Master of Science degree in statistics from Iowa State University. She received her Ph.D. from Iowa State University. Her primary interests include data visualization and communicating science and statistics to a general audience.

NORTH CAROLINA

The NISS Building in Research Triangle Park is currently leased. The original NISS building, and the upper floor of the new wing are occupied by Teledyne with a 10-year lease ending 31 Oct 2028. The NISS building is currently marketed through CBRE, Inc. (Raleigh).

IN MEMORIAM

Leland Wilkinson | With much sadness, NISS notes the passing of a good friend and colleague, Leland (Lee) Wilkinson (November 5, 1944 – December 10, 2021). Lee was a current Member of the NISS Board of Trustees since 2016 and a long-term friend and supporter of NISS. He has taken part in many NISS hosted events over the year's most recently the NISS Writing Workshop for Junior Researchers, the webinar "What's in a name – data analytics, machine learning, artificial intelligence and what else?" and taught the NISS Essential Data Science for Business tutorial, "Descriptive Analytics, Exploratory Data Analysis, and Data Visualization." NISS mourns the loss of a wonderful colleague and friend and extend our sincere condolences to his wife, Marilyn Vogel, and his daughters Amie Wilkinson and Caroline Wilkinson.

In 2010 he was the recipient of the NISS Distinguished Service Award. His citation epitomizes his positive impact on NISS, then and hence:

> *"In recognition of too many forms of service to NISS to list. The most notable things, of course, are his four years as Vice-Chair of the Board of Trustees, seven+ years as chair of the Affiliates Committee, and at least six years on the Executive Committee. Equally important, he has been a major force in several affiliates' workshops and formation of the affiliates' clusters. Speaking personally again, his wise counsel and support have helped me have the confidence to move NISS forward."*

On the Cover

L to R: Junshui Ma (Merck), Adrian Coles (BMS), Brian Millen (Eli Lilly), Paulette Ceesay (Merck), Ying Ding (University of Pittsburgh), William Brenneman (Procter & Gamble), Junshui Ma (Merck) and Wei Shen (Eli Lilly)

AWARDS

Jerome Sacks for Outstanding Cross-Disciplinary Research

MARC A. SUCHARD

Marc A. Suchard, MD, PhD

NISS is pleased to recognize Marc Suchard with the 2021 Jerome Sacks Award. Marc Suchard holds joint appointments as Professor of Computational Medicine, of Biostatistics, of Biomathematics, and of Human Genetics.

Marc's contributions to cross-disciplinary research harnesses the power of mathematical, statistical and high-performance computational approaches to modeling to apply to molecular sequence data, longitudinal modeling of biomedical processes and to evolutionary medicine.

Citation: To Marc Suchard for his highly influential and innovative contributions to the cross-disciplinary field of computational biology, including rigorous mathematical developments, advanced numerical and statistical computing, and software development, particularly in the area of phylogenetics.

Distinguished Service Award

RAYMOND P. BAIN

Raymond P. Bain, PhD

NISS is pleased to present the 2021 Distinguished Service Award to Raymond Bain, Senior Vice President at Merck's Division of Biostatistics and Research.

Ray has recently completed six years on the NISS Board of Trustees, serving as Chair of the Board for the past two years. Previously he served on the Executive and Finance Committees and led the NISS Strategic Planning Committee. Ray service while on the NISS Board has been exceptional and dedicated.

Citation: To Ray Bain for his exceptional and dedicated service on the NISS board of trustees, serving as the chair of the strategic planning committee, chair of the finance committee, vicechair, and chair of the board for the past two years. And for his strong support of NISS including the NISS-Merck meetups.

Distinguished Alumni Award

NANCY J. MCMILLAN

Nancy J. McMillan, PhD

NISS is pleased to present the 2021 Distinguished Alumni Award to Nancy McMillan, Division Manager of Advanced Analytics at Battelle. Nancy came to NISS as a post-doctoral fellow in 1993 and spent two years working with Jerry Sacks.

Since leaving NISS, Nancy has spent most of her career Battelle, developing statistical methods and models for diverse and complex problems, including environmental pollution, bioterrorism risk assessment, and forensic genomics. Nancy currently leads a research team that participates in over 150 research projects each year to bring data analytics capability to cross disciplinary research and development teams.

Citation: To Nancy McMillan: Honoring her distinguished career at Battelle and her leadership in the development of statistical methods and models for a wide variety of complex problems, including environmental pollution, bioterrorism risk assessment and forensic genomics.

RESEARCH

NISS Research Program Overview

United States Department of Agriculture
National Agricultural Statistics Service

NISS research responds to problems where data is the key to science and the foundation for evidence-based decision-making and policy. Its research results are theoretical, computational and impactful.

In keeping with its roots in cross-disciplinary research, NISS continues to reinterpret its mission, best viewed now in 2022 in the context of data science. As **John Tukey** is reported to have said, "Statisticians get to play in everyone's backyard." But now the backyard is full of big data and the new play equipment includes the necessary computational tools for data science and the new challenges are to address a much broader collection of problems within an information-rich context that was previously non-approachable.

NISS maintains a three-fold active research program including: 1) independent research at NISS or via collaborations with university faculty and students, 2) as part of onsite (or virtual) team research at federal agencies, and 3) as a neutral resource for technical expertise to address pressing issues at federal statistical agencies.

During the past year, three full-time NISS researchers plus a NISS Senior Research Fellow have conducted research at the National Agricultural Statistics Service (NASS) within the US Department of Agriculture. NISS research for the National Center for Education Statistics (IES/NCES) in the US Department of Education has involved two NISS researchers, NISS Associate Director **Brian Habing** with four additional research collaborations between NISS and university scholars at three universities.

What follows is a snapshot of NISS research over the past year.

Research at USDA - National Agricultural Statistics Service

USDA
National Agricultural Statistics Service

IMAGES: Integrated Modeling and Geospatial Estimation System

IMAGES is one of the top-ten priority projects of USDA (United States Department of Agriculture). The aim of the project is to develop statistical methodology leveraging machine learning algorithms for remote sensing, administrative and survey data that will produce early acreage estimates (and measures of uncertainty) for major crops. Given the magnitude of adverse impacts of anomalous rainfall during the planting season, and other extreme weather phenomena, NASS is studying more advanced approaches to combine data from multiple sources The goal is blend all available and useful data into a unique framework to enable accurate produce weekly planted acreage estimates at the state level.

Several datasets have been studied and processed with the purpose of informing a field-level model capable of predicting the next crop rotation. Selected classification methods have been compared by looking at the average predictive performance computed on administrative data. State-level code was automated for high-resolution maps to be run efficiently on cloud-based technologies (such as Google Earth Engine). The project also implemented transition probabilities and neural network models capable to predict next crop rotations (among 256 categories) over 48 states in the CONUS (CONtiguous United States). This model has been applied for over 100 crops in the CONUS for data covering the past five years. Uncertainty layers (based on empirical entropy), and the acreage assessments (with related uncertainties) have been produced. These methods will next be applied to the development of crop-specific covariates to be used with survey data in estimating planted acreage.

Census of Agriculture Estimates and Variances

The US Census of Agriculture is conducted every five years to provide an enumeration of the farms and ranches in the US. However, since this Census is survey-based, technical issues about survey design implications for estimation (medians, means, totals) and variance estimation continue to arise, followed by computation requirements and streamlining for implementation.

Estimation requires each record to be given a representation weight; these are generally computed using a Dual-System Estimation (DSE) methodology. However, this methodology is based on standard logistic models that do not handle the nonlinear effects that can impact calibration performance and uncertainty estimation. The first extension to the DSE was to develop a likelihood function based on simultaneous logistics regression fitted using all data available for the Census of Agriculture. This algorithm has been documented and tested using simulations; computations were streamlined based upon these results.

Variances of medians as well as means and totals, pose additional challenges for estimation and computation. Starting with the 2017 Census of Agriculture, a new resampling methodology was implemented to improve estimation of variances of totals but is not applicable to medians. Therefore a comparative study was undertaken of alternatives for a single variance estimation methodology for totals, medians and other statistics.

The penalized log-likelihood approach of DSE was revisited and further revised to account for replication schemes (such as delete a group jackknife and nonparametric bootstrap). Also a new efficient algorithm for estimation of medians avoids sorting the data and thereby reduces the computation time. The proposed new replication method utilizes the penalized log-likelihood approach followed by the Integer calibration method (INCA) previously developed by NISS researchers at NASS. Comparative simulation studies provide evidence against the variance estimation method in current use, while the newly proposed method gave good results when applied to synthetic data.

County-Level Statistics

At the close of the harvesting season NASS provides the USDA's agricultural estimates at the county level for key crops by planted acreage, harvested acreage, yield and production. During this year, research has addressed three particular technical issues that arise from the sparse sampling from individual counties.

Survey data are the primary source of information to produce estimates; however these estimates may not be fully consistent with administrative data from other sources. Thus, NASS developed and has now adopted a Bayesian model to improve the accuracy of estimates and to address possible inconsistencies in the survey data. During this year, research has addressed three particular technical issues that arise from the sparse sampling from individual counties.

Variance estimation using conventional estimators is unstable when county sample sizes are tiny, and often gives unrealistic results. To address this issue, NASS initiated a project to study different approaches to smoothing anomalous (either too small or too large) variances calculated at the individual county level. Two bootstrap algorithms were developed that provide asymptotically equivalent results as the number of replications tends to infinity. The more computationally efficient algorithm was then applied to an agriculture data set. Both algorithms were fully documented and the full set of comparative test results are included in the manuscript currently under review for journal publication.

County-Level Statistics (cont.)

Rounding is required for final published estimates at both county and state levels. This leads to inconsistencies when rounded county estimates are tabulated and compared to state rounded estimates; the inconsistencies are compounded for ratio statistics at county and state levels. At the same time, basic administrative constraints need to hold. Candidate algorithms have been created using several distinct approaches; and comparative studies are underway to evaluate accuracy and computational efficiency.

To date, a software library has been developed and documented for rounding at a single level and benchmarking state-level totals, with application first to planted and harvested acreages. This is now expanded in two ways: 1) to apply to yield, production, and ratio relationships with harvested acreage, and 2) to incorporate administrative constraints to ensure consistency with administrative information provided by the FSA (Farm Service Agency) and RMA (Risk Management Agency).

Continuing Core Research and Methodology Development

NASS research continues to expand core research as well as specific methodologic advances and adaptations to meet requirements for specific surveys and reports. Priority is often given to the particular issues raised by a contemporary focus on an aspect of agriculture information.

Cash Rental Rates for agricultural property at state and county levels have taken on increased importance over the past few years. The rate estimates provided by NASS/USDA are used in rental agreement formulation, farm program administration and related activities. NASS currently uses a model-based approach (on two-years' data) to estimate rental rates at the county level. Current research will apply small area modeling to estimate rates at the state level. For cash rental rates, individual record rates can distort results, especially at the county level. Therefore new methodology is needed to detect influential records in the survey and automatically reweight them to clean/stabilize county-level survey summaries as inputs to the state level models. This work needs to be completed for implementation for the 2022 cash rent summaries.

Outlier Detection Algorithms are used in reviewing and revising data sets in order to identify data items needing further edits. NASS has historically used rule-based methods to identify outliers without fully satisfactory results. Now NASS seeks to develop an automated process that will reduce the manual labor and simultaneously improve the consistency of the final estimates. Thus a "machine learning group" within NASS (including NISS researchers) has set up a series of competitions to collect and test a wide variety of machine learning methods. The literature on outlier detection chiefly discusses generic outlier detection algorithms that are built to identify records within a large data set that contain anomalous data. NASS is focused instead on developing cell-wise detection methods.

The novel algorithm (developed with NISS researchers' expertise) depends on an R-C interface to a fuzzy logic system that operates using robust approaches to identify outliers of three types: tail outliers, historical outliers, and "relational" outliers. Implementation leverages parallel computing, iterated QR decompositions, advanced median estimation methods, and nonparametric tests using robust scale estimators and Chebyshev's inequalities. This algorithm has been fully documented and tested. It achieves high precision on synthetic data, providing a single anomaly score for each record.

Continuing Core Research and Methodology Development (cont.)

Small Area Estimation is the foundation for NASS county-level estimates as well as estimates for other population subgroups. Core research and modeling effort for producing summary agriculture statistics continue expand the suite of available Bayesian methods to meet the specific requirements and unique constraints for each implementation. Recent additions include the development of lognormal-normal model for acreage and of spatial mixture models for cash rental rates. Model performance is extensively and systematically evaluated, first by simulations and then by application to past NASS data. Algorithms for detection of deviation from the model, identification and characterization of influential sources (e.g., counties or sampled units) are similarly validated initially via simulation and subsequently by application to past data.

PUBLICATIONS

Abernethy, J., Boryan, C., Hunt, K., **Sartore, L.** (in revision) Preseason Planted Acreage Estimation using Cost Sensitive Machine Learning. *Computers and Electronics in Agriculture*.

Chen, L., Cruze, N.B., and Young, L.J. (2021). Model-based Estimates for Farm Labor Quantities. (Submitted)

Chen, L. and Nandram, B. (2022). A Hierarchical Bayesian Beta-Binomial Model for Sub-Areas. Book: "*Applied Statistical Methods*". Springer Nature. To appear.

Chen, L., Nandram, B. and Cruze, N.B. (2022). Hierarchical Bayesian Model with Inequality Constraints for US County Estimates. *Journal of Official Statistics*. To appear.

Chen, L., **Sartore, L.**, Bencha, H., Bejleri, V., Nandram, B. (submitted) Smoothing County-Level Survey Variances to Improve Small Area Models. *Stats*.

Hyman, M., **Sartore, L.**, Young, L.J. (2021). Capture–Recapture Estimation of Characteristics of U.S. Local Food Farms Using a Web-Scraped List Frame. *Journal of Survey Statistics and Methodology.* Also available at https://doi.org/10.1093/jssam/smab008.

Sartore, L., Boryan, C., Johnson D. M., **Chen, L.**, Seffrin, R. (in revision) Combining Remote Sensing and Survey Data for Enhancing Early Season Crop Acreage Estimates. *Geocarto International*.

Sartore, L., Rosales, A.N., Johnson, D.M., and **Spiegelman, C.H.** (2022). Assessing Machine Leaning Algorithms on Crop Yield Forecasts Using Functional Covariates Derived from Remotely Sensed Data. *Computers and Electronics in Agriculture*, 194, 106704. Also available at https://doi.org/10.1016/j.compag.2022.106704 .

Sartore, L., Toppin, K. P., **Spiegelman, C.H.** (2022). INCA: An R Package for Integer Calibration. *Journal of Statistical Software*. (Submitted)

RESEARCH

PRESENTATIONS

Chen, L. (2021, August). Model-based Estimates for Farm Labor Quantities. *2021 Joint Statistical Meetings*.

Chen, L. (2021, October). Model-based Estimates for Farm Labor Quantities. *2021 Women in Statistics and Data Science Conference.*

Sartore, L., Benecha, H. (2021, August). Estimation of Power Transformations in Capture-recapture Models. *2021 Joint Statistical Meetings*

Sartore, L., Boryan, C., Dau, A., Willis, P. (2022). Predicting Crop Specific Land Cover using Transition Probabilities, Deep and Quantum-inspired Neural Network Models. *2022 Statistics and Data Science Symposium*, Pittsburgh, PA.

AWARDS

USDA Under Secretary Award

To **Lu Chen** for her work on the modeling and Implementation of crops county estimates

USDA NASS Quarter Award

To **Luca Sartore** for converting primary legacy sampling software to a contemporary programming language

USDA Circle Awards

To **Lu Chen** for her work on the Farm Labor Team

To **Lu Chen** for her work on the Cash Rents Team

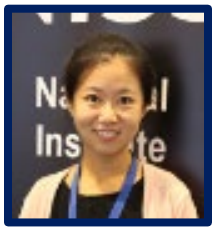
To **Luca Sartore** for producing timely and useful data for the editing and imputation stages of the 2021 June Area Survey by imagining and building the June Area Land Tool

To **Luca Sartore** for his work in implementing new and high-quality Labor Survey statistics in service to the U.S. agriculture

To **Luca Sartore** for technical expertise in implementing new Cash Rent statistics with an updated outlier identification process and a new modeling process

To **Luca Sartore** for implementing new Farm Labor statistics requested by the Secretary of Agriculture

Luca Sartore
Senior Research Associate
NISS / NASS



Lu Chen
Research Associate
NISS / NASS

RESEARCH

RESEARCH AT USDED - NATIONAL CENTER FOR EDUCATION STATISTICS

Education Research and IES/NCES Projects

For over two decades, NISS has worked with NCES to identify critical issues where technical expertise is needed to assess potential impact or to evaluate possible decisions. The NISS-NCES program has three parts.

- NISS conducts independent primary research at the request of NCES to develop statistical methodology with application to education sciences.
- NISS assembles panels of technical experts to prepare the foundation for evidence-based decision-making and/or policy by NCES and make recommendations.
- NISS collaborates with university faculty as part of NISS-NCES Scholars, forming research teams to undertake projects identified by NCES.

Over the past five years twenty panels have addressed topics such as the role of p-values, significance and non-significance in research and reporting for education sciences, innovations in survey design, imputation methodology for survey data, making process data (keystroke data) for online assessment (e.g., NAEP) usefully available to researchers, and setting priorities for integrating relevant data bases with education data. Three panels and a technical forum were held during the period of this annual report.

Distinguished researchers in statistics, quantitative methodology, psychometrics and related fields have joined with NISS staff as NISS-NCES Scholars to undertake projects identified by NCES. Recent Scholars have addressed topics including the statistical properties of a new SES indicator that integrates geo-based information from multiple sources, comparison of state-of-practice relative to state-of-the-art of non-response bias assessment and adjustment and upgrading graphs and other visualizations for online NCES reports by creating templates and tutorial materials with examples.

The value to IES/NCES is illustrated by a case study of a series of six expert panels combined with three research projects.

STATISTICAL METHODOLOGIES FOR EDUCATION DATA

Tree-based Methods for Modeling Education Data

Modeling Academic Achievement

To investigate quantitative data that is driven by the data's own internal structure rather than experimenter's enforced structure, recursive partitioning is a useful tool. Internally-driven models, such as those created by Classification and Regression Trees, provide a fuller picture of complex and nonlinear relationships than is normally achievable within traditional linear modeling. Currently these methods are not widely used for observational and survey data on educational achievement. A case study of academic achievement using data from "Early Childhood Longitudinal Study – Kindergarten 2011" provided an exemplar demonstrating the value of this non-linear approach for modeling student demographics and their performance. When taking demographics into account, student achievement models were complex and relatively homogeneous subgroups were defined by combinations of demographic attributes. Global methods applied to the full population obscured the distinctive patterns, preventing insights into expectations for performance of individual students. These results indicate that patterns not visible at the surface can be uncovered through tree diagramming.

Tree-based Methods for Modeling Education Data (cont.)

Refined Modeling to Predict Achievement and Identify At-Risk Students

Most US students do not meet grade-level achievement expectations. This prompts a substantive question and a methodological one: What are the characterizing variables and contextual variables for students who do not meet expectations? What kind of analysis is required to identify and characterize important subgroups?

Writing prompts and performance data from the 2011 NAEP (National Assessment of Educational Progress) were analyzed using Classification and Regression Trees (CRT) to identify the subgroup structure. Cluster structure was extracted using Hierarchical Linear Modeling (HLM) at student and school levels plus Hierarchical Cross-Classified Modeling (HCM) at student, school and subgroup levels. The results showed that student economic status (free/reduced price lunch) and IEP (individual education plan) were critical variables. However, the interactions of these variables with other demographic variables, measures of writing experience, and metrics for computer familiarity were required to give a clear picture of student subgroups with respect to writing achievement. The use of hidden data segments created by CRT in the HCM picked up the variance between subgroups and simultaneously reduced the variance between schools.

Applications to Writing Performance Research

Analyzing Trends in Student Writing Performance: The fraction of eighth-grade students whose NAEP writing assessments fall below the Basic Level has increased from 12% in 2007 to 20% in 2011 (2016 results are not available). NAEP data provided information on student demographics, writing experience, teachers' professional development and school characteristics. Statistical procedures with appropriate weights accounted for complex sampling features in conducting trend and gap analyses over the time span of available data. As described for the previous project, combined use of CRT, HLM and HCM allowed simultaneous conclusions about changes or shifts in relative importance among universally important predictors as well as changes in subgroup characteristics when classified based on writing performance. CRT identified specific constellations of characteristic and contextual variable that define student subgroups, in particular those performing below Basic Level. HLM and HCM analyses provide an overall picture of writing performance as influenced by predictors. Time comparison of coefficients in the HLM and HCM models indicates shifts in relative impact of universally important predictors as well as changes in subgroup characterizations.

Differential Impact of Writing Prompts on English Language Learners (ELLs): Writing prompts affect ELLs and non-ELLs differently in ways that reach beyond the writing construct being measured, causing spurious differences in measured ability. So, which features of writing prompts contribute most to the disparity? Student performance data from 2007 and 2011 NAEP writing assessments was used to examine feature of writing prompts that could differentially impact ELLs and non-ELLs. Differential item functioning via standard mean difference and logistic regression was used in conjunction with textual analysis for question specificity, cohesion, word use and cultural accommodation. The impact of word choice deviating from concrete/specific, sentences with various forms of coreference and multiple connectives, incoherence due to unclear anaphor references and other specific rhetorical properties together contribute to disparity in interactive and super-additive ways.

RESEARCH

NISS RESEARCH - USDED - NCES

Data Visualization - Methodology Development

Interactive Graphics for Education Data and Reports

NCES aspires to improve its data visualizations by applying best practices in order to communicate data more effectively and encourage viewer engagement. In doing so, it particularly seeks to emphasize accessibility for the full spectrum of its audiences. This project includes navigating agency style guides and recommendations, the latest statistical and visualization best practices, accessibility standards, and legal requirements. Areas of particular focus that involve new research include color schemes that satisfy branding, statistical, and compliance constraints, and the appropriate presentation of uncertainty for various audiences. The deliverables include the ongoing development of the *Data Visualization Handbook*, a data visualization resource with exemplars, templates, and tutorials customized to meet the specific needs of the education data and research communities and memos to address specific visualization standards such as accessibility compliant use of color.

SAID in Graphics, II

Following up the first SAID in Graphics competition from the previous year, NISS worked with NCES to develop a suitable challenge using NCES public data. The goal was to demonstrate how interactive visualization can be used to entice readers of various backgrounds to investigate substantive educational questions more deeply. Judges reviewed participants' work, recommended the best work, and provided feedback to each participant on what worked well and what could be improved.

NISS-NCES SCHOLARS RESEARCH

Nonresponse Bias Analysis in Longitudinal Studies: A Case Study with the ECLS-K 2011 Study

Nonresponse plagues most surveys and studies when individuals completely opt out of responding and when respondents selectively omit individual items. Longitudinal studies are subject additional sources of nonresponse when individuals fail to provide data for one or more entire waves or particular questions of the survey. Analysis bias due to nonresponse and adjustment for the estimated bias is regularly handled in several ways. First, popular approaches to nonresponse bias analysis (NRBA) in longitudinal studies were compared; then they were illustrated for the Early Childhood Longitudinal Study (ECLS), Kindergarten Class of 2010-11. Wave nonresponse with attrition yields a monotone missingness pattern. Weighting and multiple imputation (MI) are two commonly used approaches to NRBA for monotone patterns when the missingness mechanism is assumed missing at random (MAR). Weighting adjustments are effective when the constructed weights are correlated to the survey variable of interest. Multiple imputation (MI) allows the inclusion of auxiliary variables into the imputation model, yielding more efficient estimates when the auxiliary information is predictive of the survey outcome. Alternatives include maximum likelihood and generalized estimating equations that can also handle incomplete longitudinal data. The assumption of at random missingness (MAR) is rarely if ever tenable. To examine the impact of missingness not at random (MNAR), offsets were interpolated in the MI results as sensitivity analyses to assess deviations from MAR. For this example, NRBA was calculated for descriptive averages and analytic model estimates. Deviations in the NRBA were sufficient in the ECLS application to yield only minor changes in the substantive conclusions. The strength of evidence here is based on the strength of the relationship between the characteristics in the nonresponse adjustment and the key survey variables. So the key to a successful NRBA is to include strong predictors.

Rod Little, University of Michigan **Yajuan Si**, University of Michigan **Ya Mo**, Boise State University & NISS

Geo-based Variance Estimation

A new measure of socioeconomic status (SES), not just a poverty indicator, has been proposed that uses geo-location to link school and/or student locations with geographically-indexed federal data, for example economic and demographic data from the American Community Survey. This geographically-based index requires spatial statistics methodology, in particular kriging and related techniques that have been developed for random sampling, non-informative non-response and known (usually Gaussian) distributions. None of these assumptions is tenable for the proposed geo-based index centered on a school location. The consequences of failure of these assumptions can affect residual bias and/or lead to poor estimates of variance.

Informative sampling designs can impact spatial prediction, or kriging, in two important ways. First, the sampling design can bias spatial covariance parameter estimation, which in turn can bias spatial kriging estimates. Second, even with unbiased estimates of the spatial covariance parameters, since the kriging variance is a function of the observation locations, these estimates will vary based on the sample and will in general overestimate the population-based estimates.

Therefore, a weighted composite likelihood approach has been developed to improve spatial covariance parameter estimation under informative sampling designs. Given these parameter estimates, three specific approaches provide options for quantifying the effects of the sampling design on the bias and the variance estimates in spatial prediction. A comprehensive simulation study illustrates the three approaches and allows comparisons and decision-making based on their relative performance in different scenario.

Christopher Wikle, University of Missouri **Erin Schliep**, University of Missouri

Coordinated Sampling Design for Multiple Surveys

The objectives of this research project are to develop strategies for a coordinated sampling process to coordinate the process of approaching the schools for participation, potentially reduce the burden on decision-makers and respondents and possibly decrease refusal/nonresponse, and exploit the variables collected across surveys to leverage data from multiple surveys.

Sampling designs for multiple surveys, coordinated or not, are tricky if they are to be collectively successful in balancing the trade-off between the response burden and the statistical efficiency. One strategy to reduce the response burden is desirable to develop a negatively coordinated sampling design. A modification of the Swiss method allows for differential coordination for each sampling unit. Then statistical methods for imposing balancing conditions in planned missingness and adaptive sample size allocation for stratified random sampling can be evaluated.

A different set of four related strategies for a coordinated sampling process were also considered that would potentially reduce response burdens: 1) Independently select schools for each survey, compute the burden for each selected school, and randomly substitute schools from the same stratum. 2) Independently select schools for each survey, compute the burden for each selected school, and reject samples that exceed the burden, 3) Sequentially sample schools based on a random survey order and decrease the selection probability for schools selected in previous surveys, and 4) Use matrix sampling of to assign surveys to schools using a probabilistic mechanism, i.e., create replicates.

Preliminary work suggests that each of these approaches is feasible with respect to statistical technology and implementation. Deeper research is required in all cases to determine the robustness of the design, flexibility once the design is in the field, the performance of principal estimators, and the limitations in terms of expansion to larger numbers of overlapping studies.

Jae-Kwang Kim, Iowa State University
Trivellore Raghunathan, University of Michigan
Yajuan Si , University of Michigan
Rod Little, University of Michigan
Michael Elliott, University of Michigan

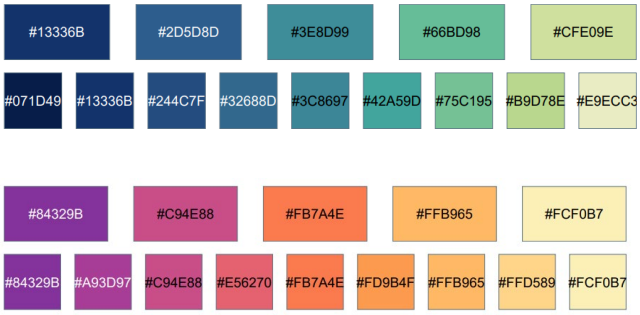
National Center for Education Statistics

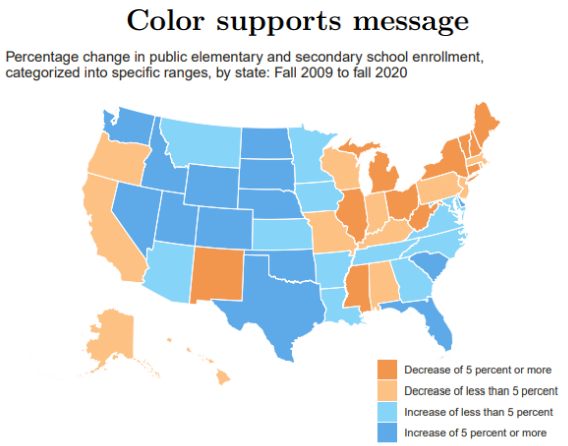
Effective Data Visualization for Education Data

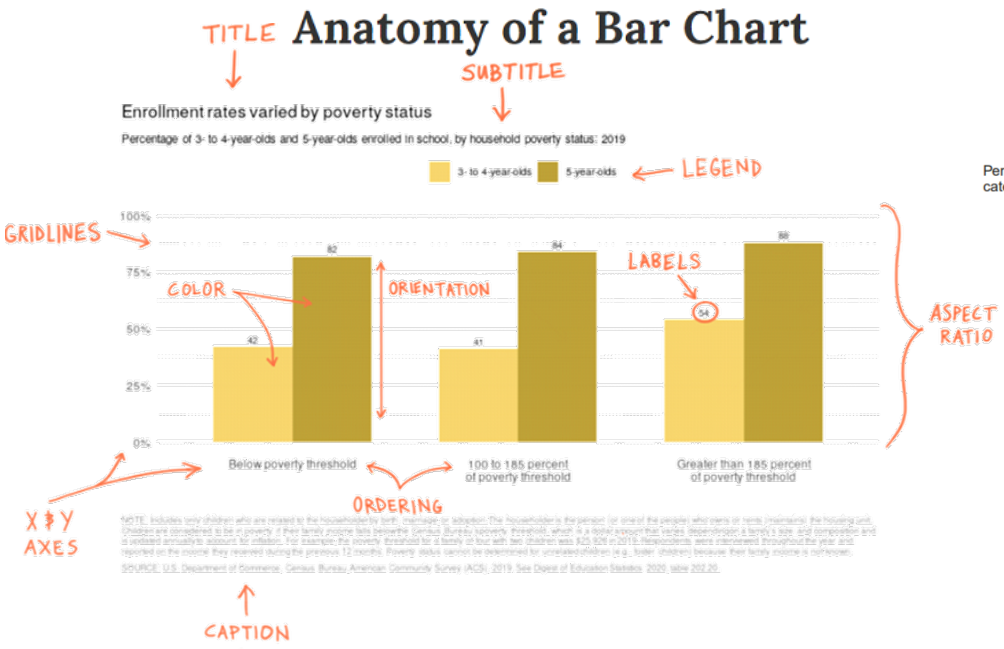
Interactive graphics offer the opportunity to engage diverse readers with a wide range of interests in looking more deeply. For the National Center for Education Statistics (NCES), this is the challenge for disseminating the information from the national surveys and assessments in the NCES data base. Guidelines for creating effective visualizations of education data are needed to be effective in communicating with their wide audience that also varies greatly in level of familiarity with metrics. Representation of quantitative information and the related uncertainties.

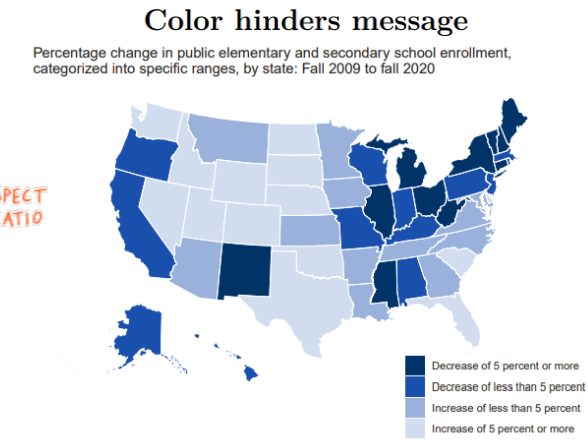
The objective of this project is to formulate and then guide the development of online and written guides to data visualization with exemplars and/or templates based on NCES data. High among priorities set by NCES staff are the design and development of visualization templates for repeated use in large-scale NCES data reports (e.g., the annual Condition of Education) together with documentation of features and required properties such as accessibility. Work is being accomplished under the leadership of Dr. Hoffmann who also supervises the assignment and performance of supervision of all technical aspects and of tasks undertaken as part of the NISS research project on Data Visualization.

Heike Hofmann, Iowa State University









RESEARCH

PUBLICATIONS

Mo, Y., **Sedransk, N.**, & **Habing, B.** (2021). Tree-based Methods in Educational Research: A Tool for Modeling Nonlinear Complex Relationships and Generating New Insights from Data. *Journal of Data*, Vol. 20, No. 3, 359-379. Also available at https://doi.org/10.6339/22-JDS1056.

Si, Y., **Little, R.J.A.**, & **Sedransk, N.** (2021). A Case Study of Nonresponse Bias Analysis in Educational Assessment Surveys. *Journal of Educational and Behavioral Statistics*. To appear.

Mo, Y., Carney, M., Cavey, L. & Totorica, T. (2021). Using Think-alouds for Response Process Evidence of Teacher Attentiveness*. Journal of Applied Measurement in Education, 34* (1), 10-26

Si, Y., **Little, R.**, & **Mo, Y., Sedransk, N.** (2021). Nonresponse Bias Analysis in Longitudinal Studies: A Case Study with the ECLS-K 2011 Study. *NCES-NISS Technical Report.* (Submitted)

Williams, N. J., Beauchemin, J., Giuntini, G., Griffis, J., & **Mo, Y.** (2022) Psychometric Evaluation of a Pragmatic Measure for Assessing Adherence to System of Care Principles in Behavioral Health Service Interactions. *Journal of Emotional and Behavioral Disorders*, Vol. 30, No. 3, also available at https://doi.org/10.1177/10634266211028204.

Mo, Y., Deng, Q., Wright, K., **Sedransk, N.**, & **Habing, B.** (2021). The Impact of Writing Prompts on the Writing Performance of English Language Learners. (Submitted)

Schliep, E., **Wikle, C.K.**, & Daw, R. (2021) Correcting Spatial Gaussian Process Parameter and Prediction Variance Estimation under Informative Sampling. (Submitted). Available now on arXiz at https://arxiv.org/abs/2108.12354

Technical Reports

Jeppson, H. & **Hofmann, H.** (2022). Preliminary Color Scales. Memo to NCES.

Jeppson, H. & **Hofmann, H.** (2022). Effective Visual Communication in Data Science Memo to NCES.

Si, Y., Little, R., & **Mo, Y.** (2021). Nonresponse Bias Analysis in Cross-sectional Studies: A Case Study with the ECLS-K 2011 Study. *NCES-NISS Taskforce Technical Report.*

Si, Y., Little, R., & **Mo, Y.** (2021). Nonresponse Bias Analysis in Cress-sectional Studies: A Case Study with the ECLS-K 2011 Study. *NCES-NISS Taskforce Technical Report*.

PRESENTATIONS

Habing, B., Stokes, L., du Toit, N., White, A., & Wilson, M. (2021) Statistically Accurate Interactive Displays for Educational and Government Reports. Topic Contributed Panel at the *2021 Joint Statistics Meeting*.

Jeppson, H., & **Hofmann, H.** (2022). NCES Data Viz Handbook Demonstration. Presentation to selected NCES Staff and Contractors.

Mo, Y., **Habing, B.**, **Sedransk, N.**, & **Albert, A.** (2022). Studying response time and performance with students' online research and comprehension ability. *2022 National Council on Educational Measurement Conference.*

Mo, Y., Cavey, L., Carney, M., Totorica, T., & Lowenthal, P. (2021). A unique item format to assess attentiveness to students' mathematical ideas. *2021 International Congress on Mathematical Education Conference.*

Mo, Y., & Jung, E. (2021). Studying reflection as a self-assessment tool for online learning. *2021 American Education Research Association Conference*.

RESEARCH

IES/NCES Expert panels

Connecting the Dots Panels

Each year NISS convenes several panels of technical experts on high priority topics for the National Center for Education Statistics (NCES) within the Institute for Education Sciences (IES) at the US Department of Education. The purpose of each panel is to provide NCES with timely expert input on issues of concern to NCES and/or information on which to base decisions. Topics range from technical statistical issues and data visualization to building data foundations for policy-making to quantitative methodology for education and social sciences.

The primary finding and recommendation of the 2020 IES/NCES expert panel on Post Covid Surveys, was to: *Implement a recognized functionally coherent and transparent structure to replace/reorganize loosely connected collection of separate surveys and assessments*.

In 2021, IES/NCES charged NISS with assembling panels to consider the feasibility and the advisability of pursuing this recommendation. The title "*Connecting the Dots*" was chosen to describe the potential for improving the available information on US education by coordinating the efforts across surveys. The fourfold objectives are simultaneously to streamline the recruitment process at state/district/local levels, to reduce burden especially at district/local levels, to diminish non-response, and to leverage data from multiple data sources both at NCES and in other federal data collections.

Connecting the Dots, I: Developing Possibilities and Framing Statistical Issues (August 2021)

> Statisticians from academia, government and contractors with specialized expertise in sample survey theory and practice examined the technical/statistical feasibility of coordinated designs for multiple surveys.

Connecting the Dots, II: Making It Happen – Implementation Issues (November 2021)

> A cross-disciplinary panel of academics, educators, social science researchers and survey contractors included professionals from the various parts of the recruitment process who examined the practical aspects of implementation of coordinated processes. They explored the impacts of such integrated sample designs on the recruitment process from the perspectives of the contractors/recruiters and of the decision-makers at all levels from state to district to school.

Coordinating Designs for Multiple Surveys (May 2022) examined several conceptual statistical approaches to determine the viability of each for coordinating or combining designs for multiple surveys.

School Survey Participation and Burden (June 2022) considered the specifications for creating a data/research resource to allow quantification of burden and compilation of individual school participation decisions.

NISS-NCES Report Library

The value of NISS as an expert resource to IES/NCES is illustrated by a case study of a series of six expert panels combined with three research projects which culminates with the three expert panels and the technical forum held during the period of this annual report.

Each year the reports from panels of technical experts that NISS has organized are added to the NCES Library on the NISS website where they are publicly available.

The NCES Report Library now contains Executive Summaries and Full Text reports for forty expert panels; of these sixteen reports (17 panels) were within the past five years, twenty-five reports (26 panels) from 2012 to the present.

NISS / NCES Report Library
https://www.niss.org/nces-report-library

What started in December 2020 as a single Expert Panel to examine the role of national education surveys in the aftermath of Covid-19 enforced isolation gradually unfolded into a progression of six Expert Panels and three separate research forays into the potential for major changes in education data collection. It culminated in formulation of two principal aspects of innovation: redesign of the survey process to coordinate recruitment and data resources for multiple NCES (and IES) surveys, assessments and studies; and an expanded design and strategy for education data base resources to integrate internal IES/NCES resources and to link with external data bases.

Carrying out the sequence of activities required an unusual breadth of skills and activities. NISS drew extensively on its experience with education data, the survey process, and its capability to bring together the diversity of high-level expertise from government, private and academic sectors to work together. The net result is the adoption of recommendations to NCES to take a more expansive perspective on the panoply of studies and to plan for major innovation in a more holistic context. Reports of all the panels described below can be found at (https://www.niss.org/nces-report-library)

Starting Point I (December 2020)**: Sampling:** The Expert Panel that inaugurated this chain of activities was planned as a single review panel to examine the potentials and the priorities for designing and implementing *Post-Covid Surveys*. So the panel was composed of statisticians, survey methodologists and researchers from the Census Bureau, from US and UK universities and from the private sector.

- The charge to the panel was:

  Take a tabula rasa *approach to two inextricably related aspects of future NCES data collections and...*

  [and identify] fruitful avenues to pursue:

  - *Engagement of participants at all levels, and*
  - *Sampling design and methodology.*

The central concept driving the panel's specific recommendations following their deliberations was for IES/NCES to:

Implement a recognized, functionally coherent and transparent structure to replace/ reorganize loosely connected collection of separate surveys and assessments.

Starting Point II (March 2021)**: Data:** A complementary Expert Panel on *Setting Priorities for Federal Data Access to Expand the Context for Education Data* examined the question of expanding the usable information base by efficiently sharing data both across NCES data collections and in conjunction with other data bases held in other federal agencies. To address this charge, statisticians, survey methodologists, economists, education economists, and education researchers were drawn from academia and the private sector as well as from the Bureau of Economic Analysis, the Census Bureau, the Office of Management and Budget and the IRS. The logic of this panel's deliberations followed the sequence of observations that:

- *Meeting the information needs of NCES stakeholders is critical to NCES's continuing relevance as a data source.*
- *Many critical issues involving education and education information can only be informed by integration of data from other sources with NCES data.*
- *Therefore, expanding the context for IES/NCES education data is a matter of some urgency.*

The panel proceeded to make the specific recommendation to:

- *Expand the context for NCES studies and data resources; create an [information resource] of contextual information, . . . consistent over time and content, to link to multiple surveys and other data collections.*

Starting Point III (January 2020-June2022)**: Non-Response Bias Analysis (NRBA):** Simultaneous research by NISS-NCES Scholars reviewed past standards and best practices for non-response bias analysis and adjustment in face of continuing declines in voluntary participation and response rates. A key finding of their research was:

- More extensive information on responders and non-responders at all levels is critical to improving the understanding of and statistical adjustment for non-response – especially at the higher levels of districts and schools.

Problem Definition (August-November 2021)**:** Findings from these three starting points led to two key questions:

- Is a statistically valid, coordinated design for multiple IES/NCES studies technically feasible?
- How would a coordinated approach to multiple studies and surveys work to streamline the data collection process and benefit participating districts and schools?

NCES commissioned NISS to assemble two new Expert Panels *Connecting the Dots, I & II: Integrated Sampling Approach for Multiple Surveys*, to characterize the two distinct aspects of the sampling and data challenges. The first panel, composed of theoretical and applied survey statisticians and quantitative (survey) methodologists from federal, private and academic sectors examined the first question, i.e., feasibility. Their response was:

- *Coordination of NCES surveys and assessments is unequivocally desirable and feasible. Accomplishing this will require extensive changes . . . and significant investment of effort and technical expertise.*

Consideration of the second question required a panel that understood each step in the data collection process from both sides: surveyor and responder. This very diverse panel included survey practitioners and recruitment coordinators, school district administrators, and statisticians, who collectively represented survey contractors, state and district education administrators, private sector and government experts on recruitment, academic departments and survey centers as well as the Census Bureau and Office of Management and Budget. Primary recommendations endorsed streamlining interactions for data collection and building trust with gatekeepers (especially at district and school levels). In addition the panel made a specific recommendation to understand burden and rationales for response/non-response, with a key facet:

- *Create a History of Participation data base for districts and schools . . . recruitment . . . results [and] reasons . . . metrics for burden . . . a research base for studying patterns . . . estimating the impact of non-response.*

First Steps toward Solution (January-May 2022)**:** NCES charged NISS with recruiting NISS-NCES Scholars, each to initiate the technical research on a different innovative approach to the technical problem of coordination of sampling design across multiple surveys (described above under 1.1.1-Sampling). In parallel, a group of experts was assembled, representing the diversity of backgrounds and experience that are essential to discuss the range of participant burdens from education studies and surveys and to define the critical information about participation/response/non-response decision-making. For this Expert Panel on *School Participation and Burden*, NISS engaged school district administrators, survey directors and managers from contractors and survey centers, academic statisticians and survey statisticians from government. The panel was tasked with articulating a definition of burden and constructing a template for the expanded data base to encompass the requisite metrics as well as the information on participation decision-making by districts and schools. The final event in this chain of development of a broader perspective on multiple data collections was a Technical Forum where NISS-NCES Scholars each presented their early results on coordinating sampling design. Four distinguished statisticians provided critiques and discussion after deep technical examination and evaluation of the potential for successful development and implementation. Across this series of panels and research investigations:

This chain of work was judged positively by NCES and is being operationalized:

PERFORMANCE

> [NISS] *recruited outstanding slates of nationally known experts to serve on small working groups to review NCES operations and methodological issues, expertly and seamlessly managed the groups orientations, convened . . . meetings, facilitated deliberations, and produced . . . final summary and recommendation reports on …critical issues for NCES.*[1]

IMPACT

Within 18 months of the original recommendation to re-examine and reimagine the sampling and recruitment processes to streamline multiple education surveys, this series of panels and research efforts has enabled NCES study design innovations:

> *NCES is rapidly moving forward to implement these innovative sampling and recruiting strategies to improve the efficiency and usefulness of its sample surveys.*[2]

[1] *CPAR for ESSIN-Task 3* 06/04/2021 – 06/03/2022

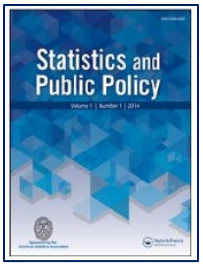
[2] *CPAR for ESSIN-Task 3* 06/04/2021 – 06/03/2022

Ingram Olkin Forums (IOF) Series

Statistical Serving Society (S^3) Forums

The Ingram Olkin Fund at NISS established a series of forums in his honor, focusing on a current societal issue that might benefit from new or renewed attention from the statistical community. These Statistics Serving Society forums aim to bring the latest innovations in statistical methodology and data science into new research and public policy collaborations, working to accelerate the development of innovative approaches that impact societal problems. Each Forum brings together a select group of experts to consider a pressing societal issue and to develop an agenda of statistical action items that are necessary to inform public policy and generate reliable evidence as a basis for decision-making. The cross-disciplinary synergy that the Forum is intended to energize is followed by individual research efforts of longer-lived working groups formed by the Forum participants.

The first IOF Statistics Serving Society Forum was held in person in June 2019 on *Gun Violence – the Statistical Issues*. The content of this Forum and follow-on research was published and is available online.



Ridgeway, G., **Rosenberger, J.L.**, **Xue, L.** (2021). Statisticians Engage in Gun Violence Research, *Statistics and Public Policy*, 8:1, 73-70. Also at DOI: 10.1080/2330443X.2021.1978354.

Challenged by Covid, IOF inaugurated a webinar series *Unplanned Clinical Trial Disruptions* with two public webinars. Four subsequent online meetings were organized around particular statistical tools. Each meeting led to formation of a working group with broad expertise to carry forward the research agenda developed at the meeting.

Van Lancker, K., Tarima, S., Bartlett, J., Bauer, M., Bharani-Dharan, B., Bretz, F., Flournoy, N., Michiels, H., Olarte-Parra, C., **Rosenberger, J.L.** & Cro, S. (2021). Estimands and Their Estimators for Clinical Trials Impacted by the COVID-19 Pandemic: Report from the NISS Ingram Olkin Forum Series on Unplanned Clinical Trial Disruptions. Statistics in Biopharmaceutical Research, https://doi.org/10.1080/19466315.2022.2094459.

Calderazzo, S., Tarima, S., Reid, C., Flournoy, N., Friede, T., Geller, N., **Rosenberger, J.L.**, Stallard, N., Ursino, M., Vandemeulebroecke, M., Van Lancker, K., & Zohar, S. (2022). Coping with Information Loss and the Use of Auxiliary Sources of Data: Report from the NISS Ingram Olkin Forum Series on Unplanned Clinical Trial Disruptions. (Submitted)

Bauer, M., Emsley, R., Flournoy, N., Jennison, C., Kunz, C.U., Lane, A., **Rosenberger, J.L.**, Rosner, G.L., Stallard, N., Tarima, S., & Zohar, S. Bayesian and Frequentist Approaches to Resuming Disrupted Trials: Report from the NISS Ingram Olkin Forum Series on Unplanned Clinical Trial Disruptions. (In preparation)

Uschner, D., Barker, C., Bretz, F., Carter, K., Chipman, J., Everett, C., Flournoy, N., Geller, N., Heussen, N., Hilgers, R-D., Johnson, V., Kuznezova, O., van der Laan, M., Lane, A., Luo, Y.A., Posch, M., Proschan, M., Tarima, S., Sverdlov, A., Rosenberger, W.F., & **Rosenberger, J.L.** Randomization Tests to Address Disruptions in Clinical Trials. Report from the NISS Ingram Olkin Forum Series on Unplanned Clinical Trial Disruptions. (In preparation)

Working groups are currently active from the (2020) *IOF Forum on Algorithmic Fairness and Social Justice* and from the (2021) *IOF Forum on Police Use of Force*.

The IOF Committee now calls for forum proposals twice a year. This is a change as the Committee has moved from forum planning and spearheading to proposal review and management. Based on the proposal from Jingchen (Monika) Hu and Claire Bowen a Forum jointly sponsored by IOF-NISS and the Urban Institute is schedule to kick off in November: *Advancing Demographic Equity with Privacy Preserving Methodologies: Current Challenges and Potential Future Work*. This public webinar will be followed by an invitational in-person meeting in January 2023.

FOCUS on EARLY CAREER STATISTICIANS

NISS Graduate Student Network (GSN)

Graduate students at many of the NISS Academic Affiliates have come together to establish a lively network with programs designed to meet their education and career goals. The overall goal of the NISS Graduate Student Network is to create connections among graduate students from different academic institutions within the NISS Affiliates Program. During the last year students organized a diversity of well attended activities ranging from networking to career-oriented topics to technical presentations. Less formal activities include partnering to share graduate student experiences, informal peer mentoring, meetups, and social events.

National Institute of Statistical Sciences

Graduate Student Network

NISS Graduate Student Network Research Conference Event/Agenda News

For the second year, a GSN Research Conference was organized and held in May, sponsored by NISS and by NISS Affiliate Proctor & Gamble. Podium presentations by 19 students composed five session: • High-dimensional statistical analysis and applications, • Novel perspectives in Bayesian methodology, • Contributions in computational and methodological statistics, • Recent advances in bioinformatics and biomedical data analysis, and • Modern statistical methods for dependent data. In addition, eleven posters were submitted for the open Poster Session. Two panels focused on relatively recent PhD recipients and senior graduate students shared their experiences in their first jobs or in internships they held. Statistics and Data Science Alumni panelists were **Andreea Luisa Erciulescu** (Westat, previously a NISS postdoctoral fellow), **Dhanushi Wijeyakulasuriya** (Microsoft), **Nathan Cruze** (NASA), and **Spiro Stilianoudakis** (P&G). The second panel, Tips for Statistical Communication and Data Storytelling, included **Lucy D'Agostino McGowan** (Wake Forest University); **Natalie Dean** (Emory University); and **Julia Silge** (RStudio PBC).

Each of the four winners four winners of the *2022 Excellent Presentation Award!* Received a certificate and cash award of $125:

- **Rebecca Kurtz-Garcia** (UC Riverside)
- **Adam Tonks** (University of Illinois U-C)
- **Manqi Cai** (University of Pittsburgh)
- **Brandon Lumsden** (Clemson University)

How to Write a Successful Grant Proposal			Attended
11/4/2021	Speakers: **Steve Kern**, Gates Foundation **Ali Shojaie**, University of Washington **Joshua Tebbs**, National Institutes of Health **Judy Huixia Wang**, National Science Foundation	Moderator: **Sumanta Basu**, Cornell University	112

The NISS Graduate Student Network and the NISS Academic Affiliates co-hosted a special two-hour event that focused on internship opportunities for graduate students. Panelists were brought together from a variety of companies that have a history of implementing statistics and/or data science internship programs. Speakers described their company's currently-offered internship opportunities and were able to share more generally with the 100+ attendees about preparation, desired qualifications, and absolute requirements for these types of internship opportunities.

FOCUS ON EARLY CAREER STATISTICIANS

GRADUATE STUDENT NETWORK

Internship Opportunities for Graduate Students		Attended
11/12/2021	Speakers: **Rob Baker**, Procter & Gamble **Sneha Chatterjee**, Google **Qing Ji**, Procter & Gamble **Jonathan Legare**, Fidelity **John Palcza**, Merck **Jan Vlachy**, Google **BriAnna Walker**, Research Triangle Institute	Moderator: **Esra Kurum**, University of California, Riverside 214

The NISS Graduate Student Network and the NISS Academic Affiliates co-hosted a special 2-hour event that focused on internship opportunities for graduate students. Panelists were brought together from a variety of companies that have a history of implementing statistics and/or data science internship programs. Speakers were able to not only describe the internship opportunities their company currently offers but were also to share more generally with the 150+ attendees about the preparation, requirements and qualifications for these types of opportunities.

NISS EVENTS - CAREER FAIRS

Academic Institutions Career Fair		Attended
9/8/2021	Speakers: **Murali Haran**, Penn State University **Tian Zheng**, Columbia University **Joshua Tebbs**, University of South Carolina	Moderator: **Irina Gaynanova**, Texas A&M University 58

Three NISS Affiliate institutions were represented by faculty intimately familiar with the academic hiring process. Topics included: preferred qualifications for a tenure-track/tenured faculty position in your institution, potential distinguishing characteristics of successful candidates for tenure-track/tenured faculty positions, advice to give to job candidates, and broad advice regarding broad future-planning in academia.

Statisticians in the Consumer Products or BioPharma Industry Career Fair		Attended
10/13/2021	Speakers: **William Brenneman**, Procter & Gamble **Junshui Ma**, Merck **Wei Shen**, Eli Lilly	Moderator: **Ying Ding**, University of Pittsburgh 184

Senior statisticians provided an inside look at the research that statisticians in these companies involve themselves with professionally. Topics were job opportunities, ranges of skills needed to succeed in those job roles, data-centric career paths, current hiring needs, for statisticians, data scientists, and analysts, and broad advice to students.

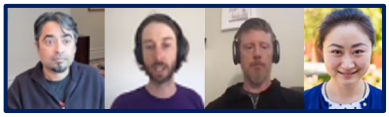
NISS EVENTS - CAREER FAIRS (CONT.)

Statisticians in the High-Tech Industries Career Fair — Attended: 363

11/10/2021

Speakers:
Amir Najmi, Google
Martin Tingley, Netflix
Elliott Merriam, Facebook

Moderator:
Piaomu Liu, Bentley University



Senior statisticians from three tech companies provided an in-depth and personalized look into the opportunities for statisticians, data scientists, and analysists within their industries. Topics included: types of the data-centric research that companies get involved in, and potential career opportunities.

Government Agency Career Fair — Attended: 119

12/8/2021

Speakers:
Jeffrey Gonzalez, USDA Economic Research Service
Patricia S. Hu, Bureau of Transportation Statistics
Rachel E. Morgan, Bureau of Justice Statistics

Moderator:
Eileen O'Brien, NASS / USDA

Statisticians in governmental agencies described career research within the United States government, promoting the influence that quality research has in correctly informing on policy issues that impact all aspects of society in the United States. Topics included: benefits of cross-collaborative opportunities, diversity in the workplace, hiring advice, and work-life practices within the federal government.

National Laboratories Career Fair — Attended: 143

1/19/2022

Speakers:
Nancy McMillan, Battelle
Emily Michele Casleton, Los Alamos
Gabriel Huerta, Sandia

Moderator:
Seiyon Ben Lee, George Mason University

Senior statisticians with extensive experience working in these specialized federal laboratories shared their experiences so that others may better understand and be better prepared for working in a national lab.

Government Agencies Career Fair — Attended: 66

2/9/2022

Speakers:
Jeffery Gonzales, Economic Research Service
Victoria Bryant, Internal Revenue Service

Moderator:
Daniel Friel, Bureau of Labor Statistics

Government data and research becomes the principle foundation for informing policy issues that impact all aspects of society. IRS Pathways/Interns & Recent Graduates & Research, Applied Analytics, & Statistics.

NISS EVENTS - CAREER FAIRS (CONT.)

Insurance & Finance Industries Career Fair — Attended: 120

3/23/2022

Speakers:
Nathan Lally, Hartford Steam Boiler (Munich Re Group)
Qingqing Anna Dai, Liberty Mutual Insurance
Daniel McCarthy, Liberty Mutual Insurance
Siddhartha Dalal, Columbia University

Moderator:
Susan Edwards, RTI International

Statisticians/data scientists from three companies in the insurance and finance industries provided an inside look at the research that statisticians in these companies get involved in and career opportunities.

Academic Departments Career Fair — Attended: 30

5/18/2022

Speakers:
Bo Li, University of Illinois Urbana-Champaign
Robert Krafty, Emory University
Dylan Small, University of Pennsylvania, The Wharton School

Moderator:
Xiufan Yu, University of Notre Dame

Varying aspects of research, teaching and service that statisticians in these academic institutions get involved in, career opportunities, distinguishing characteristics of candidates, and how PhD students or postdocs should prepare for the future.

Pharmaceutical Industries Career Fair — Attended: 34

6/15/2022

Speakers:
Qiqi Deng, Moderna
Nareen Katta, AbbVie
Tom Bradstreet, Bristol-Myers Squibb

Moderator:
Hannah Waddel, Emory University; NISS Graduate Student Network Executive Committee

Career paths and opportunities with a panel that discussed job opportunities in their companies, the needed range of skills statisticians/ data scientists/analysts need to succeed and advice for students based on their experience?

FOCUS ON EARLY CAREER STATISTICIANS cont.

DATA VISUALIZATION COMPETITION

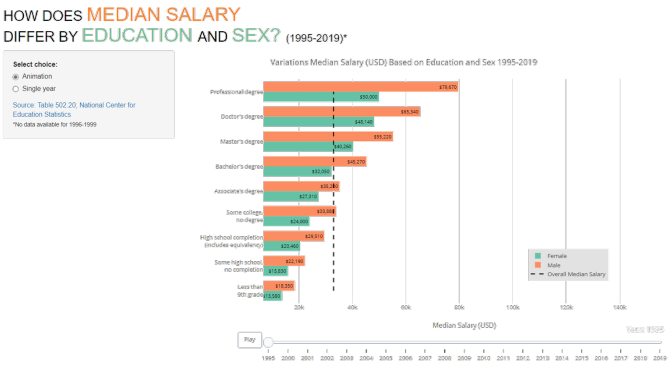
Statistically **A**ccurate **I**nteractive **D**isplays,***...In Graphics!***

In the Spring of 2022 NISS ran its second SAID in Graphics Data Visualization Contest. As with the first contest the goal was to engage students in the educational, social, and data-sciences to utilize National Center of Education Statistics (NCES) data to create innovative graphics illustrating key features of these education data. While the first contest focused on using curated data sets and students in graduate school, this follow-up was open to both undergraduates and graduates. The data sets were chosen from the Digest of Education Statistics website and the entries needed to focus on either geographic or data over time and also include a presentation of uncertainty. The contest attracted undergraduate entries from 8 universities and colleges, and graduate students from 20 universities.

The judges this year included Nola du Toit from NORC-University of Chicago, Heike Hofmann from Iowa State University, and Haley Jeppson from NISS, and in addition to an overall 1st place there was a 2nd place award for the Best Presentation of Uncertainty and a 2nd place award for the Most Inviting Graphic. As with the first contest, the judges were impressed by the entries, and decided to make an additional Judges Choice Award. The winning entries are shown below, and a poster on the competition was accepted for presentation at JSM 2022.

1 OVERALL

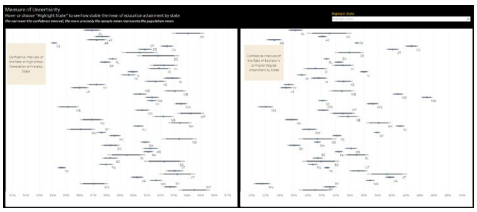
LOGAN KOCKA
Miami University (OH)



2 UNCERTAINTY

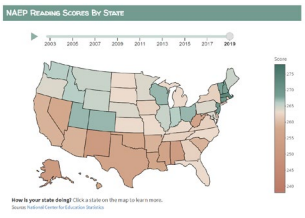
Rhodes College

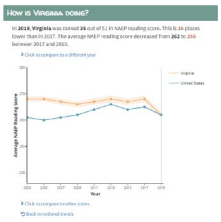
Jiaxuan Yang
Jana Turner
Thu Trang Nguyen



2 INVITING

University of California, Berkeley

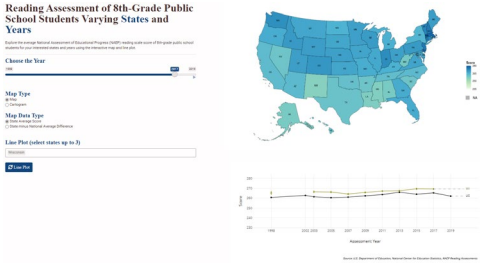




Tiffany Tang
Melody Huang
Emily Flanagan

JUDGES PRIZE

Yi Chen
Wisconsin University



DATA VISUALIZATION COMPETITION

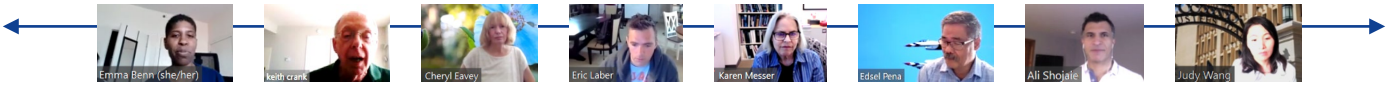
Statistically **A**ccurate **I**nteractive **D**isplays,***...In Graphics!***

As reported last year, in November 2020 NISS opened a competition for statistics and data science graduate students and quantitative methodology and socials science students to create innovative graphics for education data reports. Prizes were awarded in three categories: cross-disciplinary team, individual submission, and remarkable for creativity. Judges for the competition were Lee Wilkinson (H2O and University Illinois at Chicago), Dan Carr (George Mason University), Nola du Toit (NORC and University of Chicago), Jonathan Schwabish (Urban Institute). A panel on the results of the contest was held at JSM 2021:

Data Visualization Competition as Contributed Topic at JSM

Title: **Statistically Accurate Interactive Displays for Educational & Government Reports** August 8, 2021
Authors: **Lynne Stokes*** | **Nola du Toit*** | **Andrew White*** | **Mark Wilson*** (*presenter)
Companies: Southern Methodist University | NORC at the University of Chicago | National Center for Education Statistics | University of California Berkeley
Chair: **Brian Habing**, Associate Director, Education Activities and Research, NISS
National Institute of Statistical Sciences

WRITING WORKSHOP FOR JUNIOR RESEARCHERS



On 2021 August 6 and 13, the **National Institute of Statistical Sciences** once again held the annual **NISS Writing Workshop for Junior Researchers**.

A successful workshop since its inception in 2007, this year's workshop was no different!

NISS gathered a host of senior authors, editors, grant writers / reviewers to share their advice and experiences. Each participant in the group of 29 junior faculty and early career researchers worked one-on-one with a senior mentor to critique and improve their manuscript.

A special **THANK YOU** to the mentors for their valued contributions to the NISS Writing Workshop! (*Photo above)

Jim Albert	Bowling Green State University, emeritus
Naomi Altman	Pennsylvania State University, emeritus
David Banks	Duke University
Emma Benn*	Icahn School of Medicine, Mount Sinai
Keith Crank*	National Science Foundation, retired
Cheryl Eavey*	National Science Foundation (NSF)
Susan Ellenberg	University of Pennsylvania PSM
Xuming He	University of Michigan
Tim Hesterberg	Google, Inc.
Dave Hunter	Pennsylvania State University
Peter Imrey	Cleveland Clinic
Nicholas Jewell	UC, Berkeley\London School of Hygiene & Tropical Medicine
Jiming Jiang	University of California, Davis
Karen Kafadar	University of Virginia
Eric Laber*	Duke University
Nicole Lazar	Pennsylvania State University
Tyler McCormick	University of Washington
Karen Messer*	Natl Institutes of Health\UC, San Diego
Regina Nuzzo	ASA\Gallaudet University
Edsel Peña*	NSF\Univ of South Carolina
Don Richards	Pennsylvania State University
David Rocke	University of California, Davis
Jim Rosenberger	NISS\Pennsylvania State Univ
Ali Shojaie*	University of Washington
Judy Wang*	NSF\George Washington U
Leland Wilkinson	H2O.ai\Univ of Illinois, Chicago
Lingzhou Xue	NISS\Pennsylvania State University

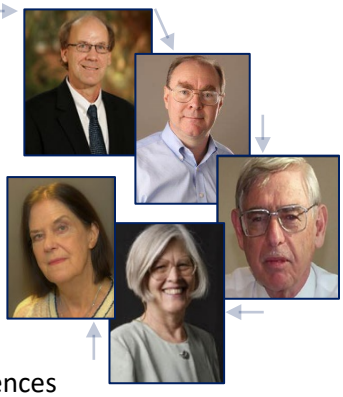
NISS AT JSM

A RETROSPECTIVE

NISS at 30: Highlights from the Early Years and Emerging Trends

Wednesday, 8/11/2021

Panelists:
- **Daniel Jeske** — University of California Riverside
- **David Banks** — Duke University & SAMSI
- **Jerome Sacks** — National Institute of Statistical Sciences
- **Nancy Flournoy** — University of Missouri
- **Nell Sedransk** — National Institute of Statistical Sciences



Sponsors: National Institute of Statistical Sciences
Statistical and Applied Mathematical Sciences Institute
Committee of Presidents of Statistical Societies
History of Statistics Interest Group

Organizer: **Lingzhou Xue**, Penn State University\National Institute of Statistical Sciences

Chair: **James Rosenberger**, National Institute of Statistical Sciences\Penn State University

AWARDS CEREMONY & AFFILIATE LUNCHEON PROGRAM

On Monday, August 2, 2021 NISS Affiliates and other invited guests assembled virtually to congratulate the 2021 winners of the NISS Awards.

A virtual luncheon for affiliates on DATE presented the ASA Task Force Report on Significance and Replicability

Presentation and Discussion of *Report on Statistical Significance and Replicability*

Introduction:
Karen Kafadar, 2019 ASA President, University of Virginia

Task Force members:
Xuming He, Task Force Co-chair, University of Michigan
Linda J. Young, Task Force Co-chair, National Agricultural Statistics Service, USDA
Stephen M. Stigler, University of Chicago
Nancy M. Reid, University of Toronto
Yoav Benjamini, Tel Aviv University

CONTRIBUTED SESSIONS

Date/Time: Thursday, August 12, 2021
Session: *Recent Advances in Small Area Estimation*
Title: **Model-Based Estimates for Farm Labor Quantities**
Authors: **Lu Chen*** | Nathan B. Cruze | Linda J. Young
Companies: National Institute of Statistical Sciences/USDA/NASS | USDA National Agricultural Statistics Service

Date/Time: Thursday, August 12, 2021
Session: *Estimation of Power Transformations in Capture-Recapture Models*
Title: **Estimation of Power Transformations in Capture-Recapture Models**
Authors: **Luca Sartore*** | Habtamu Benecha | **Clifford Spiegelman**
Companies: National Institute of Statistical Sciences/NASS | USDA NASS | Texas A&M

SOCIAL PRESENCE

NISS BY THE NUMBERS

NISS Affiliates, through the Affiliates Committee planned **2** meet-ups, **2** workshops, and **9** virtual career fairs hosted by NISS. NISS also co-sponsored **14** events hosted by NISS Affiliates. The reach of NISS grows as the NISS Parameters Newsletter & Affiliates Update grows to boast an over 8,000-person circulation! NISS Social Media numbers are:

700+ connections and 960+ followers. With almost 20 posts, NISS garnered over 14K views, averaging about 312 per post!

From July 2021 to June 2022, NISS generated a total of 98,729 impressions with 86 tweets. The average impressions per tweet are around 1,148. There are 15,606 visits to NISS Twitter profile, and 36 mentions on NISS Twitter handle. During this period, NISS gained 82 new followers from 3,629 to 3,711. This is an increase of 2.26%.

34 posts, over 3k views and 122 friends. The NISS Facebook professional page has 3k+ followers!

40+ posts on the NISS Job Announcements & NISS Careers!

NISS LIBRARY OF VIDEO WEBINARS AND EVENTS

The NISS YouTube channel added 14 new videos during this time! Videos are organized into 9 categories or playlists:

2 NISS Graduate Student Network (GSN)
10 Industry Career Fairs
8 Government Career Fairs
23 Ingram Olkin Forum: Statistics Serving Society
18 NISS Academic and Research Webinars
8 Data Science Essentials for Business
15 COPSS-NISS COVID-19 Data Science Webinar Series
9 Academic Career Fairs
17 NISS-Merck Meetups

HTTPS://WWW.YOUTUBE.COM/C/NISSCOMMUNICATIONS

Some NISS Academic and Research Webinars, NISS-Merck Meet-ups, NISS Virtual Career Fairs as well as many other session videos that NISS has hosted or sponsored, can also be found here:

HTTPS://WWW.NISS.ORG/MEET-RECORDINGS

EVENTS

NISS-Merck Meet-Up

There is general agreement that diversity and inclusion in the workplace is highly desirable. In addition to arguments around fairness, many would argue that diverse and inclusive workplaces are more innovative and have higher performance. However, building such a workplace can be challenging, especially for statistics departments in the pharmaceutical industry. Among the challenges are finding, hiring, and retaining candidates with diverse backgrounds. In this meet-up we will examine how three Pharma are attempting to meet some of these challenges.
Dr. Ceesay, *Outreach Challenges and Opportunities to Promote a Diverse and Inclusive* Workplace; **Dr. Coles**, *Diversity, Equity, and Inclusion in Talent Acquisition: An Overview of Key Considerations*; and **Dr. Millen**, *An Interim Analysis of Equity, Diversity, and Inclusion in Our Profession.*

Diversity and Inclusion Issues in Pharma			Attended
11/4/2021	Speakers: **Paulette Ceesay**, Merck **Adrian Coles**, Bristol Myers Squibb **Brian Millen**, Eli Lilly	Moderator: **Junshui Ma**, Merck	56

This meetup provided a snapshot of this vital interdisciplinary area with three talks, delivered by speakers from academic and industrial backgrounds. The presenters explained how imaging plays an important role in clinical diagnosis, biomedical research, and pharmaceutical research & development. For decades, innovative statistical methods have been applied to various biomedical image modalities. In the past 10 years, deep learning and AI have increasingly dominated this field. Recently, biomedical image analysis has become an extremely complex area, because of the diversity both in image modality and the analysis methodology.
Dr. Kang, *Characterizing Tumor Micro Environment (TME) Using H&E Images*; **Dr. Zhu**, *Imaging Genetics*; and **Dr. Janowczyk**, *Computational Pathology: Towards Precision Medicine*.

Statistical and Deep Learning Methods for Biomedical Images			Attended
3/15/2022	Speakers: **John Kang**, Merck **Hongtu Zhu**, University of North Carolina **Andrew Janowczyk**, Case Western Reserve University	Moderator: **Peining Tao**, Merck	189

SPONSORSHIPS

NISS Co-Sponsored Series and Events

7/9/2021 **Webinar Series: Mathematical Foundations of Data Science**

The Dao of Robustness

Melvyn Sim, Natl. Univ. of Singapore

7/26/2021 **Quality and Productivity Research Conference (QPRC 2021)**

Data Science and Statistics for Quality

Peihua Qiu, U Florida; **Geoff Vining**, VA Tech; **Will Welch**, U British Columbia

9/3/2021 **Distinguished Theme Seminar Series 2021: Causal Inference**

Causal Inference: Clutter-Free Causal Inference

Donald B. Rubin, Temple, Tsinghua, and Harvard

9/10/2021 **Distinguished Theme Seminar Series 2021: Causal Inference**

Single World Intervention Graphs (SWIGs): A Unification of the Graphical and Counterfactual Approaches to Causality with Applications

James M. Robins, Harvard

9/17/2021 **Distinguished Theme Seminar Series 2021: Causal Inference**

What is Causal Inference? A Logical Perspective

Judea Pearl, UCLA

2/24/2021 **Distinguished Theme Seminar Series 2021: Causal Inference**

Statistical Learning: Causal-Oriented and Robust

Peter Bühlmann, ETH Zürich

2/24/2021 **2021 Myles Hollander Distinguished Lecture**

We Used a Bandit Algorithm to Personalize But Did It Work?

Susan Murphy, Harvard

10/3/2021 **Southern Regional Council on Statistics & Summer Research Conference 2021**

New Methods for Spatial Causal Inference

Brian Reich, NCSU

10/6/2021 **ICDS Symposium**

The Future of Digital Fairness

Lorin Crawford, Microsoft Research; **Kristin Johnson**, Emory; **Anne Charlton McIlwain**, Washington, NYU; **Taylor Marion Cruz**, CSU, Fullerton; **Kellie Owens**, **Gary Weissman**, UPenn; **Andrew Hoskins**, Univ. of Glasgow; **Jennifer Wagner**, Penn State; and **Daiquiri Steele**, Univ. of Alabama

10/8/2021 **International Conference on Advances in Interdisciplinary Statistics and Combinatorics 2021**

Promote Interdisciplinary Research Involving Statistical Techniques

Karen Kafadar, ASA President 2019, UVA; **David Dunson**, Duke; **Zhezhen Jin**, Columbia

10/11/2021 **2021 Georgia Statistics Day**

COVID-19 Vaccine Efficacy Trials and "Immune Correlates of Protection" in the Moderna COVE Trial

Roshan Joseph, Georgia Tech; **Len Stefanski**, NCSU; **S.R. Varadhan**, NYU/Courant; and **Mark Daniel Ward**, Purdue

3/1/2022 **29th Annual Morris Hansen Lecture**

Working with Non-Probability Samples: Assessing and Remediating Bias

Courtney Kennedy, Pew Research Center; **Yan Li**, UMd-College Park; **Jean-François Beaumont**, Statistics Canada

SPONSORSHIPS

NISS Co-Sponsored Series and Events

4/12/2022 **14th Annual Conference on Statistical Issues in Clinical Trials Subgroup Analysis**

Subgroup Analysis in Clinical Trials: Opportunities and Challenges

David Kent, Tufts; **Ellis Unger**, Consultant; **Tom Fleming**, **Noah Simon**, UW; **Lisa McShane**, NCI; **Anastasia Ivanova**, UNC-CH; **Ilya Lipkovich**, Eli Lilly, **Patrick Schnell**, OSU; **Mark Rothmann**, FDA; **Kosuke Imai**, Harvard; **Kit Roes**, European Regulatory Perspective; **Michael Rosenblum**, Johns Hopkins; and **Janet Wittes**, Statistics Collaborative, Inc.

4/29/2022 **The Bradley Lecture**

Stability and Approximability of Deep ReLU Networks in Statistical Learning

Jianqing Fan, Princeton University

5/24/2022 **New Advances in Statistics and Data Science**

Opportunities and Challenges of 21st Century Data Science

Yuejie Chi, **David Choi**, **Jiashun Jin**, Carnegie Mellon; **Yuqi Gu**, **Arian Maleki**, Columbia; **Eric Laber**, **Anru Zhang**, Duke; **Zheng Tracy Ke**, **Lucas Janson**, **Jun S. Liu**, **Rajarshi Mukherjee**, Harvard; **Wanjie Wang**, Natl. Univ. of Singapore; **Yang Feng**, NYU; **Runze Li**, PSU; **Jianqing Fan**, **Mengdi Wang**, **Jason D. Lee**, Princeton; **Genevera Allen**, **Philip Ernst**, Rice; **Regina Liu**, **Cun-Hui Zhang**, Rutgers; **Tengyu Ma**, Stanford; **Mladen Kolar**, U-Chicago; **Krishnakumar Balasubramanian**, UC-Davis; **Jelena Bradic**, UC-San Diego; **Weichen Wang**, U-Hong Kong; **Peter XK Song**, **Ji Zhu**, UMich; **Tony Cai**, **Edgar Dobriban**, **Hongzhe Lee**, **Weijie Su**, UPenn; **Yingying Fan**, **Adel Javanmard**, **Jinchi Lv**, USC; **Stanislav Volgushev**, Univ. of Toronto; **Simon Du**, UW; **Chunming Zhang**, UWisc-Madison; and **Heping Zhang**, **Hongyu Zhao**, Yale

Deep Learning Methods and Theory

NISS partnered with Purdue University's Department of Statistics for their Distinguished Theme Seminar Series on:

Clutter-Free Causal Inference

9/3/2021 Speaker:

Donald B. Rubin, Temple University, Tsinghua University, and Harvard University

Single World Intervention Graphs (SWIGs):
A Unification of the Graphical and Counterfactual Approaches to Causality with Applications

9/10/2021 Speaker:

James M. Robins, T.H. Chan School of Public Health, Harvard University

What is Causal Inference? A Logical Perspective

9/17/2021 Speaker:

Judea Pearl, Samueli School of Engineering, University of California, Los Angeles

Statistical Learning: Causal-oriented and Robust

9/24/2021 Speaker:

Peter Bühlmann, Department of Mathematics, ETH Zürich

Mathematical Foundations of Data Science

NISS co-sponsored a weekly online seminar on random topics on mathematical foundations of machine learning, statistics and optimization. Sponsored by Two Sigma, ETH Zurich, Georgia Institute of Technology, Harvard University, Northwestern University, Princeton University, Pennsylvania State University - Department of Statistics, ORAI China, Synced, and the National Institute of Statistical Sciences.

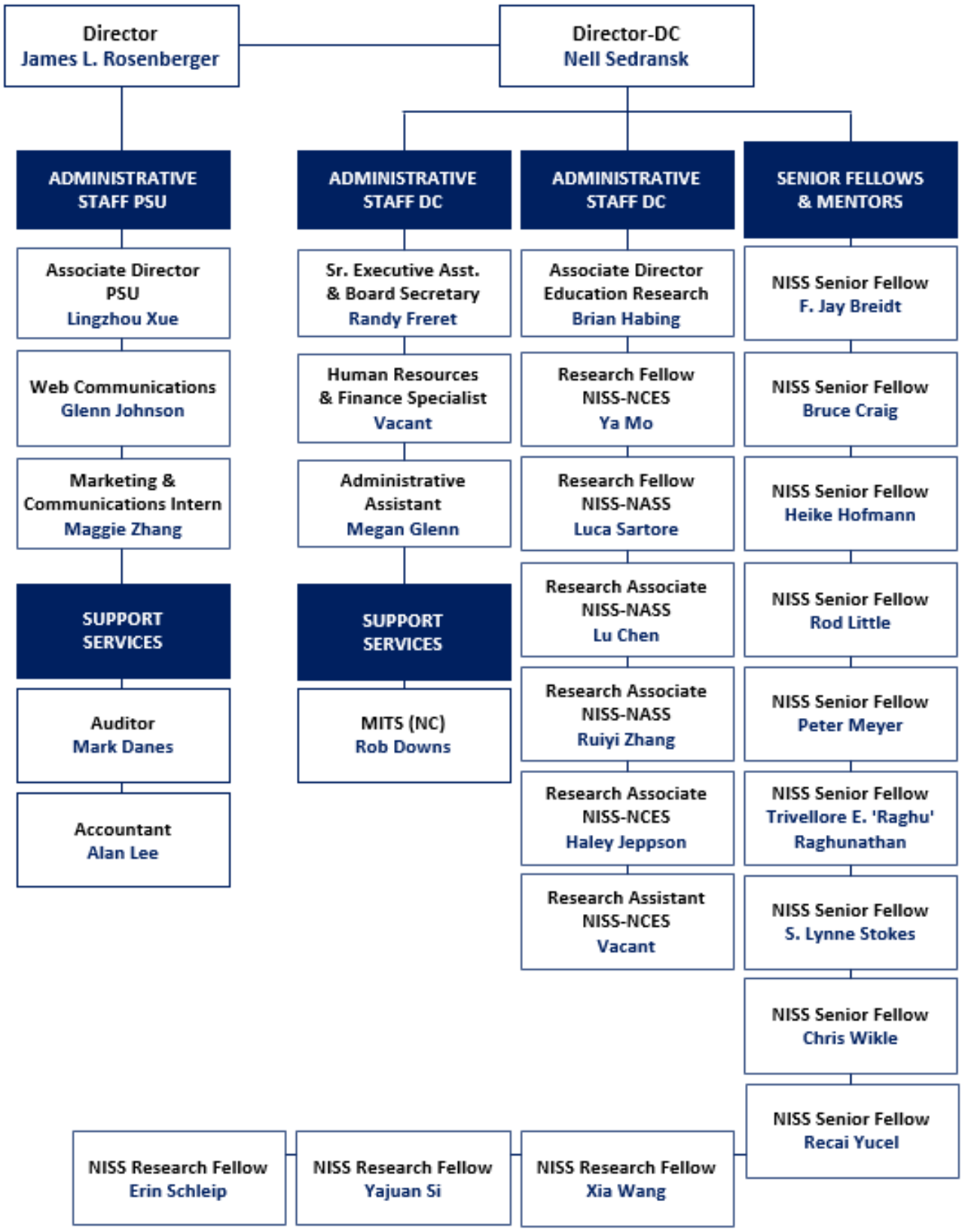
The Dao of Robustness

7/9/2021 Speaker:

Melvyn Sim, National University of Singapore

ORG CHART

AS OF JUNE 30, 2022



FINANCIAL STATEMENT

NISS STATEMENT OF ASSETS, LIABILITIES AND NET ASSETS

National Institute of Statistical Sciences

As of 30 June 2022

	Jun 30, 22	Jun 30, 21
ASSETS		
Current Assets		
Checking/Savings		
Total Checking/Savings	560,878	582,724
Total Accounts Receivable	222,175	262,967
Total Other Current Assets	(987)	5,695
Total Current Assets	782,066	851,386
Total Fixed Assets	5,333,477	5,535,285
Other Assets		
Security Deposits	5,400	5,400
TOTAL ASSETS	6,120,943	6,392,071
LIABILITIES & EQUITY		
Total Accounts Payable	36,870	126,864
Total Other Current Liabilities	26,779	26,407
Total Long Term Liabilities	2,233,301	2,337,936
Total Liabilities	2,298,314	2,498,797
Equity		
Net Assets	3,584,608	3,584,608
Unrestricted Net Assets	308,666	122,484
Net Income	(70,644)	186,182
Total Equity	3,822,630	3,893,274
TOTAL LIABILITIES & EQUITY	6,120,944	6,392,071

Unaudited 10/28/2022

FINANCIAL STATEMENT

NISS STATEMENT OF ACTIVITIES

National Institute of Statistical Sciences

As of 30 June 2022

Accrual Basis

	Jul '21 - Jun 22	Jul '20 - Jun 21
Ordinary Income/Expense		
Income		
GRANT AND CONTRACT REVENUE	1,636,484	1,559,170
Total OTHER REVENUE	164,843	186,626
BUILDING REVENUE		
Base Rent	260,977	322,196
Operating Expenses Rent	143,646	140,248
Building Management Fee Income	13,878	8,568
Total BUILDING REVENUE	418,501	471,012
Total Income	2,219,828	2,216,808
Expenses		
Total SALARIES and FRINGE BENEFITS	1,189,175	1,097,836
OFFICE EXPENSES		
Total OFFICE EXPENSES	118,591	105,106
Total TRAVEL EXPENSES	10,181	3,060
Accounting Fees	26,255	25,600
Consultants	415,401	259,500
Honorarium	10,750	5,350
Other Fees	16,111	12,179
Professional Services	46,179	41,612
Web Support	3,535	5,130
Total CONSULTANTS / PROFESSIONAL FEES	518,231	349,371
Board of Trustees - Meals	129	0
Miscellaneous	5,593	4,299
SACKS Award Expense	1,000	1,000
Total MISCELLANEOUS	6,593	5,299
Total BUILDING EXPENSES	197,869	216,268
Total Depreciation Expense	183,000	182,748
Total Expense	2,223,769	1,959,688
Income Tax Expense	6,090	2,895
Interest Expense	60,615	68,042
Net Income	(70,646)	186,183

Unaudited 10/28/2022

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