BIOGRAPHICAL SKETCH

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NAME: Cho, Hyunkeun

eRA COMMONS USER NAME (credential, e.g., agency login): HYUCHO

POSITION TITLE: Associate Professor

EDUCATION/TRAINING *(Begin with baccalaureate or other initial professional education, such as nursing, include postdoctoral training and residency training if applicable. Add/delete rows as necessary.)*

INSTITUTION AND LOCATION	DEGREE *(if applicable)*	Completion Date MM/YYYY	FIELD OF STUDY
Stony Brook University	BA	05/2007	Mathematics
Stony Brook University	BS	05/2007	Applied Math & Statistics
Stony Brook University	MS	05/2008	Applied Math & Statistics
University of Illinois at Urbana-Champaign	MS	05/2011	Statistics
University of Illinois at Urbana-Champaign	PhD	08/2013	Statistics

A. Personal Statement

I am an Associate Professor of Biostatistics at the University of Iowa with research interests in both experimental study and observational study, where individuals are repeatedly measured over time, or grouped in many different ways, or both. I am a member of the Clinical Trials Statistical and Data Management Center (CTSDMC) and Center for Access & Delivery Research and Evaluation (CADRE). I provide statistical support and oversight for CTSDMC and CADRE, including supervision and mentoring of staff biostatisticians. I have collaborated with researchers from a myriad of scientific disciplines through my role as a statistical consultant.

Cho, H. (2018). Statistical inference in a growth curve quantile regression model for longitudinal data, Biometrics 74, 855-862.
Cho, H., Kim, S. and Lee, M. (2020). Adjusting a subject-specific time of event in longitudinal studies, Statistical Methods in Medical Research 29, 1787-1798.
Jasper, E.A., Cho, H., Breheny, P.J., Bao, W., Dagle, J.M. and Ryckman, K.K. (2021). Perinatal determinants of growth trajectories in children born preterm, PLoS ONE 16, e0245387.
Kim, S., Cho, H. and Kim, M. O. (2021). Generalized bivariate varying coefficient model in longitudinal studies, Statistics in Medicine, in press.

B. Positions and Honors

Positions and Employment

2010-2013	Research Assistant, Department of Statistics, University of Illinois at Urbana-Champaign
2013-2017	Assistant Professor, Department of Statistics, Western Michigan University
2017-2021	Assistant Professor, Department of Biostatistics, University of Iowa
2018-present	Affiliated Faculty, Clinical Trials Statistical and Data Management Center
2019-present	Affiliated Faculty, Center for Advancing Multimorbidity Science
2020-present	Biostatistician, Center for Access & Delivery Research and Evaluation
2021-present	Associate Professor, Department of Biostatistics, University of Iowa

Other Experience and Professional Membership

2008-present	Member, American Statistical Association
2011-present	Member, Korean International Statistical Society

2013-present	Member, American Statistical Association
2014-2016	Statistician, Office of Provost, Western Michigan University
2014-2017	Mentor, Data Science Major and Minor, Western Michigan University
2016	Program Chair, Great Lakes International Symposium: Interdisciplinary Research in Data Science
2017	Mentor, DataFest Team (Winner of the Grand Prize)
2017-present	Member, International Biometric Society

Honors

2007	Degree Honor `Magna Cum Laude', Stony Brook University
2012	Distinguished Student Paper Award at Midwest Statistics Research Colloquium
2013	Graduate College Travel Award, University of Illinois
2013	Norton Prize Finalist for Outstanding Doctoral Thesis in Statistics, University of Illinois
2014-2016	Faculty Travel Award, Western Michigan University
2017	Faculty Research Opportunity Award, University of Iowa
2017	New Faculty Research Award, University of Iowa

C. Contributions to Science

My research contributions to science have been in methodological statistics and in application of statistical methodology to address general classes of biomedical problems. In particular, my applied interdisciplinary research interests lie broadly in both experimental study and observational study. I have collaborated with researchers in several areas and mention a few collaborations that I am actively working below.

Parkinson's Progression Markers Initiative

The Parkinson's Progression Markers Initiative (PPMI) is an ongoing observational, international, multi-center longitudinal study. It aims to comprehensively evaluate cohorts of interest (e.g., Parkinson's disease group, control group, prodromal group, genetic group, etc.) to identify biomarkers of Parkinson's disease progression. As a member of the PPMI statistical core, sponsored by the Michael J. Fox Foundation, I have managed the longitudinal data and collaborated with principal investigators in the PPMI steering committee.

Simuni, T., Uribe, L., Cho, H., Caspell-Garcia, C., Coffey, C., Siderowf, A., Trojanowski, J.Q., Shaw, L.M., Seibyl, J., Singleton, A., Toga, A.W., Galasko, D., Foroud, T., Tosun, D., Poston, K., Weintraub, D., Mollenhauer, B., Tanner, C.M., Kieburtz, K., Chahine, L.M., Reimer, A., Hutten, S.J., Bressman, S. and Marek, K. (2020). Clinical and DAT imaging characteristics of non-manifest LRRK2 and GBA mutation carriers in the PPMI: A cross sectional study, Lancet Neurology 19, 71-80.

Weintraub, D., Caspell-Garcia, C., Simuni, T., Cho, H., Coffey, C., Aarsland, D., Alcalay, R.N., Barrett, M.J., Chahine, L.M., Eberling, J., Espay, A.J., Hamilton, J., Hawkins, K., Leverenz, J., Litvan, I., Richard, I., Rosenthal, L., Siderowf, A. and York, M. (2020). Neuropsychiatric symptoms and cognitive abilities over the initial quinquennium of Parkinson disease, Annals of Clinical and Translational Neurology 7, 449-461.

Chahine, L.M., Brumm, M., Caspell-Garcia, C., Oertel, W., Mollenhauer, B., Amara, A., Fernandez-Arcos, A., Tolosa, E., Simonet, C., Hogl, B., Videnovic, A., Hutten, S., Tanner, C., Weintraub, D., Burghardt, E., Coffey, C., Cho, H., Kieburtz, K., Poston, K., Merchant, K., Galasko, D., Foroud, T., Siderowf, A., Marek, K., Simuni, T. and Iranzo, A. (2021). Dopamine transporter imaging predicts clinically-defined α-synucleinopathy in REM sleep behavior disorder, Annals of Clinical and Translational Neurology 8, 201-212.

Espay, A.J., Lafontant, D-E, Poston, K.L., Caspell-Garcia, C., Marsili, L., Cho, H., McDaniel, C., Kim, N., Coffey, C.S., Mahajan, A., Ezzat, K. and Sturchio, A. (2021). Cerebrospinal fluid proteins and brain volume in Parkinson’s disease, Parkinsonism & Related Disorders, in press.

Psychiatry and Neuroscience

Shinozaki Laboratory led by an associate professor at the Department of Psychiatry and Neurosurgery at the University of Iowa studies molecular influences of environmental factors such as trauma, stress, and inflammation on individual susceptibility to psychiatric conditions including major depressive disorder, post-traumatic stress disorder, and delirium. I have helped Dr. Shinozaki and his team to advance the science by contributing substantive statistical support on epigenetic approaches as well as medical engineering approaches.

Saito, T., Shinozaki, G., Koga, M., Tanichi, M., Takeshita, S., Nakagawa, R., Nagamine, M., Cho, H., Morimoto, Y., Kobayashi, Y., Yoshino, A. and Toda, H. (2020). Effect of interaction between a specific subtype of child abuse and the FKBP5 rs1360780 SNP on DNA methylation among patients with bipolar disorder, Journal of Affective Disorders 272, 417-422.
Saito, T., Braun, P. R., Daniel, S., Jellison, S. S., Hellman, M., Shinozaki, E., Lee, S., Cho, H., Yoshino, A., Toda, H. and Shinozaki, G. (2020). The relationship between DNA methylation in neurotrophic genes and age as evidenced from three independent cohorts. Neurobiology of Aging 94, 227-235.
Saito, T., Toda, H., Duncan, G., Jellison, S., Yu, T., Klisares, M., Daniel, S., Andreasen, A., Leyden, L., Hellman, M., Shinozaki, E., Lee, S., Yoshino, A., Cho, H. and Shinozaki, G. (2020). Epigenetics of neuroinflammation: immune response, inflammatory response and cholinergic synaptic involvement evidenced by genome-wide DNA methylation analysis of delirious inpatients. Journal of Psychiatric Research 129, 61-65.
Yamanashi, T., Malicoat, J.R., Steffen, K.T., Zarei, K., Li, R., Purnell, B.S., Najafi, A., Saito, K., Singh, U., Toth, B.A., Lee, S., Dailey, M.E., Cui, H., Kaneko, K., Cho, H., Iwata, M., Buchanan, G.F. and Shinozaki, G. (2021). Bispectral EEG quantifying neuro-inflammation in mice induced by systemic inflammation: a potential mouse model of delirium, Journal of Psychiatric Research, in press.

My methodological contributions are to develop new statistical methodology for dependent data, such as longitudinal data, clustered data, and multilevel data, with a variety of potential problems due to missing, dropout, heteroscedasticity, causation, and so forth. Details of specific areas that I am working in are listed below.

Quantile Regression
The Gaussian paradigm dominates longitudinal data analysis, whereas repeated responses follow a non-normal distribution over time in many cases. Moreover, an assumption that explanatory variables uniformly affect different parts of the conditional distribution of the responses may make little sense in practice. Quantile regression (QR) provides a viable alternative. Cho (2018) introduced growth curve quantile analysis that provides: i) a unique opportunity in exploring a longitudinal trajectory of the repeated responses across quantile levels; and ii) a comprehensive assessment about treatment effects on changes of the distribution of the responses over time. Cho, Kim and Kim (2017) proposed an efficient estimation procedure that accesses quantile-specific regression coefficients across multiple quantiles simultaneously and developed a novel test for the homogeneity of explanatory variables effects across the quantiles. It is common that subjects drop out of a longitudinal study before the end of follow-up. If the missingness is related to observed variables, ignoring missing responses often result in bias. Cho, Hong and Kim (2016) built a missing model under the missing at random mechanism and achieved a consistent estimator of quantile-specific regression coefficients. Kim, Cho and Wu (2020) proposed a bivariate risk-predictive probability model that quantifies the likelihood of bivariate responses in the future and developed a simulation-based estimation procedure under a stratified bivariate time-varying QR model.

Cho, H., Hong, H. G. and Kim, M. O. (2016). Efficient quantile marginal regression for longitudinal data with dropouts, Biostatistics 17, 561-575.
Cho, H., Kim, S. and Kim, M-O. (2017). Multiple quantile regression analysis of longitudinal data: Heteroscedasticity and efficient estimation, Journal of Multivariate Analysis 155, 334-343.
Cho, H. (2018). Statistical inference in a growth curve quantile regression model for longitudinal data, Biometrics 74, 855-862.
Kim, S., Cho, H. and Wu, C. (2021). Risk-predictive probabilities and dynamic nonparametric conditional quantile models for longitudinal analysis, Statistica Sinica, in press.

Precision Medicine
In clinical trials, treatments are compared to determine which one is effective against disease; however, patients can react to the same treatment very differently. Cho, Wang and Qu (2017) proposed: i) an unspecified random-effects model that describes unobserved subject-specific treatment effects; and ii) a penalized quasil-likelihood that estimates the heterogeneous treatment effects across individuals. Kim, Cho and Zhang (2019) and Niu and Cho (2019) developed an initial severity-dependent model that allows a mean response trajectory to vary with respect to a level of the response at baseline and proposed a test that evaluates the treatment effects at different baseline severity levels. As research emerges on personalized treatment regimes, a focus has shifted from finding an overall beneficial treatment to identifying a subgroup of the population that would have a positive effect

from a specific treatment. Andrews and Cho (2018) offered a complete process from subgrouping to validation for personalized treatments.

Cho, H., Wang, P. and Qu, A. (2017). Personalized treatment for longitudinal data using unspecified random-effects model, Statistica Sinica 27, 187-205.
Andrews, N. and Cho, H. (2018). Validating effectiveness of subgroup identification for longitudinal data, Statistics in Medicine 37, 98-106.
Kim, S., Cho, H. and Zhang, X. (2019). Initial severity-dependent longitudinal model with application to a randomized controlled trial of women with depression, Statistics in Medicine 38, 1678-1689.
Niu, X. and Cho, H. (2019). Adjusting for baseline information in comparing the efficacy of treatments using bivariate varying-coefficient models, Journal of Nonparametric Statistics 31, 680-694.

High dimensional or Multivariate Data
Statistical analysis of the longitudinal data requires accounting for the correlations, yet it is challenging in high-dimensional longitudinal data analysis because of size and complexity of the data. Cho and Qu (2013) proposed a penalized quadratic inference function that performs model selection and estimation simultaneously, while considering the within-subject correlations. Cho and Qu (2015) proposed an efficient and stable quadratic inference function combining moment conditions optimally using principle component analysis. When studies involve multiple response variables, a sophisticated multivariate data analysis is required to perform statistical inferences properly. Niu and Cho (2019) modeled the multiple response variables and estimate all regression parameters associated with the multiple responses simultaneously. Cho (2016) extended these concepts to the analysis of multivariate longitudinal data that involves complex correlated nature due to repeated measures across different response variables and measurement times.

Cho, H. and Qu, A. (2013). Model selection for correlated data with diverging number of parameters, Statistica Sinica 23, 901-927.
Cho, H. and Qu, A. (2015). Efficient estimation for longitudinal data by combining large-dimensional moment conditions, Electronic Journal of Statistics 9, 1315-1334.
Cho, H. (2016). The analysis of multivariate longitudinal data using multivariate marginal models, Journal of Multivariate Analysis 143, 481-491.
Niu, X. and Cho, H. (2019). Simultaneous estimation and inference for multiple response variables, Communications in Statistics-Theory and Methods 48, 2734-2747.

A complete list of my published work can be found in MyBibliography:
https://www.ncbi.nlm.nih.gov/myncbi/browse/collection/56843173/?sort=date&direction=ascending

D. Research Support
Current Research
VA IPA CADRE Statistical Consultant 03/01/20 – present
US Department of Veterans Affairs
Role: Principal-Investigator
Hyunkeun Cho will provide statistical consultation and support for CADRE's health services research grant submissions and CADRE's operational collaborate the Veteran's Rural Health Resource Center - Iowa City.

Targeted Metabolic Profiling to Predict Major Neonatal Morbidity in Very Preterm Newborns (PI: Ryckman)
Role: Co-Investigator 08/01/2020 – present
National Institutes of Health
Understanding the relationship between specific metabolites and neonatal morbidity will lead to the long-term goal of improved diagnostics, more effective therapeutic agents, and a precision approach to clinical management of the very preterm neonate.

Building a Bridge (between Clinical and Community Care): Post Diagnosis Support of Persons with Dementia and their Family (PI: Ashida) 07/01/19 – present
National Institutes of Health
Role: Co-Investigator

This study will provide an intervention that enables the development of community-based services and care plans at the medical clinics when families receive dementia diagnosis to eliminate the service gap between medical and community-based services.

Iowa Summer Institute in Biostatistics (PI: Zamba) 03/01/2019 – present
National Institutes of Health
Role: Co-Investigator
The objective of the Iowa Summer Institute in Biostatistics is to provide statistical research education in biostatistics and applied research opportunities to undergraduates. My role is to provide a lecture and an opportunity to engage in medical science research through biostatistics.

Parkinson's Progression Markers Initiative Statistical Core (PI: Coffey) 02/01/18 – present
The Michael J. Fox Foundation for Parkinson's Research
Role: Co-Investigator
The mission of PPMI is to identify one or more biomarkers of PD progression. The discovery of a biomarker is a critical step in the development of new and better treatments for PD. PPMI is a collaboration of researchers, funders and study participants working toward the goal of identifying progression biomarkers to improve PD therapeutics. The role of the Statistics Core leads the statistical analyses on the PPMI data and samples.

Completed Research

SPR 1648 (PI: Kwigizile) 03/01/16 – 12/31/17
Evaluating the Impacts of Speed Limit Changes on Identified Case Studies
Michigan Department of Transportation
Role: Co-PI
Raising speed limits on freeways may have an impact on both crashes and operational speeds as documented in many studies. This study aimed at determining the impact of changing speed limits on crash frequency and severity, as well as operational speeds in Michigan.

Network for Excellence in Neuroscience Clinical Trials (NeuroNEXT)-DCC (PI: Coffey) 02/01/18 – 09/30/2020
National Institute of Neurological Disorders and Stroke
Role: Co-Investigator
NeuroNEXT is designed to: 1) Increase efficiency of clinical trials; 2) Expand the capability of NINDS to test promising new therapies; 3) Respond quickly as opportunities arise to test promising new treatments for people with neurological disorders. The NeuroNEXT data coordinating center (DCC) provides statistical leadership from trial design and implementation, to final analysis and publication. The DCC experts on the Statistical Design Team assist investigators in developing innovative methodologies for the design and analysis of clinical trials.