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## EDUCATION

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- 2014     **Johns Hopkins Bloomberg School of Public Health**, Baltimore, MD  
Ph.D. in Biostatistics  
Thesis title: *Statistical Methods for Individualized Health: Etiology, Diagnosis, and Intervention Evaluation*  
Advisors: Scott Zeger and Constantine Frangakis
- 2009     **Fudan University**, Shanghai, China  
B.Sc. in Mathematics

## PROFESSIONAL EXPERIENCE

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- 2016 - present     **Assistant Professor**  
Department of Biostatistics, University of Michigan  
**Research Assistant Professor**  
Michigan Institute of Data Sciences (MIDAS), University of Michigan
- 2014 - 2016     **Postdoctoral Fellow**  
Hopkins individualized Health (*inHealth*), Johns Hopkins University  
Department of Biostatistics, Johns Hopkins Bloomberg School of Public Health
- 2014 - 2016     **Co-lead Statistician**  
Pneumonia Etiology Research for Child Health (PERCH) funded by Gates Foundation,  
International Vaccine Access Center (IVAC), Johns Hopkins Bloomberg School of Public  
Health  
*Principal Investigator*: Katherine O'Brien
- 2015 August     **Visiting Scholar**  
Combining Health Information, Computation and Statistics (CHICAS)  
Lancaster University, Lancaster, England
- 2013 - 2014     **External Consultant**  
Child Health Research Foundation (CHRF), Dhaka, Bangladesh; National Center for  
Immunization and Respiratory Diseases (NCIRD), The U.S. CDC
- 2010 - 2014     **Research Assistant**  
International Vaccine Access Center (IVAC), Johns Hopkins Bloomberg School of Public  
Health  
*Advisor*: Scott Zeger; *Principal Investigator*: Katherine O'Brien
- 2008     **Research Scholar**  
California NanoSystems Institute, and Department of Mechanical and Aerospace Engi-  
neering, University of California, Los Angeles
- 2007 - 2009     **Research Scholar**  
Center for Computational Systems Biology, Fudan University, Shanghai, China

## RESEARCH SUPPORT

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Active: \_\_\_\_\_

- Co-investigator, PCORI ME-1408-20318 (PI: Zeger) 07/01/2015 - 06/31/2018  
[Bayesian Hierarchical Models for Design and Analysis of Studies to Individualize Healthcare](#).  
 Funding for Methodological Research, Patient-Centered Outcomes Research Institute.  
 50% effort.
- Co-lead Statistician, Gates Foundation 48968 (PI: O'Brien) 09/01/2014-12/31/2016  
[Pneumonia Etiology Research for Child Health \(PERCH\)](#).  
 50% effort.
- Investigator, Project Data Sphere, LLC (PDS) by AstraZeneca 10/01/2015-03/31/2016  
 Prostate Cancer DREAM Challenge Educational Program Award  
 \$2307.69.
- Co-investigator, Johns Hopkins Biostatistics (PI: Colantuoni) 12/01/2014 - 08/31/2016  
 Evaluation of Peer-Review Grading in Biostatistics Courses Focused on Development of Data Analysis Skills.  
 Variable effort.

## HONORS AND AWARDS

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### JOHNS HOPKINS UNIVERSITY

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- 2015 Top Performer for [2015 Prostate Cancer DREAM Challenge](#) 1b; As part of *Bmore Dream Team*. [Press Release](#).
- 2015 Scholarship for Summer Institute in Statistics and Modeling in Infectious Diseases. University of Washington, Seattle, WA
- 2015 NSF Big Data Travel award for Drawing Causal Inference from Big Data. National Academy of Sciences, Washington DC
- 2015 Induction into Alpha Chapter of *Delta Omega* Public Health Honor Society
- 2015 Induction into *Phi Beta Kappa* Honor Society
- 2014 First Place: Biostatistics Section of the Delta Omega Poster Competition
- 2012, 2013 Joseph Zeger Travel Award to ENAR and JSM
- 2012 [June B. Culley Award](#), for outstanding achievement on school-wide oral exam paper
- 2011-14 [Johns Hopkins Sommer Scholar](#)
- 2009-14 Department of Biostatistics Graduate Fellowship

### UNIVERSITY OF CALIFORNIA, LOS ANGELES

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- 2008 UCLA-China Cross Disciplinary Scholarship in Science and Technology (CSST)

FUDAN UNIVERSITY

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2009 B.Sc. with First Class Honors  
 2007-09 [Chun-Tsung Scholar](#), Chinese Undergraduate Research Endowment (CURE) Scholarship  
 2008 First Class National Scholarship, Ministry of Education, China  
 2007 Excellent Undergraduate Student, Government of Shanghai  
 2006-07 First Class People's Scholarship  
 2006 First Class Shi Dai Scholarship

**PUBLICATIONS** (†: alphabetical order)

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PUBLISHED/IN PRESS

**Wu Z**, Deloria-Knoll M, and Zeger SL (2016). Nested Partially-Latent Class Models (npLCM) for Dependent Binary Data; Estimating Disease Etiology. *Biostatistics*. To appear. doi:10.1093/biostatistics/kxw037.

**Wu Z**, Deloria-Knoll M, Hammitt LL, and Zeger SL, for the PERCH Core Team (2016). Partially Latent Class Models (pLCM) for Case-Control Studies of Childhood Pneumonia Etiology. *Journal of the Royal Statistical Society: Series C (Applied Statistics)*, 65: 97-114. doi: 10.1111/rssc.12101.

Frangakis CE, Qian T, **Wu Z**, Diaz I (2015). Deductive Derivation and Turing-computerization of Semiparametric Efficient Estimation. *Biometrics*. doi:10.1111/biom.12362. Discussion paper.

Frangakis CE, Qian T, **Wu Z**, Diaz I (2015). Rejoinder: Deductive Derivation and Turing-computerization of Semiparametric Efficient Estimation. *Biometrics*. doi:10.1111/biom.12365.

**Wu Z**, Frangakis CE, Louis TA, Scharfstein DO (2014). Estimating Treatment Effects in Cluster Randomized Trials by Calibrating Covariate Imbalances between Clusters. *Biometrics*, 70: 1014-1022. doi: 10.1111/biom.12214.

Georgiades C, Geschwind J-F, Neil H, Hines-Peralta A, Liapi E, Hong K, **Wu Z**, Kamel I, Frangakis CE (2012). Lack of response after initial chemoembolization for hepatocellular carcinoma: Does it predict failure of subsequent treatment? *Radiology*, 265:115-123.

UNDER REVISION/REVIEW

**Wu, Z** and Zeger SL (2016+). **baker**: Bayesian Analytic Kit for Etiology Research.

**Bmore Dream Team**: Deng D, Du Y, Ji Z, Rao K, **Wu Z**, Zhu Y, Coley RY (2016+). Predicting Survival Time for Metastatic Castration-Resistant Prostate Cancer: An Iterative Imputation Approach. *Submitted to F1000 Research (DREAM Challenges Channel)*.

IN PREPARATION

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**Wu Z** and Zeger SL (2016+). Bayesian Regression Analysis for Estimating Disease Etiology from Case-Control Data.

**Wu Z** and Zeger SL (2016+). Sparse Latent Class Regression for Multivariate Binary Data; A Bayesian Approach.

**Wu Z** and Zeger SL (2016+). Individualizing Health with Longitudinal Measurements and Feedback in Treatment Assignments

**Wu Z**, Ji HK, Leek JT, Colantuoni E (2016+). Evaluation of Peer-Review Grading in Biostatistics Courses Focused on Development of Data Analysis Skills.

Deloria-Knoll M, **Wu Z**, Fu W, Prosperi C, Zeger SL, for the PERCH Core Team (2016+). Epidemiologic considerations in applying a partial-latent class analysis for etiologic estimations in The Pneumonia Etiology Research for Child Health Study. In preparation for *Clinical Infectious Disease*.

**Wu Z**, with PERCH Study Group (2016). The Burden and Etiology of Severe and Very Severe Childhood Pneumonia in Developing Countries: A 21st Century Perspective. In preparation for *Lancet*.

Guinney J et al. - **Wu Z** in PCC DREAM Consortium (2016). A Community Challenge to Improve Prognostic Models in Patients with Metastatic Castration-Resistant Prostate Cancer. In preparation for *Nature Biotechnology*.

## SOFTWARE

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**baker:** Bayesian Analysis Kit for Etiology Research - Fitting and visualizing Bayesian nested partially-latent class models for estimating disease etiology

<https://github.com/zhenkewu/baker>

**mpcr:** Robust covariate-calibrated estimation of treatment effect in matched-pair cluster randomized trials.

<https://github.com/zhenkewu/mpcr>

## PRESENTATIONS (\*upcoming)

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### ORAL: INVITED

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2016 Bayesian Nested Partially-Latent Class Models for Dependent Binary Data; Estimating Disease Etiology.

- 9th International Conference of the ERCIM WG on Computational and Methodological Statistics. December 9-11, University of Seville, Spain.\*
- Department of Biostatistics, University of Michigan. February 25, Ann Arbor, MI.
- Department of Biostatistics, University of Massachusetts, Amherst. February 5, Amherst, MA.
- Biostatistics Research Branch, Division of Clinical Research, National Institute of Allergy and Infectious Diseases, NIH. February 1, Rockville, MD.

2016 Sparse Latent Class Regression for Multivariate Binary Data; A Bayesian Approach. Survival, Longitudinal and Multivariate Data Working Group. Department of Biostatistics, Johns Hopkins University. May 6, Baltimore, MD.

- 2015 Informative Bayes Models for Estimating Disease Etiology.
- Biostatistics Grand Rounds, Johns Hopkins Bloomberg School of Public Health. November 9, Baltimore, MD.
  - CHICAS, Medical School, Lancaster University. August 17, Lancaster, England.
  - Department of Biostatistics, Brown University. February 17, Providence, RI.
- 2014 Partially Latent Class Models (npLCM) for Case-Control Studies of Childhood Pneumonia Etiology. SLAM Working Group. December 12, Baltimore, MD.
- 2014 Partially Latent Class Models (npLCM) for Case-Control Studies of Childhood Pneumonia Etiology. Pneumonia Etiology Research for Child Health (PERCH) Executive Committee Meeting. December 2, London, England.
- 2013 Estimating Infectious Etiology from Hierarchical Dirichlet Process Perspective. Pneumonia Etiology Research for Child Health (PERCH) Executive Committee Meeting. December 2, London, England.
- 2013 Partially Latent Class Models (pLCM) for Case-Control Studies of Childhood Pneumonia Etiology. US Centers for Disease Control and Child Health Research Foundation: Aetiology of Neonatal Infection in South Asia (ANISA) Project Committee Meeting. November 10, San Diego, CA.
- 2012 Revealing and Addressing Existing Basic Inadequacies in the Use of Paired Cluster Randomized Trials. Department of Biostatistics. Johns Hopkins Biostatistics Causal Inference Working Group. December 6, Baltimore, MD.

#### ORAL: CONTRIBUTED

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- 2016 Sparse Latent Class Regression for Multivariate Binary Data; A Bayesian Approach. Joint Statistical Meetings. July 31-August 4, Chicago, IL.\*
- 2016 Bayesian Regression Analysis for Estimating Disease Etiology. Eastern North American Regional meeting of the International Biometric Society. March 6-9, Austin, TX.
- 2015 Bayesian Nested-Partially Latent Class Models for Estimating Disease Etiology. Eastern North American Regional meeting of the International Biometric Society. March 15-18, Miami, FL.
- 2014 Nested Partially Latent Class Models (npLCM) for Case-Control Studies of Childhood Pneumonia Etiology. Joint Statistical Meetings. August 7, Boston, MA.
- 2014 Estimating Treatment Effects in Cluster Randomized Trials by Calibrating Covariate Imbalances between Clusters. Eastern North American Regional meeting of the International Biometric Society. March 18, Baltimore, MD.
- 2013 Estimating Treatment Effects in Cluster Randomized Trials by Calibrating Covariate Imbalances between Clusters. Joint Statistical Meeting. August 4, Montreal, QC, Canada.

#### POSTER

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- 2016 Bayesian Nested-Partially Latent Class Models for Estimating Disease Etiology. 18th Meeting of New Researcher Conference in Statistics and Probability. July 28-30, University of Wisconsin, Madison.
  - 2015 Bayesian Nested-Partially Latent Class Models for Estimating Disease Etiology. John W. Tukey 100th Birthday Celebration Conference. Center for Statistics and Machine Learning (CSML), Princeton University. September 18, Princeton, NJ.
  - 2014 Estimating Childhood Pneumonia Episodes Attributable to Putative Pathogens from Indirect Measurements: Seasonality and Impact of HIV Infection. Delta Omega Scientific Poster Competition. February 8, Baltimore, MD.
  - 2013 Hierarchical Bayesian Model for Combining Information from Multiple Biological Samples with Measurement Errors: An Application to Children Pneumonia Etiology Study. Eastern North American Regional meeting of the International Biometric Society. March 12, Orlando, FL.

#### TEACHING (see [website](#) for materials)

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##### INSTRUCTOR

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- 2016 Fall Statistical and Computational Methods for Learning through Graphical Models (Advanced Topics in Biostatistics; BIOSTAT 830), Department of Biostatistics, University of Michigan.
- 2014 Statistical Methods for Individualizing Health (Short course taught with Scott Zeger), Mayo Clinic, Department of Health Sciences Research, November 17, Rochester, MN.

##### GUEST LECTURER

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- 2016 Data Visualization for Individualized Health via `ggplot2`. Public Health Studies, Undergraduate Seminar Course, Johns Hopkins University (taught by Yates Coley). March 1.
- 2016 Methods in Biostatistics (140.653; Master-level). Johns Hopkins University. February 11.
- 2015 A Survey of Automatic Bayesian Software and Why You Should Care. Hopkins Biostatistics Student Computing Club.
- 2015 Exploring the Posterior Distribution by Markov chain Monte Carlo. Hopkins Biostatistics Student Computing Club.
- 2014 Introduction to Empirical Processes and Semiparametric Inference. SLAM Working Group.
- 2012 Advanced Special Topics in Statistical Machine Learning, 140.840 (taught by Han Liu).

##### TEACHING ASSISTANT

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- 2014 Multilevel Statistical Models, Graduate, 140.656 (taught by Elizabeth Colantuoni).
- 2014 Analysis of Longitudinal Data, Graduate, 140.655 (taught by Elizabeth Colantuoni).

- 2013 Biostatistics in Public Health, Undergraduate, 280.346 (taught by Scott Zeger).  
 2013 Case-based Introduction to Biostatistics, [www.coursera.org](http://www.coursera.org) (taught by Scott Zeger; ~ 23,000 global enrollments).  
 2013 Bayesian Methods **I-II**, Graduate, 140.762-763 (taught by Gary Rosner).  
 2012 Biostatistics in Public Health, Undergraduate, 280.346 (taught by Scott Zeger).  
 2011-12 Advanced Probability Theory **I-II**, Graduate, 550.620 - 621 (taught by James Fill).  
 2010-11 Essentials of Probability and Statistical Inference **I-IV**, Graduate, 140.646-649 (taught by Michael Rosenblum and Charles Rohde).

## PROFESSIONAL ACTIVITIES

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|-----------------------------|---|
| Hosted Attendee             | Methods Summit. 2015 PCORI Annual Meeting: Building a Patient-Centered Research Community. Arlington VA. October 6-8, 2015  |
| Co-Organizer                | <a href="#">Hopkins Biostatistics Student Journal Club</a> , 2012-2013  |
| Committee and treasurer     | <a href="#">Chinese Public Health Forum (CPHF) at Johns Hopkins</a> , 2010-2012   |
| Volunteer                   | ENAR Spring Meeting, Washington, DC, 2012   |
| Representative and panelist | Johns Hopkins Department of Biostatistics Alumni Day, April 2016<br>Department of Biostatistics Student Recruitment Committee, 2010-2012  |
| Member                      | Hopkins inHealth (HiH) Learning Methodologies Working Group<br><a href="#">JHSPH Causal Inference Working Group</a><br><a href="#">Survival, Longitudinal, and Multilevel Modeling (SLAM) Working Group</a><br>American Association for the Advancement of Science (AAAS) Program for Excellence in Science, American Statistical Association (ASA), International Chinese Statistical Association (ICSA), International Biometric Society (ENAR), Institute of Mathematical Statistics (IMS), American Public Health Association (APHA)  |
| Consultant                  | Studio Consultation, Johns Hopkins Institute for Clinical and Transnational Research (ICTR)   |
| Reviewer                    | <b>Journals:</b> <i>Biometrics</i> , <i>Journal of Business and Economic Statistics</i> , <i>Statistics in Medicine</i> , <i>Annals of Statistics</i> , <i>Ophthalmic Epidemiology</i> , <i>Computational Statistics and Data Analysis</i> , <i>Statistical Science</i> , <i>Sankhya (The Indian Journal of Statistics)</i><br><b>Conference:</b> International Conference on Artificial Intelligence and Statistics (AISTAT)<br><b>Grants:</b> 2016 Johns Hopkins Individualized Health Initiative Request for Proposal (RFP); 2016 Methodology Research Grant, Medical Research Council, United Kingdom |

## REFERENCES

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**Scott L. Zeger, PhD**

Professor  
Department of Biostatistics  
**Director**, Hopkins *inHealth*  
Johns Hopkins University  
410-502-9054  
[sz@jhu.edu](mailto:sz@jhu.edu)

**Thomas A. Louis, PhD**

Professor  
Department of Biostatistics  
Johns Hopkins University  
410-614-7838  
[tlouis@jhu.edu](mailto:tlouis@jhu.edu)  
Associate Director for Research and Methodology  
U.S. Census Bureau  
301-763-8799  
[thomas.arthur.louis@census.gov](mailto:thomas.arthur.louis@census.gov)

**Constantine E. Frangakis, PhD**

Professor  
Department of Biostatistics  
Johns Hopkins University  
410-502-1936  
[cfrangak@jhsph.edu](mailto:cfrangak@jhsph.edu)

**Katherine L. O'Brien, MD, MPH**

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Executive Director, International Vaccine Access Center (IVAC)  
Department of International Health  
Bloomberg School of Public Health  
Johns Hopkins University  
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