

PROMOTION RECOMMENDATION

The University of Michigan
School of Public Health
Department of Biostatistics

Min Zhang, associate professor of biostatistics, with tenure, Department of Biostatistics, School of Public Health, is recommended for promotion to professor of biostatistics, with tenure, Department of Biostatistics, School of Public Health.

Academic Degrees:

Ph.D.	2008	North Carolina State University
M.S.	2004	Duke University
B.A.	2001	Peking University

Professional Record:

2015-Present	Associate Professor, Department of Biostatistics, University of Michigan
2008-2015	Assistant Professor, Department of Biostatistics, University of Michigan
2007-2008	Statistician (Intern), Duke Clinical Research Institute (DCR), Duke University
2007	Statistician (Intern), Eli Lilly and Company
2005-2007	Research Assistant, Department of Statistics, North Carolina State University
2004-2005	Teaching Assistant, Department of Statistics, North Carolina State University
2002-2004	Teaching Assistant, Department of Biology, Duke University

Summary of Evaluation:

Teaching – Since her promotion to associate professor, Professor Zhang has taught two masters levels classes and two doctoral level courses, including key theory courses. She has contributed substantially to the redevelopment of BIOS 602 Biostatistical Inference, a large required course. Her teaching evaluations since promotion are outstanding ranging from 4.4 to 4.9 on Q1 and from 4.5 to 4.9 on Q2. Professor Zhang also has a strong record of mentoring serving as chair or co-chair on four doctoral dissertation committees in biostatistics, supervising six biostatistics graduate student research assistants, and serving on the dissertation committee of an additional 12 students (including five biostatistics and one epidemiology student). She has seven publications and two manuscripts under review with student co-authors.

Scholarship – An internationally recognized researcher in clinical trials, Professor Zhang has proposed effective methods for covariate adjustment, adaptive designs and optimal dynamic treatment regimes. Her methodological research addresses critical issues in causal inference for observational data, missing data, mediation analysis and genetic association and gene-environment interaction studies. She has a strong collaborative research program in cardiovascular and kidney disease. Her work at the University of Michigan Kidney Epidemiology and Cost Center (UM-KECC) is impactful and highly relevant for handling complex data structures in clinical trials and observational studies. Currently, she is the director of the data analysis core for a project developing precision medicine for solid organ transplantation that has been awarded a highly competitive and prestigious Taubman Institute Innovation Project Award at Michigan Medicine. Professor Zhang has made major contributions to finding efficient semiparametric methods for causal inference. A key strength and innovation

in Professor Zhang's methodological research is using the theory of robust inference, inverse probability weighting, generalized estimating equations and M-estimation to propose inference in situations with complex data. She has proposed adjustment of covariates in survival analysis that are both robust and efficient. She has also proposed a new classification framework (C-learning) that makes use of a doubly robust augmented inverse probability estimator to improve both efficiency and robustness in a sequential manner.

A strong collaborative researcher, Professor Zhang is well funded, serving currently as a co-investigator on six R01's and one R21 from the National Institutes of Health (NIH). She is also a co-investigator on a National Science Foundation (NSF) grant, and serves as the director of the data analysis core for a Taubman Institute Innovation Project. In 2017, she completed an NSF grant where she served as a co-principal investigator. Professor Zhang has a total of 69 publications with 35 published since her promotion to associate professor at the University of Michigan. Of those 35 she was first or senior author on five publications. Her work has been published in high impact and prestigious journals in both statistics and medicine, including the *Journal of the American Statistical Association*, *Biometrics*, *Biostatistics*, *Statistics in Medicine*, *Lifetime Data Analysis*, *Annals of Applied Statistics*, *JAMA*, and *JAMA Surgery*. She has presented several invited talks on her methodologic work during her time in rank.

Recent and Significant Publications:

- Zhang, M. (2015). Robust methods to improve efficiency and reduce bias due to chance imbalance in estimating survival curves in randomized clinical trials. *Lifetime Data Analysis*, 21(1),119-137.
- He, Z., Zhang, M., Lee, S., Smith, J.A., Guo, X., Palmas, W., Kardia, S.L.R., Roux, A.V.D., Mukherjee, B. (2015). Set-based tests for genetic association in longitudinal studies. *Biometrics*, 71(3):606-15.
- He, Z., Zhang, M., Lee, S., Smith, J.A., Kardia, S.L.R., Diez Roux, A.V., Mukherjee, B. (2017). Set-based tests for gene-environment interaction in longitudinal studies. *Journal of the American Statistical Association*, 112(519):966-978.
- Zhang, B. and Zhang, M. (2018). C-learning: a new classification framework to estimate optimal dynamic treatment regimes. *Biometrics*, 74(3):891-899.
- Zhang, B. and Zhang, M. (2018). Variable selection for estimating the optimal treatment regimes in the presence of a large number of covariates. *Annals of Applied Statistics*, 12(4), 2335-2358.

Service – Professor Zhang has been serving the department diligently in various capacities including serving as the chair of the department seminar committee and serving as a member of the candidacy committee, the curriculum committee, the admission committee, and the Rackham pre-doctoral fellowship committee. She has served as a reviewer for the Michigan Institute for Clinical and Health Research (MICHR) Pilot Grant Program: Promoting Progress in Statistics Award. In addition to her strong record of departmental service, Professor Zhang is an associate editor for the *International Journal of Biostatistics* and has served as a grant reviewer for the NIH and the NSF. She has also served as a session chair for conferences of the International Biometric Society (ENAR) and the Joint Statistical Meetings and regularly serves as a reviewer for statistical and epidemiologic journals. She currently serves on a Data Safety and Monitoring

Board for a University of Michigan clinical trial. She has regularly presented invited talks to the broader biostatistics community.

External Reviewers:

Reviewer A: “Some of the issues solved or suggested by Dr. Zhang and her team may serve exemplary standard practice in the analysis of clinical trials data, including ‘principled but flexible method’ for covariate adjustment, and adaptive design with dynamic treatment regimes, among others.”

Reviewer B: “Dr. Zhang and her research team members developed several methodologies for estimating the optimal treatment regime that can be used to make informed treatment decision rules. Among them, their proposed C-learning algorithm (Biometrics, 2018) is a powerful and flexible tool to directly optimize decision rules and outperforms and shows advantages of both the traditional outcome regression-based methods (Q-and A-learning) and the more recent direct optimization methods. The potential impact of their methods in precision medicine is very high.”

Reviewer C: “Dr. Zhang’s statistical methodological contribution is mainly related to semi-parametric efficiency and robustness theory and its application in various statistical contexts ... Systematic research along this line of research has established her reputation as an internationally recognized leading expert in this area. ... Dr. Zhang is an outstanding biostatistician, a widely recognized expert in semi-parametric efficiency and robustness theory, and excellent teacher.”

Reviewer D: “The hallmarks of Dr. Zhang’s work in causal inference are addressing important scientific problems by developing semiparametric approaches that are efficient but require less assumptions than previous approaches to the problems. ... She is among the top biostatisticians in her peer group with an outstanding record of scientifically motivated methodological research and a strong record of collaboration.”

Reviewer E: “Overall, Dr. Zhang’s published work is both impressive and of the highest quality in terms of innovation, technical rigor and potential for impact.”

Reviewer F: “Dr. Zhang has contributed significantly to the development of optimal dynamic treatment regimes. She recently proposed a novel general framework for obtaining an optimal treatment regime from a classification framework in the multiple decision point setting and proposed a powerful and flexible C-learning algorithm to learn the optimal dynamic treatment regimes by utilizing doubly robust augmented inverse probability weighted estimator. ... I believe Dr. Zhang’s wide body of research, encompassing important biostatistical paradigms, has significantly advanced our biostatistics discipline. I would rate her research as outstanding.”

Reviewer G: “She has made broad and innovative contributions to statistical methodology and theory in several important areas in biostatistics: causal inference, missing/censored data analysis, optimal treatment regime estimation, testing for genetic association and gene-environment interactions, among others. I am particularly interested in and impressed by her

recent work on optimal treatment regime estimation for precision medicine. This is an important topic and has drawn a lot of attention in recent years.”

Summary of Recommendation: Professor Zhang is an outstanding biostatistician and a widely recognized expert in semi-parametric efficiency and robustness theory, dynamic treatment regimes and causal inference. She is an excellent teacher and mentor. Her passion for methodological research, her active role in promoting cutting-edge statistical methods through her collaborations in solid organ transplantation, kidney disease and cardiac surgery clearly place her as a leader in the field. Her contribution to graduate student teaching, training and mentoring has been outstanding. She has been a proactive and engaged member of the professional community. It is with the support of the School of Public Health Executive Committee that we recommend Min Zhang for promotion to professor of biostatistics, with tenure, Department of Biostatistics, School of Public Health.



F. DuBois Bowman, Ph.D.
Dean, School of Public Health

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