

# Miao Cai, M.S.

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## Areas of interests

Bayesian inference, Clinical epidemiology, Causal inference, Health economics

## Education

2017 – 2020	Ph.D. in Biostatistics, Saint Louis University, the United States
2014 – 2017	M.S. in Hospital Management, Huazhong University of Science and Technology, China
2010 – 2014	B.S. in Health Management, Huazhong University of Science and Technology, China

## Working experience

2019 – 2020	Biostatistician at the Clinical Epidemiology Center, <i>Department of Veteran Affairs</i> , Saint Louis, USA
2017 – 2019	Graduate Research Assistant, <i>Saint Louis University</i> , USA
2016	Data analyst at <i>Diao Long Medical Data Co. Ltd</i> , Wuhan, Hubei, China
2014	Program coordinator at <i>Health and Family Planning Commission</i> , Wuhan, Hubei, China

## Programming languages

R	Everyday R user: Rmarkdown, tidyverse, data.table, shiny, brms...
SAS	Data management and statistical modeling for over 2 billion national VA patient datasets
Python	Experienced Python user: pandas, pyspark, dask, h2o, tensorflow
Stan & JAGS	Bayesian inference with Gibbs sampler and Hamiltonian Monte Carlo
SQL	Data management with over 2 billion patient data at the VA
ArcGIS	Thematic maps, geoprocessing, spatial interpolation
GeoDA	Spatial statistics: Moran's I, LISA, spatial lag/error models
STATA	Econometric analysis
L <sup>A</sup> T <sub>E</sub> X	Aesthetically beautiful documents with L <sup>A</sup> T <sub>E</sub> X

## Participated Projects

- 2019 – 2021 *Department of Veteran Affairs's Health Services Research and Development Service, USA* Cause-specific mortality among users of Proton Pump Inhibitors. PI: Dr. Ziyad Al-Aly at Clinical Epidemiology Center, Department of Veteran Affairs, Saint Louis, USA.
- 2017 – 2019 *National Science Foundation, USA* GOALI/Collaborative Research: Human Maintenance - A Prognostics Framework to Model Changes in Drivers' Safety Performance and Optimize Dispatching Policies. PI: Fadel Megaged at Auburn University & Steven E. Rigdon (PhD mentor) at Saint Louis University.
- 2015 – 2018 *National Natural Science Foundation of China* Performance Evaluation and Influencing Factors for the Closed Type Medical Association Based on Structural Equation. PI: Hongbing Tao, PhD.
- 2012 – 2015 *National Natural Science Foundation of China* Construction of Evaluation Model and Managing Pathways of Inpatient Hospital Resources Utilization in Urban General Hospitals. PI: Hongbing Tao, PhD.
- 2013 – 2014 *Ministry of Health, China* Research on the function orientation and scale of public hospitals in China. PI: Hongbing Tao, PhD

## Honors & Awards

- 2020 *The Alpha Delta Chapter member* of The Delta Omega Honorary Society in Public Health
- 2018 *PhD student funding* sponsored by the China Scholarship Council, first year fully funded by a NSF grant, 2nd and 3rd year partial funded by Saint Louis University and China Scholarship Council
- 2017 *Excellent graduate student* by Huazhong University of Science and Technology
- 2016 *Joint master student* sponsored by China Scholarship Council
- 2014 *Excellent undergraduate student* by Huazhong University of Science and Technology
- 2014 *Best Undergraduate Dissertation Paper* (Silver prize) by the Ministry of Education, Hubei
- 2013 *National Scholarship* by Huazhong University of Science and Technology
- 2012 *National Lizhi Scholarship* by Huazhong University of Science and Technology
- 2012 *Hong Kong Ethics Scholarship* by Hong Kong Ethic Association
- 2011 *National Lizhi Scholarship* by Huazhong University of Science and Technology

## Press coverage

- 2019 Cincinnati Public Radio: [Miami University Is On The Road To Safer Driving](#),
- 2019 Miami University, News and Communications: [Miami researchers study factors affecting truck driver alertness](#),
- 2019 Saint Louis University, College for Public Health and Social Justice, college connect: [SLU Study Finds Vertically Integrated Hospital Care Improves Cancer Patient Outcomes](#).

## Professional Memberships

- 2019 – American Statistical Association (ASA): Member,
- 2017 – American Public Health Association (APHA): Member,
- 2017 – The Chinese Economists Society (CES): Member,
- 2017 – China Health Policy and Management Society (CHPAMS): Member.

## Service to the profession

Referees for:

- 2019 – International Journal of Integrated Care,
- 2019 – JAMIA (Journal of the American Medical Informatics Association) Open,
- 2019 – Clinical Epidemiology,
- 2019 – International Journal of Geriatric Psychiatry,

2018 – BMJ (British Medical Journal) Open,  
2017 – International Journal for Equity in Health.

## Publications & talks

### INTERNATIONAL PEER-REVIEWED JOURNAL ARTICLES

- 2020 Yan Xie, Benjamin Bowe, Yan Yan, Miao Cai, Ziyad Al-Aly. “County-level Contextual Characteristics and Disparities in Life Expectancy”, *Mayo Clinic Proceedings*. Forthcoming.
- 2020 Benjamin Bowe, Yan Xie, Yan Yan, Miao Cai, Ziyad Al-Aly. “Integrative Non-linear Exposure-Response Model for Estimation of Burden of Chronic Kidney Disease Attributable to Ambient Fine Particulate Matter Air Pollution”, *BMJ Global Health*. DOI: [10.1136/bmjgh-2019-002063](https://doi.org/10.1136/bmjgh-2019-002063).
- 2020 Eric Adjei Boakye, Nosayaba Osazuwa-Peters, Betty Chen, Miao Cai, Betelihem Tobo, Sai Challapalli, Paula Buchanan, Jay Piccirillo. “Multilevel correlates of and development of a nomogram for in-hospital mortality among hospitalized head and neck cancer patients”, *JAMA Otolaryngology-Head & Neck Surgery*. DOI: [10.1001/jamaoto.2020.0132](https://doi.org/10.1001/jamaoto.2020.0132).
- 2020 Miao Cai, Echu Liu, Xiaojun Lin, Ruihua Zhang, Steven E. Rigdon, Zhengmin Qian, Rhonda Belue, Jen-jen Chang. “Validating the in-hospital mortality predictive performance of Charlson and Elixhauser comorbidity indices among a Chinese population”, *Clinical Epidemiology*. DOI: [10.2147/CLEP.S241610](https://doi.org/10.2147/CLEP.S241610).
- 2020 Amir Mehdizadeh, Miao Cai, Qiong Hu, Mohammad Ali Alamdar Yazdi, Nasrin Mohabbati Kalejahi, Aleksandr Vinel, Steven E. Rigdon, Karen C. Davis, Fadel M. Megahed\* (2020). “A Review of Data Analytic Applications in Road Traffic Safety. Part 1: Descriptive and Predictive Modeling”, *Sensors*. DOI: [10.3390/s20041107](https://doi.org/10.3390/s20041107), (co-first author).
- 2020 Qiong Hu, Miao Cai, Nasrin Mohabbati Kalejahi, Amir Mehdizadeh, Mohammad Ali Alamdar Yazdi, Aleksandr Vinel, Steven E. Rigdon, Karen C. Davis, Fadel M. Megahed (2020). “A Review of Data Analytic Applications in Road Traffic Safety. Part 2: Prescriptive Modeling”, *Sensors*. DOI: [10.3390/s20041096](https://doi.org/10.3390/s20041096).
- 2018 Xiaojun Lin, Miao Cai, Qiang Fu, et al. (2018), “Does Hospital Competition Harm Inpatient Quality? Empirical Evidence from Shanxi, China”, *International Journal of Environmental Research and Public Health*. DOI: [10.3390/ijerph15102283](https://doi.org/10.3390/ijerph15102283)
- 2018 Miao Cai, Echu Liu, Wei Li\*, et al. (2018), “Rural Versus Urban Patients: Benchmarking the Outcomes of Patients with Acute Myocardial Infarction in Shanxi, China from 2013 to 2017”, *International Journal of Environmental Research and Public Health*. DOI: [10.3390/ijerph15091930](https://doi.org/10.3390/ijerph15091930)
- 2018 Miao Cai, Echu Liu, Hongbing Tao\*, et al. (2018), “Does A Medical Consortium Influence Health Outcomes of Hospitalized Cancer Patients? An Integrated Care Model in Shanxi, China”, *International Journal of Integrated Care*. DOI: [10.5334/ijic.3588](https://doi.org/10.5334/ijic.3588)
- 2018 Nan Zhang, Xiang Hu, Qiao Zhang, Peng Bai, Miao Cai, et al. (2018), “Non-high-density lipoprotein cholesterol to high-density lipoprotein cholesterol ratio is an independent risk factor for diabetes mellitus: results from a population-based cohort”, *Journal of Diabetes*. DOI: [10.1111/1753-0407.12650](https://doi.org/10.1111/1753-0407.12650)
- 2017 Miao Cai, Echu Liu, Hongbing Tao\*, et al. (2017), “Does Level of Hospital Matter? A Study of Mortality of Acute Myocardial Infarction Patients in Shanxi, China”. *American Journal of Medical Quality*. DOI: [10.1177/1062860617708608](https://doi.org/10.1177/1062860617708608)
- 2017 Xiaojun Lin, Miao Cai, Hongbing Tao\* (2017), “Insurance status, inhospital mortality and length of stay in hospitalised patients in Shanxi, China: a cross-sectional study”, *BMJ Open*. DOI: [bmjopen-2017-015884](https://doi.org/10.1136/bmjopen-2017-015884)
- 2017 Manli Wang, Haiqing Fang, Hongbing Tao\*, Zhaohui Cheng, Xiaojun Lin, Miao Cai, et al. (2017), “Bootstrapping data envelopment analysis of efficiency and productivity of county public hospitals in Eastern, Central, and Western China after the public hospital reform”, *Journal of Huazhong University of Science and Technology*. DOI: [10.1007/s11596-017-1789-6](https://doi.org/10.1007/s11596-017-1789-6)

- 2016 Zhaohui Cheng, Miao Cai, Hongbing Tao\*, et al. (2016), “The efficiency and productivity measurement of rural township hospitals in China: a bootstrapping data envelopment analysis”, *BMJ Open*. DOI: [10.1136/bmjopen-2016-011911](https://doi.org/10.1136/bmjopen-2016-011911)
- 2016 Xiaojun Lin, Hongbing Tao\*, Miao Cai, et al. (2016), “A Systematic Review and Meta-analysis of the Relationship Between Hospital Volume and Outcome for Percutaneous Coronary Intervention”, *Medicine*. DOI: [10.1097/MD.0000000000002687](https://doi.org/10.1097/MD.0000000000002687)
- 2015 Qin Shu, Miao Cai, Hongbing Tao\*, et al. (2015), “What does a Hospital Survey on Patient Safety reveal about patient safety culture of surgical units compared with that of other units?”, *Medicine*. DOI: [10.1097/MD.0000000000001074](https://doi.org/10.1097/MD.0000000000001074)
- 2015 Zhaohui Cheng, Hongbing Tao\*, Miao Cai, et al. (2015), “Technical efficiency and productivity of Chinese county hospitals: an exploratory study in Henan province, China”, *BMJ Open*. DOI: [10.1136/bmjopen-2014-007267](https://doi.org/10.1136/bmjopen-2014-007267)

#### BOOK CHAPTERS

- 2019 Fadel M. Megahed, L. Allison Jones-Farmer, Miao Cai, Steven E. Rigdon, Manar Mohamed. (December, 2019), “A Statistical (Process Monitoring) Perspective on Human Performance Modeling in the Age of Cyber-Physical Systems”. In *Frontiers in Statistical Quality Control 13* (pp. 21-53). Springer, Cham.

#### CONFERENCE ABSTRACTS

- 2020 Miao Cai, Kenton Johnston, Xiaojun Lin\*, et al. (2020), “Does the medical consortium reform improve hospital efficiency? Evidence from secondary general hospitals in Shanxi, China, 2013-2017”. *International Conference on Health Policy Statistics* by American Statistical Association in San Diego, California, 2020. [link](#)
- 2019 Miao Cai\*, Eric Adjei Boakye, Ziqi Peng, et al. (2019), “Disparity of The Disparities: A Comparison of Rural-Urban Disparity Regarding In-Hospital Mortalities Among Acute Myocardial Infarction Patients, An Observational Study Between China and The United States, 2013-2015”. *International Society for Pharmacoeconomics and Outcomes Research (ISPOR) 2019*.
- 2016 Xiaojun Lin, Hongbing Tao\*, Miao Cai, et al. (2016), “Health insurance and quality and efficiency of medical care for patients with acute myocardial infarction in tertiary hospitals in Shanxi, China: a retrospective study”. *The Lancet-CAMS Health Summit*. DOI: [10.1016/S0140-6736\(16\)31997-3](https://doi.org/10.1016/S0140-6736(16)31997-3)
- 2016 Manli Wang, Hongbing Tao\*, Haiqing Fang, Zhaohui Cheng, Miao Cai, et al. (2016), “Patient safety culture in surgical departments versus other departments in county hospitals of Hubei province, China: a cross-sectional survey”. *The Lancet-CAMS Health Summit*. DOI: [10.1016/S0140-6736\(16\)31998-5](https://doi.org/10.1016/S0140-6736(16)31998-5)
- 2015 Zhaohui Cheng, Hongbing Tao\*, Miao Cai, et al. (2015), “Using a two-stage data envelopment analysis to estimate the efficiency of county hospitals in China: A panel data study”. *The Lancet-CAMS Health Summit*. DOI: [10.1016/S0140-6736\(15\)00645-5](https://doi.org/10.1016/S0140-6736(15)00645-5)

#### CONFERENCE PRESENTATIONS

- 2019 Xiaojun Lin, Kenton Johnston, Miao Cai. (March 2019), “Does the medical consortium reform improve hospital efficiency? Evidence from secondary general hospitals in Shanxi, China, 2013-2017”, *The 1st Health Economics and Policy Forum* at Peking University, Beijing, China
- 2018 Miao Cai, Echu Liu, Hongbing Tao\*, et al. (May, 2018), “Does A Medical Consortium Influence Health Outcomes of Hospitalized Cancer Patients: An Integrated Care Model in Shanxi, China”, *2018 Biennial Conference “Advances in Health Policy and Healthcare: The Road Ahead”* by China Health Policy and Management Society (CHPAMS) at Yale University, New Haven, Connecticut, USA

#### CHINESE PEER-REVIEWED JOURNAL ARTICLES

- 2019 Chen, M., Cai, M., Huang, A., Shen, M., Wu, Q., Zhang, Z., Le, H.. "Analysis of Influencing Factors of Hospitalization Expenditure of Patients with Serious Disease Based on K-means Clustering and Support Vector Machine". *Chinese Hospital Management*. 2019, 39(5): 45-47. [Link](#)
- 2017 Cai, M., Tao, H., Liu, E., et al. "The Influence of Market Competition on Hospital Technical Efficiencies: Empirical Evidence from Henan and Jiangsu Provinces". *Chinese Hospital Management*. 2017, 37(6): 22-24. [Link](#)
- 2017 L. Delgado, H. Tao, Cai, M., Ashleigh Oguagha. "Adoption and implementation of multidisciplinary cancer teams in China: Health professionals' views". *Chinese Journal of Medical Management Sciences*. 2017, 7(3): 41-46. [Link](#)
- 2017 He, J., Tao, H., Lin, X., Xiao, T., Cai, M.. "A Comparative Study on Medical Quality among Hospitals of Different Ownerships". *Chinese Health Quality Management*. 2017, 24(4): 18 - 20. [Link](#)
- 2017 Xia, S., Tao, H., Du, L., Cai, M., Lin, X., Lin, H. "Problems and Countermeasures in Quality and Safety of Mobile Health Service in the Context of 'Internet Plus'". *Chinese Health Quality Management*. 2017, 24(3): 82 - 85. [Link](#)
- 2016 Lin, H., Tao, H., Cheng, Z., Lin, X., Cai, M.. "Medical resource utilization efficiency of county-level Traditional Chinese medicine hospitals and their influencing factors in Henan". *Chinese Journal of Hospital Administration*. 2016, 32(2): 117 - 120. [Link](#)
- 2016 Zuo, Y., Tao, H., Cheng, Z. Lin, H., Cai, M.. "Analysis of Efficiency Changes of Private Hospitals in Henan Province Based on Malmquist Index". *Chinese Hospital Management*. 2016; 36(6):35-37. [Link](#)
- 2016 Zhang, P., Tao, H., Lin, X., Cai, M.. "Status Quos and Quality and Safety Problems of the Medical associations in China and the Countermeasures". *Chinese Hospital Management*. 2016, 36(11): 52-54. [Link](#)
- 2016 Lin, X., Tao, H., Zhang, S., Cheng, Z., Cai, M., Liu, H.. "A Visualization Analysis of the Evolution of Hospital Efficiency". *Chinese Hospital Management*. 2016, 36(4): 27-29. [Link](#)
- 2015 Cai, M., Tao, H.. "Status and Countermeasures of Adverse Events Report in Intensive Care Units". *Chinese Health Quality Management*. 2015, 22(2): 11-14. [Link](#)
- 2015 Lin, H., Tao, H., Cheng, Z., Cai, M.. "The efficiency evaluation of obstetrical departments of hospitals in Wuhan and the factors affecting their efficiency". *Chinese Journal of Medical Management Sciences*. 2015, 5(5): 9 - 13. [Link](#)
- 2013 Cai, M., Tao, H.. "Adverse events reporting status in internal medicine specialties and surgery specialties and improving strategies". *Chinese Hospitals*. 2013, 17(8): 31 - 33. [Link](#)
- 2013 Cai, M., Xu, X., Cai, H., et al. "Analysis on Different Approaches to Identifying Medical Adverse Events and Intervention Measures". *Medicine and Society*. 2013, 26(9): 20 - 22. [Link](#)
- 2013 Cai, M., Tao, H., Lin, X., et al. "Factors Impeding Reporting of Medical Adverse Events among Doctors and Nurses". *Chinese Health Quality Management*. 2013, 20(5): 41 - 43. [Link](#)

#### SUBMITTED PAPERS

- 2020 Miao Cai, Mohammad Ali Alamdar Yazdi, Qiong Hu, Amir Mehdizadeh, Aleksandr Vinel, Karen C. Davis, Fadel Megahed, Steven E. Rigdon\*. "The association between crashes and safety-critical events: synthesized evidence from crash reports and naturalistic driving data among commercial truck drivers", first round revision at *Transportation Research Part C: Emerging Technologies*.
- 2020 Xiaojun Lin, Jeremy C. Green, Hong Xian, Miao Cai, Julia Skrzypek, Hongbing Tao\*. "Holiday and weekend effects on mortality for acute myocardial infarction in Shanxi, China from 2014 to 2017", first round revision at *International Journal of Public Health*.
- 2019 Cai, M., Xie, Y., Bowe, B., Yan, Y., Al-Aly, Z. "Trends in Rates of Lower Extremity Amputation and

Contributing Factors Among Veterans in the United States, 2008-2018”, submitted to *JAMA Internal Medicine*. (SCI Q1, IF: 20.768, rank: 6/160)

2020 Miao Cai, Rong Yang, Shaoping Yang, Tongzhang Zheng, Guanghui Dong, Hualiang Lin, Steven E. Rigdon, Hong Xian, Leslie J. Hinyard, Pamela K. Xaverius, Thomas E. Burroughs, Echu Liu, Daire R. Jansson, Bin Zhang\*, Zhengmin Qian\*. “Association between maternal physical exercise and the risk of preterm birth: A case-control study in Wuhan, China”, submitted to *Annals of Epidemiology*.

2020 Miao Cai, Mohammad Ali Alamdar Yazdi, Qiong Hu, Amir Mehdizadeh, Aleksandr Vinel, Karen C. Davis, Fadel Megahed, Steven E. Rigdon\*. “Modeling Recurrent Safety-critical Events among Commercial Truck Drivers: A Bayesian Hierarchical Jump Power Law Process”, submitted to *Journal of the American Statistical Association*.

## R Package development

2019 R Package: *NDS*. “An R package for manipulating naturalistic driving datasets”.  
Source: <https://github.com/caimiao0714/NDS>

2017 R Package: *MiaoCom*. “A R package for calculating comorbidity indexes (i.e. Charlson Comorbidity Index, Elixhauser Comorbidity Index, and C3 Index) for epidemiologists”.  
Source: <https://github.com/caimiao0714/MiaoCom>

## Website development and maintenance

2019 Supplementary materials for “Bridging the Gap between Transportation Safety Research and its Incorporation in Optimization Models: a Detailed Review and Perspective”, a manuscript submitted to *Transportation Research Part C: Emerging Technologies*.  
Source: <https://caimiao0714.github.io/TrafficSafetyReviewRmarkdown/>