Miao Cai, M.S.

Department of Epidemiology and Biostatistics
College for Public Health and Social Justice
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Find me on: Google Scholar, GitHub, ResearchGate, LinkedIn, ORCID, Scopus

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Impact

- **Research projects**: Participation as statistician in multiple NIH R01, VA HSR&D, NSF (US and China), Ministry of Health China funded projects. Sponsoring amount > 2 Million USD + 2 Million RMB.
- **Publications**: 17 SCI/SSCI indexed peer-reviewed articles (5 first author), 14 peer-reviewed Chinese articles (5 first author), 1 book chapter.
- **Academic impact**: Total citations: 177; H-index: 7; I10-index: 5 (as of August 3, 2020).

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

Professional experience

2019 – 2020	Biostatistician at the Clinical Epidemiology Center, *Department of Veteran Affairs*, St. Louis, USA
2017 – 2019	Graduate Research Assistant, *Saint Louis University*, USA
2016	Data analyst at *Diao Long Medical Data Co. Ltd*, Wuhan, Hubei, China
2014	Program coordinator at *Health and Family Planning Commission of 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`
SQL	Data management with over 2 billion patient data at the VA
Stan & JAGS	Bayesian inference with Gibbs sampler and Hamiltonian Monte Carlo
INLA	Bayesian spatial modeling using Integrated Nested Laplace Approximation
GeoDA	Spatial statistics: Moran's I, LISA, spatial lag/error models
LaTeX	Aesthetically beautiful documents with LaTeX

Honors & Awards

2020   *The Alpha Delta Chapter member* of The Delta Omega Honorary Society in Public Health

2018   *PhD student funding*, first year fulled 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.

Participated Projects

1. *National Institute of Health, R01, USA* "Characterize the Joint Effect of $PM_2.5$ and its Components on Risk of Health Outcomes". PI: Ziyad Al-Aly. 2021 – 2025.

2. *Veteran Affair's Health Services Research and Development Service Fund, USA* "Comparative Effectiveness and Safety of Newer and Older Antihyperglycemic Medications". PI: Ziyad Al-Aly. 2021 – 2024.

3. *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 and Steven E. Rigdon (PhD mentor) at Saint Louis University. 2017 – 2020.

4. *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. 2015 – 2018

5. *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. 2012 – 2015

6. *Ministry of Health, China* "Research on the function orientation and scale of public hospitals in China". PI: Hongbing Tao, PhD. 2013 – 2014.

Publications and talks

International peer-reviewed Journal articles (N = 17, first/corresponding author = 5)

2020

1. **Cai, M.**, Liu, E., Zhang, R.*, Lin, X., Rigdon, S.E., Qian, Z., Belue, R., Chang, J.J. (2020) "Comparing the Performance of Charlson and Elixhauser Comorbidity Indices to Predict In-Hospital Mortality Among a Chinese Population", *Clinical Epidemiology*. DOI: 10.2147/CLEP.S241610.

2. Mehdizadeh, A., **Cai, M.**, Hu, Q., Alamdar Yazdi, M.A., Mohabbati-Kalejahi, N., Vinel, A., Rigdon, S.E., Davis, K.C. and Megahed, F.M.* (2020) "A Review of Data Analytic Applications in Road Traffic Safety. Part 1: Descriptive and Predictive Modeling", *Sensors*. DOI: 10.3390/s20041107, (co-first author).

3. Hu, Q., **Cai, M.**, Mohabbati-Kalejahi, N., Mehdizadeh, A., Alamdar Yazdi, M.A., Vinel, A., Rigdon, S.E., Davis, K.C. and Megahed, F.M.* (2020) "A Review of Data Analytic Applications in Road Traffic Safety. Part 2: Prescriptive Modeling", *Sensors*. DOI: 10.3390/s20041096.

4. Lin, X., Green, J.C., Xian, H., **Cai, M.**, Skrzypek, J., Tao, H.* "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*. DOI: 10.1007/s00038-020-01443-x.

5. Xie, Y., Bowe, B., Yan, Y., **Cai, M.**, Al-Aly, Z.* (2020) "County-level Contextual Characteristics and Disparities in Life Expectancy", *Mayo Clinic Proceedings*. Forthcoming.

6. Bowe, B., Artimovich, E., Xie, Y., Yan, Y., **Cai, M.**, Al-Aly, Z.* (2020) "The global and national burden of chronic kidney disease attributable to ambient fine particulate matter air pollution: a modelling study", *BMJ Global Health*. DOI: 10.1136/bmjgh-2019-002063.

7. Boakye, E.A., Osazuwa-Peters, N., Chen, B., **Cai, M.**, Tobo, B.B., Challapalli, S.D., Buchanan, P. and Piccirillo, J.F.* (2020) "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.

2018

8. **Cai, M.**, Liu, E. and Li, W. (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

9. **Cai, M.**, Liu, E., Tao, H., Qian, Z., Fu, Q.J., Lin, X., Wang, M., Xu, C. and Ni, Z. (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

10. Lin, X., **Cai, M.**, Fu, Q., He, K., Jiang, T., Lu, W., Ni, Z. and Tao, H. (2018), "Does Hospital Competition Harm Inpatient Quality? Empirical Evidence from Shanxi, China", *International Journal of Environmental Research and Public Health*. DOI: 10.3390/ijerph15102283

11. Zhang, N., Hu, X., Zhang, Q., Bai, P., **Cai, M.**, Zeng, T.S., Zhang, J.Y., Tian, S.H., Min, J., Huang, H.T. and Zheng, J. (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

2017

12. **Cai, M.**, Liu, E., Tao, H., Qian, Z., Lin, X. and Cheng, Z. (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

13. Lin, X., **Cai, M.**, Tao, H., Liu, E., Cheng, Z., Xu, C., Wang, M., Xia, S. and Jiang, T. (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

14. Wang, M.L., Fang, H.Q., Tao, H.B., Cheng, Z.H., Lin, X.J., **Cai, M.**, Xu, C. and Jiang, S. (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

2016   15. Cheng, Z., **Cai, M.**, Tao, H., He, Z., Lin, X., Lin, H. and Zuo, Y. (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

16. Lin, X., Tao, H., **Cai, M.**, Liao, A., Cheng, Z. and Lin, H. (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

2015   17. Shu, Q., **Cai, M.**, Tao, H.B., Cheng, Z.H., Chen, J., Hu, Y.H. and Li, G. (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

18. Cheng, Z., Tao, H., **Cai, M.**, Lin, H., Lin, X., Shu, Q. and Zhang, R.N. (2015), "Technical efficiency and productivity of Chinese county hospitals: an exploratory study in Henan province, China", *BMJ Open*. DOI: 10.1136/bmjopen-2014-007267

Book chapters (N = 1)

2019   1. 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.

Chinese peer-reviewed journal articles (N = 14, first/corresponding author = 5)

2019   1. 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   2. **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

3. 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

4. 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

5. 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   6. 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

7. 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

8. 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

9. 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

2016 10. **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 11. 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 12. **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

13. **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

14. **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

Conference abstracts (N = 5, first/corresponding author = 2)

2020 1. **Cai, M.**, Johnston, K., Lin, X.* (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 2. **Cai, M.***, Boakye E.A., Peng, Z. (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 3. Lin, X.J., Tao, H.B., **Cai, M.**, Cheng, Z.H., Wang, M.L., Xu, C., Lin, H.F. and Jin, L. (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

4. Wang, M., Tao, H., Fang, H., Cheng, Z., **Cai, M.**, Lin, X. and Xu, C. (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

2015 5. Cheng, Z.H., Tao, H.B., Cai, M., Lin, H.F., Lin, X.J., Shu, Q. and Zhang, R.N. (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

Conference presentations (N = 2)

2020 1. Rigdon, S.E., **Cai, M.**, Xian, H., Alamdar Yazdi, M., Megahed, F., Davis, K., Vinel, A., Mehdizadeh, A., Hu, Q. (July 2020). "Factors Affecting Transportation Safety: Results of a Large Naturalistic Driving Study", *Joint Statistical Meeting 2020* by American Statistical Association

2019 2. Lin, X., Johnston, K., **Cai, M.** (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.

3. **Cai, M.**, Liu, E., Tao, H., Qian, Z., Fu, Q.J., Lin, X., Wang, M., Xu, C. and Ni, Z. (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.

Submitted papers

1. **Cai, M.**, Alamdar Yazdi, M.A., Hu, Q., Mehdizadeh, A., Vinel, A., Davis, K.C. and Megahed, F.M., Xian, H., Rigdon, S.E.* "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*.

2. **Cai, M.**, Hu, Q., Mehdizadeh, A., Alamdar Yazdi, M.A., Vinel, A., Davis, K., Megahed, F., Xian, H., Rigdon, S.E.* "Modeling safety-critical events using trucking naturalistic driving data: A driver-centric hierarchical framework for data analyses", submitted to *Analytic Methods in Accident Research*.

3. **Cai, M.**, Mehdizadeh, A., Hu, Q., Alamdar Yazdi, M.A., Vinel, A., Davis, K.C. and Megahed, F.M., Xian, H., Rigdon, S.E.* "Hierarchical Point Process Models for Recurring Safety Critical Events Involving Commercial Truck Drivers: A Reliability Framework for Human Performance Modeling", submitted to *Journal of the American Statistical Association*.

4. **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 Network Open*.

5. **Cai, M.**, Yang, R., Yang, S., Zheng, T., Dong, G., Lin, H., Rigdon, S.E., Xian, H., Hinyard, L.J., Xaverius, P.K., Burroughs, T.E., Liu, E., Jansson, D.R., Zhang, B.*, Qian, Z.* "Association between maternal physical exercise and the risk of preterm birth: A case-control study in Wuhan, China", submitted to *Annals of Epidemiology*.

6. Bowe, B., **Cai, M.**, Xie, Y., Gibson, A., Maddukuri, G., Al-Aly, Z.* "Acute Kidney Injury in a National Cohort of Hospitalized United States Veterans with COVID-19, submitted to *Clinical Journal of the American Society of Nephrology*. (SCI Q1, IF: 6.243, rank: 7/80)

7. Xie, Y., Bowe, B., **Cai, M.**, Gibson, A., Maddukuri, G., Al-Aly, Z.* "Comparative Evaluation of Clinical Manifestations and Risk of Death in Hospitalized Patients with COVID-19 and Seasonal Influenza, submitted to *Journal of the American Medical Association*. (SCI Q1, IF: 51.273, rank: 3/160)

8. Lin, X., Johnston, K., **Cai, M.**.* "Medical consortium and hospital efficiency: Evidence from China", submitted to *International Journal of Integrated Care*.

R Package development

1. 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

1. Supplementary materials for "Bridging the Gap between Transportation Safety Research and its Incorporation in Optimization Models: a Detailed Review and Perspective".

   Source: https://caimiao0714.github.io/TrafficSafetyReviewRmarkdown/

Professional Memberships

2019 –
- American Statistical Association (ASA): Member,

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

Service to the profession

Referees for the following international peer-review journals:

2020–
- American Journal of Managed Care,

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

2018 –
- BMJ (British Medical Journal) Open,

2017 –
- International Journal for Equity in Health.