Michael Li

wzmichael.li@gmail.com

Research interests

I am a theoretical/computational/mathematical/statistical disease modeler/analyst. I focus on human-related diseases (HIV, influenza, and currently COVID-19) and some wildlife diseases (canine rabies), especially in forecasting epidemic outbreaks, retrospective analysis of the evolution of infectious diseases and intervention strategies/policies for disease control. I work at the interface between statistics, disease ecology and mathematical epidemiology; developing new methods that appropriately account for uncertainties and link statistical summaries and estimates with meaningful ecological and epidemiological parameters; and analyzing the effects of policy changes on disease control.

Skills

- **Mathematical modeling**: Dynamical modeling of disease transmissions; spatial-temporal movement models; mechanistic modeling; deterministic and stochastic simulation and forecasting
- **Statistical Analysis and modeling**: Model/simulation statistical validations; data calibration to mathematical models using likelihood approaches; frequentist and bayesian statistical approaches; time series analysis; generalized-linear mixed model approaches; phylogenetic comparative analysis; survival analysis
- **Programming**: R; SAS; BUGS and STAN; high performance computing (clusters/servers); shinyapps
- **Data Science**: Big data manipulation (E.g., simulation, large administrative databases, Demographic Health Survey (DHS)); data visualization

Education

Ph.D., Biology, McMaster University, 2015–2019. Thesis: *Methods For Modeling The Spread of Infectious Disease*. Supervisors: Dr. Ben Bolker, Dr. Jonathan Dushoff

- Developing models and tools for emerging disease outbreaks
- Reassessing global historical risk of canine rabies
- Exploring heterogeneities and bias of generation time in disease transmission mechanism (canine rabies)
- Developing computational efficient tools for phylogenetic mixed effect modeling

M.Sc., Statistics, McMaster University, 2013–2015. Thesis: *Incorporating Temporal Heterogeneity in Hidden Markov Models For Animal Movement*. Supervisor: Dr. Ben Bolker

HB.Sc., Statistics and Mathematics, University of Toronto: 2009–2013

Recent Work experience

Research Associate: South African Centre for Epidemiological Modelling and Analysis (SACEMA), 2020–present

Postdoctoral fellow: McMaster University, 2019–present. Supervisor: Dr. Jonathan Dushoff

- Developing models to fit and forecast COVID risk and public health demands for Canadian provinces, South Africa (provincial and national level), Afro-Regional (49 countries) and another large (confidential) jurisdiction.
- Dynamical analysis of spatiotemporal data streams to support elimination of canine rabies.

Professional service

MS. reviewer For *New England Journal of Medicine*, *Epidemics*, *Journal of Agricultural, Biological, and Environmental Statistics*, *Journal of Animal Ecology*, and *Movement Ecology*.

Publications

Publicly available government reports

Provincial and National Projection reports for Republic of South Africa.

Research Articles

Park SW, Bolker BM, Champredon D, Earn DJD, Li M, Weitz JS, Grenfell BT, Dushoff J. "Reconciling early-outbreak estimates of the basic reproductive number and its uncertainty: framework and applications to the novel coronavirus (SARS-CoV-2) outbreak." Journal of The Royal Society Interface. July 2020; 17:168

Li M, Bolker BM, Dushoff J, Ma J, Earn DJD. Patterns of seasonal and pandemic influenza-associated health care and mortality in Ontario, Canada. BMC Public Health. 2019 Dec 1;19(1):1237.

Shi, Chyun, Michael Li, and Jonathan Dushoff. "Traditional Male Circumcision is Associated with Sexual Risk Behaviors in Sub-Saharan Countries Prioritized for Male Circumcision." AIDS and behavior (2019): 1–9.

Li, M., Dushoff, J., & Bolker, B. M. (2018). Fitting mechanistic epidemic models to data: a comparison of simple Markov chain Monte Carlo approaches. Statistical methods in medical research, 27(7), 1956–1967.

Shi, C. F., Li, M., & Dushoff, J. (2017). Evidence that promotion of male circumcision did not lead to sexual risk compensation in prioritized Sub-Saharan countries. PloS one, 12(4), e0175928.

Champredon, D., Li, M., Bolker, B.M. and Dushoff, J., 2018. Two approaches to forecast Ebola synthetic epidemics. Epidemics, 22, pp.36-42.

Li, M., & Bolker, B. M. (2017). Incorporating periodic variability in hidden Markov models for animal movement. Movement ecology, 5(1), 1.

Preprint Articles

Papst, I., Li, M., Champredon, D., Bolker, B.M., Dushoff, J. and Earn, D.J.D, 2020. Age-dependence of healthcare interventions for SARS-CoV-2 infection in Ontario, Canada. medRxiv.

Park, S.W., Sun, K., Champredon, D., Li, M., Bolker, B.M., Earn, D.J.D, Weitz, J.S., Grenfell, B.T. and Dushoff, J., 2020. Cohort-based approach to understanding the roles of generation and serial intervals in shaping epidemiological dynamics. medRxiv.

Past Work experience

Researcher

Statistics Canada Research Data Centre (RDC) at McMaster University

Teaching Assistant (McMaster University)

- Bio 3SS3 "Population Ecology" (winter 2016, 2017, 2018, 2019)
- Bio 3FF3 "Evolution" (fall 2018)
- Bio 1M03 "Ecology and Evolution" (fall 2015, 2016, 2017)
- Stat 3J3Y "Probability and Statistics for Engineering" (fall 2013, 2014, winter 2014)
- Stat 2MB3 "Statistical Methods and Applications" (winter 2014)
- Math 1F03 "Introduction to Calculus and Analytic Geometry" (fall 2014)