

Timothy M Wolock

Statistics PhD Student, Imperial College London

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US/UK dual citizen

Summary

Creative and self-motivated quantitative researcher and PhD student focused on using statistics and machine learning to ask more robust and useful questions in social science and public health. Experienced in developing statistical methods, conducting analyses, and communicating results to stakeholders in both high-profile academic research environments and in private-sector software development.

Education

Doctor of Philosophy

Summer 2021 (planned)

Mathematics: Statistics
Imperial College London
London, UK

Supervisors: Dr Seth Flaxman, Dr Jeffrey Eaton

Thesis Research: Developing methods for inference of HIV incidence over space and time simultaneously at large, granular geographic scales

Master of Public Health

August 2016

Global Health: Health Metrics and Evaluation
University of Washington
Seattle, WA, USA

Thesis Title: "Estimating the effect of state-level gun purchasing policy on county-level firearm suicide mortality"

Thesis Committee Chair: Dr Joseph Dieleman

Bachelor of Arts

May 2013

Mathematics with Economics Minor
Wesleyan University
Middletown, CT, USA

Work Experience

Postgraduate Researcher

October 2018-Present

Imperial College London
London, UK

- Developing methods for inference of HIV incidence over space and time simultaneously at large, granular geographic scales in a modern Bayesian inference framework (Template Model Builder). Fitting epidemic models to multiple population-level data sources simultaneously to facilitate more robust inference of HIV incidence over small areas. Incorporating inherent spatial dynamics of HIV directly into epidemic models.
- Developed model of sexual partner age distributions that reproduced observed data more accurately than any previous method. Distributional regression framework allows for hierarchical structure that makes best use of sparse data.
- Assisting on a variety of other projects in applied Bayesian statistics, hierarchical modelling, and machine learning, including spatio-temporal estimation of food security in Yemen, Bayesian reconstruction of aggregated survey estimates, and improving methodologies for ecological causal inference from small-area mortality data in the US.

Senior Data Analyst I

December 2017-August 2018

Data Analyst II

July 2016-December 2017

PayScale, Inc.

Seattle, WA, USA

- Helped maintain and administer a web-based survey of worker salaries, education, skills, etc. Utilized the data collected by this survey (approximately 55 million observations) for public-facing, social science research projects to promote the company's data and products.
- Designed and executed a novel study examining determinants of employee satisfaction and turnover using data from more than five hundred thousand survey respondents. Wrote mixed-effect logistic and ordinal logistic regression models that were able to quantify the effect of ordinal independent variables on ordinal dependent variables without simplifying the structure of the data. Results were presented to Human Resources professionals at annual user conference and 2018 World at Work Total Rewards Conference (PayScale's first such presentation).
- Revised and expanded PayScale's College Salary Report and College Return-on-Invest Report, which estimate post-college income and cost-adjusted return for American universities. Used college-specific random effects to simultaneously produce a unique maturity curve for each institution and improve estimates in schools with fewer observations. Increased estimate stability allowed us to include more than 1,000 more schools in the reports.
- Developed a county-level index of annual wage change in the United States. Used conditional autoregressive-distributed splines to fit each county with

a unique, geographically correlated curve with respect to time. This approach reduced unrealistic noise in the data and allowed for credible estimates in counties with few or no observations.

Post-Bachelor Fellow

September 2013-July 2016

Institute for Health Metrics and Evaluation
Seattle, WA, USA

- Developed the HIV/AIDS modeling code base for the Global Burden of Disease. Produced estimates for the 2013 and 2015 iterations of the GBD.
- Ported the UNAIDS “Spectrum” model of HIV/AIDS burden to Python and adapted it for parallel execution. Built in the ability to run counterfactual policy evaluation scenarios.
- Developed a new method to retroactively fit Spectrum’s adult HIV incidence assumptions to government mortality data in countries with relatively complete vital registration systems.
- Adapted the Estimation and Projection Package (EPP) model of HIV incidence for use on IHME’s computing cluster. Developed a system by which uncertainty in input data could be incorporated more appropriately.
- Used C++ and R to build a Bayesian model of population in years not covered by national censuses. Allows for reliable interpolation of single-age, single-year population levels.

Technical Skills

Concepts: Bayesian statistics, hierarchical modelling, machine learning, nonparametric statistics, multivariate regression methods, probabilistic programming, data visualization

Software: R (ggplot2, Stan, TMB, Keras, RMarkdown), Python (scikit-learn, TensorFlow, Keras, matplotlib), C++ (Eigen)

Presentations

“GBD 2013 HIV Methodology Overview,” Institute for Disease Modeling Symposium, Bellevue, WA, April 2015.

“Inferring HIV incidence trends and transmission dynamics with a spatio-temporal HIV epidemic model,” Poster presented at Epidemics 7. Charleston, SC, USA, December 2019.

Awards & Honors

Imperial College President’s PhD Scholar, 2018-2021

Publications

Note that the Global Burden of Disease papers all have many authors. My contributions to these papers were through my work in HIV modeling. I have omitted the author lists from all but the HIV-specific papers.

The global burden of tuberculosis: results from the Global Burden of Disease Study 2015. The Lancet Infectious Diseases. 2018 Mar 1. doi: 10.1016/S1473-3099(17)30703-X.

Global, regional, and national levels of maternal mortality, 1990–2015: a systematic analysis for the Global Burden of Disease Study 2015. The Lancet. 2016 Oct 7. doi: 10.1016/S0140-6736(16)31470-2.

Global, regional, and national life expectancy, all-cause mortality, and cause-specific mortality for 249 causes of death, 1980–2015: a systematic analysis for the Global Burden of Disease Study 2015. The Lancet. 2016 Oct 7. doi: 10.1016/S0140-6736(16)31012-1.

Wang H, **Wolock TM**, et al., *Estimates of global, regional, and national incidence, prevalence, and mortality of HIV, 1980–2015: the Global Burden of Disease Study 2015.* The Lancet HIV. 2016 Jul 19. doi: 10.1016/S2352-3018(16)30087-X.

Global and national burden of diseases and injuries among children and adolescents between 1990 and 2013: Findings from the Global Burden of Disease 2013 study. JAMA Pediatrics. 2015 Jan 25. doi: 10.1001/jamapediatrics.2015.4276.

Under-5 mortality in 2,851 Chinese counties, 1996–2012: a subnational assessment of achieving MDG 4 goals in China. The Lancet. 2015 Oct 25. Doi: 10.1016/S0140-6736(15)00554-1.

Global, regional, and national disability-adjusted life years (DALYs) for 306 diseases and injuries and healthy life expectancy (HALE) for 188 countries, 1990–2013: quantifying the epidemiological transition. The Lancet. 2015 Aug 27. doi: 10.1016/S0140-6736(15)61340-X.

Global, regional, and national incidence, prevalence, and years lived with disability for 301 acute and chronic diseases and injuries in 188 countries, 1990–2013: a systematic analysis for the Global Burden of Disease Study 2013. The Lancet. 2015 June 8. doi: 10.1016/S0140-6736(15)60692-4.

Global, regional, and national age-sex specific all-cause and cause-specific mortality for 240 causes of death, 1990–2013: a systematic analysis for the Global Burden of Disease Study 2013. The Lancet. 2014 Dec 17. doi: 10.1016/S0140-6736(14)61682-2.

Murray CJL, Ortblad KF, Guinovart C, Lim SS, **Wolock TM**, et al., *Global, regional, and national incidence and mortality for HIV, tuberculosis, and malaria during 1990–2013: a systematic analysis for the Global Burden of Disease Study 2013*. The Lancet. 2014 July 23. doi: 10.1016/S0140-6736(14)60844-8.

Global, regional, and national levels and causes of maternal mortality during 1990–2013: a systematic analysis for the Global Burden of Disease Study 2013. The Lancet. 2014 May 2. doi: 10.1016/S0140-6736(14)60696-6.