

# Angela E. Kilby, Ph.D.

\* (617) 955-4003 \* [angela.kilby@gmail.com](mailto:angela.kilby@gmail.com) \* [github.com/akilby](https://github.com/akilby) \* [Academic CV](#) \*

## SUMMARY

- Economist and health care subject matter expert, with fourteen years of experience with data and statistical analysis, causal inference, and machine learning and artificial intelligence research on large health datasets
- Cross-disciplinary research and communication across economics, data science, computer science/machine learning, and public health/medicine

## EXPERIENCE

### Northeastern University

Assistant Professor of Economics

Faculty Affiliate, Institute for Experiential AI

Boston, MA

2017–present

2021–present

*Research* \* Led research group focusing on health economics, pharmaceutical policy, and health tech/AI

- *Research Area 1: Developing novel AI applications for patient and public health research*
  - Used machine learning techniques (lasso, random forest, gradient boosting) to identify a cohort of pain patients in a claims dataset (MarketScan) for research to understand treatment effects of a policy restricting opioids
  - Applied unsupervised natural language processing (NLP) technique (latent Dirichlet allocation) to generate *interpretable sub-cohorts of pain patients*
  - Used NLP techniques to extract novel geographically-identified longitudinal dataset of experiences of illicit opioid users from unstructured social media conversation; published open-source data package
- *Research Area 2: Understanding clinical value and patient impacts of real-world health AI technology*
  - Constructed and audited a machine learning algorithm to predict opioid use disorder risk using commercial claims data (MarketScan), similar to algorithms commercially deployed in clinical practice
  - Obtained Northeastern TIER 1 grant to fund stream of additional research on the clinical value of machine learning/AI technologies for health care; received *media coverage in Wired*
- *Research Area 3: Physician and health care provider prescribing and practice behavior*
  - Constructed novel data linkage across five data sources on physicians and health care providers. Used to conduct research on access to pharmaceutical therapies for opioid use disorder
- Led, supervised, and mentored research group of 1-2 Ph.D. students, 2-3 research master's students, and 3-6 undergraduate research assistants working in Python, R, Tableau, ArcGIS, and Stata
- Published open-source packages to distribute or provide APIs for research-ready datasets: *arcos*, *npi*, *drug\_pricing*, and package that provides tools for data science workflows: *tributary-cache*
- Invited seminars and speaking include: Google Bioethics and Health Trust Speaker Series, ACM FAccT (*video*), IEAI (*video*), NBER Conference in Machine Learning in Health Care, American Public Health Association, Stanford University Institute for Theoretical Economics (SITE), Johns Hopkins School of Public Health, American Economic Association (ASSA) and Association for Public Policy Analysis and Management (APPAM) annual meetings

*Service & Leadership* \* Member of Institute for Experiential AI; built university capacity in interdisciplinary AI research

- Served on University High Performance Computing Committee to improve research computing infrastructure for interdisciplinary AI applications
- Served on faculty search committee in Artificial Intelligence/Technology Policy
- Chaired undergraduate research committee for Economics Department

*Teaching* \* Developed graduate and undergraduate courses in health economics and policy

- Created three new courses that explore the economics and organization of the U.S. healthcare sector
- Mentored students in capstone health data research projects utilizing R, Python, or Stata
- Received 2020 CSSH Outstanding Teaching Award

**National Bureau of Economic Research and NIH/NIA**  
*Post-Doctoral Fellow in Aging and Health Research*

Cambridge, MA  
2016–2017

- Laid computational groundwork and obtained data for research agenda as Assistant Professor
  - Automated custom research workflow pipeline on AWS for analysis in parallel of large, complex health datasets
  - Integrated Python data science stack (Pandas, Scikit-Learn, SciPy, XGBoost, NLTK, Snorkel, etc.) with Stata and R for exploratory and statistical analysis, machine learning, and data visualization
- Translated and communicated quantitative dissertation research findings to a general audience
  - Coauthored *Washington Post op-ed*; disseminated research in media: *Boston Globe* [1], [2], *Chicago Tribune*, *Quartz*
  - Invited as speaker and discussant at workshops and conferences, including across disciplines to physicians

**Massachusetts Institute of Technology**

*National Science Foundation Graduate Research Fellow*

*Pre-Doctoral Fellow in Aging and Health Research, NBER and NIH/NIA*

Cambridge, MA  
2011–2016  
2015–2016

- Conducted advanced econometric analyses of public policies regarding opioid prescribing by physicians
  - Analyzed MarketScan claims data, constructing and validating measures of clinical and health outcomes
  - Integrated analyses of U.S. administrative mortality data, hospital quality scores, disability claims, and DEA records
  - Released the first quasi-experimental study to quantify costs and benefits of restrictions on prescription opioids
- Supervised undergraduate cross-disciplinary research assistant (computer science major)

*Teaching Assistant*

2013–2014, 2016

- Assisted in development of new MIT course, *14.31–Data Analysis for Social Scientists*, that merged foundational statistics with theory and practice of real-world data analysis (A/B testing, machine learning, GIS, and data visualization)
- Popular and well-reviewed instructor for *14.01–Introduction to Microeconomics*

*University Service*

2011–2016

- Recognized with Graduate Student Council Service Award for mentorship, high-profile committees, and advocacy

**Adherean, Inc.**

*Economist; Co-Creator – XoutTB*

Cambridge, MA  
2007–2010; 2011–2013

- Co-founded digital health startup using behavioral incentives to increase patient adherence to therapeutic regimens
- Team raised initial \$100,000 angel round of funding, opened lab, and completed prototype
- XoutTB team won \$5,000 Lemelson-MIT prize and \$50,000 Harvard Catalyst grant for further development
  - Media coverage: *Tech Talk*, *The Lancet*, *MIT Technology Review*, *Freakonomics*, *The Economist*

**Jameel Poverty Action Lab**

*Research Analyst; Research Assistant*

Jakarta, Indonesia; Freetown, Sierra Leone; Cambridge, MA

2006–2007; 2008–2011

- Designed randomized controlled experiments in collaboration with government, World Bank, and donors, evaluating Sierra Leone roads infrastructure and rural micro hydro electrification in Indonesia
- Wrote Stata programs to automate data cleaning; developed ArcGIS map of all donor-financed roads in Sierra Leone

**Akatiga Foundation**

*Luce Scholar (Indonesia)*

Bandung, Indonesia  
2007–2008

- Awarded Luce Scholarship to support research on Indonesian textile and clothing industry at Indonesian NGO

## PUBLICATIONS AND RESEARCH

- Guo, J., Kilby, A., Marks, M. 2022. *The Impact of Scope-of-Practice Restrictions on Access to Medical Care*. [Link](#).
- Kilby, A. 2021. *Algorithmic Fairness in Predicting Opioid Use Disorder Using Machine Learning*. In Proceedings of the 2021 ACM Conference on Fairness, Accountability, and Transparency, 272. FAccT '21. New York, NY, USA: Association for Computing Machinery. <https://doi.org/10.1145/3442188.3445891>.
- Kilby, A. 2021. *Opioids for the masses: Welfare Tradeoffs in the Regulation of Narcotic Pain Medications*. [Link](#).

- Kilby, A., Denhart, C. 2021. *Location inference on social media data for agile monitoring of public health crises: An application to opioid use and abuse during the Covid-19 pandemic.* [Link](#).
- Kilby, A., Finn, Z., Wallace, B., Beletsky, L. 2021. *Machine learning to predict and prevent opioid use disorder and opioid overdose: A systematic literature review.*
- Kilby, A. 2021. *Algorithmic Fairness in Predicting Opioid Use Disorder using Machine Learning.* [Link](#).
- Kilby, A. 2021. *The Medicaid Expansion and Increased Access to Prescription Medications: Implications for the Opioid Overdose Crisis.*
- Gruber, J., Kilby, A. 2017. *Opinion. The Senate health bill would make the epidemic worse. Here's how.* Washington Post. [Link](#).

## EDUCATION

**Massachusetts Institute of Technology** Cambridge, MA  
*Ph.D. Economics, with major fields in Health/Public Finance, minor fields in Econometrics and Statistics* 2011–2016

**Massachusetts Institute of Technology** Cambridge, MA  
*S.B. Economics, S.B. Political Science, with Departmental Best Thesis award* 2003–2007

**London School of Economics** London, UK  
*General Course, with First Class Honours in Econometrics and Public Economics* 2005–2006

## SKILLS

- Statistical modeling, causal inference, controlled trials, machine learning, and natural language processing
- Expertise with commercial claims data (MarketScan), CMS data, and construction of novel health data sources
- Python, Stata, R, L<sup>A</sup>T<sub>E</sub>X, Git/GitHub, Bash, AWS (S3, EC2, EFS; command-line interface), Tableau, ArcGIS, SQL
- Package development for data and data science workflow management
- Team management, leadership, written and oral communication
- Conversational (and rusty) Indonesian