

Curriculum Vitæ

Ziad Obermeyer

Acting Associate Professor of Health Policy and Management
School of Public Health, University of California at Berkeley

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Contact

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Education

- 2001 Harvard College, Cambridge, MA
A.B., History and Science (*magna cum laude* with highest honors in field)
- 2002 University of Cambridge, Cambridge, UK
M.Phil., History and Philosophy of Science
- 2008 Harvard Medical School, Boston, MA
M.D. (*magna cum laude*)
- 2012 Brigham and Women's & Massachusetts General Hospitals, Boston, MA
Clinical Residency, Emergency Medicine

Faculty Positions

- 5/13-6/18 Assistant Professor of Emergency Medicine and Health Care Policy
Harvard Medical School
- 7/18- Acting Associate Professor of Health Policy and Management
UC Berkeley, School of Public Health

Other Professional Experience

- 8/02-8/03 Business Analyst
McKinsey & Co., Florham Park, NJ
- 9/03-7/07 Research Associate
Harvard Initiative for Global Health, Cambridge, MA
- 7/07-6/08 Research Scientist
Institute for Health Metrics and Evaluation, Seattle, WA
- 07/12-6/18 Associate Physician, Emergency Medicine
Brigham and Women's Hospital, Boston, MA
- 07/12-6/18 Affiliated Faculty
Harvard Institute for Quantitative Social Science, Cambridge, MA
- 12/13-6/18 Associate Faculty
Ariadne Labs, Boston, MA
- 6/15-6/18 Faculty Member
Dana Farber/Harvard Cancer Center, Boston, MA
- 1/2016- Affiliate
ideas42, New York, NY
- Fall 2016 Visiting fellow
University of Chicago Booth School of Business, Chicago, IL
- 7/2018- Research economist
National Bureau of Economic Research, Cambridge, MA
- 9/2018- Strategic Advisory Board Member (unpaid)
GNS Healthcare, Cambridge, MA
- 10/2018- Faculty Affiliate
Berkeley Opportunity Lab, Berkeley, CA
- 1/2019- Staff physician
Tséhootsooí Medical Center, Fort Defiance, AZ
- 9/2019- Co-founder and Chief Medical Officer
Nightingale Project, Chicago, IL

Honors and Prizes

- 1998-2000 John Harvard and Harvard College Scholarships
Harvard College

2001	Phi Beta Kappa Harvard College
2001	Rothschild Award for Best Senior Thesis History of Science, Harvard University, Cambridge, MA
2001	Frank Knox Scholarship Harvard College
2004	Summer Research Award Harvard Medical School
2004	Certificate of Distinction in Teaching Harvard College
2008	Rose Seegal Prize Harvard Medical School
2010	Richard C. Wuerz Award Emergency Medicine, Brigham and Women's Hospital, Boston, MA
2012	Early Independence Award Office of the Director, National Institutes of Health, Bethesda, MD
2014	Certificate of Excellence in Tutoring Harvard Medical School
2015	Young Investigator Award Society for Academic Emergency Medicine
2018	Peter K. Ranney Innovation Award World Medical Innovation Forum
2020	Donald K. Buffmire Visiting Lectureship in Medicine University of Arizona College of Medicine
2020	Gerald and Sally DeNardo Lectureship in the Health Sciences Santa Clara University
2020-23	Emerging Leader in Health and Medicine National Academy of Medicine
2020	Lectureship in Cancer Care Innovation University of Pennsylvania

Professional Service

- 2013- Institutional Review Board
National Bureau of Economic Research, Cambridge, MA
- 2013-16 Scientific Committee
African Federation of Emergency Medicine, Cape Town, South Africa
- 2013-16 Executive Committee
Acute Care Development Consortium, Boston, MA
- 2016-17 Advisory Committee on Emergency and Post-Conflict Health Systems
World Bank, Washington, D.C.
- 2018- Co-organizer, Machine Learning and Health Meeting (with Cutler D)
National Bureau of Economic Research, Cambridge, MA
- 2019 Planning committee, Social Science Modeling for Big Data
Committee on National Statistics of the National Academy of Sciences,
Engineering, and Medicine, Washington, DC
- 2019-20 Member, The Paradigm Project
AcademyHealth and the Robert Wood Johnson Foundation, Washington, DC
- 2019 Co-organizer, Fair Machine Learning in Healthcare workshop
NeurIPS 2019, Vancouver, BC
- 2019 Executive committee
Conference on Health, Inference, and Learning, Toronto, BC
- 2020 Reviewer, Health Services Organization and Delivery
Center for Scientific Review, National Institutes of Health, Bethesda, MD

Current Licensure and Certification

- 2011- Massachusetts Medical License
- 2013- Diplomate, American Board of Emergency Medicine

Teaching and Training

- 2012-2018 Clinical supervision and training: Emergency medicine
Brigham and Women's Hospital
- 2016 Data science and medicine (ECON 1160)
Harvard University
- 2018 Econometric Methods for Applied Research II (Ec 2115 / HKS API-115)
Harvard Kennedy School

- 2018 Theories and Methods in Health Policy and Health Services Research (PH 237A)
School of Public Health, UC Berkeley
- 2018 Dissertation Seminar (PH 237D)
School of Public Health, UC Berkeley
- 2019 Machine learning and health summer course (3 days)
Southern Denmark University, Odense, Denmark
- 2019 Dissertation Seminar (PH 237D)
School of Public Health, UC Berkeley
- 2019 Artificial Intelligence for Medicine and Health Policy (PH 196A)
School of Public Health, UC Berkeley
- 2019 NBER Health Boot Camp: Machine learning and health economics
NBER, Cambridge, MA

Peer review activities

General journals: *British Medical Journal, Journal of the American Medical Association, Lancet, New England Journal of Medicine, Proceedings of the National Academy of Sciences, Quarterly Journal of Economics, Nature Medicine, Review of Economics and Statistics, Science, Science Translational Medicine*

Computer science conferences: *Association for Computing Machinery Conference on Bioinformatics, Computational Biology, and Health Informatics 2017, Machine Learning and Health Care 2016-2017, Workshop on Methods and Applications in Healthcare Analytics 2016*

Social science journals: *American Economic Journal: Economic Policy, Demography, Journal of Peace Research, Journal of Public Economics, Journal of Medical Economics, Population and Development Review*

Biomedical journals: *Academic Emergency Medicine, Bulletin of the World Health Organization, Circulation: Cardiovascular Quality and Outcomes, Critical Care, BMJ Global Health, BMJ Supportive and Palliative Care, eLife, EMJ: Emergency Medicine Journal (Associate editor: 2015-17), Healthcare: The Journal of Delivery Science and Innovation, JAMA Oncology, JAMA Internal Medicine, Journal of Clinical Oncology, NPJ: Precision Oncology, Pancreas, PLoS Medicine, Prehospital and Disaster Medicine, World Journal of Surgery*

Academic press: *Cambridge University Press (Mathematical Sciences)*

Foundations: Robert Wood Johnson Pioneer Grant Program

Report of Scholarship

Research

1. Ottmani S, **Obermeyer Z**, Bencheikh N, Mahjour J. Beliefs and behaviors surrounding tuberculosis in Morocco. *Eastern Mediterranean Health Journal*. 2008 Mar-Apr;14(2):298-304.
2. **Obermeyer Z**, Abbott-Klafter J, Murray CJL. Has the DOTS strategy impacted case detection or treatment success? An empirical assessment. *PLoS One*. 2008 Mar 5;3(3):e1721.
3. Gakidou E, Nordhagen S, **Obermeyer Z**. Coverage of cervical cancer screening in 57 countries: Low average levels and large inequalities. *PLoS Medicine*. 2008 Jun 17;5(6):e132.
4. **Obermeyer Z**, Murray CJL, Gakidou E. Fifty years of violent war deaths from Vietnam to Bosnia: Analysis of data from the world health survey programme. *BMJ*. 2008 Jun 28;336(7659):1482-6.
5. **Obermeyer Z**, Rajaratnam JK, Park CH, Gakidou E, Hogan MC, Lopez AD, Murray CJL. Measuring adult mortality using sibling survival: A new analytical method and new results for 44 countries, 1974-2006. *PLoS Medicine*. 2010 Apr 13;7(4):e1000260.
6. **Obermeyer Z**, Makar M, Abujaber S, Dominici F, Cutler DM. Association Between the Medicare Hospice Benefit and Health Care Utilization and Costs for Patients With Poor-Prognosis Cancer. *JAMA*. 2014 12 Nov; 312(18):1888-1896.
7. Bobb J, **Obermeyer Z**, Wang Y, Dominici F. Cause-Specific Risk of Hospital Admission Related to Extreme Heat in Older Adults. *JAMA*. 2014 24/31 Dec; 312(24):2659-2667.
* Paper of the year, National Institute of Environmental Health Sciences, National Institutes of Health (2015)
8. Makar M, Ghassemi M, Cutler DM, **Obermeyer Z**. Short-term Mortality Prediction for Elderly Patients Using Medicare Claims Data. *International Journal of Machine Learning and Computing*. 2015 Jun; 5(3): 192-7.
9. Ezzati M, **Obermeyer Z**, Tzoulaki I, Mayosi BM, Elliott P, Leon DA. The contributions of risk factor trends to cardiovascular mortality trends. *Nature Reviews Cardiology*. 2015 16 Jun; 82: 1-23.
10. Powers B, Makar M, Jain SH, **Obermeyer Z**. Cost Savings Associated with Expanded Hospice Use in Medicare. *Journal of Palliative Medicine*. 2015 May; 18(5): 400-1.
11. **Obermeyer Z**, Powers B, Makar M, Keating NL, Cutler DM. Physician Characteristics Strongly Predict Patient Enrollment In Hospice. *Health Affairs*. 2015 Jun; 34(6): 993-1000.
* "One of the year's major achievements in clinical cancer research and care," American Society of Clinical Oncology's Clinical Cancer Advances 2016
12. Liu S, Chang Y, **Obermeyer Z**, Narayan K. Frequency of ED revisits and death among older adults after a fall. *American Journal of Emergency Medicine*. 2015 Aug; 33(8): 1012-8.

13. **Obermeyer Z**, Abujaber S, Makar M, Stoll S, Kayden SR, Wallis LA, Reynolds TA. Emergency care delivery in 60 low- and middle-income countries: Systematic review and descriptive analysis. *Bulletin of the World Health Organization*. 2015 Aug 1; 93(8):577-586.
14. **Obermeyer Z**, Clarke AC, Makar M, Schuur JD, Cutler DM. Association of the Medicare Hospice Benefit with Emergency Utilization. *Journal of the American Geriatrics Society*. 2016 Feb; 64(2): 323-9.
15. Niedzwiecki M, Wilson M, Cutler DM, **Obermeyer Z**. Short-term Outcomes for Medicare Beneficiaries after Low-acuity Visits to Emergency Departments and Clinics. *Medical Care*. 2016 May; 54(5): 498-503.
16. Chang CJ, Abujaber S, Reynolds T, Camargo CA, **Obermeyer Z**. Burden of emergency conditions and emergency care utilization: New estimates from 40 countries. *Emergency Medicine Journal*. 2016 Nov;33(11):794-800.
17. Abujaber S, Chang CJ, Reynolds T, Mowafi H, **Obermeyer Z**. Developing metrics for emergency care research in low- and middle-income countries. *African Journal of Emergency Medicine*. 2016 Sep;6(3): 116–124.
18. Lakin JR, Robinson MG, Bernacki RE, Powers BW, Block SD, Cunningham R, **Obermeyer Z**. Predicting One-Year Mortality for High-Risk Primary Care Patients Using the “Surprise” Question. *JAMA Internal Medicine*. 2016 Dec 1;176(12):1863-1865.
19. Chang B, Pany MJ, **Obermeyer Z**. Early death after emergency department discharge in patients with psychiatric illness. *American Journal of Emergency Medicine*. 2016 Nov 17. pii: S0735-6757(16)30868-3.
20. Venkatesh A, Mei H, Kocher K, **Obermeyer Z**, Spatz E, Granovsky M, Rothenberg C, Krumholz H, Lin Z. Identification of Emergency Department Visits in Medicare Administrative Claims: Approaches and Implications. *Academic Emergency Medicine*. 2017 Apr;24(4):422-431.
21. **Obermeyer Z**, Cohn B, Wilson M, Jena AB, Cutler DM. Early death after discharge from emergency departments: analysis of national US insurance claims data. *BMJ*. 2017 Feb 1;356: 239.
22. Asaria P, Elliott P, Douglass M, **Obermeyer Z**, Soljak M, Majeed A, Ezzati M. Acute myocardial infarction hospital admissions and deaths in England. *Lancet Public Health*. 2017 Apr; 2(4): 191–201.
23. Ouchi K, Jambaulikar G, George NR, Xu W, **Obermeyer Z**, Aaronson EL, Schuur JD, Schonberg MA, Tulsy JA, Block SD. The "Surprise Question" Asked of Emergency Physicians May Predict 12-Month Mortality among Older Emergency Department Patients. *J Palliat Med*. 2017 Aug 28.
24. **Obermeyer Z**, Samra JK, Mullainathan S. Individuals' body temperatures vary meaningfully and predict mortality. *BMJ*. 2017 Dec 13;359: 5468.

25. Elfiky A, Pany MJ, Parikh RB, **Obermeyer Z**. Development and application of a machine learning approach to assess short-term mortality risk in patients with cancer starting chemotherapy. *JAMA Network Open*. 2018 1, e180926 (preprint: bioRxiv 204081).
* Awarded "Most promising idea," Dana Farber Junior Investigators in Cancer Research Symposium (2016)
26. Finkelstein A, Einav L, Mullainathan S, **Obermeyer Z**. Predictive modeling of US healthcare spending in late life. *Science*. 2018 Jun 29;360(6396):1462-1465.
27. Chang CY, Abujaber S, Pany MJ, **Obermeyer Z**. Are vital sign abnormalities associated with poor outcomes after emergency department discharge? *Acute Med*. 2019;18(2):88-95.
28. **Obermeyer Z**, Mullainathan S. Dissecting Racial Bias in an Algorithm that Guides Health Decisions for 70 Million People. *ACM FAT* '19: Proceedings of the Conference on Fairness, Accountability, and Transparency*. Jan 29–31, 2019.
* Best paper, non-archival track
29. Miller AC, **Obermeyer Z**, Mullainathan. A Comparison of Patient History- and EKG-based Cardiac Risk Scores. *AMIA Jt Summits Transl Sci Proc*. 2019 May 6;2019:82-91.
30. Miller AC, **Obermeyer Z**, Cunningham JP, Mullainathan S. Regularizing Latent Variable Models with Discriminative Models. *ICML '19: Proceedings of the International Conference on Machine Learning*. Jun 9–15th, 2019.
31. Raghu M, Blumer K, Sayres R, **Obermeyer Z**, Mullainathan S, Kleinberg J. Direct Uncertainty Prediction for Medical Second Opinions. *ICML '19: Proceedings of the International Conference on Machine Learning*. Jun 9–15th, 2019.
32. Hiti EA, Tamim H, Makki M, Geha M, Kaddoura R, **Obermeyer Z**. Characteristics and determinants of high-risk unscheduled return visits to the emergency department. *EMJ*. 2020 Feb;37(2):79-84.
33. Chang CY, **Obermeyer Z**. Association of Clinical Characteristics With Variation in Emergency Physician Preferences for Patients. *JAMA Network Open*. 2020 Jan 3;3(1):e1919607.
34. Mullainathan S, **Obermeyer Z**. Are We Over-Testing? Using Machine Learning to Understand and Improve Doctors' Decisions. NBER Working Paper Series, 2019.
35. **Obermeyer Z**, Powers B, Vogeli C, Mullainathan S. Dissecting Racial Bias in an Algorithm Used to Manage the Health of Populations. *Science*. 2019 Oct 25;366(6464):447-453.
36. **Obermeyer Z**, Pope D. Weather to Test: Effect of Ambient Temperature on 215 Million Laboratory Results for 4.9 Million Patients. Revise and resubmit (#3) at *BMJ*.
37. Pierson E, Cutler DM, Leskovec J, Mullainathan S, **Obermeyer Z**. Using Machine Learning to Understand Racial and Socioeconomic Differences in Knee Pain. In submission.

Invited papers and peer-reviewed commentaries

1. Makhoul MV, **Obermeyer Z**. Bipedicle flap for wounds following Achilles tendon repair. *Plastic and Reconstructive Surgery*. 2008 Apr;121(4):235e-6e.
2. Martindale JL, Senecal EL, **Obermeyer Z**, Nadel ES, Brown DF. Altered mental status and hypothermia. *Journal of Emergency Medicine*. 2010 Oct;39(4):491-6. 3.
3. Hasegawa K, **Obermeyer Z**, Milne LW. Eczema Herpeticum. *Journal of Emergency Medicine*. Epub 2011 Aug 16.
4. Mowafi H, Dworkis D, Bisanzo M, Hansoti B, Seidenberg P, **Obermeyer Z**, Hauswald M, Reynolds TA. Making Recording and Analysis of Chief Complaint a Priority for Global Emergency Care Research in Low-income Countries. *Academic Emergency Medicine*. 2013 Dec;20(12):1241-5.
5. Reynolds TA, Bisanzo M, Dworkis D, Hansoti B, **Obermeyer Z**, Seidenberg P, Hauswald M, Mowafi H. Research Priorities for Data Collection and Management Within Global Acute and Emergency Care Systems. *Academic Emergency Medicine*. 2013 Dec;20(12):1246-1250.
6. Bernacki R, Obermeyer Z. A need for more, better, and earlier conversations with cancer patients about goals of care. *Evidence Based Oncology*. 2015 Apr; 21(6): 166-7.
7. Brown JA, Grudzen C, Kyriacou D, **Obermeyer Z**, Quest T, Rivera D, Stone S, Wright J, Shelburne N. The Emergency Care of Patients with Cancer. *Annals of Emergency Medicine*. 2016 Dec;68(6):706-711.
8. Kleinberg J, Ludwig J, Mullainathan S, **Obermeyer Z**. Prediction Policy Problems. *American Economic Review: Papers and Proceedings* 2015, 105(5): 491–495.
9. **Obermeyer Z**, Emanuel E. Predicting the Future: Big Data, Machine Learning, and the Future of Clinical Medicine. *NEJM*. 2016 Sep 29;375(13):1216-9.
10. Mullainathan S, **Obermeyer Z**. Does Machine Learning Automate Moral Hazard and Error? *American Economic Review: Papers and Proceedings*. 2017 107(5): 1–5.
11. **Obermeyer Z**. Is less more, or is it less? The growing evidence on high-intensity hospital care. *Emergency Medicine Journal*. 2017 Oct;34(10):698-699.
12. **Obermeyer Z**, Lee TH. Lost in Thought—The limits of the human mind and the future of medicine. *NEJM*. 2017 Sep 27;377(13):1209-11.
13. Parikh RB, **Obermeyer Z**, Navathe AS. Regulation of predictive analytics in medicine. *Science*. 2019 Feb 22;363(6429):810-812.
14. **Obermeyer Z**. Putting decision making under the microscope. *Nature Medicine*. 2019 Nov;25(11):1656.

Report of Funded Projects

2007-08 Measuring adult mortality in the developing world
Bill & Melinda Gates Foundation / Institute for Health Metrics and Evaluation,
Seattle, WA

As part of the larger Global Burden of Disease effort (\$110 million), this study developed new methods for measuring mortality in the developing world on the basis of household survey data.

2011-13 Measuring death after discharge from the Emergency Department
Center of Excellence in Quality and Patient Safety, Boston, MA
Department of Emergency Medicine, Brigham and Women's Hospital

This study aims to identify patients who die within two weeks of being sent home from an Emergency Department visit, and understand clinical factors that might predict these events.

2012-17 Unexpected death after medical encounters: Measurement, reporting, and
analysis
Office of the Director, National Institutes of Health / DP5 OD012161
PI (\$1,229,397)

The project studies patients who die unexpectedly after being sent home from a medical encounter. In order to reliably identify expected and unexpected deaths, the project also aims to improve existing methods for predicting short-term mortality in general outpatients. Finally, rate of early unexpected death after discharge is proposed as a novel outcome measure of the quality of health services.

2014-17 Adaptive Quality Measurement
Arnold Foundation
Co-Investigator

As part of a larger grant (\$10 million) this project aims to develop and pilot test an innovative approach to quality measurement, based on adaptive approaches and grounded in measurement science. The new approach will not be overly burdensome or easily gameable. Because a single measurement system cannot serve all purposes, we will develop a measurement system intended to ensure system level quality of care in systems held accountable for economic and clinical outcomes (e.g. in ACOs or MA plans).

2014-16 Population health analytics: Identifying phenotypes for end-of-life care
Dana Farber Cancer Institute
Co-Investigator (\$75,000)

The project seeks to optimize end of life care for a cohort of patients undergoing treatment for cancers. We use machine learning to predict six-month prognosis, and feed predictions back to treating oncologists. We track uptake of palliative and hospice care, chemotherapy and surgical interventions, and place of death in these patients, and compare these outcomes to a control group of patients about whom no prognostic information was given to physicians.

2015-16 Bad incentives or bad predictions? Rethinking low-value health care using
machine learning
Harvard University Interfaculty Collaboration Fund
Co-PI (\$50,000), with Mullainathan S

This interdisciplinary project combines insights from behavioral economics and clinical medicine with machine learning, to identify human misjudgments in medical practice. For a set of important medical decisions, we use machine learning to predict the utility of a procedure or test, and compare this prediction to the physician's decision. This method can identify both mistakes, and predictable mistakes, and help design interventions to reduce them.

2015-16 Improving the Effectiveness and Efficiency of High-Risk Care Management through Machine Learning
National Institute for Health Care Management
PI (\$50,000)

This project applies machine learning to identify individuals who will benefit from so-called 'care management programs' for high-risk or high-cost patients. The aim is to create more effective and efficient programs, and amplify the ability of these initiatives to provide patients with better care at lower cost.

2015-18 Strengthening emergency care in conflict zones
World Bank
Co-PI (\$485,000), with Mowafi H

This project seeks to assess needs for emergency care in conflict zones in the Middle East. It will collect preliminary data from emergency departments, and develop a focused training and quality improvement intervention as a function of needs. This intervention will be deployed in a block-randomized fashion to half of the hospitals in which data collection is taking place, to measure impact.

2015-17 Predicting acute complications in cancer with machine learning
National Cancer Institute
PI, Intergovernmental Personnel Agreement (\$90,000)

In collaboration with researchers at the Division of Cancer Control and Population Sciences, this projects will use large observational datasets—Medicare claims, electronic health record data—to understand and predict acute complications of cancer care. This will range from medical complications like infections and venous thromboembolic disease, to complications of treatment, especially novel chemotherapeutic agents.

2015-18 Physician judgment and machine predictions: understanding and improving medical decisions using machine learning
Robert Wood Johnson Foundation
Co-PI (\$499,600), with Navathe A

This project seeks to improve the value of care and reduce health disparities by developing a set of powerful algorithms to consistently improve upon human clinical judgments. Our test case will be detecting sepsis in patients in the emergency department of the University of Pennsylvania Health System. We will measure the potential impact of improved decision-making on both low-value care and health disparities.

2016-18 Learning more about effectiveness for less: Applying novel statistical techniques to claims data
National Institute on Aging, P01 AG005842 (Pilot)
Co-PI (\$50,000) with Baicker K

We aim to use Medicare claims data to quantify experimental effects for drugs as they are prescribed, using "incidental experimentation" and the tools of machine learning. These data are

uniquely well-suited to this analysis, both because of the scope of the information captured and the scale of the population represented. We will draw on the large literature on doctor prescription pattern variation as well as the natural experiment of drug introduction to generate difference-in-difference and IV strategies.

2016-17 Incorporating physiological sensor data into household surveys
World Bank
PI (\$32,000)

The advent of sensors and wearables for physiological monitoring could transform how we collect data in household surveys. Just as dried blood allowed us to test for HIV or diabetes, physiological monitors like accelerometers, ECG, pulse oximeters, or digital retinal photography could allow us to screen reliably for a wide range of other conditions, including COPD, prior heart attack, and stroke. This project aims to review the literature and do preliminary field testing on high-performance physiological sensors, to lay the groundwork for incorporation into a large World Bank funded household survey.

2017-18 Low-Value Care: Moral Hazard or Mis-Prediction?
Pershing Square Fund for Research on the Foundations of Human Behavior
Initiative, Harvard
Co-PI (\$40,000) with Mullainathan S

Economics provides a compelling explanation for why the return on health care dollars can be low: moral hazard, i.e. physicians provide too much care because they are incentivized to do so. The proposed work will provide another explanation for low-value care, grounded in a behavioral perspective on medical decision-making: doctors make mistakes. Critically, this account is capable of accounting for potential under-use, not just over-use. Deciding who should receive care is hard and biases can lead to the wrong people being tested: this is neither over- nor under-use, but misuse. We will examine both sides of this coin in a concrete decision: deciding who should be tested for acute coronary syndromes in the emergency setting.

2017-18 Assessing the Overuse and Underuse of Diagnostic Testing
National Institute on Aging P30 AG012810 (Pilot)
Co-PI (\$50,000) with Baicker K

Low-value health care—care that provides little health benefit in light of its costs—is a central concern for policymakers. Diagnostic testing is a particularly important example: the use of high-cost diagnostic tests has skyrocketed, but for many tests the “yield”—the frequency with which tests identify new diagnoses or trigger effective interventions—appears low. This project draws on advances in machine learning to (1) gauge the extent of over- and under-use of diagnostic tests nationally using Medicare claims, and (2) develop the basis for a clinical decision support tool using data from the Harvard hospital system.

2017-18 Integrated Model of Palliative and Primary Care in Seriously Ill Older Adults
National Institute on Aging R56 AG055728
Co-PI (\$382,595) with Temel J

Despite major advances in palliative care for patients with specific diseases, we know little about how to deliver palliative interventions ‘upstream’—earlier in the disease trajectory for older adults with multiple chronic conditions. This project applies advanced predictive modeling techniques (‘machine learning’) to identify older patients in a primary care setting who would benefit most from palliative care: those whose complex interplay of chronic conditions puts them at high risk of near-term death. Building on our team’s strong infrastructure for clinical trials in

palliative care, we will enroll the highest-risk patients in a randomized controlled trial, comparing usual primary care to primary care integrated with palliative care.

2017-22 Assessing the Overuse and Underuse of Diagnostic Testing
National Institute on Aging P01 AG005842 (R01)
Co-PI (\$750,000) with Baicker K

This project draws on advances in machine learning to gauge the extent of over- and under-use of diagnostic tests nationally, and to develop the basis for a clinical decision support tool. Building on early evidence that machine learning algorithms combined with massive datasets can make highly accurate predictions, we will assess the extent to which doctors are testing patients with predictably low benefit or failing to test patients with predictably high benefit. After identifying the most promising opportunities to optimize testing using Medicare claims, we will use electronic health records (EHR) to predict yield using data available to doctors at the time of decision. This will pave the way for real-time clinical decision support tools.

2019- Project Nightingale
Schmidt Futures
Co-PI (\$2,000,000) with Mullainathan S

This grant funds the creation of Nightingale, a data platform for public good with the goal of driving innovations in research at the intersection of medicine and data science. Nightingale will bring together high-dimensional, cutting-edge medical datasets, to enable the best researchers in the world to push forward the boundaries of medical science. Ultimately we believe this work will create a new field: 'computational medicine' that uses data, in combination with sophisticated algorithms, to answer fundamental questions in medicine.

2019- Diagnostic Excellence Where It Counts: An Ecosystem for Machine Learning
Diagnostics in Contra Costa County
Gordon and Betty Moore Foundation
PI (\$695,000)

This grant funds work to create an ecosystem for machine learning research in the Contra Costa County Health System. The goal is to transform this under-resourced county into ground zero for the data-driven transformation of medicine, by leveraging the unique leadership, data assets, and the human capital in the surrounding academic institutions.

Invited Presentations

2007 Harvard Humanitarian Health Conference, Cambridge, MA
International Health Economics Association, Copenhagen, Denmark
Population Health Metrics Consortium, Hyderabad, India

2008 Global Fund to Fight AIDS, TB, and Malaria, Glion, Switzerland
Centre for Research on the Epidemiology of Disasters, Brussels, Belgium

2013 African Federation for Emergency Medicine, Cape Town, South Africa
NIH Director's Early Independence Award Symposium, Bethesda, MD
Institute for Health Metrics and Evaluation, University of Washington, Seattle, WA
Ariadne Labs, Boston, MA

- 2014 Health Care Policy, Harvard Medical School, Boston, MA
 Grand Rounds, Palliative Care, Massachusetts General Hospital, Boston, MA
 Primary Care and Public Health, Imperial College, London, UK
 African Conference on Emergency Medicine, Addis Ababa, Ethiopia
 Grand Rounds, Emergency Medicine, Yale School of Medicine, New Haven, CT
 Healthcare Policy and Research, Weill Cornell, New York, NY
- 2015 National Conference on Emergency Care, Helsingborg, Sweden
 Primary Care Working Group, World Health Organization, Bellagio, Italy
 Outcomes Research, Dana Farber/Harvard Cancer Center, Boston, MA
 TEDx Harvard, Cambridge, MA
 Associate Secretary for Planning and Evaluation, Department of Health and
 Human Services, Washington, DC
 National Cancer Institute, Symposium on Oncologic Emergencies, Bethesda, MD
 National Heart, Lung, and Blood Institute, Big Data Symposium, Bethesda, MD
 American Medical Informatics Association, San Francisco, CA
 Healthcare Management, University of Pennsylvania, Philadelphia, PA
- 2016 Emergency Medicine, New York University, New York, NY
 Health Policy, Weill Cornell, New York, NY
 National Academy of Sciences, Washington, DC
 Applied Microeconomics, Chicago Booth School of Business, Chicago, IL
 Surveillance Research Program, National Cancer Institute, Rockville, MD
 Bioinformatics, Harvard Medical School, Boston, MA
 Ariadne Labs, Boston, MA
 Skåne University Hospital, Malmö, Sweden
 Global Symposium on Health Systems Research, Vancouver, BC, Canada
 American Economic Association, Chicago, IL
- 2017 Seminar, Department of Internal Medicine, Hospital da Luz, Lisbon, Portugal
 Department of the Prime Minister and Cabinet, Canberra, Australia
 Department of Internal Medicine, Lund University, Malmö, Sweden
 TIMI Study Group, Brigham and Women's Hospital, Boston, MA
 Machine Learning & AI in Healthcare Conference, Boston, MA
 Health Economics, Dartmouth, Hanover, NH
 IBM Research, Yorktown, NY
 Briefing to Jason Study Group, La Jolla, CA
 TEDx Boston, Boston, MA
 Health Economics, University of Chicago, Chicago, IL
 Microsoft Research New England, Cambridge, MA
 Recenti Progressi in Medicina, Pensiero Scientifico, Rome, Italy
- 2018 School of Public Health, UC Berkeley, Berkeley, CA
 Harvard Kennedy School of Government, Cambridge, MA
 Harris School of Public Policy, University of Chicago, Chicago, IL
 Program of Applied Translational Research Seminar, Yale School of Medicine
 NorthEast Computational Health Summit, MIT-IBM Watson Lab, Cambridge, MA
 World Medical Innovation Forum, Boston, MA
 Health Leadership Program, Harvard Kennedy School, Cambridge, MA

Machine Learning and Health, NBER, Cambridge, MA
Max Planck/NBER Workshop on Ageing and Health, Munich, Germany
Verily, Cambridge, MA
Psychology and Economics, UC Berkeley, Berkeley, CA
Haas School of Business, UC Berkeley, Berkeley, CA
Biostatistics, UC Berkeley, Berkeley, CA
Health Policy and Management, UC Berkeley, Berkeley, CA
Social and Behavioral Sciences, National Institutes of Health, Bethesda, MD
Microsoft Research, Washington, DC
CareMore, Los Angeles, CA
Digital Health Information Network, University of Sydney, Sydney, Australia

2019

Google, Mountain View, CA
NEJM Catalyst, Cedars-Sinai Hospital, Los Angeles, CA
Regulation, Therapeutics, And Law, Harvard Law School, Cambridge, MA
Pharmacoepidemiology, Harvard Medical School, Boston, MA
Electrical Engineering and Computer Science, UC Berkeley, Berkeley, CA
School of Information, UC Berkeley, Berkeley, CA
Goldman School of Public Policy, UC Berkeley, Berkeley, CA
Biostatistics, UC Berkeley, Berkeley, CA
Berkeley-UCSF Health Research Symposium, Berkeley, CA
Scripps Translational Research Institute, La Jolla, CA
Demography, UC Berkeley, Berkeley, CA
Nature Medicine–Weizmann Institute of Science, Rehovot, Israel
NYC Data Science Seminar (joint with Columbia, Cornell Tech, Facebook, NYU, Microsoft Research), New York, NY
Taiwan Society for Emergency Medicine, Taipei, Taiwan (keynote)
NBER Summer Institute, Health, Cambridge, MA
Optum Forum, Las Vegas, NV (unpaid)
Grand Rounds, UCSF Medicine, San Francisco, CA
Penn Conference on Big Data in Population Health Sciences, Philadelphia, PA
Innovation for Shared Prosperity (Healthtech plenary), Stanford, Palo Alto, CA
NeurIPS '19, Fair Machine Learning in Health (keynote), Vancouver, BC
Duke Margolis and Duke Law, Trust But Verify (keynote), Washington, DC
Federal Trade Commission, Washington, DC
Pharmaceutical Economics and Policy, UCLA Public Health, Los Angeles, CA
Operations, Information and Decisions, Wharton School, Philadelphia, PA
Health Policy and Management, University of Minnesota, Minneapolis, MN
NYU Wagner, New York, NY
American Medical Colleges Council of Deans meeting, San Diego, CA
Diagnostic Excellence Summit (keynote), Johns Hopkins, Baltimore, MD