

# XIAO WU

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## EDUCATION

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### Harvard University

Ph.D., Biostatistics

Dissertation: Causal Inference with Complex Exposures in Observational Studies

Committee: Dr. Francesca Dominici, Dr. Jose R. Zubizarreta, Dr. Danielle Braun

Cambridge, MA

September 2017 - March 2021

### Harvard T.H. Chan School of Public Health

M.S., Biostatistics

Boston, MA

September 2015 - May 2017

### Peking University

B.S., Mathematics

LL.B., Laws

Beijing, China

September 2011 - July 2015

September 2011 - July 2015

## ACADEMIC EXPERIENCE

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### Stanford University

Data Science Postdoctoral Fellow; Mentor: Dr. Trevor J. Hastie

Stanford, CA

October 2021 - Present

### Harvard T.H. Chan School of Public Health

Postdoctoral Researcher; Mentor: Dr. Francesca Dominici

Boston, MA

March 2021 - September 2021

### Harvard T.H. Chan School of Public Health

Graduate Research Assistant; Mentor: Dr. Francesca Dominici

Boston, MA

September 2017 - October 2020

### Harvard Business School

Research Associate; Mentor: Dr. Lauren Cohen

Boston, MA

July 2016 - March 2017

### Stanford University School of Medicine

Summer Visiting Student; Mentor: Dr. Ying Lu

Stanford, CA

June 2014 - August 2014

## INDUSTRY EXPERIENCE

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### Facebook Inc

Research Scientist Intern; Mentors: Drs. Abbas Zaidi, Will Bullock

Menlo Park, CA

June 2020 - August 2020

- Developed a Bayesian meta-analytic framework that draws inferences from post-stratified user metrics data

### Google LLC

Data Scientist Intern; Mentors: Drs. Li Pan, Meeyoung Park

Sunnyvale, CA

May 2019 - August 2019

- Designed an experimentation platform on user interference network using bipartite graph clustering randomization

### PRO Unlimited, Inc. (End Client: Sanofi Genzyme)

Biostatistician Intern; Mentor: Dr. Yi Xu

Cambridge, MA

June 2017 - August 2017, February 2019 - April 2019

- Developed a novel Bayesian adaptive commensurate design that borrows adaptively from historical trial information and optimizes the timing of interim analysis

### Peking University Clinical Research Institute

Data Analyst; Mentor: Prof. Chen Yao

Beijing, China

February 2014 - June 2014

## TEACHING EXPERIENCE

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<b>Harvard T.H. Chan School of Public Health</b>	<i>Boston, MA</i>
Teaching Fellow, Bayesian Methodology in Biostatistics; Instructor: Dr. Jeffrey Miller	<i>Spring 2020</i>
Teaching Fellow, Theory and Methods for Causality II; Instructor: Dr. Andrea Rotnitzsky	<i>Fall 2019</i>
Teaching Fellow, Introduction to Statistical Genetics; Instructor: Dr. Martin Aryee	<i>Fall 2019</i>
Teaching Fellow, Applied Bayesian Analysis; Instructor: Dr. Lorenzo Trippa	<i>Fall 2018</i>
Teaching Fellow, Applied Survival Analysis; Instructor: Dr. Rui Wang	<i>Spring 2017</i>
<b>Harvard T.H. Chan School of Public Health</b>	<i>Boston, MA</i>
Guest Lecturer, Computing for Big Data - Working with Medicare Data	<i>December 2018</i>
<b>Harvard Medical School</b>	<i>Boston, MA</i>
Guest Lecturer, An Introduction to Propensity Score Methods	<i>September 2018</i>

## TECHNICAL SKILLS

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<b>Programming Languages</b>	R, Python, SAS, SQL
<b>Software &amp; Tools</b>	Tensorflow, Stan, R Studio, Matlab, Github, Latex
<b>Certificates</b>	SAS Base and Advanced Programming

## ACADEMIC AWARDS & HONORS

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<b>Forbes 30 Under 30 - Healthcare</b>	<i>2022</i>
Forbes Magazine	
<b>Ram and Vijay Shriram Data Science Fellowship</b>	<i>2021</i>
Stanford Data Science	
<b>Barry R. and Irene Tilenius Bloom Fellowship</b>	<i>2021</i>
Harvard T.H. Chan School of Public Health	
<b>IMS Hannan Graduate Student Travel Award</b>	<i>2020</i>
Institute of Mathematical Statistics	
<b>American Statistical Association Scholarship Award</b>	<i>2020</i>
ASA Biopharmaceutical Section	
<b>ISEE Annual Conference Travel Award</b>	<i>2020</i>
International Society for Environmental Epidemiology	
<b>American Statistical Association Student Paper Award</b>	<i>2019</i>
ASA Statistics and the Environment Section	
<b>American Statistical Association Student Travel Award</b>	<i>2019</i>
ASA Biopharmaceutical Section Regulatory-Industry Statistics Workshop	
<b>Summer Institute in Statistics for Big Data Scholarship</b>	<i>2017</i>
University of Washington	
<b>1st Prize of the National Mathematics Contest</b>	<i>2009</i>
The Chinese Mathematical Society (CMS)	

## PROFESSIONAL ACTIVITIES

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<b>Journal Peer Reviewer</b>
Statistics in Medicine – 2, Biometrical Journal – 4, Journal of Biopharmaceutical Statistics - 1, Journal of Agricultural, Biological, and Environmental Statistics – 1, Clinical Trials - 1, International Journal of Biostatistics – 2, American Journal of Preventive Medicine – 2, Health Services and Outcomes Research

Methodology – 1, Environmental International – 1, Environmental Research – 8, Atmospheric Environment – 1, International Journal of Biometeorology – 2, Scientific Reports – 3, Annals of Transnational Medicine – 1, Harvard Public Health Review – 3, Health Science Reports – 1, Population and Environment (POEN) – 1, Journal of Statistical Computation and Simulation – 1, BMC Public Health – 1, JAMA network open – 1, Annals of the American Association of Geographers – 2, BMJ Open – 1, ACS Chemical Neuroscience – 2, Annals of the American Association of Geographers – 1

### Grant Peer Reviewer

The Tel Aviv University Center for Combatting Pandemics Research Grants

## PRESENTATIONS

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### Conference Presentations

1. The Intersection between Air Quality and COVID-19 Disease, American Thoracic Society (ATS) International Conference, 2021 (**Panel Discussant**).
2. Exposure to Air Pollution and COVID-19 Mortality in the United States, Annual Conference of the International Society for Environmental Epidemiology (ISEE), 2020, Washington, D.C. (**Oral**).
3. Impacts of Long-term Exposure to Fine Particulate Matter on Mortality Among the Elderly, Annual Conference of the International Society for Environmental Epidemiology (ISEE), 2020, Washington, D.C. (**E-Poster**).
4. Causal effects of long-term PM<sub>2.5</sub> exposure on all cause mortality, Harvard Data Science Initiative Conference, 2019, Boston, MA.
5. Optimizing Interim Analysis Timing for Bayesian Adaptive Commensurate Designs, ASA Biopharmaceutical Section Regulatory-Industry Statistics Workshop (BIOP), 2019, Washington, D.C. (**Poster**).
6. Matching on generalized propensity scores with continuous treatments, Joint Statistical Meeting (JSM), 2019, Denver, CO.
7. Matching on generalized propensity scores with continuous treatments, Atlantic Causal Inference Conference (ACIC), 2019, Montreal, QC, Canada (**Invited**).
8. Causal Inference Challenges in Air Pollution Research, Atlantic Causal Inference Conference (ACIC), 2019, Montreal, QC, Canada (**Discussant**).
9. Statistical methods for pooling categorical biomarkers from multiple studies, Joint Statistical Meeting (JSM), 2018, Vancouver, BC, Canada.
10. Causal inference in air pollution epidemiology using generalized propensity score matching, Harvard/MIT ACE Center Science Advisory Committee (SAC) Meeting, 2018, Boston, MA (**Invited**).
11. Matching on generalized propensity scores with continuous treatments, European Causal Inference Meeting (EuroCIM), 2018, Florence, Italy.
12. Causal inference in the context of an error prone exposure: air pollution and mortality, International Chinese Statistical Association (ICSA), Applied Statistics Symposium, 2018, New Brunswick, NJ (**Invited**).
13. Causal inference in the context of an error prone exposure: air pollution and mortality, Eastern North American Region (ENAR) International Biometric Society Meeting, 2018, Atlanta, GA.
14. Methods to estimate causal effects adjusting for confounding when an ordinal exposure is mis-measured in the context of air pollution, Harvard/MIT ACE Center Science Advisory Committee (SAC) Meeting, 2017, Boston, MA (**Invited**).

## Invited Presentations

1. Causal Inference with Complex Exposures in Climate and Health Research. Columbia University Mailman School of Public Health, 2021.
2. Air Pollution, COVID-19 Pandemic, and Human Health: Connecting the Science with Statistics and Causal Inference. The Center for Statistical Science at Peking University, 2020.
3. Pulmonary Health, ARDS, COVID-19 and Air Pollution: Connecting the Science. The Collaborative on Health and the Environment (CHE), 2020.
4. Air Pollution, Covid-19, and Communities of Color: What We Can Do About It. MetroWest Climate Solutions, 2020.
5. Historical Exposure to Air Pollution and COVID-19 Mortality in the United States. All-Party Parliamentary Group (APPG) on Air Pollution, 2020, London, U.K.
6. Historical Exposure to Air Pollution and COVID-19 Mortality in the United States. The U.S. House Select Committee on the Climate Crisis, 2020, Washington, D.C.
7. Coronavirus Tracking Project for Rapid-prototyping Response. MIT Center for Bits and Atoms, 2020, Cambridge, MA.
8. Harvard Public Health Symposium for Young Leaders in China. Harvard T.H. Chan School of Public Health, 2019, Boston, MA.

## PUBLICATIONS

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### Journal Articles

1. Mendy, A., **Wu, X.**, Keller, J.L., Fassler, C.S., Apewokin, S., Mersha, T.B., Xie, C. and Pinney, S.M., 2021. Air pollution and the pandemic: Long-term PM<sub>2.5</sub> exposure and disease severity in COVID-19 patients. *Respirology*.
2. Weinberger, K.R., **Wu, X.**, Sun, S., Spangler, K.R., Nori-Sarma, A., Schwartz, J., Requia, W., Sabath, B.M., Braun, D., Zanobetti, A. and Dominici, F., 2021. Heat warnings, mortality, and hospital admissions among older adults in the United States. *Environment International*, 157, p.106834.
3. Klompmaker, J.O., Hart, J.E., James, P., Sabath, M.B., **Wu, X.**, Zanobetti, A., Dominici, F. and Laden, F., 2021. Air pollution and cardiovascular disease hospitalization—Are associations modified by greenness, temperature and humidity?. *Environment International*, 156, p.106715.
4. Field, R.D., Moelis, N., Salzman, J., Bax, A., Ausiello, D., Woodward, S.M., **Wu, X.**, Dominici, F. and Edwards, D.A., 2021. Inhaled Water and Salt Suppress Respiratory Droplet Generation and COVID-19 Incidence and Death on US Coastlines. *Molecular Frontiers Journal*, pp.1-13.
5. Klompmaker, J.O., Hart, J.E., Holland, I., Sabath, M.B., **Wu, X.**, Laden, F., Dominici, F. and James, P., 2021. County-level exposures to greenness and associations with COVID-19 incidence and mortality in the United States. *Environmental research*, p.111331.
6. Mendy, A., **Wu, X.**, Keller, J.L., Fassler, C.S., Apewokin, S., Mersha, T.B., Xie, C. and Pinney, S.M., 2021. Long-term exposure to fine particulate matter and hospitalization in COVID-19 patients. *Respiratory medicine*, 178, p.106313.
7. **Wu, X.**<sup>†</sup>, Nethery, R.C.<sup>†</sup>, Sabath, B.M., Braun, D. and Dominici, F., 2020. Air pollution and COVID-19 mortality in the United States: Strengths and limitations of an ecological regression analysis. *Science Advances*, 6(45), p.eabd4049.

8. **Wu, X.**<sup>†</sup>, Braun, D.<sup>†</sup>, Schwartz, J., Kioumourtzoglou, M.A. and Dominici, F., 2020. Evaluating the impact of long-term exposure to fine particulate matter on mortality among the elderly. *Science Advances*, 6(29), p.eaba5692.
9. Shi, L.<sup>†</sup>, **Wu, X.**<sup>†</sup>, Yazdi, M., Braun, D., Liu, P., Awad, Y., Di, Q., Wei, Y., Wang, Y., Schwartz, J.D., Dominici, F., Kioumourtzoglou, M.A. and Zanobetti, A., 2020. Long-term effects of PM<sub>2.5</sub> on neurological disorders in the American Medicare population: a longitudinal cohort study. *The Lancet Planetary Health*, 4(12), pp.e557-e565.
10. **Wu, X.**, Xu, Y. and Carlin, B.P., 2020. Optimizing interim analysis timing for Bayesian adaptive commensurate designs. *Statistics in Medicine*, 39(4), pp.424-437.
11. Wei, Y., Wang, Y., **Wu, X.**, Di, Q., Shi, L., Koutrakis, P., et al. Causal effects of air pollution on mortality in Massachusetts, 2020. *American Journal of Epidemiology*.
12. Zhang, Z., Li, X., **Wu, X.**, Qiu, H. and Shi, H., 2020. Propensity score analysis for time-dependent exposure. *Annals of Transnational Medicine*, 8(5).
13. **Wu, X.**, Braun, D., Kioumourtzoglou, M.A., Choirat, C., Di, Q. and Dominici, F., 2019. Causal inference in the context of an error prone exposure: air pollution and mortality. *The Annals of Applied Statistics*, 13(1), pp.520-547.
14. Won, J.H., **Wu, X.**, Lee, S.H. and Lu, Y., 2017. Cross-sectional design with a short-term follow-up for prognostic imaging biomarkers. *Computational Statistics & Data Analysis*, 113, pp.154-176.

#### Submitted Manuscripts

1. **Wu, X.**, Weinberger, K.R., Wellenius, G.A., Dominici, F. and Braun, D., 2021. Assessing the causal effects of a stochastic intervention in time series data: Are heat alerts effective in preventing deaths and hospitalizations?. *arXiv preprint arXiv:2102.10478*.
2. **Wu, X.**, Mealli, F., Kioumourtzoglou, M.A., Dominici, F. and Braun, D., 2021. Matching on Generalized Propensity Scores with Continuous Exposures. *arXiv preprint arXiv:1812.06575*.  
\* An earlier version is winner of 2019 American Statistical Association Student Paper Competition
3. Ren, B., **Wu, X.**, Braun, D., Pillai, N. and Dominici, F., 2021. Bayesian modeling for exposure response curve via Gaussian processes: Causal effects of exposure to air pollution on health outcomes. *arXiv preprint arXiv:2105.03454*.
4. Yao, Y., Lv, X., Qiu, C., Li, J., **Wu, X.**, Zhang, H., Yue, D., Eshak, E., Anstey, K., Livingston, G. and Xue, T., 2021. Clean Air Act mitigate the cognitive deterioration in older adults.

#### In Preparation

1. **Wu, X.**, Li, X., Dominici, F. and D'Amour, A., 2020+. Identifying and estimating heterogeneous causal effects of continuous exposures.
2. **Wu, X.**, Gail, M.H. and Wang, M., 2020+. Statistical method for pooling categorical biomarkers from multi-center matched/nested case-control studies.

<sup>†</sup>indicates co-first authorship