

# XIAO WU

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## EDUCATION

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### Harvard University

Cambridge, MA

Ph.D., Biostatistics

September 2017 - March 2021

Dissertation: Causal Inference with Complex Exposures in Observational Studies

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

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

Boston, MA

M.S., Biostatistics

September 2015 - May 2017

### Peking University

Beijing, China

B.S., Mathematics

September 2011 - July 2015

LL.B., Laws

September 2011 - July 2015

## ACADEMIC EXPERIENCE

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### Stanford University

Stanford, CA

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

October 2021 - Present

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

Boston, MA

Postdoctoral Researcher; Mentor: Dr. Francesca Dominici

March 2021 - September 2021

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

Boston, MA

Predoctoral Researcher; Mentor: Dr. Francesca Dominici

June 2017 - October 2020

### Harvard Business School

Boston, MA

Research Associate; Mentor: Dr. Lauren Cohen

July 2016 - March 2017

### Stanford University School of Medicine

Stanford, CA

Statistical Researcher; Mentor: Dr. Ying Lu

June 2014 - August 2014

## ACADEMIC AWARDS & HONORS

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### Forbes 30 Under 30 - Healthcare

2022

Forbes Magazine

### Ram and Vijay Shriram Data Science Fellowship

2021

Stanford Data Science

### Barry R. and Irene Tilenius Bloom Fellowship

2021

Harvard T.H. Chan School of Public Health

### IMS Hannan Graduate Student Travel Award

2020

Institute of Mathematical Statistics

### American Statistical Association Scholarship Award

2020

ASA Biopharmaceutical Section

### ISEE Annual Conference Travel Award

2020

International Society for Environmental Epidemiology

### American Statistical Association Student Paper Award

2019

ASA Statistics and the Environment Section

<b>American Statistical Association Student Travel Award</b> ASA Biopharmaceutical Section Regulatory-Industry Statistics Workshop	<i>2019</i>
<b>Summer Institute in Statistics for Big Data Scholarship</b> University of Washington	<i>2017</i>
<b>1st Prize of the National Mathematics Contest</b> The Chinese Mathematical Society (CMS)	<i>2009</i>

## INDUSTRY EXPERIENCE

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<b>Facebook Inc</b> Research Scientist Intern; Mentors: Drs. Abbas Zaidi, Will Bullock	<i>Menlo Park, CA June 2020 - August 2020</i>
<b>Google LLC</b> Data Scientist Intern; Mentors: Drs. Li Pan, Meeyoung Park	<i>Sunnyvale, CA May 2019 - August 2019</i>
<b>Sanofi Genzyme</b> Biostatistician Intern; Mentor: Dr. Yi Xu	<i>Cambridge, MA June 2017 - August 2017, February 2019 - May 2019</i>
<b>McKinsey &amp; Company</b> Part-time Analyst; Mentor: Dr. Jie Cheng	<i>Beijing, China April 2015 - July 2015</i>
<b>Peking University Clinical Research Institute</b> Data Analyst; Mentor: Prof. Chen Yao	<i>Beijing, China February 2014 - June 2014</i>

## TEACHING EXPERIENCE

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<b>Harvard T.H. Chan School of Public Health</b> Teaching Fellow, Bayesian Methodology in Biostatistics; Instructor: Dr. Jeffrey Miller Teaching Fellow, Theory and Methods for Causality II; Instructor: Dr. Andrea Rotnitzsky Teaching Fellow, Introduction to Statistical Genetics; Instructor: Dr. Martin Aryee Teaching Fellow, Applied Bayesian Analysis; Instructor: Dr. Lorenzo Trippa Teaching Fellow, Applied Survival Analysis; Instructor: Dr. Rui Wang	<i>Boston, MA Spring 2020 Fall 2019 Fall 2019 Fall 2018 Spring 2017</i>
<b>Emory Rollins School of Public Health</b> Guest Lecturer, Air Quality in the Urban Environment	<i>Atlanta, GA March 2021</i>
<b>Massachusetts Institute of Technology</b> Guest Lecturer, Global Health Informatics to Improve Quality of Care	<i>Cambridge, MA March 2021</i>
<b>Harvard T.H. Chan School of Public Health</b> Guest Lecturer, Computing for Big Data - Working with Medicare Data	<i>Boston, MA December 2018</i>
<b>Harvard Medical School</b> Guest Lecturer, An Introduction to Propensity Score Methods	<i>Boston, MA September 2018</i>

## ADVISING EXPERIENCE

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<b>Sophie Woodward</b> , Bachelor student, Harvard College	<i>April 2021 - Present</i>
<b>Zhewen Hou</b> , Bachelor student, Peking University	<i>April 2020 - March 2021</i>
<b>Josh Villarreal</b> , Bachelor student, Harvard College	<i>May 2020 - August 2020</i>

## PROFESSIONAL ACTIVITIES

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<b>Grant Peer Reviewer</b> The Tel Aviv University Center for Combatting Pandemics Research Grants
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## Journal Peer Reviewer

Biometrics, Statistics in Medicine, Biometrical Journal, Journal of Agricultural, Biological, and Environmental Statistics, International Journal of Biostatistics, Statistical Sinica, Clinical Trials, American Journal of Respiratory and Critical Care Medicine, American Journal of Epidemiology, American Journal of Preventive Medicine, Environmental International, Environmental Research, Atmospheric Environment

## Mentor

MIT COVID-19 Datathon 2020

## Session Chair

Recent Advances in Nonparametric Statistical Methods, Joint Statistical Meeting (JSM) 2018

## Biostatistics Consultant

Biostatistics Student Consulting Center, Harvard T.H. Chan School of Public Health

## Legal Consultant

Legal Aid Association, Peking University Law School

## 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

## 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. Dominici, F., Zanobetti, A., Schwartz, J., Braun, D., Sabath, B.M., and **Wu, X.**, 2022. Assessing adverse health effects of long-term exposure to low levels of ambient air pollution: Implementation of causal inference methods. Research Reports: Health Effects Institute.
2. Yao, Y., Lv, X., Qiu, C., Li, J., **Wu, X.**, Zhang, H., Yue, D., Liu, K., Eshak, E.S., Lorenz, T., Anstey, K.J., Livingston, G., Xue, T., Zhang, J., Wang, H. and Zeng, Y., 2022. The impact of China's Clean Air Act on cognitive function in older adults: a population-based, quasi-experimental study. The Lancet Healthy Longevity (in press).
3. 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 PM2.5 exposure and disease severity in COVID19 patients. *Respirology*, 26(12), pp.1181-1187.
4. Weinberger, K.R., **Wu, X.**, Sun, S., Spangler, K.R., Nori-Sarma, A., Schwartz, J., Requia, W., Sabath, B.M., Braun, D., Zanobetti, A., Dominici, F. and Wellenius, G.A., 2021. Heat warnings, mortality, and hospital admissions among older adults in the United States. *Environment International*, 157, p.106834.

5. 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.
6. 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.
7. 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.
8. 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.
9. **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.
10. **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.
11. 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 Zanoibetti, A., 2020. Long-term effects of PM2.5 on neurological disorders in the American Medicare population: a longitudinal cohort study. *The Lancet Planetary Health*, 4(12), pp.e557-e565.  
\* **Runner-up of China Health Policy and Management Society (CHPAMS) Rising Scholar Best Paper Award in 2020**
12. **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.  
\* **Winner of American Statistical Association Student Poster Award in 2019**
13. Wei, Y., Wang, Y., **Wu, X.**, Di, Q., Shi, L., Koutrakis, P., Zanoibetti, A., Dominici, F. and Schwartz, J.D., 2020. Causal effects of air pollution on mortality in Massachusetts. *American Journal of Epidemiology*, 189(11), pp.1316-1323.
14. 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).
15. **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.
16. 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. *under review* at Biostatistics.
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. *revision invited* at Journal of the American Statistical Association.  
\* **Winner of American Statistical Association Student Paper Award in 2019**

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. *under review* at The Annals of Applied Statistics.
4. Josey, K.P., deSouza, P., **Wu, X.**, Braun, D. and Nethery, R., 2021. Estimating a causal exposure response function with a continuous error-prone exposure: A study of fine particulate matter and all-cause mortality. arXiv preprint arXiv:2109.15264. *revision invited* at Journal of Agricultural, Biological, and Environmental Statistics.
5. Kodros, J.K., Bell, M.L., Dominici, F., L'Orange, C., Godri Pollitt, K.J., Weichenthal, S., **Wu, X.**, Volckens, J., 2021. Racial segregation and an unequal exposure burden to particulate transition metals.
6. Lee, W., Heo, S., Stewart, R., **Wu, X.**, Fong, K.C., Son, J-Y., Sabath, M.B., Braun, D., Park, J.Y., Kim, Y.C., Lee, J.P., Schwartz, J.D., Kim, H., Dominici, F. and Bell, M.L., 2021. Associations between greenness and kidney disease in Massachusetts: the US Medicare longitudinal cohort study. *under review* at American Journal of Epidemiology.

### In Preparation

1. Woodward, S.M.<sup>†</sup>, **Wu, X.**<sup>†</sup>, Hou, Z., Mork D., Braun, D., and Dominici, F., 2021+. Air pollution and COVID-19 mortality in the United States: Combining aggregate and individual data to investigate individual-level association.
2. Weinberger K.R., Veeravalli N., Henk H.J., **Wu, X.**, Nassikas N., Wellenius G.A., 2021+. Long-term impact of tropical cyclones on disease exacerbation among children with asthma in the eastern United States, 2000-2018.
3. **Wu, X.**, Li, X., Dominici, F. and DAmour, A., 2020+. Identifying and estimating heterogeneous causal effects of continuous exposures.
4. **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