

Sophie Mirabai Woodward

PhD Candidate in Biostatistics

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Research Summary

I develop statistical methods for causal inference in spatial data settings, with a focus on addressing unmeasured spatial confounding in environmental health studies. My work integrates ideas from spatial statistics, causal inference, and semiparametric estimation to improve the validity of exposure–health effect estimation. I am beginning to explore how foundation models trained on complex spatial and environmental data generalize to unseen causal inference tasks. I am broadly motivated by scientific problems that combine methodological innovation with scalable data science and real-world impact in health, environment, and policy.

Education

Harvard University

PhD in Biostatistics (Expected 2027), AM in Biostatistics (2024) 2022–2027

Developing methods to address unmeasured spatial confounding in causal inference under the guidance of Dr. Francesca Dominici.

Selected Coursework: Probability Theory II, Statistical Inference II, Causal Inference: Theory and Practice, Epidemiology, Bayesian Methodology, Multivariate and Longitudinal Data, Social and Biological Networks (GPA 4.0/4.0).

Harvard College

BA in Statistics and Mathematics 2018–2022

Graduated Magna Cum Laude with Highest Honors.

Selected Coursework: Probability I (graduate-level), Statistics I (graduate-level), Computer Science, Linear Models, Spatial Statistics, Generalized Linear Models, Stochastic Processes, Design of Experimental and Non-Experimental Studies, Causal Inference (GPA 3.96/4.0).

Publications and Preprints

Woodward, S.M., Dominici, F., & Zubizarreta, J. (2025). Understanding Spatial Regression Models from a Weighting Perspective in an Observational Study of the Impact of Superfund Cleanups on Birth Outcomes. *Arxiv preprint*.

Woodward, S.M., Tec, M., & Dominici, F. (2024). An Instrumental Variables Framework to Unite Spatial Confounding Methods. *Under review*.

Tec, M., Trisovic, A., Audirac M., **Woodward, S.M.**, Hu, J., Khoshnevis, N. & Dominici, F. (2024). SpaCE: The Spatial Confounding Environment. *International Conference on Learning Representations*.

Woodward, S.M., Mork, D., Wu, X., Hou, Z., Braun, D., & Dominici, F. (2023). Combining aggregate and individual-level data to estimate individual-level associations between air pollution and COVID-19 mortality in the United States. *PLOS Global Public Health*, 3(8), e0002178.

Woodward, S.M., & Wu, X. (2023). Review 1: “Long-term Outdoor Air Pollution and COVID-19 Mortality in London: an Individual-level Analysis”. *Rapid Reviews Infectious Diseases*.

Field, R. D., Moelis, N., Salzman, J., Bax, A., Ausiello, D., **Woodward, S.M.**, & Edwards, D. A. (2021). Inhaled water and salt suppress respiratory droplet generation and COVID-19 incidence and death on US coastlines. *Molecular Frontiers Journal*, 5(01n02), 17-29.

Awards

2025: Tom Ten Have Award at the *American Causal Inference Conference* for poster on spatial regression from a weighting perspective.

2024 and 2025: Certificate of Distinction in Teaching, Harvard Biostatistics; teaching evaluations average above 4.8/5.

2024: Selected Student Speaker at the *Accelerate: Data for Social Impact Conference*.

2022: National Science Foundation Graduate Research Fellowship.

2020: John Harvard Scholarship (GPA in the top 5% of class).

Teaching

Statistical Inference I (BST 231)

Harvard University

Teaching Fellow

2024–2025

Led weekly lab sections, graded assignments, and held office hours for master's and doctoral students.

Supervisor: Dr. Rui Wang.

StatStart Summer Program

Harvard University

Instructor

2024–2025

Volunteered to teach introductory courses on statistics, R programming, and data analysis to high school students in a computational summer program.

Introduction to Probability and Statistics

Harvard University

Teaching Assistant

2020–2022

Led weekly lab sections, graded assignments, and held office hours for undergraduate students.

Supervisor: Dr. Joseph Blitzstein.

Presentations

2025: American Causal Inference Conference, Detroit, MI — Poster, May 2025.

2025: Eastern North American Region International Biometric Society Spring Meeting, New Orleans, LA — Talk, March 2025.

2024: Accelerate: Data for Social Impact Conference — Talk, June 2024.

2024: American Causal Inference Conference, Seattle, WA — Poster, May 2024.

2022: National Collegiate Research Conference, Cambridge, MA — Poster, Jan 2022.

Skills

Programming: R (SuperLearner, sf, spdep, mgcv, data.table, tidyverse), Python (numpy, pandas, scikit-learn, statsmodels, tensorflow, pytorch)

Service

Peer Reviewer: NeurIPS 2025 Workshop CauScien, Uncovering Causality in Science.