Ellen Considine

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Education

Ph.D. in Biostatistics | 5th Year (class of 2025) | Harvard T.H. Chan School of Public Health (HSPH)

- **M.A. in Biostatistics** | May 2022 | HSPH
  - National Institutes of Health (NIH) Environmental Statistics Training Grant Program
- Advisors: Rachel Nethery and Francesca Dominici
- Thesis (working title): Advancing the use of statistical / data science methods in environmental health policy design

B.S. in Applied Mathematics | 2020 | University of Colorado (CU) Boulder

- Outstanding Graduate of the College of Engineering & Applied Science
- Minors: Statistics, Economics, Geography
- Emphases: Global Public Health, Remote Sensing & GIS, International Development
- Summa cum laude with honors (GPA: 3.98)
- Research mentor: Colleen Reid, Department of Geography

Fellowships, Grants, and Funding

- 2024 Student Paper Competition Winner | American Statistical Association, Section on Statistical Learning and Data Science, Applied Track → $1,000 for travel to the Joint Statistical Meetings
- 2020 Graduate Research Fellow | National Science Foundation → 3 years x ($37,000 stipend + $12,000 cost of education)
- 2019 Astronaut Scholar | Astronaut Scholarship Foundation → $10,000 plus travel to the Innovators Weekend in Washington, DC
- 2019 Goldwater Scholar | Barry Goldwater Foundation → $7,500
- 2019 Undergraduate Research Opportunities Program (UROP) Individual Grant | CU Boulder → $3,000
- 2018 Norlin Scholar | CU Boulder Special Undergraduate Enrichment Programs → 2 years x $6,000

Other Honors and Awards

- Trusted Reviewer | IOP Publishing | Jun. 2023
- Outstanding Graduate of the College of Engineering & Applied Science | CU Boulder | Apr. 2020
- "Outstanding" paper on modeling the spread of the opioid epidemic| COMAP International Mathematical Contest in Modeling | Apr. 2019
- "Finalist" paper on balancing economic growth and happiness through taxation | COMAP International Interdisciplinary Contest in Modeling | Apr. 2017
- Engineering Honors Program (EHP) | CU Boulder | Aug. 2016 – May 2020

Publications

- **Considine EM**, Braun D, Kamareddine L, Nethery RC, and deSouza P. 2023. Investigating use of low-cost sensors to increase accuracy and equity of real-time air quality information. *Environmental*

Science & Technology.

- **Considine EM**, Hao J, Braun D, deSouza P, Reid CE, and Nethery RC. 2023. Evaluation of model-based $PM_{2.5}$ estimates for exposure assessment during wildfire smoke episodes in the western U.S. *Environmental Science & Technology.*
- Reid CE, **Considine EM**, Watson GL, Telesca D, Pfister GG, and Jerrett MLB. 2023. Effect modification of the association between fine particulate air pollution during a wildfire event and respiratory health by area-level measures of socio-economic status, race/ethnicity, and smoking prevalence. *Environmental Research: Health.*
- **Considine EM**, Reid CE, Ogletree MR, Dye T. 2021. Improving accuracy of air pollution exposure measurements: Statistical correction of a municipal low-cost airborne particulate matter sensor network. *Environmental Pollution.*
- Reid CE, **Considine EM**, Maestas MM, Li G. 2021. Daily $PM_{2.5}$ concentration estimates by ZIP code in 11 western states wildfire and non-wildfire, 2008-2018. *Scientific Data.*
- Bell J, **Considine EM**, McCallen L, and Chatfield K. 2021. The Prevalence of Noonan Spectrum Disorders in Pediatric Patients with Pulmonary Valve Stenosis. *The Journal of Pediatrics.*
- Reid CE, **Considine EM**, Watson GL, Telesca D, Pfister GG, and Jerrett MLB. 2019. Associations between ozone and fine particulate matter with respiratory health during a wildfire event. *Environment International.*
- **Considine EM**, Soti S, and Webb E. 2019. Random Walks and Rehab: Analyzing the Spread of the Opioid Crisis. *Undergraduate Mathematics and Its Applications (UMAP).*

Working papers

- **Considine EM,** Nethery RC, Wellenius GA, Dominici F, and Tec M. Optimizing heat alert issuance with reinforcement learning. [arXiv preprint]

Presentations

- **Considine EM.** "Heat Alert Reinforcement Learning: Bridging AI and Environmental Health." CAFÉ (Climate & Health Research Coordinating Center) webinar, titled "Research to Inform Optimization of Heat Health Early Warning Systems". April 26, 2024.
- **Considine EM.** "Reinforcement Learning Methods to Optimize Heat Alert Issuance for Public Health in the United States." Annual conference of ENAR, the Eastern North American Region of the International Biometric Society. Baltimore, MD. March 12, 2024.
- **Considine EM.** "Optimizing Heat Alert Issuance with Reinforcement Learning." Harvard Biostatistics Student Seminar. Boston, MA. March 4, 2024.
- **Considine EM.** "Can Reinforcement Learning Improve Strategies for Issuing Heat Alerts?" Harvard Causal Inference Working Group. Boston, MA. February 2, 2023.
- deSouza P and **Considine EM**. "Investigating Use of Low-Cost Sensors to Increase Accuracy and Equity of Real-Time Air Quality Information." Air Sensors International Conference (hybrid). May 11, 2022.
- **Considine EM.** "The Promise of Blue Skies: Air Pollution, Health, and Data Science." Harvard Science in the News (SITN) Speaker Series (virtual). March 30, 2022.
- **Considine EM.** "Air Pollution, Global Health, and Data Science." Invited guest lecture (virtual) for undergraduate course CVEN 2837: Intro to Global Engineering at CU Boulder. September 23, 2021.
- **Considine EM.** "Using Statistics to Improve Air Quality and Respiratory Health in Denver, CO." Special Undergraduate Enrichment Programs Research Conference at CU Boulder (virtual). April 11, 2020.

- **Considine EM.** "Investigating the Health Impacts of Air Pollution from Wildfires." Astronaut Scholarship Foundation Technical Conference. Washington DC. August 24, 2019.
- **Considine EM.** "When the Western US Burns: Understanding the Population Health Impacts of Smoke from Wildfires." Special Undergraduate Enrichment Programs Research Conference at CU Boulder. April 13, 2019.
- **Considine EM**, Soti S and Webb E. "Mars Vives: Jointly Optimizing GDP and Happiness." Society for Industrial & Applied Mathematics (SIAM) Front Range Student Conference. Denver, CO. March 4, 2017.

Posters

- **Considine EM.** "Reinforcement Learning Methods to Optimize Heat Alert Issuance for Public Health in the United States." First annual CAFÉ Climate & Health Conference (virtual). February 6, 2024.

Research Experience

- Biostatistics Researcher | National Studies on Air Pollution & Health Group, HSPH | Jan. 2021 – present
    - Reinforcement learning to improve strategies for issuing heat alerts to protect public health
        - *Won the student paper competition in the Joint Statistical Meetings (JSM) Section on Statistical Learning and Data Science (SLDS) Applied Track in Jan. 2024*
    - Quantifying tradeoffs between measurement accuracy, density of networks, and relative placement of low-cost sensors using detailed simulations
    - Comparing accuracy of machine learning-derived wildfire smoke exposure datasets
- Environmental Health Data Science Intern | CU Earth Lab | Sept. 2017 – Jul. 2020
    - Estimating the health impacts of wildfire smoke, overall and for marginalized groups
    - Machine learning to predict air pollution across the western US
- Research Consultant | Denver Department of Public Health & Environment | May 2019 – Jul. 2020
    - Statistical calibration of low-cost air quality sensor network (dealing with noisy measurements)
- Statistical Collaborator | CU Laboratory for Interdisciplinary Statistical Analysis | Jan. 2020 – May 2020
    - Worked with domain experts in pediatric genetics, environmental design, and global engineering to identify and use appropriate statistical methods for their research projects
- Final projects for upper-division courses | HSPH and CU Boulder | March 2018 – present
    - Reviewed state-of-the-art offline reinforcement learning algorithms
    - Investigated the usefulness of Bayesian Additive Regression Trees (BART) for estimating uncertainty in wildfire smoke prediction
    - Explored methods to deal with measurement error (noise) in longitudinal (correlated) data
    - Explored the evolution of discourse surrounding global public health surveillance and information systems, including future opportunities and risks in implementation
    - Used network methods, spatial and socioeconomic data to model migration between US cities
    - Used data assimilation methods to model seasonal flu cases in Denver, CO
    - Used spatial kriging to improve estimation of air quality from a random forest model
    - Used satellite imagery to analyze trends in air quality over Southeast Asia
    - Used a hierarchical model and change-point analysis to predict energy usage from temperature in US cities. *My model was the class's most accurate on unseen data.*
    - Used a convolutional neural network to predict sociodemographic information based on satellite images of US cities
- International Mathematical / Interdisciplinary Contest in Modeling | COMAP | Jan. 2017, 2018, 2019

    - Worked on a team of three undergraduates over a 99-hour period to develop a solution to an interdisciplinary data science problem and write a 20-page report
- Drone Mapping Team | CU Engineers Without Borders Nepal Team | May 2017 – Dec. 2018
    - Collected aerial imagery in remote areas of Nepal and used photogrammetry software to develop 3D maps to be used in my team's engineering work
- Independent research project modeling the long-term economic outcomes of college choice | May 2016 – Aug. 2016

Professional Service / Extracurriculars

- Peer Reviewer (documented on my Web of Science profile): [*Journal* – number of papers (year)]
    - *Environmental Research: Health* – 2 (2023)
    - *Environmental Science & Technology* – 1 (2024)
- Service to the Department of Biostatistics | HSPH | Sept. 2020 – present
    - Various committees on PhD student workload & mental health and departmental EDIB
- Vice President / E-Board Member | Harvard Griffin GSAS Science Policy Group | Sept. 2022 – May 2024
    - During academic year 2023-2024, co-organized a three-part series of events on the intersection of climate change & health, sponsored by the Harvard Salata Institute for Climate and Sustainability; spearheaded and moderated a panel and networking dinner on the translation of research into policy
- Founding Member | HSPH Spatial Methods in Public Health Journal Club | Feb. 2023 – May 2024
- Reviewer for the 2024 edition of the World Meteorological Organization's report on the state of the science and recommended use of low-cost air quality sensors (in preparation) | Jan. 2024
- Review Editor for the Fifth National Climate Assessment, Western Wildfires Focus Box | U.S. Global Change Research Program | Nov. 2022 – May 2023
- Fellow / Columnist: "Breathing Data" blog on air pollution, health, and data science | *HPHR Journal* (formerly the *Harvard Public Health Review*) | May 2021 – Sept. 2021
- Member | Environmental Justice Student Organization at HSPH | 2021
- Reflections on Professional Experiences | Personal website / blog | Oct. 2020 – present
    - Career advice as well as academic thought leadership
- Science Manager | CU Engineers Without Borders Chapter Board | Jan. 2019 – May 2020
- Sustainability Lead | CU Engineers Without Borders Nepal Team | Jan. 2017 – Jan. 2019
- CU Diversity in Engineering Programs (BOLD Center, AWM, SWE) | Aug. 2016 – Mar. 2020

Teaching / Mentoring Experience

- Teaching Fellow for graduate-level biostatistics courses | HSPH | Aug. 2021 – May 2024
    - BST 226: Applied Longitudinal Analysis (Spring 2024)
    - BST 210: Applied Regression Analysis (Fall 2023)
    - BST 222: Basics of Statistical Inference (Fall 2021)
- Pedagogy Fellow for the Department of Biostatistics and HSPH overall | Aug. 2022 – May 2023
    - Developed curriculum for PhD-level (bio)statistical consulting / collaboration course
    - Developed short course, "Overview of Data Science Tools for Climate & Health" for the HSPH online MPH program. Includes ~1 hour of video lectures, auto-graded quizzes, and reading list.

    - Collaboratively created recommendations for participation tracking in HSPH courses
- Alumni Mentor | Goldwater Foundation Diversity, Equity, & Inclusion Program | Jan. 2021 – present
- Data Science Instructor | StatStart (camp for underrepresented high school students) | Jul. 2022
- Primary mentor for master's student Jiayuan Hao on her research, Aug. 2021 – May 2022
- Recitation Leader | CU Engineering Honors Program philosophy class | Aug. 2018 – May 2020
- Created educational modules on topics ranging from global health to environmental impact analysis to project documentation and fundraising | CU Engineers Without Borders | Sept. – Nov. 2019
- Probability & Machine Learning Instructor| CU STEM Camp for grades 6-12 | July 2019