Mona Dai

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SUMMARY

My goal is to work at the intersection of public health and engineering, innovating practical policy solutions for solving complex issues in environmental health. I have experience in:

- Data science & machine learning
- Exposure modeling & risk assessment
- Children's environmental health
- Environmental justice

EDUCATION

Harvard University, Cambridge, MA   expected May 2024

Doctor of Philosophy (Ph.D) in Environmental Science and Engineering

- Advisor: Dr. Elsie Sunderland, Biogeochemistry of Global Contaminants Lab

Johns Hopkins Bloomberg School of Public Health, Baltimore, MD   May 2017

Master of Health Sciences (MHS) in Environmental Health

- Certificate: Food Systems, Water and Environmental Sustainability
- Conducted literature review entitled *Alaska Native Health: The Challenge of Living at Home with Climate Change*

Duke University, Durham, NC   May 2015

Bachelor of Science (BSE) in Civil Engineering, Minor: Environmental Science & Policy

- Semester abroad at James Cook University, Townsville, Australia Fall 2013

RESEARCH EXPERIENCE

MEMCARE Superfund Research Center | *Doctoral Research Fellow*   Sep 2019 – Present

Harvard University, Cambridge, MA

- Develop and apply statistical methods in R to test whether marginalized groups are disproportionately exposed to mercury emissions from coal-fired power plants after implementation of the Mercury and Air Toxics Standards (MATS)
- Create regression models to evaluate associations between inorganic chemical contamination & sociodemographic disparities in US public drinking water supplies
- Map in ArcGIS over 3.1 million concentrations of 17 heavy metals at over 90,000 US public water supplies in partnership with the Environmental Working Group (EWG)
- Explore temporal and spatial data trends relating to equity for US public water consumers
- Analyze 600 tap water samples for heavy metals using inductively coupled plasma mass spectrometry (ICP-MS) collected by the Nurses' Health Study
- Collect & analyze 60 tap water samples for heavy metals from Boston parks to bring local awareness of water issues through a public art installation
- Build an ArcGIS StoryMap exploring historical trends regarding redlining & construction of lead drinking water service lines across Boston
- Collect & analyze up to 1,000 tap water samples for heavy metals & per- and polyfluoroalkyl substances (PFAS) from participants in the St. Louis Baby Teeth Study

RESEARCH EXPERIENCE (cont.)

MEMCARE Superfund Research Center (cont.)

- Co-advise undergraduate student on machine learning project forecasting Superfund site contributions to heavy metal mixtures in US private wells using random forest modeling
- Volunteer at Boston community engagement events, educating Cambridge elementary through high school students and Roxbury families about lead
- Initiate and lead monthly environmental justice journal club between Harvard and Yale students

Oak Ridge Institute for Science and Education | *Research Fellow*   Sep 2017 – Aug 2019
Office of Children's Health Protection (OCHP), US EPA, Washington DC

- Developed ExpoKids, a sensitivity analysis tool to improve aggregate exposure assessment to environmental chemicals the Exposure Factors Handbook using R Shiny
    - Invited to present two training webinars to over 35 EPA employees demonstrating how to use ExpoKids
    - Recognized with Administrative Office (AO) Collaborative Partnership Award
- Explored susceptibility of early-life exposure to endocrine disrupting chemicals and cancer development to establish an age-dependent adjustment factor
- Conducted a systematic literature review of epidemiology and toxicology studies on DES and other synthetic estrogen chemicals
- Collected, analyzed, and interpreted chemical data to address highly complex needs for regulatory programs, human health risk assessment, and toxicology related to children's health
- Evaluated hazards and characterized risks after analyzing technical information contributing to development of strategies to reduce & prevent chemical pollution
- Prepared reports and program documents for regulations such as the Toxic Substances Control Act (TSCA) & the Safe Drinking Water Act (SDWA) to communicate technical conclusions
- Represented OCHP at weekly exposure technical team meetings with the Office of Pollution Prevention and Toxics Risk Assessment Division (OPPT/RAD)
    - OCHP TSCA team recognized by OPPT/RAD with award for valuable contributions on potentially exposed and susceptible subpopulations in the TSCA risk evaluations
- Served as OCHP representative in internal and external workgroups relating to TSCA risk assessments and the SDWA Contaminant Candidate List 4 (CCL4) determination to make recommendations ensuring children's vulnerabilities were addressed
- Performed evaluations and reviews of exposure & reproductive/developmental health endpoints of CCL4 chemical & microbial substances
- Conducted a systematic literature review on the susceptibility of early-life exposure to estrogenic chemicals and cancer development to understand the need for establishing an age-dependent adjustment factor

Friends of the Earth | *Research Assistant*   Jan 2017 – May 2017
Baltimore, MD

- Perform logistics and communications for organic biomonitoring project to compare pesticide metabolite levels in families eating organic vs. conventional foods

RESEARCH EXPERIENCE (cont.)

National Academy of Engineering Grand Challenge Program | *Scholar*   Jan 2014 – May 2015
Duke University, Durham, NC
- Selected as 1 of 13 scholars to tackle the challenge of providing access to clean water
- Determined prevalence of harmful bacteria in water sources surrounding Kyenjojo district by sampling and conducting total coliform & gram stain tests
- Developed methodology and selection criteria for best management practices in point-of-use water treatment devices
- Optimized ceramic water filters for families living in rural Uganda by partnering with the nonprofit, Bringing Hope to the Family
- Invited speaker on 2 panels at 2018 National Academy of Engineering Grand Challenge Scholars Program (NAE-GCSP) Annual Meeting

Farandé Village Development Committee (RIPP-Engage)|*Project Engineer.*   Jan 2013 – Aug 2013
Farandé, Togo
- Developed and implemented human wastewater sanitation system incorporating anaerobic digestion, nitrification, passive solar sterilization, and electricity generation in rural community in Togo
- Designed and calculated multiple engineering components in AutoCAD
- Served as French translator between English speaking engineering team and local Kabiye speaking community members
- Prepared report for use in evaluating program operations for development of an information gathering system for sustainable use and maintenance of sanitation system
- Awarded $2,000 for funding in Duke University's annual social innovation competition, ChangeWorks

Department of Civil & Environmental Engineering|*Research Assistant*   Sep 2011 – May 2015
Duke University, Durham, NC
- Constructed upflow anaerobic sludge blanket (UASB) digester funded by the Gates Foundation to be applied to waste treatment in rural settings in developing nations under Dr. Marc Deshusses

NASA Missouri Space Grant Consortium | *Research Assistant*   June 2010 – Aug 2010
University of Missouri St. Louis, St. Louis, MO
- Analyzed water and methane molecular gas emissions from comet c/2002 T7 (LINEAR) using IDL programs under Dr. Erika Gibb

POLICY EXPERIENCE

Center for Applied Environmental Law and Policy (CAELP) | *Consultant*   May 2023
- Conducted 10-year literature review on health effects of multi-pathway exposure to toxic metals emitted by coal-fired power plants
- Prepared for inclusion in public comment on US EPA's proposed review of Mercury and Air Toxics Standards (MATS)

POLICY EXPERIENCE (cont.)

Federation of American Societies for Experimental Biology | *Public Affairs Fellow*   March 2020 –2023
Washington DC
- Advocated for NIH and NSF science funding as a Howard Garrison Public Affairs Fellow in meetings with elected representatives of Congress

European Environmental Agency (EEA) Expert Workshop | *Attendee*   June 2018
Copenhagen, Denmark
- Attended interdisciplinary workshop on sustainability consequences of chemical exposures with 40 international experts
- Identified how human health and risk assessment evidence of chemical exposures can be tailored to assess socio-economic policy options regarding the precautionary principle

TEACHING & MENTORING EXPERIENCE

Leverett House | *Senior Resident Tutor*   Aug 2021 – Present
Harvard University, Cambridge, MA
- Build community in 500 student dormitory by providing guidance and support related to health & wellness, public service, and STEM
- Advise 14 sophomores interested in engineering & mathematics on navigating their concentration and general career advice

Department of Environmental Science & Engineering | *Teaching Fellow*   Jan 2021 – May 2022
Harvard University, Cambridge, MA
- Develop & evaluate problem sets, lab manuals, & projects for *Introduction to Environmental Science and Engineering* course
- Instruct freshmen on coding & basic physics, exploring best-available engineering solutions to current environmental issues
- Awarded Derek Bok Center Certificate of Distinction in Teaching

Graduate School of Arts and Sciences Student Center | *Outings Fellow*   Sep 2020 – 2021
Harvard University, Cambridge, MA
- Plan, organize, and lead programming on social events open to over 20,000 graduate students with $30,000 budget
- Managed events ranged from meditation, hiking, and escape rooms to ceramics painting, opera, and entrepreneurship

Department of Civil and Environmental Engineering | *Teaching Assistant*   Jan 2014 – May 2015
Duke University, Durham, NC
- Support student projects and grading for *Introduction to Structural Engineering* course

Housing, Dining & Residence Life | *Resident Assistant*   Jan 2014 – May 2014
Duke University, Durham, NC
- Led 150 undergraduates in residential hall by providing resources, planning programs, and offering academic & personal mentoring

LEADERSHIP & SERVICE EXPERIENCE

Duke Alumni Admissions | *Volunteer Interviewer*   Dec 2015 – Present
Duke University, Durham, NC
- Interview prospective high school applicants to learn about interviewee motivations and share my Duke experience

Diversity, Inclusion, and Belonging Graduate Student Subgroup | *Member*   July 2020 – Feb 2022
Harvard University, Cambridge, MA
- Strategize community-wide initiatives on diversity and inclusion related to graduate student recruitment for the department
- Reviewed personal statements and resume/CVs for prospective students during the Graduate School Application Assistance Initiative

Geoclub | *Admitted Student Chair*   Sep 2019 – 2021
Harvard University, Cambridge, MA
- Organize two-day visit for 15 newly admitted PhD students by arranging meetings with existing students and faculty, leading tours, and acting as general resource for answering questions

Student Outreach Resource Center (SOURCE) | *Program Assistant*   Sep 2016 – May 2017
Johns Hopkins University, Baltimore, MD
- Coordinated over 30 internships between medical, nursing, and public health students acting as consultants to local Baltimore community-based organizations
- Improved community partner relationships by creating guidance documents, data analytics tools, and in-person meetings with over 50 students and 12 preceptors to evolve community partnerships

Alpha Phi Omega | *President, Service Vice President, Pledge Master*   April 2012 – May 2015
Duke University, Durham, NC
- Directed weekly and semester long service projects for 126 service fraternity members
- Partnered with over 15 local community partners (e.g., Duke Campus Farm, Carolina Tiger Rescue, Habitat for Humanity) to help carry out nonprofit missions

TECHNICAL EXPERIENCE

Draper Aden Associates | *Staff Engineer*   Aug 2015 – July 2016
Richmond, VA
- Engaged with public and private stakeholders in construction, modification, and closure of landfills in Virginia by creating base grades, performing stormwater drainage calculations, and implementing erosion and sediment control procedures in AutoCAD

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PUBLICATIONS

Peer-Reviewed Journals:

- **Dai, M.Q.**, Geyman, B.M., Hu, X.C., Thackray, C. P. & Sunderland, E.M. Sociodemographic Disparities in Mercury Exposure from United States Coal-Fired Power Plants. *Environ. Sci. Technol. Lett.* (2023) doi:10.1021/acs.estlett.3c00216

- Hu, X.C., **Dai, M.**, Sun, J.M. Sunderland, E.M. The Utility of Machine Learning Models for Predicting Chemical Contaminants in Drinking Water: Promise, Challenges, and Opportunities. *Curr Envir Health Rpt* 10, 45–60 (2023). doi:doi.org/10.1007/s40572-022-00389-x

- de Vera, G.A. Brown, B.Y., Cortesa, S., **Dai, M.**, Bruno, J., LaPier, J., Sule, N., Hancock, M., Yoon, B., Chalah, A., Sunderland, E.M., Wofsy, S.C. HazeL: A Low-Cost Learning Platform for Aerosol Measurements. *Journal of Chemical Education*, 99(9), pp. 3203–3210. (2022). doi:10.1021/acs.jchemed.2c00535

- **Dai, M.**, Euling, S.Y., Phillips, L., Rice, G.E. ExpoKids: An R-based tool for characterizing aggregate chemical exposure during childhood. *J Expo Sci Environ Epidemiol* (2020). doi:10.1038/s41370-020-00265-6

- *In preparation:* **Dai, M.Q.**, et al. "Sociodemographic disparities in exposures to inorganic contaminants in US drinking water and effects of variable spatial units of analyses."

Reports:

- Sunderland, E.M., Thackray, C., Geyman, B.M., **Dai, M.**, Hammitt, J., Goho, S., Driscoll, C. A Template for a State-of-the-Science Assessment of the Public Health Benefits associated with Mercury Emissions Reductions for Coal-fired Electricity Generating Units. *Harvard Chan C-CHANGE*. (2022). https://www.hsph.harvard.edu/c-change/news/mercury-emissions-reductions/

PRESENTATIONS

Conference Presentations:

- **Dai, M.Q.**, Geyman, B.M., Hu, X.C., Thackray, C.P. & Sunderland, E.M. 35th Conference of the International Society for Environmental Epidemiology. "Sociodemographic Disparities in Mercury Exposure from United States Coal-Fired Power Plants." (Sepember 2023)

- **Dai, M.**, Hu, X.C., Coull, B., Campbell, C., Andrew, D.Q., Naidenko, O.V., Sunderland, E.M. 34th Conference of the International Society for Environmental Epidemiology. "Sociodemographic Disparities and Metal Concentrations in US Drinking Water Supplies" (Sepember 2022)

- **Dai, M.**, Euling, S.Y., Phillips, L., Rice, G.E. Pediatric Environmental Health Specialty Unit (PEHSU) Annual Meeting. "Developing a Tool to Characterize Aggregate Chemical Exposure by Lifestage." (June 2019)

Invited Talks:

- **Dai, M.**, Hu, X.C. University of Liverpool Geographic Data Science Lab Brown Bag. "Mapping the Invisible: Using Data Science to Improve Drinking Water Quality, Public Health and Health Equity." (May 2023)

PRESENTATIONS (cont.)

Invited Talks (cont.):
- **Dai, M.**, Euling, S.Y., Phillips, L., Rice, G., Pfeiffer, S. US EPA Office of Children's Health Protection (OCHP) Webinar. "ExpoKids Version 1.0 Training for R users." (November 2020)
- **Dai, M.**, Euling, S.Y., Phillips, L., Rice, G.E. EPA Children's Environmental Health Partner Alliance Coordination Team (CEH PACT) Webinar. "Characterizing Aggregate Exposure to Environmental Chemicals by Lifestage During Childhood." (June 2019)

Posters:
- **Dai, M.**, Hu, X.C., Campbell, C., Andrew, D.Q., Naidenko, O.V., Sunderland, E.M. Society of Environmental Toxicology and Chemistry (SETAC) North America Meeting. "Characterizing U.S. Drinking Water Inorganic Pollutant Concentrations Through an Environmental Justice Lens." (November 2020)
- **Dai, M.**, Euling, S.Y., Phillips, L., Rice, G.E. Society for Risk Analysis (SRA) 2019 Annual Meeting. "ExpoKids: a tool to characterize environmental chemical aggregate exposures across childhood lifestages." (December 2019)
- **Dai, M.**, Euling, S.Y., Foos, B. International Conference on Fetal Programming and Developmental Toxicity (PPTOX VI). "A Comparative Approach to Assessing Lifestage-Dependent Susceptibility to Estrogenic Agent Exposures and Cancer Development" (May 2018)
- **Dai, M.**, Euling, S.Y., Foos, B. Teratology Society 58th Annual Meeting. Birth Defects Research Journal (doi: 10.1002/bdr2.1355). "Does Early-life Exposure to Estrogenic Chemicals Warrant an Age Dependent Adjustment Factor in Carcinogen Risk Assessments?" (May 2018)

PROFESSIONAL AFFILIATIONS
- International Society of Environmental Epidemiology (ISEE)
- American Public Health Association (APHA)
- Society for Birth Defects Research and Prevention (BDRP)

SKILLS & CERTIFICATIONS

Collaborative Institutional Training Initiative (CITI Program) Certificate   Dec 2020
- Earned online certification training for biomedical research investigators

NIH Protecting Human Research Participants Certificate   Dec 2016
- Earned online certification training on ethics of protecting human subjects for research

Engineer in Training (EI/EIT)   Jan 2015
- Passed the NCEES Fundamentals of Engineering test

Computer: R, ArcGIS, Python, MATLAB, LaTeX, Photoshop, Qualtrics, Zotero, Microsoft Office
Lab: Inductively coupled plasma mass spectrometry (ICP-MS)
Languages: English, Chinese (Mandarin), French (basic)
Hobbies: Rock climbing, camping, tennis, card making, cooking