

Michael B. Fisher

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Education

U.C. Berkeley, Berkeley, CA. Ph.D. in Environmental Engineering, May 2011.

Massachusetts Institute of Technology, Cambridge, MA. M.S. in Environmental Engineering, September 2004

Grinnell College, Grinnell, IA. Bachelor of Arts in chemistry with honors, May 2002

Experience

Assistant Professor, University of North Carolina at Chapel Hill, Department of Environmental Sciences and Engineering (2018-Present). My work at UNC focuses on addressing emerging and neglected environmental challenges associated with water supply and development, both in the US and internationally. This work focuses on three areas: 1) understanding and addressing emerging and under-recognized contaminants and challenges to safely managed water under SDG 6; 2) applications of implementation science and quality improvement methods to global safe water and public health challenges; 3) application of novel monitoring and surveillance tools and methods to tracking, understanding, and managing these challenges. Topics of particular interest within these areas include improving the monitoring and control of antimicrobial resistant (AMR) organisms and genes in environmental media, as well as pathogens (such as protozoan cysts and enteric viruses) that are resistant to conventional disinfection methods. Overall, this research contributes to understanding the determinants of effective and beneficial water and sanitation service delivery, and to innovations and evidence that can be used to improve public health in US and global settings.

Senior Research Scientist, University of North Carolina at Chapel Hill, Department of Environmental Sciences and Engineering (2017-2018). My work at UNC focused on identifying opportunities to improve the sustainable delivery of global water and sanitation services through improvements in intervention design, implementation, and monitoring. I led a 10-country study of heavy metal contamination in drinking water; a three-country study of the determinants of poor drinking water quality (using Bayesian network models to analyze a high-quality primary dataset); and the reformulation of the most widely-used commercial drinking water disinfectant in developing countries (Aquatabs[®], used to treat over 10 billion liters of water each year) to improve effectiveness against chlorine-resistant pathogens such as *Cryptosporidium* species. I also led continuous quality improvement (CQI) projects focusing on water and sanitation service delivery in Ghana, Niger, Mali, and Burkina Faso. Additional activities included teaching [ENVR 682](#) (WaSH and Global Health), supervising graduate and undergraduate researchers, as well as leading funding proposals.

Postdoctoral Research Associate, University of North Carolina at Chapel Hill, Department of Environmental Sciences and Engineering (2012-2017). My work at UNC focused on leveraging monitoring and evaluation to maximize the impact of water, sanitation, and hygiene (WaSH) interventions at the household and community levels. This work includes developing indicators, tools, and methods for more effectively monitoring and evaluating WaSH interventions, applying these qualitative and quantitative methods, along with mobile survey tools and field-level water quality testing approaches, to rigorous monitoring and impact evaluation studies, and using both multivariable regression and Bayesian network models for data analysis and quality improvement. This work included the design, supervision, and analysis of numerous international field studies in Ghana, Burkina Faso, Niger, Mali, Ethiopia, India, and other international settings, as well as the application of novel methods to the analysis and interpretation of secondary field data. Other research included assessing the safety of packaged water in Sierra Leone and proposing recommendations for the Ministry of Health for improving packaged water safety, studying the determinants of sustained functionality for rural water systems in Ghana, and the first adaptation of implementation science methods to global WaSH programs. Responsibilities also included assisting with the training and mentoring of graduate students and other researchers, instructing [ENVR 682](#) (a graduate-

level course on Water, Sanitation, Hygiene and Global Health), serving as a guest lecturer for ENVR 421 (Environmental Health Microbiology), and leading external funding proposals.

Visiting Researcher, Fundacion Cantaro Azul, Mexico (2011- 2012). I worked with Fundacion Cantaro Azul to develop, implement, and evaluate systems for the low-cost disinfection of drinking water in rural Mexico. Work included designing, constructing, and evaluating water kiosks using UV disinfection in combination with modular slow-sand filtration, and training community members and practitioners on UV disinfection, as well as other topics related to WaSH and health.

Research Associate, Royal College of Surgeons in Ireland, Dept. of Physiology & Medical Physics (2010). I worked with Dr. Kevin McGuigan at RCSI and collaborators at the Dublin Institute of Technology on developing and evaluating novel photocatalytic coatings for solar drinking water disinfection. I also conceived, designed, and led collaborative work on developing and evaluating novel chemical disinfectants for drinking water. This work led to a recent successful funding proposal to reformulate and optimize advanced disinfectant tablets. Duties also included training students in environmental microbiology techniques.

Doctoral and Master's Research, University of California at Berkeley, Department of Civil and Environmental Engineering (2004-2011, Ph.D.) and Massachusetts Institute of Technology, Department of Civil and Environmental Engineering (2003-2004, M.S.). Research focused on understanding how sunlight inactivates *E. coli* and other microorganisms in surface water and applying these findings to solar drinking water disinfection in developing countries. This work included laboratory studies at MIT and UC Berkeley, as well as field work in Cochabamba, Bolivia. Teaching duties included developing lectures, assignments, and exams, and leading weekly discussion sessions for CE 210, a graduate course on Control of Water Related Pathogens, as well as serving as a graduate student instructor for CE 211A, a graduate course on Environmental Physical/Chemical processes, and CE 111, an undergraduate Introduction to Environmental Engineering.

Awards

- NIEHS BIOS Training Grant 2012-2015
- NSF Graduate Research Fellowship 2005-2007
- NDSEG Graduate Research Fellowship 2003-2004
- AWWA LARS Fellowship 2003

Publications

- Reuland, F., Behnke, N., Cronk, R., McCord, R., **Fisher, M.B.**, Abebe, L., ... & Mmodzi Tseka, J.; Energy access in Malawian healthcare facilities: consequences for health service delivery and environmental health conditions. *Health policy and planning*.; 2019; *Health policy and planning*.
- Sozzi, E.; Baloch, M.; Strasser, J.; **Fisher, M.B.**; Leifels, M.; Camacho, J.; Mishal, N.; Elmes, S.F.; Allen, G.; Gadai, G.; Valenti, L.; Sobsey, M. (2019). A Bioassay-based Protocol for Chemical Neutralization of Human Faecal Wastes Treated by Physico-Chemical Disinfection Processes: A Case Study on Benzalkonium Chloride. *International Journal of Hygiene and Environmental Health*.
- Wu, J., Stewart, J. R., Sobsey, M. D., Cormency, C., **Fisher, M. B.**, & Bartram, J. K. (2018). Rapid Detection of Escherichia coli in Water Using Sample Concentration and Optimized Enzymatic Hydrolysis of Chromogenic Substrates. *Current microbiology*, 1-8.
- Geere, J; Bartram, J.; Bates, L.; Danquah, L.; Evans, B.; **Fisher, M.B.**; Groce, N. et al. "Carrying water may be a major contributor to disability from musculoskeletal disorders in low income countries: a cross-sectional survey in South Africa, Ghana and Vietnam." *Journal of Global Health* (2017).
- **Fisher, M. B.**, Mann, B. H., Cronk, R. D., Shields, K. F., Klug, T. L., & Ramaswamy, R. "Evaluating Mobile Survey Tools (MSTs) for Field-Level Monitoring and Data Collection: Development of a Novel Evaluation Framework, and Application to MSTs for Rural Water and Sanitation Monitoring." *International Journal of Environmental Research and Public Health* 13.9 (2016): 840.
- Williams, A.R.; Bain, R.E.S.; **Fisher, M.B.**; Cronk, R.D.; Kelly, E.R.; Bartram, J.K.; A Systematic Review and Meta-Analysis of Fecal Contamination and Inadequate Treatment of Packaged Water.; 2015; (*PLOS ONE*).

- **Fisher, M.B.**; Shields, K.; Leker, H.; Christenson, E.; Cronk, R.D.; Samani, D.; Apoya, P.; Lutz, A.; Bartram, J.K.; Understanding handpump sustainability: Determinants of rural water source functionality in the Greater Afram Plains region of Ghana.; 2015; *Water Resources Research*
- **Fisher, M.B.**; Williams, A.R.; Jalloh, M.F.; Saquee, G.; Bain, R.E.S.; Bartram, J. K.; Microbiological and chemical quality of packaged water and household stored drinking water in Freetown, Sierra Leone.; 2015; *PLoS One*; 10(7)
- Bartram, J.K.; Brocklehurst, C.; **Fisher, M.B.**; Luyendijk, R.; Hossain, R.; Wardlaw, T.; and Gordon, B.; Global Monitoring of Water Supply and Sanitation: History, Methods and Future Challenges. ; 2014; *Int. J. Environ. Res. Public Health*; 11(8):8137-8165
- **Fisher, M.B.**; Nelson, K.L.; Inactivation of *Escherichia coli* by Polychromatic Simulated Sunlight: Evidence for and Implications of a Fenton Mechanism Involving Iron, Hydrogen Peroxide, and Superoxide.; 2014; *Appl Environ Microbiol*; 80(3):935-42
- **Fisher, M.B.**; Keane, D. A; Fernández-Ibáñez, P.; Colreavy, J.; Hinder, S.; McGuigan, K.G.; Pillai, S.; Nitrogen and copper doped solar light active TiO₂ photocatalysts for water decontamination.; 2012; *Appl Cat B*; 130-131:8-13
- **Fisher, M.B.**; Iriarte, M.; Nelson, K.L.; Solar disinfection (SODIS) of *E. coli*, *Enterococcus*, and MS2 phage: effects of additives and alternative container materials.; 2012; *Water Research*; 46(6):1745-54
- **Fisher, M.B.**; Love, D.C.; Schuech, R.; Nelson, K.L.; et al.; Simulated sunlight action spectra for inactivation of MS2 and PRD1 bacteriophages in clear water.; 2011; *Environmental Science and Technology*; 45(21): 9249-55
- **Fisher, M.B.**; Keenan, C.R.; Nelson, K.L.; Voelker, B.M.; et al.; Speeding up Solar Disinfection: Effects of hydrogen peroxide, temperature, pH, and copper plus ascorbate on the photoinactivation of *E. coli* in river water.; 2008; *J Wat Health*; 6(1): 35-51.

Under Review

- **Fisher, M.B.**; Guo, A.z.; Tracy, J.W.; Prasad, S.K.; Browning, E.G.; Liang, K.R.; Kelly, E.R.; Bartram, J.K.; Submitted Manuscript.; Occurrence of Lead and other Toxic Metals Derived from Drinking-Water Systems in three West African Countries. (Submitted to PNAS).
- Kelly, E.R.; Cronk, R.D.; **Fisher, M.B.** and Bartram, J.K. Submitted Manuscript. Sanitary inspection, microbial water quality analysis and water safety in rural sub-Saharan Africa. (Submitted to NPJ Clean Water).
- **Fisher, M.B.**; Danquah, L.; Seidu, Z.; Fechter, A.N.; Saga, B.; Bartram, J.K.; Liang, K.M.; Ramaswamy, R.. Submitted Manuscript. WaSH CQI: Applying Continuous Quality Improvement methods to Water Service Delivery in four districts of rural northern Ghana. (In revisions, PLOS One).
- Williams, A.R.; **Fisher, M.B.**; Danquah, L.; Bates, L.; Geere, J.; Majuru, B.; Mokoena, M.M.; Mukhola, M.S.; Nguyen-Viet, H.; Duc, P.P.; Schmidt, W.P.; Groce, N.; Evans, B.; Hunter, P.R.; Bartram, J.K. Submitted Manuscript. Factors affecting household use of multiple water sources for consumption in Ghana, South Africa, and Vietnam: findings from a 3-country study and implications for global monitoring efforts. (In revisions, PLOS One).
- Oza, H.H.; **Fisher, M.B.**, Abebe, L.; Cronk, R.; McCord, R.; Reuland, F.; Behnke, N.; Kafanikhale, H.; Mofolo, I.; Hoffman, I.; Bartram, J. Submitted Manuscript. Application of Tools to Monitor Environmental Health Conditions, Identify Exposures to Healthcare Acquired Infections and Inform Decision-making to Improve Infection Prevention and Control Practices in Malawian Maternity Wards. (In revisions, Environmental Monitoring and Assessment).

Selected Presentations, Reports, and Conference Proceedings

- Bartram, J.K.; **Fisher, M.B.**; Fuente, D.; Kelly, E.; Setty, K. Clear thinking on water and health? November 23, 2017. Invited Oxford Water Network Seminar, Christchurch College, University of Oxford, UK.
- **Fisher, M.B.**; Danquah, L.K.; Seidu, Z.; et al.; Application of Continuous Quality Improvement methods to improve the microbial quality of household stored water and decreasing borehole repair times in northern Ghana. October 17, 2017; Water and Health Conference, Chapel Hill, NC (poster presentation)

- **Fisher, M.B.**; Ramaswamy, R.; Madsen, E.; Seidu, Z.; Maliki, H.; Labat, A. September 28, 2016. Using Data for More Responsive Programme Improvement (Global Webinar)
- **Fisher, M.B.**; WaSH CQI: Continuous Quality Improvement for Water, Sanitation, and Hygiene. October 27, 2015; Water and Health Conference, Chapel Hill, NC (conference workshop)
- **Fisher, M.B.** Determinants of water point functionality from a cross-sectional study of three districts in northern Ghana. October 15, 2014; Water and Health Conference, Chapel Hill, NC (verbal presentation)
- **Fisher, M.B.**; Williams, A.R.; Jalloh, M.F.; Saquee, G.; Bain, R.E.S.; Bartram, J. K.; Microbiological and chemical quality of packaged water in bottles and sachets and household stored drinking water in Freetown, Sierra Leone. October 16, 2014; Water and Health Conference, Chapel Hill, NC (poster presentation)
- **Fisher, M.B.**; Why Do Germs Get Sunburns? Photoinactivation of Bacteria and Viruses by Sunlight: Mechanistic Studies and Applications to Drinking Water and Sanitation in Developing Country Settings. April 9, 2014. Invited ENVR 400 Seminar, UNC, Chapel Hill, NC
- **Fisher, M.B.**; Williams, A.R.; Bain, R.E.S.; Bartram, J.K.; Drinking Water Quality and Source Characteristics of Urban, Rural, and Peri-urban Communities in Ghana, South Africa, and Vietnam.; October 16, 2013; Water and Health Conference, Chapel Hill, NC (verbal presentation)
- **Fisher, M.B.**; Crocker, J.; Cronk, R.D.; Sobsey, M.D.; Field-Based Water Quality Testing.; October 15, 2013; Water and Health Conference, Chapel Hill, NC (conference workshop)
- **Fisher, M.B.**; Nelson, K.L.; Performance of Accelerated Solar Disinfection Under Lab and Field Conditions.; September 22, 2009; International Research Colloquium of the HWTS Network; Dublin, Ireland (verbal presentation)
- **Fisher, M. B.**; Nelson, K.L.; and Iriarte, M.; Sunlight inactivation rates of wild-type, mutant, and wastewater-derived *E. coli* in the presence and absence of iron chelators and ROS scavengers: Applied and Mechanistic Implications for SODIS.; *Proceedings of the Water Environment Federation* 2009.1 (2009): 202-221.
- Nelson, K. L.; Kadir, K.; **Fisher, M.B.**; Love, D.; New insights into sunlight disinfection mechanisms in waste stabilisation ponds; *8th IWA Specialist Group Conference on Waste Stab. Ponds Belo Horizonte*, pp. 26-30. 2009.