Exhibit 490

Frances Carter (for the Estate of Ronald Lee Carter)
v. United States of America

U.S. District Court for Eastern District of NC, Southern Division
Case No. 7:23-cv-01565

Specific Causation Expert Report of Howard Hu, MD, MPH, ScD

Howard Hu, M.D., M.P.H., Sc.D.
Occupational/Environmental Medicine, Internal Medicine, and Epidemiology
Professor, Keck School of Medicine
University of Southern California, Los Angeles, CA, USA[1]
[redacted]

February 7, 2025

Re: Ronald Lee Carter
DOB: [redacted]/1948
DOD: 5/9/2022

I am writing in response to your request for a medical expert evaluation of Ronald Lee Carter with respect to the potential relationship between his development of a malignancy and the exposures to trichloroethylene (TCE), perchloroethylene (PCE) and benzene that he may have experienced in association with the Camp Lejeune.

Background & Qualifications

I am a physician-scientist, board-certified internist and board-certified preventive medicine (occupational medicine) specialist, with a doctoral degree in epidemiology. As my Curriculum Vitae reflects, my current academic appointments are Professor of Population and Public Health Sciences (tenured) of the Department of Population and Public Health Sciences, Keck School of Medicine of the University of Southern California (USC), and Adjunct Professor in the University of Michigan School of Public Health. I am currently on a 1-year sabbatical from USC (July 1, 2024 – June 30, 2025) after having served as the Flora L. Thornton Chair of the Department since July of 2020. Previously, I had been the Founding Dean of the Dalla Lana School of Public Health and Professor of Environmental Health, Epidemiology, Global Health, and Medicine (tenured), University of Toronto (2012–2018); the NSF International Endowed Chair of the Department of Environmental Health Sciences, Professor of Environmental Health, Epidemiology and Medicine (tenured), Founding Director of the NIH/NIEHS Environmental Health Core Sciences Center, and Associate Physician at the University of Michigan and University of Michigan Health System (2006–2012); and Professor of Occupational & Environmental Medicine (tenured), Founding Director of the NIH/NIEHS Center for Children's Environmental Health, Director of the Occupational Medicine Residency at the Harvard School of Public Health and Associate Physician in the Brigham & Women's Hospital in Boston (1988–2006).

In terms of specific scientific expertise, since 1990, I have led multi-institutional and international teams of scientists, students, and fellows devoted to investigating the environmental, nutritional, social, psychosocial, genetic, and epigenetic determinants of chronic disease and impaired child development in population-based studies in the United States, Mexico, India (where I was a senior faculty Fulbright Scholar, 2000–2001), China, and elsewhere around the world. Our research team's work has generated over 350 publications in the peer-reviewed literature and won several awards, such as the 1999 Progress and Achievement Award from the U.S. NIH/NIEHS, the 2009 Linus Pauling Lifetime Achievement Award, the 2011 Award of Excellence from the American Public Health Association, and the 2015 John Goldsmith Award for Outstanding Contributions from the International Society for Environmental Epidemiology. In my current position, I am continuing NIH-funded environmental birth cohort research while also co-leading the Global Burden of Disease-Pollution, Climate, and

[1] Affiliation listed for identification purposes only.

Health initiative, which aims to improve understanding of pollution's "footprint" on the global burden of disease. I also lead several epidemiological studies related to the COVID-19 pandemic. In terms of service that capitalizes on my expertise, I served on, among other entities, the Board of Population and Public Health Practice of the Institute of Medicine of the National Academy of Sciences; on the Board of Environmental Studies and Toxicology of the National Research Council; on the External Advisory Council of the U.S. National Institute for Environmental Health Sciences; and on the Energy Research Committee of the Health Effects Institute. I am currently serving as the Chair of the Scientific Advisory Board of the Marilyn Brachman Hoffman Foundation; on the Board of Directors of Pure Earth; on the Board of Directors of Wellness Equity Alliance; and as the Co-Chair of the Research Council of the Public Health Foundation of India.

In terms of expertise and service specific to environmental exposures and cancer, I trained specifically in toxicology, environmental health, environmental epidemiology, and cancer epidemiology as part of my Masters in Public Health coursework in occupational health and Doctorate in Science coursework in epidemiology, all at the Harvard School of Public Health. I collaborated on environmental and molecular epidemiologic studies of cancer as they relate, for example, to environmental risk factors for bladder cancer,[2,3], lung cancer,[4] prostate cancer,[5] hepatic steatosis,[6] and non-alcoholic fatty liver disease[7] (known risk factors for liver cancer), and genetic susceptibility factors related to B-cell lymphomas.[8] I served on the Advisory Board for the Cancer Epidemiology Education in Special Populations Program at the University of Michigan School of Public Health, have lectured on translational research opportunities and challenges for cancer research, and served as the Principal Investigator of an investigation of cancer and the environment funded by Health Canada.[9]

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[2] Guo HR, Chiang HS, Hu H, Lipsitz SR, Monson RR. Arsenic in drinking water and incidence of urinary cancers. Epidemiology. 1997 Sep;8(5):545-50. PubMed PMID:9270957.

[3] Hu H, Markowitz SB. A case-study of industrial bladder cancer. Einstein Quarterly Review of Biology and Medicine 1982;1:29-35.

[4] Guo HR, Wang NS, Hu H, Monson RR. Cell type specificity of lung cancer associated with arsenic ingestion. Cancer Epidemiol Biomarkers Prev. 2004 Apr;13(4):638-43. PubMed PMID: 15066930.

[5] Tse LA, Lee PMY, Ho WM, Lam AT, Lee MK, Ng SSM, He Y, Leung KS, Hartle JC, Hu H, Kan H, Wang F, Ng CF. Bisphenol A and other environmental risk factors for prostate cancer in Hong Kong. Environ Int. 2017 Oct;107:1-7. doi: 10.1016/j.envint.2017.06.012. Epub 2017 Jun 20. PubMed PMID: 28644961.

[6] Betanzos-Robledo L, Cantoral A, Peterson KE, Hu H, Hernández-Ávila M, Perng W, Jansen E, Ettinger AS, Mercado-García A, Solano-González M, Sánchez B, Téllez-Rojo MM. Association between cumulative childhood blood lead exposure and hepatic steatosis in young Mexican adults. Environ Res. 2021 May;196:110980. doi: 10.1016/j.envres.2021.110980. Epub 2021 Mar 7. PMID: 33691159; PMCID: PMC8119339.

[7] Stratakis N, Golden-Mason L, Margetaki K, Zhao Y, Valvi D, Garcia E, Maitre L, Andrusaityte S, Basagana X, Borràs E, Bustamante M, Casas M, Fossati S, Grazuleviciene R, Haug LS, Heude B, McEachan RRC, Meltzer HM, Papadopoulou E, Roumeliotaki T, Robinson O, Sabidó E, Urquiza J, Vafeiadi M, Varo N, Wright J, Vos MB, Hu H, Vrijheid M, Berhane KT, Conti DV, McConnell R, Rosen HR, Chatzi L. In Utero Exposure to Mercury Is Associated With Increased Susceptibility to Liver Injury and Inflammation in Childhood. Hepatology. 2021 Sep;74(3):1546-1559. doi: 10.1002/hep.31809. Epub 2021 Aug 30. PMID: 33730435; PMCID: PMC8446089.).

[8] Bashash M, Connors JM, Gascoyne RD, Meissner B, Schuetz JM, Leach S, Slack GW, Berry R, Hu H, Sehn LH, Brooks-Wilson AR, Spinelli JJ. Genetic polymorphism at BCL2 as a predictor for rituximab, cyclophosphamide, doxorubicin, vincristine and prednisone efficacy in patients with diffuse large B-cell lymphoma. Haematologica. 2017 May;102(5):e199-e202. doi: 10.3324/haematol.2016.159087. Epub 2017 Feb 2. PubMed PMID: 28154089; PubMed Central PMCID: PMC5477624.

[9] 5/15/2015-5/15/2019. Health Canada; PI, "A Community-based First Nation Study of Cancer and the Environment in Northern Ontario".

I am also familiar with the process of systematic review as it pertains to assessing the scientific literature and coming to conclusions regarding causality, having collaborated on 3 iterations of the systematic review of behavioral, environmental, occupational, and metabolic risk factors as part of the Global Burden of Disease Project (e.g., GBD, 2015[10]), a systematic review of the potential health impacts of unconventional oil and development,[11] a systematic review of lead exposure in low- and middle-income countries,[12] and an on-going systematic review of lead exposure and anti-social behavior.[13] Several of these have included dose-response modeling, an exercise in which I have also engaged with collaborators on studies of the relationship between prenatal fluoride exposure and offspring cognitive outcomes.[14,15]

In terms of clinical expertise, in addition to my board certifications in Internal Medicine and Preventive (Occupational) Medicine and clinical appointments I summarized earlier, I have been licensed to practice medicine and have practiced internal medicine and occupational/environmental medicine continuously since completion of my clinical training. I am currently licensed to practice medicine in the State of Washington (license # 60853585) and the State of California (license # G175714) and have an active US Drug Enforcement Administration (DEA) registration as a practitioner. My practices focus primarily on serving as a consultant in occupational/environmental medicine, and as such, I apply my scientific knowledge and research as well as my clinical training and experience to my approach to the evaluation, diagnosis, and management of patients and other individuals.

Methodology

This evaluation: In order to conduct this expert medical evaluation, I reviewed and relied upon the following documents and reports:

- The Complaint by representative of Ronald Lee Carter v. United States of American under the Camp

[10] GBD 2013 Risk Factors Collaborators, Forouzanfar MH, Alexander L, Anderson HR…Hu H…Lopez AD, Vos T, Murray CJ. Global, regional, and national comparative risk assessment of 79 behavioural, environmental and occupational, and metabolic risks or clusters of risks in 188 countries, 1990-2013: a systematic analysis for the Global Burden of Disease Study 2013. Lancet. 2015 Dec 5;386(10010):2287-323. doi: 10.1016/S0140-6736(15)00128-2. Epub 2015 Sep 11. PubMed PMID: 26364544; PubMed Central PMCID: PMC4685753.

[11] HEI Energy Research Committee (Hu: Member). Potential Human Health Effects Associated with Unconventional Oil and Gas Development: A Systematic Review of the Epidemiology Literature. Health Effects Institute, September 2019. Available at: https://hei-energy.org/publication/potential-human-health-effects-associated-unconventional-oil-and-gas-development

[12] Ericson B, Hu H, Nash E, Ferraro G, Sinitsky J, Taylor MP. Blood lead levels in low-income and middle-income countries: a systematic review. Lancet Planet Health. 2021 Mar;5(3):e145-e153. doi: 10.1016/S2542-5196(20)30278-3. PMID: 33713615.

[13] Shaffer RM, Forsyth JE, Ferraro G, Till C, Carlson LM, Hester K, Haddock A, Strawbridge J, Lanfear CC, Hu H, Kirrane E. Lead exposure and antisocial behavior: A systematic review protocol. Environ Int. 2022 Aug 4;168:107438. doi: 10.1016/j.envint.2022.107438. Epub ahead of print. PMID: 35994796.

[14] Grandjean P, Hu H, Till C, Green R, Bashash M, Flora D, Tellez-Rojo MM, Song PXK, Lanphear B, Budtz-Jørgensen E. A Benchmark Dose Analysis for Maternal Pregnancy Urine-Fluoride and IQ in Children. Risk Anal. 2021 Jun 8. doi: 10.1111/risa.13767. Epub ahead of print. PMID: 34101876.

[15] Grandjean P, Meddis A, Nielsen F, Beck IH, Bilenberg N, Goodman CV, Hu H, Till C, Budtz-Jørgensen E. Dose dependence of prenatal fluoride exposure associations with cognitive performance at school age in three prospective studies. Eur J Public Health. 2023 Oct 5:ckad170. doi: 10.1093/eurpub/ckad170. Epub ahead of print. PMID: 37798092.

Lejeune Justice Act of 202 ("CLJA") Pub. L. No. 117-168, § 804, 136 Stat. 1802, 1802–04 (2022).

- 9/9/2024 Summary of Medical History, Ronald Lee Carter, by Aperio Solutions (Tara Stephanie Pronstroller).
- Review of medical records from the Carolina East Medical Center (9/4/2001; 12/27/2011-1/2/2012)
- "My Dad's Work Life"—by Angela Allen (Ronald Carter's adult daughter)
- 10/25/2024 Expert Report of Morris L. Maslia, Consulting Engineer
- 1/20/2017 ATSDR Public Health Assessment for Camp Lejeune Drinking Water, U.S. Marine Corps Base Camp Lejeune, North Carolina
- 2/6/2017 report by Dr. Kelly Reynolds

In this case, I also relied on the general causation report I had authored dated 12/09/2024 in which I provided a medical expert opinion on the relationship between exposure to trichloroethylene (TCE), tetrachloroethylene (PCE), and/or benzene and the causation of Non Hodgkins Lymphoma (NHL), as well as the January 31, 2025 supplement to my general causation report in which I incorporated into my opinions the Camp Lejeune cancer incidence study that Bove et al. published in late 2024. Both the general causation report and supplement are included in my materials relied on list and are hereby incorporated by reference in their entirety as if fully set forth herein.

In addition, I relied upon other peer-reviewed scientific literature that, in my opinion, is the most rigorous and relevant to the issues inherent in this evaluation. As appropriate, such evidence will be cited during the course of this report.

Here, I build on the material listed above to assess Mr. Carter's exposure in relation to Camp Lejeune and determine whether the exposures may have increased his risk of developing cancer. I then perform a differential etiology assessment, a methodology that is generally accepted in the medical and scientific fields in which I am an expert. Considering the relevant risk factors for developing the cancer experienced by Mr. Carter, in light of Mr. Carter's exposure to TCE, PCE, benzene and the associated increased risk of cancer, I then make a determination regarding the likely role of his exposures to TCE, PCE, benzene at Camp Lejeune in the causation of his cancer.

Preview of Conclusion

In summary, I conclude to a reasonable degree of scientific and medical certainty that Mr. Carter's combination of exposures to TCE, PCE, and benzene at the Camp Lejeune facility more likely than not was a substantial contributing factor towards the causation of Mr. Carter's Mantle Cell Lymphoma/Non-Hodgkins Lymphoma (MaCL/NHL).

I. Ronald Carter: Medical Assessments, Relevant Diagnosis, Family History

Medical history: Mr. Carter was born on [redacted] 1948. There are no known complications or unusual circumstances surrounding his birth or first few years of life. Other than what his spouse recalls him describing as migraine headaches that started in childhood and then faded away by the age of 50, Mr. Carter is not known to have had any significant childhood illnesses or injuries. In terms of his adult history, Mr. Carter was known to had two occurrences of transient Bell's Palsy in the 1970's/1980's; surgery in 2001 for carpal tunnel syndrome, ulnar nerve entrapment, and removal of a right forearm lesion with neurolysis; coronary artery

disease diagnosed by cardiac catheterization and treated with the placement of 2 stents in 2002 with a normal exercise treadmill test (no pain or evidence of ischemia; ejection fraction of 64%) in 2004; return of angina in 2004, with a cardiac catheterization revealing 3 vessel disease, treated with atenolol, lipitor, aspirin; a 2014 myocardial infarction (after his cancer was diagnosed) involving the left anterior descending artery, treated with another stent and medication, ejection fraction of 45%; a sleep apnea condition since 2008; hypertension beginning in 2010; glucose intolerance diagnosed in 2011; herpes zoster (during his cancer chemotherapy treatment; see below) and Gastroesophageal Reflex Disorder diagnosed in 2012. As of 10/19/2011, Mr. Carter was known to be taking atenolol, Pravachol, and low-dose aspirin. He was also known to have developed allergies or other adverse reactions to penicillin, ibuprofen, Bactrim, Zostavax, and lisinopril. He also was known to have seasonal allergies to pollen.

In October of 2011, Mr. Carter experienced symptoms of excess flatus, dyspepsia, an increase in the frequency of his stools, and rectal bleeding. A colonoscopy conducted on 11/23/2011 revealed a cecal mass at the appendiceal orifice and multiple submucosal nodules throughout the colon. A biopsy demonstrated tissue findings consistent with mantle cell lymphoma. CT scan revealed the mass in the cecum extending into the appendix and adenopathy consistent with metastatic disease. A bone marrow biopsy demonstrated a mildly hypercellular bone marrow (60%) with involvement of mature B-Cell Non-Hodgkins Lymphoma (NHL) cells, compatible with the recently diagnosed mantle cell lymphoma, representing approximately 10-30% of marrow cells by morphological assessment. Based on these findings, Mr. Carter was diagnosed with Stage IV mantle cell lymphoma with diffuse colonic and bone marrow involvement. In the rest of his work-up, Mr. Carter was also found to be anemic requiring the transfusion of 2 units of packed red blood cells.

Mr. Carter was felt to be a candidate for aggressive systemic chemotherapy using the Hyper-CVAD protocol (cyclophosphamide, vincristine sulfate, doxorubicin hydrochloride, methotrexate, cytarabine and the steroid dexamethasone), a combination of drugs that is typically used for certain types of NHL. After placement of a port, Mr. Carter underwent 2 cycles of the Hyper-CVAD chemotherapy at the University of North Carolina Health System complicated by thrombocytopenia requiring platelet transfusion and an E. Coli infection requiring intravenous antibiotics. He then was switch to a R-CHOP/R-DHAP chemotherapy protocol (rituximab, cyclophosphamide, doxorubicin, vincristine, prednisone, dexamethasone, cytarabine, cisplatin). During the course of treatment, he required treatment for renal insufficiency, thrombocytopenia, anemia, infection of unknown origin, and herpes zoster.

A repeat bone marrow biopsy on 5/11/2012 revealed focal involvement with residual mantle cell lymphoma, which was addressed by preparation and execution of an autologous stem cell transplant 4 months later. Subsequent evaluations over the next 5 years by clinical evaluation, chest CT, and PET CT suggested Mr. Carter was tumor-free. However, on 3/4/2022, Mr. Carter presented with a nasopharyngeal mass, a biopsy of which revealed recurrent mantle cell lymphoma. Two weeks later, Mr. Carter experienced an acute cerebrovascular event; work-up revealed occlusion of the right posterior cerebral artery with suspected intravascular lymphoma that was untreatable. Following supportive care and transfer to Home Hospice care, Mr. Carter expired at home on 5/9/2022.

Radiological procedures: Based on a review of medical records, prior to the diagnosis of mantle cell lymphoma in 2011, Mr. Carter was known to have had 7 x-rays and 0 CT scans (for various medical work-ups; number of dental x-rays and occupational health x-rays unknown).

Body Mass Index (BMI) History: In terms of body habitus, Mr. Carter is known to have been 6' 1" tall. Between 2001 and 2010, his body weight had been measured between a low of 196 pounds and a high of 204.7 pounds. This is associated with a body mass index of between 25.9 to 27.0.

Family History: Mr. Carter's father died at the age of 69 reportedly of a heart attack, no history of cancer. Mr. Carter's mother died at the age of 77, reportedly due to chronic obstructive pulmonary disease. Mr. Carter is known to have had two sisters, one who reportedly died of chronic obstructive pulmonary disease, the other of unknown causes (although she was known to have severe arthritis). Both were in their late 60's, early 70's. Mr. Cater also had two brothers, one who was a smoker and died of lung cancer at age 61, the other of some type of "blood cancer" at age 76.

Race/Ethnicity/Heritage: Mr. Carter was white. His heritage was reportedly English on both sides of his family, dating back to the 1700's.

Education: Mr. Carter graduated from high school and was known to have attended community colleges in North Carolina but did not obtain a degree. He received certification relation to building/home inspections.

Genetic testing: Mr. Carter is not known to have undergone genetic testing for genetic variants associated with a future increased risk of mantle cell lymphoma or NHL. He did have a genetic test of his tumor tissue that detected the IGH-CCND1 fusion, translocation t(11;14); however, this test is specific for tumor tissue and is used to support the diagnosis of mantle cell lymphoma; it is not a genetic test used to screen for future risk of mantle cell lymphoma.

International travel: Mr. Carter is not known to have traveled or lived internationally for any extended period of time (i.e., greater than a week).

Smoking/Passive Smoking history: Mr. Carter was known to have been a cigarette smoker, smoking an average of 1 pack/day between 1974-1992 when he quit (i.e., from age 26-44).

Alcohol history: Mr. Carter reportedly did not drink alcohol.

Illicit drug history: n/a

Pets: No record of any pets in his adult home. His family was known to have hunting dogs when he was young, all kept outside.

Dietary history: Mr. Carter's spouse testified that for breakfast he typically had grits, eggs, bacon and toast early in their marriage (later, just milk and donuts or no breakfast); home-made sandwiches and chips for lunch; pork chops, mashed potatoes, gravy, green beans as a typical dinner; and multiple cups of coffee during the day.

Physical activity history: Mr. Carter was not known to regularly engage in exercise. However, he was active, hunting and fishing. He was also reported to ride a bicycle at times, for example, when hunting.

Occupational history: Was known to have worked in a shipyard in Virginia for 3-5 months after

graduating from high school. Then spent one year working for a vending machine company age 19-20; followed by several jobs each lasting only 1-3 months (construction, mobile home, service station); 3-6 months in a temporary federal job working on generators. None of these jobs were known to have entailed exposure to toxic chemicals. He then worked at the federal job at Camp Lejeune, from 1973-2007 when he retired. In this job, he was known to have had some occupational exposure to asbestos; and to have conducted lead paint testing.

Residential history:

Ronald Lee Carter, Sr. – Address History		
Born	September 22, 1948	Princess Anne, Virginia
Birth – Age 6 months	September 22, 1948, to approximately March 1949	*(street address unknown)* Newport News, Virginia
Age 6 months – Age 19	March 1949 - March 1968	Family-Owned Property Lee Rogers Road, Hubert, NC 28539
Age 19 – Age 20	March 1968 – March 1969	Rouse's Mobile Home Park Hubert, NC
Age 20 – Age 73 *(Death)*	March 1969 – May 9, 2022	125 Lee Rogers Road Hubert, NC 28539

Hobby history: Mr. Carter was known to engage in hunting, fishing, and shrimping. He also maintained a large vegetable garden, growing much of their own produce. He reportedly used some pesticides to maintain the garden ("Sevin Dust", purchased at Lowes; contains Bifenthrin, a synthetic pyrethroid insecticide).

Other environmental history of potential relevance: No known other significant pesticide exposures; no other known toxic environmental exposures of significance.

II. ATSDR Exposure Assessment, Risk of Cancer: Camp Lejeune

The 1/20/2017 ATSDR Public Health Assessment for Camp Lejeune Drinking Water[16] made a number of conclusions, of which the following are directly relevant to Mr. Carter:

(A) Groundwater was Camp Lejeune's sole source of drinking water;

(B) Water sampling conducted in the early 1980's showed that drinking water distributed by Camp Lejeune's Hadnot Point water treatment plant (WTP) was contaminated by PCE, TCE, and benzene. Historical reconstruction modeling conducted by ATSDR estimated that (1) levels of PCE exceeded the ATSDR cancer risk evaluation guide concentration for drinking water (CREG[17],[18]) of 12 parts per billion (ppb) from the mid-1970's to 1985, with a maximum concentration of 39 ppb around 1982 and a maximum rolling 3-year average

[16] ATSDR. *Public Health Assessment for Camp Lejeune Drinking Water, U.S. Marine Corps Base Campe Lejeune, North Carolina, January 20, 2017.* Agency for Toxic Substances and Disease Registry, U.S. Department of Health and Human Services.

[17] CREG cancer risk evaluation guide concentrations represent concentrations of cancer-causing substances unlikely to result in an increase of cancer risk in an exposed population above a target risk level of one excess cancer case per 1 million exposed people; they are derived by ATSDR using USEPA cancer slope factors, default exposure assumptions (regarding ingestion rates and body weights).

[18] ATSDR. Public Health Assessment Guidance Manual, Appendix F: Derivation of Comparison Values. Agency for Toxic Substances and Disease Registry, U.S. Department of Health and Human Services. Available at: https://www.atsdr.cdc.gov/pha-guidance/index.html ; accessed January 21, 2025.

concentration of 25 ppb around 1981; (2) levels of TCE exceeded the ATSDR CREG of 0.43 ppb from the early 1950s to 1985, with concentrations in the 100 ppb + range beginning in the mid-1970's, a maximum concentration of 783 ppb around 1983, and a maximum rolling 3-year average of 519 ppb around 1981; and (3) levels of benzene exceeded the ATSDR CREG of 0.44 ppb from the early 1960's to 1995 with a maximum concentration of 12 ppb around 1985 and a maximum rolling 3-year average of 8 ppb around 1981.

(C) Water sampling conducted in the early 1980's showed that drinking water distributed by Camp Lejeune's Tarawa Terrace WTP was contaminated by PCE, TCE, and vinyl chloride. Historical reconstruction

Figure 1 (ATSDR, 2017)

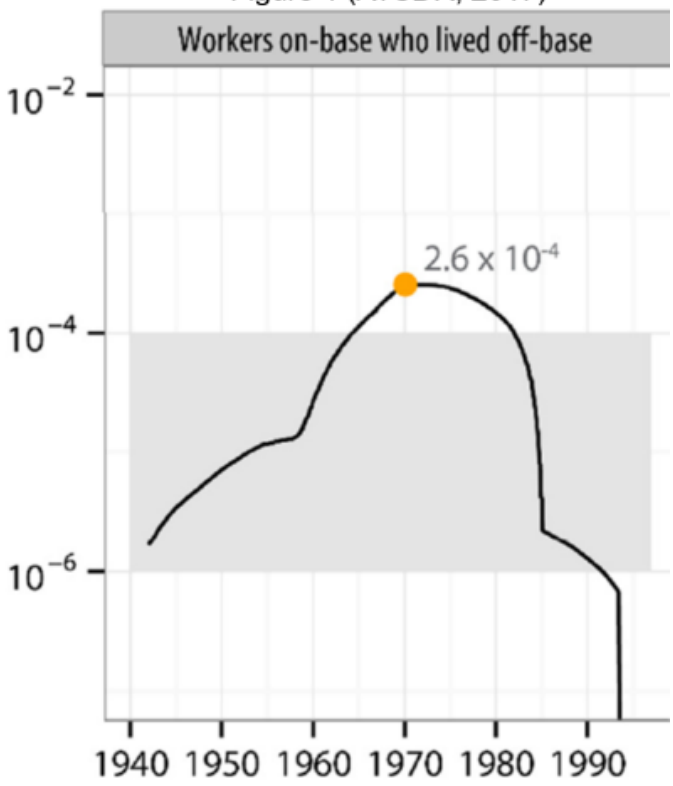
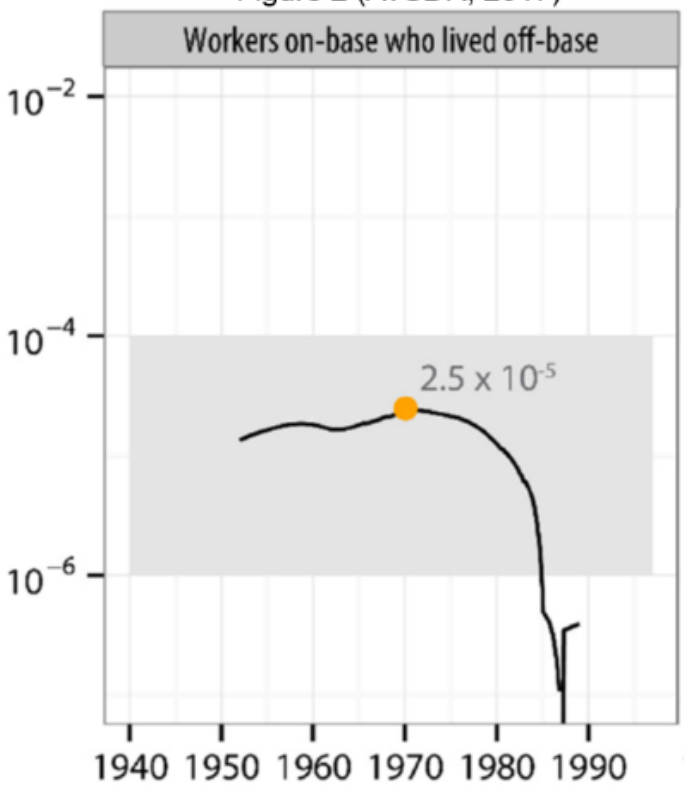


Figure 2 (ATSDR, 2017)



modeling conducted by ATSDR estimated that (1) levels of PCE exceeded the ATSDR CREG concentration for drinking water (CREG) of 12 parts per billion (ppb) from the late 1950's to around 1986, with concentrations exceeding 50 ppb from around 1962 to 1986, a maximum concentration of 158 ppb around 1983, and a maximum rolling 3-year average concentration of 103 ppb around 1982; and (2) levels of TCE exceeded the ATSDR CREG of 0.43 ppb from the early 1950s to 1985, with a maximum concentration of 7 ppb around 1983 and a maximum rolling 3-year average concentration of 103 ppb around 1982.

(D) Use of drinking water from the Hadnot Point WTP ended completely by February 1985, and use of drinking water from the Tarawa Terrace WTP ended completely when the WTP was shut down in March, 1987;

(E) ATSDR acknowledged that TCE exposure is associated with an increased risk of NHL, among other cancers.

(F) ATSDR estimated the lifetime cancer risk by age group over time based on 15-years of exposure to workers on-base who lived off-base to all chemical contaminants from Hadnot Point (i.e., PCE, TCE, and benzene) to be over 1 per 10,000 for exposures between the mid-1960's to around 1982, with a peak of 2.6 per

10,000 for exposures surrounding 1970 (see Figure 1[19]).

(G) ATSDR estimated the lifetime cancer risk by age group over time based on 15-years of exposure to workers on-base who lived off-base to all chemical contaminants from Tarawa Terrace (i.e., PCE, TCE, and vinyl chloride) to be over 1 per 1,000,000 and in the range of 1 per 100,000 for exposures between the early 1950's to mid-1980's, with a peak of 2.5 per 100,000 for exposures surrounding 1970 (see Figure 2).

(H) ATSDR estimated, overall, that a worker working on-base but living off-base who had 15 years of exposure to Hadnot Point WTP drinking water during the mid-1960s to early 1980s had an estimated, upper-bound cancer risk of about 3 excess cases of cancer per 10,000 exposed people. Given the same exposure scenario to Tarawa Terrace WTP drinking water, ATSDR estimated that a worker with 15 years of exposure would not have an upper-bound cancer risk exceeding the USEPA Superfund target risk range (of 1 per 10,000 to 1 per 1 million).

III. Exposure Assessment, Risk of Cancer: Ronald Carter

Within this context, Ronald Lee Carter is known to have experienced exposures to TCE, PCE, and benzene through his ingestion of drinking water originating from both the Hadnot and Tarawa Terrace WTPs while working at the Camp Lejeune facility from 1968 to the end of 1987. As summarized in the report by Dr. Kelly Reynolds, Mr. Carter was exposed to drinking water from the Hadnot WTP from February 1, 1968 through May 30, 1980; from the Tarawa Terra WTP from June 1, 1980 through December 31, 1987; and from the Midway Park WTP from June 1, 1980 through May 30, 1983. During the period of time that Mr. Carter was exposed to drinking water from the Hadnot WTP, Dr. Reynolds calculated that his cumulative exposure to PCE, TCE, and Benzene was 864 (µg/L)-months, 25,603 (µg/L)-months, and 387 (µg/L)-months, respectively. During the period of time the Mr. Carter was exposed to drinking water from the Tarawa Terra WTP, Dr. Reynolds calculated that his cumulative exposure to PCE, TCE, and Benzene was 7,040 (µg/L)-months, 225 (µg/L)-months, and 0 (µg/L)-months, respectively; and during the period of time that Mr. Carter was exposed to drinking water from the Midway Park WTP, Dr. Reynolds calculated that his cumulative exposure to PCE, TCE, and Benzene was 0 (µg/L)-months, 49 (µg/L)-months, and 0 (µg/L)-months, respectively. Accounting for Mr. Carter's work week, vacations, etc., Dr. Reynolds estimated Mr. Carter had a total exposure time of 6,865 days, which is equivalent to 229 months. One can consequently calculate Mr. Carter's time-weighted average exposure levels of PCE, TCE, and Benzene by totaling his (µg/L)-months of exposure to each chemical (from Hadnot, Tarawa Terra, and Midway Park) and dividing by 229 months. This yields time-weighted average exposure levels of 34.5 ug/L (ppb) of PCE; 113.0 µg/L (ppb) of TCE; and 1.7 µg/L (ppb) of Benzene.

I note that these exposure estimates do not include exposures Mr. Carter sustained to contaminated water at Camp Lejeune through inhalation (of aerosolized PCE, TCE, and benzene) or dermal absorption (i.e., skin contact), which would have added to his cumulative exposure.

Of note is that the level of exposure to TCE of 113.0 µg/L (ppb) is over 100 times greater than the ATSDR CREG for TCE of 0.43 ppb and over 20 times the Maximum Contaminant Level (MCL) for drinking water set by the U.S. Environmental Protection Agency (EPA) of 5 ppb. The level of exposure to PCE of 34.5 µg/L (ppb) exceeds the ATSDR CREG value for PCE of 12 ppb and EPA's MCL for PCE of 5 ppb. Finally, the level of exposure to Benzene of 1.7 µg/L (ppb) exceeds the ATSDR CREG value for Benzene of 0.44 ppb.

[19] ATSDR. *Public Health Assessment for Camp Lejeune Drinking Water, U.S. Marine Corps Base Campe Lejeune, North Carolina, January 20, 2017.* Agency for Toxic Substances and Disease Registry, U.S. Department of Health and Human Services. Figure 9, p. 35.

That these exposures occurred over 229 months (19.1 years) and in combination with each other is also an important factor to consider in this determination.

In addition, I note that Mr. Carter's status as a civilian worker at Camp Lejeune and the timing of his exposure profile very closely aligns with, and, in fact, exceeds, the exposure profile (discussed in II.G. above) of "15-years of exposure to workers on-base who lived off-base to all chemical contaminants from Hadnot Point (i.e., PCE, TCE, and benzene)" that ATSDR estimated was associated with a lifetime cancer risk of over 1 per 10,0000 for exposures between the mid-1960's to around 1982, with a peak of 2.6 per 10,000 for exposures surrounding 1970. Added to that risk was his exposure to Tarawa Terrace WTP from June 1, 1980 through December 1, 1987, which is mostly within the interval of time (1950's to mid-1980's) in which ATSDR estimated the lifetime cancer risk by age group over time based on 15-years of exposure to workers on-base who lived off-base to all chemical contaminants from Tarawa Terrace (i.e., PCE, TCE, and vinyl chloride) to be over 1 per 1,000,000 and in the range of 1 per 100,000.

IV. Impact of TCE, PCE, Benzene Exposure at Camp Lejeune on Ronald Lee Carter

As noted at the start, my charge is to provide an expert evaluation of Ronald Lee Carter with respect to the potential relationship between his development of a malignancy and the exposures to TCE, PCE, and benzene he experienced related to the Camp Lejeune facility in North Carolina.

I will focus on the relationship of TCE, PCE, and benzene exposures he sustained with his experience with mantle cell lymphoma/Non-Hodgkins Lymphoma (hereafter referred to as "MaCL/NHL"). All of the following represent my opinions based on a reasonable degree of medical and scientific certainty.

A. TCE, PCE, Benzene, and Mantle Cell Lymphoma/Non-Hodgkins Lymphoma (MACL/NHL)

As noted in my report regarding the general causation relationship between TCE, PCE, benzene exposure and cancer, dated December 9, 2024, mantle cell lymphoma is one of the subtypes of B-cell Non-Hodgkins Lymphomas (NHL). As such, I consider the opinion I expressed regarding the causal relationships between TCE, PCE, benzene and NHL to be relevant to mantle cell lymphoma. In that regard, I concluded that TCE exposure more likely than not causes NHL (and therefore, mantle cell lymphoma); that PCE is at least as likely as not to cause NHL (and therefore, mantle cell lymphoma); and that benzene exposure more likely than not causes NHL (and therefore, mantle cell lymphoma).

In addition, I draw attention to a very recent study of the Camp Lejeune cancer experience published by Bove et al. in October of 2024[20] that I discussed in the January 31, 2025 supplement to my December 9, 2024 general causation report. The findings of this study are of particular relevance to Mr. Carter. As noted in my supplemental report, this was a cancer *incidence* study in which elevated adjusted Hazard Ratios (AHRs) with confidence interval ratios (the ratio of the upper to lower limits of the 95% confidence interval) less than or equal to 3 (an indicator of precision) were reported for a number of cancers. Among them was NHL, which, among the Camp Lejeune (v. Camp Pendleton) civilian workers, had an aHR of 1.19 (95% CI: 0.83, 1.71; CIR:

[20] Bove FJ, Greek A, Gatiba R, Kohler B, Sherman R, Shin GT, Bernstein A. Cancer Incidence among Marines and Navy Personnel and Civilian Workers Exposed to Industrial Solvents in Drinking Water at US Marine Corps Base Camp Lejeune: A Cohort Study. Environ Health Perspect. 2024 Oct;132(10):107008. doi: 10.1289/EHP14966. Epub 2024 Oct 24. PMID: 39446420; PMCID: PMC11500795.

2.1) and mantle cell cancer, which, among the Camp Lejeune (v. Camp Pendleton) Marines/Navy personnel, had an AHR of 1.26 (95% CI: 0.73, 2.19; CIR: 3.0).

In my opinion, the results from this recently published cancer *incidence* study, together with all the other factors I discussed in my general causation report and in this report, allow me to specifically conclude that the combination of TCE, PCE, and benzene at the levels of exposure encountered at Camp Pendleton more likely than not are a risk factor for NHL and, specifically, for mantle cell lymphoma.

B. Specific causation: TCE, PCE, benzene, and Mr. Carter's MACL/NHL

I was asked to evaluate whether Mr. Carter's exposure to the contaminants in the water at Camp Lejeune was at least as likely as not a cause of his MaCL/NHL. My answer to this question is that the combination of TCE, PCE and Benzene exposures were at least as likely as not, causative of Mr. Carter's MaCL/NHL.

In reaching conclusions regarding causation, practitioners in the medical and scientific fields in which I specialize must acknowledge and account for certain inherent limitations to understanding the etiology of an individual's cancer. There is nothing specific about cancer (e.g., its clinical presentation or its pathology), when it develops in an individual, that definitively indicates or proves its cause. There are also no tests that have yet been developed that can definitively identify cause in such a manner. Methods have been developed aimed at quantitatively estimating the contribution to the causation of an individual's disease by an individual's exposure to an associated risk factor. However, as with most cases of cancer induced by environmental causes, making such precise estimates is not possible in this case. In terms of the case of Ms. Carter's cancer, among the uncertainties that need to be taken into account are the limited knowledge of the shape of the dose response curve relating exposures to TCE, PCE, benzene and MaCL/NHL; and the precise quantitative amounts of Mr. Carter's exposure to TCE, PCE, and benzene. These factors, while limiting our ability to quantify the precise fraction of cancer risk to Mr. Carter attributable to TCE, PCE, and benzene, do not leave us unable to understand whether or not TCE, PCE, and benzene was a cause of his MaCL/NHL.

Rather, we can assess the impact of a putative cause or causes by evaluating the evidence related to various likely risk factors, including, in this case, exposures to TCE, PCE, and benzene associated with the Camp Lejeune facility. Professionals in my field regularly conduct such an analysis to understand the likely cause or causes of a patient or research subject's symptoms.

Having reviewed the information discussed in this report regarding Mr. Carter's background and exposure to TCE, PCE, and benzene, it is my opinion to a reasonable degree of medical and scientific certainty that the combination of TCE, PCE and Benzene exposures from Camp Lejeune more likely than not was a substantial contributing factor to the causation of his mantle cell lymphoma. In particular, the following factors are in support of this determination:

(1) The exposure assessment by Dr. Reynolds indicates that Mr. Carter was exposed to TCE, PCE, and benzene while working at the Camp Lejeune facility beginning at the age of 19 years (1968) and lasting until age 49 years (1987), during which, accounting for non-exposure days (e.g., weekends, vacations) he is estimated to have had a total of 6,865 days (19.1 years) of exposure. During this time, as noted above, his time-weighted average levels of exposure are estimated to have exceeded the ATSDR CREG for all three contaminants; to have exceeded the EPA MCL for TCE and PCE; and to have been especially high for TCE,

with levels over 100 times greater than the ATSDR CREG and over 20 times greater than the MCL. As I discussed, his exposure timing and profile also align closely with and, in fact, exceeds the exposure scenario described in the 2017 ATSDR report in which 15-years of exposure to workers on-base who lived off-base to PCE, TCE, and benzene from Hadnot Point was estimated to be associated with a lifetime cancer risk of over 1 per 10,0000 for exposures between the mid-1960's to around 1982, with a peak of 2.6 per 10,000 for exposures surrounding 1970.

(2) That Mr. Carter's exposures to TCE, PCE, and benzene were at least as likely as not causative of his MaCL/NHL is also consistent with the findings of the most recently published epidemiological study of the cancer incidence experience of personnel stationed or employed at Camp Lejeune v. Camp Pendleton that I discussed earlier. Finally, the ability of the environmental exposures Mr. Carter sustained to increase his risk of cancer is also consistent with two of the few epidemiological studies that have been conducted on communities exposed to PCE or TCE in drinking water. In a population case-control study of cancer incidence rates in Massachusetts in relation to drinking water contamination, Aschengrau et al. (1993[21]) found that in comparison to unexposed persons, chronic exposure to PCE at medium- and high-use sites ranging from 1.5 to 80 ppb among residents who were estimated to have been exposed at the 90th percentile of the relative delivered dose of PCE had an adjusted relative risk for leukemia of 7.02 (95% CI: 1.5, 32.79; without latency). In another population case-control study of cancer incidence rates in New Jersey in relation to drinking water contamination, Cohn et al. (1994[22]) found that in comparison to women living in unexposed towns, women exposed to TCE at levels exceeding 5.0 ppb had a relative risk for NHL of 1.36 (95% CI: 1.08, 1.70), and men exposed to TCE at levels exceeding 5.0 ppb had a relative risk for intermediate-grade NHL (diffuse large cell/reticulosarcoma) of 1.59 (95% CI: 1.04-2.43).

(3) As noted, Mr. Carter's exposure timing and profile is closely aligned with a exposure scenario that ATSDR estimated to be associated with a lifetime cancer risk of over 1 per 10,0000 for exposures between the mid-1960's to around 1982, with a peak of 2.6 per 10,000 for exposures surrounding 1970. These magnitudes of risk greatly exceed the risk communication category of negligible risk promulgated by the World Health Organization[23] (less than 1 in 1 million), and it exceeds the *de minimis* risk level typically promulgated by the U.S. Environmental Protection Agency for carcinogens of 1 in 1 million[24],[25].

(4) Mr. Carter was exposed to the combination of TCE, PCE, and benzene. As discussed in general causation report, it is reasonable to apply the regulatory approach to carcinogens with a common mode of action and conclude that the combined risk of simultaneous exposure to TCE, PCE, and benzene is more likely than not to be at least additive. This is also consistent with the 2017 ATSDR report, which concluded that the

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[21] Aschengrau A, Ozonoff D, Paulu C, Coogan P, Vezina R, Heeren T, Zhang Y. Cancer risk and tetrachloroethylene-contaminated drinking water in Massachusetts. Arch Environ Health. 1993 Sep-Oct;48(5):284-92. doi: 10.1080/00039896.1993.9936715. PMID: 8215591.

[22] Cohn P, Klotz J, Bove F, Berkowitz M, Fagliano J. Drinking Water Contamination and the Incidence of Leukemia and Non-Hodgkin's Lymphoma. Environ Health Perspect. 1994 Jun;102(6-7):556-61. doi: 10.1289/ehp.94102556. PMID: 9679115; PMCID: PMC1569761.

[23] WHO. *Communicating Radiation Risks in Paediatric Imaging.* Geneva: World Health Organization 2016. ISBN 978 924 4 151034 9.

[24] US EPA. *Residual Risk—Report to Congress.* US Environmental Protection Agency, Office of Air and Radiation; Office of Air Quality Planning and Standards. Research Triangle Park:March, 1999. EPA-453/R-99-001.

[25] Castorina R, Woodruff TJ. Assessment of potential risk levels associated with U.S. Environmental Protection Agency reference values. Environ Health Perspect. 2003 Aug;111(10):1318-25. doi: 10.1289/ehp.6185. PMID: 12896853; PMCID: PMC1241613.

combined effects of TCE and PCE are to be considered to be additive for Cancer Risk[26].

(5) In terms of latency, Mr. Carter developed his MaCL/NHL at age 63, which is 14 and 44 years after the end and start, respectively, of his exposure to TCE, PCE, and benzene from Camp Lejeune. This is consistent with the relatively long latency period that has been associated with mantle cell lymphoma. For example, Racke et al. found evidence of pathological specimens with evidence of *in situ* mantle cell lymphoma among patients whose clinical presentation for the disease occurred up to 15.5 years later[27]. It is also consistent with an epidemiological study of NHL among men occupationally exposure to organic solvents in which Olssen and Brandt[28] found large variations in the length of period between the start of exposure to the diagnosis of NHL, ranging from 2 to 60 years with a median of 21 years.

(6) A consideration in the case of Mr. Carter is differential etiology, i.e., what other risk factors might he have experienced for MaCL/NHL? Given that MaCL is a relatively rare form of NHL (~5%), research specific to environmental risk factors for MaCL is challenging, and few such studies exist[29]. A 2008 Swedish case control study of NHL found that infection by Borrelia (the agent that causes Lyme Disease) was associated with a significantly increased risk of MaCL[30]. However, such an association has reportedly not been found in studies of Borrelia infection in the USA[31], and a review of Mr. Carter's medical records has not uncovered evidence of Borrelia infection. In terms of NHL (of which MCL is a sub-type), other than TCE, PCE and benzene as risk factors (that I had discussed in my general causation report), other risk factors for which there is evidence of an association with NHL include being white (v. African American or Asian American), having a family history of a first degree relative with NHL, previous treatment with cancer chemotherapy drugs, radiation exposure, weakened immune systems (e.g., those weakened by immunosuppressive drugs of HIV/AIDS), certain inherited syndromes associated with immunodeficiency (e.g., ataxia-telangiectasia, Wiskott-Aldrich syndrome), autoimmune disease (such as rheumatoid arthritis, systemic lupus erythematosus), previous lymphoma, chronic infections that cause continuous immune system activity (e.g., Helicobacter pylori; Chlamydophila psittaci; Campylobacter jejuni, Hepatitis C), and breast implants[32]. Of these risk factors, Mr. Carter had only two. He. Carter was white and had low-level and low-duration radiation exposure from radiology studies. And as noted earlier, prior to the diagnosis of mantle cell lymphoma in 2011, Mr. Carter was known to have had 7 x-rays and 0 CT scans (for various medical work-ups; number of dental x-rays and occupational health x-rays unknown). Neither of these characteristics are unusual or outstanding. In terms of his residential history, prior to his diagnosis of mantle cell lymphoma in 2011, Mr. Carter spent his entire life (age 6 months onwards) living in Hubert, NC, which is not known to be a geographic area associated with high rates of cancer in association with

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[26] ATSDR. *Public Health Assessment for Camp Lejeune Drinking Water, U.S. Marine Corps Base Campe Lejeune, North Carolina, January 20, 2017.* Agency for Toxic Substances and Disease Registry, U.S. Department of Health and Human Services. p. 33.
[27] Racke F, Simpson S, Christian B, Blum KA, Hasserjian R, Zhao W. Evidence of long latency periods prior to development of mantle cell lymphoma. Blood 2010;116(21): 323 (available at https://doi.org/10.1182/blood.V116.21.323.323)
[28] Olsson H, Brandt L. Risk of non-Hodgkin's lymphoma among men occupationally exposed to organic solvents. Scand J Work Environ Health. 1988 Aug;14(4):246-51. doi: 10.5271/sjweh.1925. PMID: 3175557.
[29] Smedby KE, Hjalgrim H. Epidemiology and etiology of mantle cell lymphoma and other non-Hodgkin lymphoma subtypes. Semin Cancer Biol. 2011 Nov;21(5):293-8. doi: 10.1016/j.semcancer.2011.09.010. Epub 2011 Sep 18. PMID: 21945518.
[30] Schöllkopf C, Melbye M, Munksgaard L, Smedby KE, Rostgaard K, Glimelius B, Chang ET, Roos G, Hansen M, Adami HO, Hjalgrim H. Borrelia infection and risk of non-Hodgkin lymphoma. Blood. 2008 Jun 15;111(12):5524-9. doi: 10.1182/blood-2007-08-109611. Epub 2008 Apr 18. PMID: 18424667; PMCID: PMC2972577.
[31] Aberer E, Fingerle V, Wutte N, Fink-Puches R, Cerroni L. Within European margins. Lancet. 2011 Jan 8;377(9760):178. doi: 10.1016/S0140-6736(10)62241-6. PMID: 21215884.
[32] American Cancer Society. Non Hodgkins Lymphoma Risk Factors. Available at: https://www.cancer.org/cancer/types/non-hodgkin-lymphoma/causes-risks-prevention/risk-factors.html ; accessed December 29, 2024.

concentrated industry. I note that Mr. Carter was a smoker, and benzene is one of the contaminants known to be associated with cigarette smoke. However, epidemiological studies of both MaCL and NHL have not identified cigarette smoking as a risk factor for either cancer[33]. The benzene exposure that Mr. Carter was subject to at Camp Lejeune is different than that of smoking, however, since it occurred in combination with TCE and PCE. Overall, Mr. Carter had no clear evidence of any known risk factor for MaCL or NHL, and, certainly, no risk factor that would negate the contribution of his combined exposure to TCE, PCE, and benzene as discussed above.

Thus, given my general causation assessment and the factors reviewed above, it is my opinion, to a reasonable degree of medical certainty, that the combination of Mr. Carter's exposures to TCE, PCE, and benzene from Camp Lejeune more likely than not was a substantial contributing factor to the causation of his mantle cell lymphoma.

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This concludes my evaluation of Mr. Ronald Carter with respect to the relationship between exposures to TCE, PCE, and benzene that he experienced from Camp Lejeune and the mantle cell lymphoma that he developed (and that was the proximate cause of his death).

Respectfully,

Howard Hu, M.D., M.P.H., Sc.D.

[33] Smedby KE, Hjalgrim H. Epidemiology and etiology of mantle cell lymphoma and other non-Hodgkin lymphoma subtypes. Semin Cancer Biol. 2011 Nov;21(5):293-8. doi: 10.1016/j.semcancer.2011.09.010. Epub 2011 Sep 18. PMID: 21945518.

Exhibit 1

CURRICULUM VITAE Updated on November 24, 2024

NAME: Howard Hu
PRIMARY AFFILIATION: Keck School of Medicine, University of Southern California
SECONDARY AFFILIATIONS: School of Public Health, University of Michigan

CONTACT: Howard Hu, M.D, M.P.H., Sc.D.
Email: howard.hu@med.usc.edu

TABLE OF CONTENTS

EDUCATION:

9/1973-6/1976	Biology	B.Sc.	Brown University
9/1977-6/1982	Medicine	M.D.	Albert Einstein College of Medicine
9/1979-6/1980 (degree in 6/1982*)		M.P.H. (Occ Hlth)	Harvard School of Public Health
9/1985-6/1986	Epidemiology	M.S.	Harvard School of Public Health
7/1986-6/1990	Epidemiology	Sc.D.	Harvard School of Public Health

* Awarding of the Harvard M.P.H. to medical students is delayed until the M.D. degree is conferred

POSTDOCTORAL TRAINING:

Research Fellowships

7/1987-6/1988 Occupational Health Research Fellow, Dept. of Environmental Health
Harvard School of Public Health

Internship and Residencies

7/1982-6/1983	Intern in Medicine	Boston City Hospital
7/1983-6/1984	Junior Assistant Resident, Internal Medicine	Boston City Hospital
7/1984-6/1985	Senior Assistant Resident, Internal Medicine	Boston City Hospital
7/1985-6/1987	Resident, Occupational Medicine	Harvard School of Public Health

CERTIFICATION AND LICENSURE:

1984	Massachusetts Medical License Registration
1985	American Board of Internal Medicine, Diplomate
1987	American Board of Preventive Medicine, Diplomate (Occupational Medicine)
2006	Michigan Medical License Registration
2013	College of Physicians & Surgeons of Ontario
2018	Washington State Medical License Registration
2021	California State Medical License Registration

ACADEMIC APPOINTMENTS:

9/1988-6/1992	Instructor in Medicine Department of Medicine, Harvard Medical School
9/1988-6/2006	Associate Physician (Clinical and Research), Channing Laboratory, Department of Medicine, Brigham & Women's Hospital
9/1990-6/1994	Assistant Professor of Occupational Medicine Department of Environmental Health, Harvard School of Public Health
7/1992-6/1997	Assistant Professor of Medicine

	Department of Medicine, Harvard Medical School
7/1994-6/2002	Associate Professor of Occupational Medicine Department of Environmental Health, Harvard School of Public Health
7/1997-8/2006	Associate Professor of Medicine Department of Medicine, Harvard Medical School
7/2002-8/2006	Professor of Occupational and Environmental Medicine (tenured) Department of Environmental Health, Harvard School of Public Health
9/2006-6/2012	Chair and Professor of Environmental Health Sciences (tenured), Department of Environmental Health Sciences, University of Michigan School of Public Health
9/2006-8/2009	Adjunct Professor of Occupational and Environmental Medicine Department of Environmental Health, Harvard School of Public Health
9/2006-6/2012	Research Associate Physician, Channing Laboratory, Department of Medicine, Brigham & Women's Hospital
5/2007-2012	Professor of Epidemiology, University of Michigan School of Public Health
5/2007-2012	Professor of Internal Medicine, University of Michigan Medical School
1/2009-2012	NSF International Endowed Department Chair, University of Michigan School of Public Health, Department of Environmental Health Sciences
7/2012-2018	Professor of Environmental Health, Epidemiology and Global Health (tenured) Dalla Lana School of Public Health, University of Toronto, Toronto, Ontario, Canada (on sabbatical/administrative leave, 2017-2018)
7/2012-2018	Professor, School of Medicine, University of Toronto, Toronto, Ontario, Canada
7/2012-	Adjunct Professor, Department of Environmental Health Sciences, University of Michigan School of Public Health
7/2012-2013	Director, Dalla Lana School of Public Health, University of Toronto, Toronto, Ontario, Canada
7/2013-6/2018	Founding Dean, Dalla Lana School of Public Health, a Faculty of the University of Toronto, Toronto, Ontario, Canada
7/2018-	Affiliate Professor (started as a Visiting Scholar, transitioned in 2018), Department of Occupational and Environmental Health Sciences, University of Washington School of Public Health, Seattle, WA
7/2020-	Professor (tenured) and Flora L. Thorton Endowed Chair (2020-2024), Department of Population and Public Health Sciences (previously, Department of Preventive Medicine), Keck School of Medicine, University of Southern California, Los Angeles, CA
7/2024	Sabbatical (1 year, through 6/2025)

ADMINISTRATIVE APPOINTMENTS:

7/1991-6/2006	(Founding) Director, Metals Epidemiology Research Group, Channing Laboratory, Department of Medicine, Brigham and Women's Hospital, Harvard Medical School, and Department of Environmental Health, Harvard School of Public Health
7/1992-6/1995	Director, Commission to Investigate the Health and Environmental Effects of Nuclear Weapons Production, International Physicians for the Prevention of Nuclear War
7/1996-6/2006	Director, Residency Program in Occupational and Environmental Medicine, Harvard School of Public Health

7/1996-8/2006 Director, Occupational and Environmental Medicine Core, National Institute for Occupational Safety and Health Educational Resource Center at the Harvard School of Public Health
7/1998-6/2004 (Founding) Medical Editor, Environmental Health Perspectives (official journal of NIEHS)
7/2000-8/2006 Associate Director, the Harvard NIEHS Environmental Sciences Center, Harvard School of Public Health
7/2004-6/2009 (Founding) Principal Investigator and Director, Harvard Center for Children's Environmental Health and Disease Prevention Research (co-PI and co-Director after 9/1/08)
9/2006-6/2012 Chair, Department of Environmental Health Sciences, University of Michigan School of Public Health
9/2006-2012 Director, Occupational Epidemiology Core, NIOSH Education and Research Center, University of Michigan
9/2006-2012 Co-Director, Michigan-Harvard/Harvard-Michigan Metals Epidemiology Research Group
7/2009-2011 Director, NIA T32 Training Grant in Aging and Public Health, University of Michigan School of Public Health
1/2010-2012 Chair, Faculty Steering Committee on Global Health, University of Michigan School of Public Health
4/2011-2012 (Founding PI) and Director, University of Michigan NIEHS P30 Core Center.
7/2012-2013 Director and Professor, Dalla Lana School of Public Health, University of Toronto, Toronto, Ontario, Canada
7/2013-6/2018 Founding Dean (2013-2017) and Professor, Dalla Lana School of Public Health, a Faculty of the University of Toronto, Toronto, Ontario, Canada
7/2020-6/2024 Flora L. Thornton Endowed Department Chair (2020-2024) and Professor, Department of Population and Public Health (previously, the Department of Preventive Medicine until July 1, 2021), Keck School of Medicine, University of Southern California, Los Angeles, CA

CLINICAL APPOINTMENTS:

7/1985-6/1987 Attending Physician, Emergency Department, Whidden Memorial Hospital
7/1985-6/1988 Assistant Visiting Physician, Department of Medicine, Boston City Hospital
1/1985-6/2006 Consultant in Occupational and Environmental Medicine, Center for Occupational and Environmental Medicine, Northeast Specialty Hospital (formerly known as the Olympus Specialty Hospital, the Massachusetts Respiratory Hospital, and Norfolk County Hospital).
3/1987-9/1987 Attending Physician, Occupational Health Program, University Hospital/Boston University Medical Center
7/1988-9/2006 Associate Physician, Brigham and Women's Hospital
7/1990-6/1995 Occupational/Environmental Medicine Consultant, Brigham and Women's Hospital Employee Health Services
7/2007-2012 Associate Physician, Division of General Medicine, Department of Medicine, University of Michigan Health System

1/2019-2020 Staff Physician, RotaClinic-Lake City, Seattle, WA
2021 (pending) Associate Physician, Keck Medical Center

OTHER ACADEMIC POSITIONS and MAJOR VISITING APPOINTMENTS:

7/1987-6/1990 Visiting Physician, South Cove Health Center, Boston (Chinatown)
7/1996-8/2006 Associate, Center for Health and the Global Environment, Harvard Medical School
2/1997 Alice Hamilton Visiting Professor, Division of Occupational and Environmental Medicine, Department of Medicine, University of California at San Francisco
11/2000- Visiting Scientist, Sri Ramachandra Medical College and Research Institute
7/2010- Senior Consultant, Tianjin Centers for Disease Control and Prevention, Tianjin, China
10/2012- Visiting Professor, Shanghai Key Laboratory of Children's Environmental Health, Xinhua Hospital, Shanghai Jiao-Tung University, China
7/2013-6/2016 Visiting Professor, Shanghai Jiao Tong School of Medicine, China
5/2015- Affiliate Scientist to the Li Ka Shing Knowledge Institute, St. Michael's Hospital, Toronto, Canada

MAJOR RESEARCH INTERESTS:

1. Environmental and molecular epidemiologic research related to heavy metals, potential endocrine disruptors, other neurotoxicants, carcinogens, and their impact on adverse health outcomes.
2. Gene-environment interactions; epigenetic dysregulation
3. Fetal/early life exposures and long-term effects
4. Aging-environment interactions
5. Health disparities
6. Health and human rights
7. Health, climate change, sustainability, and the global environment
8. "Big Data" for population health
9. Attitudes, behaviors, the immune response to infection and vaccines, and susceptibilities related to COVID19.

GRANTS (as PI, Co-PI, or primary mentor only):

Past Funding:

1980 (summer) Montefiore Hospital, Bronx NY,PI; $2,000 (approx)
A study of rural and occupational health in Tulua, Colombia, South America
1982 (summer) Albert Einstein College of Medicine, PI; $3,000 (approx)
A study of occupational/environmental health in Shanghai, China
7/1987-6/1989 NIEHS Center Grant ES00002 Pilot Project, PI; $12,000
The Long-term Renal and Neurologic Effects of Childhood Plumbism
7/1989-6/1990 NIEHS subcontract 7083-1, PI; $50,000 (approx)

The Use of X-Ray Fluorescence to Measure Lead Burden and Childhood Lead Exposure

7/1990-6/1992 Agency for Toxic Substances and Disease Registry, PI; $150,000 (approx)
"Clinical Environmental/ Occupational Medicine Research Fellowship Award",

7/1990-6/1991 NIEHS Center Grant ES00002 Pilot Project, PI; $12,000
The Metabolic Effects of Pregnancy and Lactation on Lead Burden

7/1990-6/1991 Harvard School of Public Health Basic, PI
Research Support Grant; $10,000
K-X-Ray Fluorescence Measured Lead Burden

10/1991-11/1991 NIOSH Special Grants, PI; $50,000 (approx)
The Carpenters Lead Project

4/1991-3/1996 NIEHS/R01, PI; $2,200,000 (approx)
The Epidemiology of Lead, Diet and Blood Pressure

7/1991-6/1996 NIEHS/R01 supplement, PI; $240,000 (approx)
The Epidemiology of Lead, Diet and Blood
Pressure--Research Supplement for Minority Investigator

7/1992-6/1995 NIEHS/R01 (Office of Research on Women), PI; $200,000 (approx)
Lead and Hypertension in Women

7/1993-6/1996 NIEHS/subcontract, PI; $150,000 (approx)
Exposure to Neurotoxins as Risk Factors for Amyotrophic Lateral Sclerosis

7/1995-6/1998 State of Washington, Department of Labor, PI; $350,000 (approx)
SPECT Imaging of the Brain in Patients with Multiple Chemical Sensitivity Syndrome and Controls

7/1996-6/1997 NIEHS Center Grant ES00002 Pilot Project, PI; $15,000
Electrocardiographic abnormalities in association with low-level lead exposure among middle-aged to elderly men: the Normative Aging Study

4/1995-3/2000 NIEHS Project PI (Program Project PI: Richard Monson); $1,800,000 (approx)
Lead Exposure, Accumulation in Bone, and Reproductive Toxicity Among Men and Women In Mexico

4/1995-3/2000 NIEHS Project PI (Program Project PI: Richard Monson); $1,900,000 (approx)
Lead Exposure, Accumulation in Bone, and Cognitive Toxicity Among Elderly Men and Women

6/1997-5/2002 NIEHS/R01 ES05257 PI; $2,312,274
Lead Biomarkers, Aging, and Chronic Disease

7/1997-6/1999 NIEHS Center Grant ES00002 Pilot Project, PI; $10,000
The effect of genetic polymorphisms of metallothionein-IIA on mRNA levels in middle-aged to elderly men: the Normative Aging Study

7/1998-6/2003 NIEHS/R01 PI (with no-cost extension; 5R01ES007821); $2,291,833
Lead Dose Biomarkers, Reproduction, and Infant Outcomes

7/1999-6/2000 NIEHS Center Grant ES00002 Pilot Project, co-PI; $14,000
Magnetic Resonance Spectroscopy in the Evaluation of Lead Neurotoxicity: the Normative Aging Study

7/2000-6/2001 MAVERIC (Massachusetts Area Veterans Epidemiology Resource and Institute Center) Pilot Project PI (with Dr. Robert Wright, co-PI); $10,000
The Use of Magnetic Resonance Spectroscopy in Lead Poisoning

7/2000-6/2001 NIOSH Center Grant Pilot Project, PI (with Dr. Robert Wright, co-PI); $12,000
Interaction between ApoE Genotype and Lead Exposure in the Development of Cognitive Impairment

7/2002-6/2004 The Rasmussen Foundation/Health Care Without Harm; $50,000
Medical Use of Phthalate Containing Products in the Neonatal Intensive Care Unit and Biomarkers of Neonatal Phthalate Metabolites

7/2002-6/2003 NIEHS Center Grant Pilot Project, PI; $8,000
Vitamin D Receptor Gene and Bone Lead in Reproduction

3/2004-2/2005 The Critelli Family Foundation; $10,000
Review of Environmental Cadmium Exposure and Toxicity

4/2000-3/2007 NIEHS Project Leader (Program Project PI: Richard Monson; 5P01ES05947); $2,472,677; Controlled Trial in Pregnancy of Dietary Supplements for the Suppression of Bone Resorption and Mobilization of Lead into Plasma (no cost extension)

4/2000-3/2007 NIEHS Project co-Leader (Program Project PI: Richard Monson; 5P01ES05947); $1,210,000 (approx); A Community-Based Study of Lead Exposure Pathways, Biomarkers of Dose, Health Effects, and Phytoremediation Strategies at the Tar Creek Superfund Site (no cst extension)

4/2002-9/2007 NIEHS/R01 PI (5R01ES010798); $3,011,295
Gene-Metal Interactions and Parkinson's Disease

10/2003-9/2007 NCMHI/P20 Project Leader (MD000501-01; Hughes Harris, PI); $828,781(Project)
"FAMU and Harvard Center for Health and Health Care Disparities"

8/2003-7/2008 NIEHS/R01 PI (2R01ES05257-11A2); $3,357,424 (bécame co-PI in 2007 after move to University of Michigan)
Lead-Gene Interactions and Cognition

6/2004-3/2009 NIEHS/P01 PI (5 P01ES012874-01); $6,662,670 (became co-PI in 2006 after move to University of Michigan)
Metals Mixtures and Children's Health (Center for Children's Environmental Health and Disease Prevention Research)

7/2002-12/2009 NIH/R03 PI (1R03TW005914; no cost ext through 2008); $192,000 (approx)
Lead, Genes, and Cognition in Children in Chennai, India

9/2006-7/2011 NIEHS/R01 PI (R01ES0007821); $3,116,831
Fetal Origins of Neurobehavior: Lead and Cholesterol Metabolism Interactions

7/2006-6/2011 NIEHS/R01 co-PI (R01ES013744; PI Wright), $3,200,000
Stress, Lead, Iron Deficiency and Neurodevelopment

7/2006-6/2011 NIEHS/R01 co-PI (RO1ES014930; PI Wright), $2,800,000
Metal Mixtures and Neurodevelopment

2/2008-2/2010 Michigan Institute for Clinical and Health Research (MICHR; home of the UM CTSA; UL1RR024986) Pilot Project PI; $26,000 (no cost extension)
Epigenetics of Early Life Events and Environmental Toxicants

4/2009-4/2010 Michigan Alzheimer's Disease Research Center Pilot Project PI, $25,000
Environment, Epigenetics and Alzheimer's Disease (no cost extension)

12/2009-12/2010 University of Michigan Center for Global Health Pilot Project PI, $25,000

Climate Variability and Impacts on Mortality and Morbidity in Chennai, India: A Pilot Project Stemming from the 2009 U.S.-India Workshop on Climate Change and Public Health, Goa India (no cost extension)

9/2009-9/2010 Michigan Institute for Clinical and Health Research (MICHR; home of the UM CTSA; UL1RR024986) Pilot Project PI; $26,000 (no cost extension)
Epigenetics and Epigenomics in the Etiology of Alzheimer Disease

7/2008-6/2011 NIA/T32 PI (T32AG027708); $450,000
Interdisciplinary Training Program in Aging and Public Health

4/2010-3/2015 NIEHS P42 Superfund Co-Inv, Project 2, Co-investigator (P42ES017198; PI: Alshawabkeh, Project 2 Leader: Meeker) Puerto Rico Testsite For Exploring Contaminant Threats, $12,000,000

4/1/2011-6/2015 NIEHS Core Environmental Health Sciences Center, Founding PI and Director (until 2012; now consultant; P30 ES017885), $ 4,620,100;
"Lifestage Exposures and Adult Disease"

4/2010-3/2014 NIEHS/EPA P20 Co-PI and Clin Health Specialist (P20 ES018171; PI Peterson)
Formative Children's Environmental Health and Disease Prevention Center, $1,959,960; "Perinatal Exposures, Epigenetics, Child Obesity & Sexual Maturation"

7/1/2013-6/30/2014 CIHR, Canadian Institute for Health Services and Policy Research; Planning Grants-Priority Announcement:Partnerships for Health System Improvement; PI, $24,992
"The Surviving Opioid Overdose with Naloxone (SOON) Project and Roundtable"

07/1/11-06/30/16 NIEHS K01 ES019909 (co-mentor; PI: Somers)
"Immune dysfunction associated with early life heavy metal exposure"

4/1/12-3/30/17 NIEHS R01ES013744 (consultant; PI: Wright; Mt Sinai School of Medicine)
"Stress-Lead Interactions and Child Development"

7/1/2012-7/1/2017 European Commission (EC), Funded under FP7-Health, Project 304925, co-Investigator; PI, epidemiologic studies, $6,000,000 E
"A novel micronutrient-based strategy to prevent hearing impairments: test and road to market for age-related hearing loss and preservation of residual hearing"

6/1/2012-7/1/2020, 1R01ES021446, PI, $4,140,000 (parent + supplement awards);
"Prenatal and Childhood Exposure to Fluoride and Neurodevelopment"

5/15/2015-5/15/2020 Health Canada; PI, $200,000 (Phase 1); $1,400,000 (proposed Phase 2) "A Community-based First Nation Study of Cancer and the Environment in Northern Ontario"

5/1/2021-4/30/2022 Environmental Pollutant Risk Factors for Worse COVID-19 Related Clinical Outcomes, PI, $49,999; the Southern California Environmental Health Sciences Center Pilot Project Program, University of Southern California, Los Angeles, CA

3/8/2021-3/8/2022 The USC SARS-CoV-2 Vaccination Campaign Research Initiative: Uptake, Markers and Determinants of Effectiveness, Subsequent Behaviors, PI, $1,200,000; The Keck COVID-19 Research Fund in the Keck School of Medicine; USC Office of the Provost; USC Office of Research.

11/1/2020-10/30/2022 The Population Health COVID-19 Pandemic Research Center, co-PI, $320,000, The Keck Medicine COVID-19 Research Initiative; the Keck Foundation

3/24/2020-2/28/2022 Pilot Project Proposal for Rapid Response Funding, University of Michigan

NIEHS P30 Core Sciences Center (co-PI); $6,250, "Environmental Cadmium and Influenza-related Mortality in NHANES: An Environment-Infectious Disease Interaction Study with Implications for Strategies for Reducing COVID-19-related Morbidity and Mortality"

9/1/16-8/31/22 NIH 5R01ES026033-02, (Consultant/Co-investigator; PI: Arora at Mt. Sinai School of Medicine) $648,000 "Novel Biomarker to Identify Critical Windows of Susceptibility to Metal Mixture"

12/31/2020-6/30/2023 The Los Angeles Pandemic Surveillance Cohort Initiative, PI, $ 1,997,934; The Los Angeles County Public Health Departmen, PH-003903-W2/U.S. Centers for Disease Control and Prevention Cooperative Agrement US0CK000498.

4/1/13-3/31/23NIEHS/EPA P01ES022844 (co-inv; PI: Peterson at the University of Michigan) "Lifecourse Exposures & Diet: Epigenetics, Maturation & Metabolic Syndrome."

Current Funding

8/22/23-10/31/25 Research and Innovation (R&I) Collaborative Research Planning Award Office of Research, University of Southern California, MPI, $72,074; "Building a Faculty Team and Platform for Research on Health and Health Policy that Improves Population Health in a Low Resource Setting in India Known for Innovation: the State of Meghalaya"

7/1/16-6/30/26 CIHR (co-PI; Director; PI: Jeffrey Brook at the Dalla Lana School of Public Health) $4,700,000 CNDN
"CANadian Urban Environmental (CANUE) Health Research Consortium"

9/1/17-6/30/27 NIH R24ES028502 (Consultant/Co-investigator; PI: Peterson at the University of Michigan, "E3GEN: Multigenerational Effects of Toxicant Exposures on Life Course Health and Neurocognitive Outcomes in the ELEMENT Birth Cohorts"; $2,009,022

Applications Under Review

1/1/2025-12/31/2025 Reckitt Global Hygiene Institute Foundation, PI, $199,997
"Climate Change and Precipitation Extremes in India: The Diarrhea Outbreaks, Sanitation and Hygiene Interventions (DOSHI) Project"

1/1/2025-12/31/2025 Pilot Project Proposal, Southern California Environmental Health Sciences Center NIEHS P30 Pilot Project Program, co-I (PI: T. Islam)
"Effects of Climate Change on Respiratory Diseases in Meghalaya, India"

7/1/2025-6/30/2027 Novo Nordisk Fonden Foundation, PI, $1,015,254 (Application No. 0093393)
"Remedying the Effects of Climate Change on Respiratory and Diarrheal diseases (RECoRD): A Scalable Project in Rural India"

7/1/2025-6/30/2030 NIH 1 RM1 NS143787-01, PI, $12,280,616
"The Multiethnic Translational Research on Neuro-PASC (METRON) Project)

HONORS AND AWARDS:

1978-1982 National Health Service Corps Scholarship
1985-1988 National Research Service Award
1990-1992 Agency for Toxic Substances and Disease Registry Clinical Environmental Medicine Award
1994 Will Solimene Award of Excellence, American Medical Writers Association, for: Chivian E, McCally M, Hu H, Haines H, eds. *Critical Condition: Human Health and the Environment*. Cambridge: The MIT Press, 1993.
1997 Alice Hamilton Lecturer, University of California at San Francisco
1998 First Prize for Best Infant Nutrition Research, Instituto Danone, Mexico (for González-Cossío T, Peterson KE, Sanín L, Fishbein SE, Palazuelos E, Aro A, Hernández-Avila M, Hu H. "Decrease in birth weight in relation to maternal bone lead burden." Published in *Pediatrics*)
1999 National Institute for Environmental Health Sciences "Progress and Achievement of the Year Award", 1998-1999
1999 True Memorial Lecturer, Maine Medical Center, Portland ME.
2000-2001 Faculty Sabbatical Award, Harvard School of Public Health
2000-2001 Senior Fulbright Scholar in India
2001 Hoopes Prize, Faculty Mentorship (for Senior Thesis of Charles Lin, "More than Black and White: Lead Poisoning as an Environmental Justice Issue in Boston")
2003 Best Paper in Preventive Medicine by a Medical Student (for Senior Thesis of Vanitha Janakiraman; Janakiraman V, Hu H, Mercado-Garcia A, Hernandez-Avila M. A randomized crossover trial of nocturnal calcium supplements to suppress bone resorption during pregnancy. Am J Prev Med 2003;24:260-4.). American College of Preventive Medicine, Ulrich and Ruth Frank Foundation for International Health.
2004 Das Travel Grant Award, The South Asia Initiative, Harvard University (for Travel in India)
2005 Adolph G. Kammer Merit in Authorship Award, the American College of Occupational and Environmental Medicine (for Rhodes D, Spiro A, Aro A, Hu H "Relationship of Bone and Blood Lead Levels to Psychiatric Symptoms: The Normative Aging Study", Published in the *Journal of Occupational and Environmental Medicine*)
2006 Teacher of the Year Award, Occupational/Environmental Medicine Residents, Harvard School of Public Health
2006 Harriett Hardy Award, the New England College of Occupational and Environmental Medicine
2009 Linus Pauling Award for Lifetime Achievements, American College for the Advancement of Medicine

2011 Award for Excellence, American Public Health Association
2015 John R. Goldsmith Award for Outstanding Contributions to Environmental Epidemiology, International Society for Environmental Epidemiology
2016 Election to Fellowship, Canadian Academy of Health Sciences

MEMBERSHIPS IN PROFESSIONAL SOCIETIES

Memberships

1981- American Public Health Association (APHA)
1982-2006 Massachusetts Coalition for Occupational Safety and Health
1983-1989 American College of Physicians
1985- Physicians for Social Responsibility
1987- Physicians for Human Rights
1990- International Society for Environmental Epidemiology (ISEE)
1990-2000 American Association for the Advancement of Science
1990-2006 Association of Occupational and Environmental Clinics (AOEC)
1991- International Physicians for the Prevention of Nuclear War (IPPNW)
1994-1996 Society for Occupational and Environmental Health (SOEH)
2000-2012 American College of Occupational and Environmental Medicine (ACOEM)
2009-2012 Society of Toxicology
2012-2018 Canadian Public Health Association (CPHA)
2020- Washington State Medical Association
2020- International Society for Children's Health and the Environment
2023- California Academy of Preventive Medicine

Committee Assignments

1981-1982 Program Committee, Occupational Safety and Health Section, APHA
1987-1988 Program Committee, Asian-American Caucus, APHA
1992-1998 Membership Committee, ISEE
1995-1998 Quality Assurance Committee, AOEC
1997-1998 Program Committee, 1998 Superfund Basic Research Program, Annual National Meeting
2001-2006 Program Committee, New England College of Occupational and Environmental Medicine Annual Meetings

EDITORIAL POSITIONS AND BOARDS:

1977-1982 Einstein Community Health Newsletter
1988-1992 Bookreview Co-Editor, Section on Occupational Safety and Health, Am Public Health Assoc.

1993-	Journal of Health and Human Rights
1998-	Environmental Health Perspectives (Founding Medical Editor, 1998-2004; Associated Editor, 2004-)
2004-	American Journal of Industrial Medicine
2007-2009	Faculty of 1000 Medicine
2017-	Current Environmental Health Reports
2017-	Faculty of 1000 Medicine

PEER REVIEW SERVICE

American Journal of Clinical Nutrition
American Journal of Epidemiology
American Journal of Industrial Medicine
Archives of Environmental and Occupational Health
Biomed Central
Circulation
Environmental Epidemiology
Environmental Health
Environmental Health Perspectives
Environment International
Environmental Research
Epidemiology
Indian Journal of Medical Research
Journal of Health and Human Rights
Journal of the American Medical Association
Kidney International
Lancet
New England Journal of Medicine
Pediatrics
PLOS One
Science of the Total Environment

TEACHING:

1. LOCAL CONTRIBUTIONS (at the Harvard School of Public Health, 1985-2006)

1985-	"Toxicology of the Kidney and Urinary Tract" Guest Lecturer for TOX204a,b
1988-	"Occupational Health" Guest Lecturer for EH201a,b
1989-1992	"Lead Toxicology"

	Guest Lecturer for TOX204a,b
1990-	Grand Rounds in Occupational/Environmental Medicine Director
1990-2000	Introduction to Occupational and Environmental Medicine (EH232c,d) Course director, lecturer
1990-	"The Epidemiology of Lead Exposure, Dose, and Toxicity" Guest Lecturer for EPE215c,d and EPE215t
1990-	"Solvent toxicity" Fundamentals of Industrial Hygiene, Continuing Education Department
1992	"Current Research on Lead", Metals Epidemiology Research Group Seminar Presenter
1992	"Lead Poisoning Without a Known Source in a Hyperthyroid Patient" Case discussant, Grand Rounds in Occupational and Environmental Medicine
1992-	"Biological Markers of Lead Dose" Guest Lecturer, EHE280c,d
1994-	"Screening for Lead Toxicity" Guest lecturer, EPI227d
1994-	"Lead Exposure and Biological Monitoring" Guest Lecturer, ID263b
1994-	"Case Study: Lead" Guest Lecturer and Case Discussant, EH202d
1996-	Introduction to Environmental Health (EH201b) Course director and lecturer
1997-	Human Health and Global Environment Change (EH278a,b) Course Co-developer, Co-director, and lecturer

Hospital courses and Invited Teaching Presentations (Harvard-affiliated Hospitals)

1990	Guest Lecturer on Occupational Medicine Residency Program, Department of Medicine, Brigham and Women's Hospital
1994	Speaker, Grand Rounds; "Is Lead a Ticking Time Bomb?" Department of Obstetrics and Gynecology, Brigham and Women's Hospital
1994	Speaker, Grand Rounds; "Is Lead a Ticking Time Bomb?" Department of Medicine, Brockton V.A. Hospital
1994	Speaker, Symposium on Preventive Medicine and Clinical Epidemiology,; "Is Lead a Ticking Time Bomb"; Brigham and Women's Hospital
1995	Discussant, "Multiple Chemical Sensitivity", Occupational/Environmental Medicine Grand Rounds, Occupational Health Program, Harvard School of Public Health
1996	Guest lecturer, "Lead Toxicity as a Paradigm for a Regional and Global Health Hazard", Environmental Health Student Group, Holmes Society, Harvard Medical School
1997	Speaker, "Mobilization of maternal bone lead as a hazard to the fetus", Grand Rounds, Dept. of Neonatology, Beth Israel Hospital, Boston, MA
2000	Guest lecturer, "Update on Lead Toxicity Research", Program in Pediatric

	Toxicology, Children's Hospital
2000	Discussant, "Adult Lead Toxicity", Weekly Case Round, Department of Medicine, Brigham and Women's Hospital, Boston.
2000	Lecturer, "Update on Lead Toxicity, Hypertension, and Chronic Renal Failure", Renal Rounds, Division of Nephrology, Department of Medicine, Brigham and Women's Hospital, Boston.
2002	Lecturer, "Maternal Bone Lead as a Threat to Fetal Development", Program in Neonatology, Beth Israel-Deaconness Hospital, Boston, MA

Doctoral student committees

Chair and member:

Dr. Rokho Kim	Dr.P.H. Occupational Health and Epidemiology, '96
Dr. Yawen Cheng	Sc.D. Epidemiology, '98
Dr. Sharon Tsaih	Sc.D. Epidemiology, '99
Dr. Hung Yi Chuang	Sc.D. Occupational Health, '99
Dr. Adrienne Ettinger	Sc.D. Environmental Health, '03
Dr. Florence Wang	Sc.D. Environmental Health, '05
Dr. Sung K. Park	Sc.D. Environmental Health, '05
Dr. Pradeep Rajan,	Sc.D. Occupational Health, '06

Member/Advisor:

Dr. How Ran Guo	Sc.D. Occupational Health, '94
Dr. Joshua Cohen	Sc.D. Health Policy and Management, '94
Dr. Jane Hoppin	Sc.D. Environmental Health, '95
Dr. Salma Elreedy	Sc.D. Environmental Health, '97
Dr. Mary Jean Brown	Sc.D. Maternal and Child Health, '00
Dr. Brisa Sanchez	Sc.D. Biostatistics, '06
Dr. Ami Zota	Sc.D. Environmental Health, '07
Dr. Ananya Roy	Sc.D. Environmental Health, '08
Dr. Elissa Wilker	Sc.D. Environmental Health, '09

Post-doctoral fellow mentor:

Dr. Marinelle Payton (Channing Lab), Dr. Susan Korrick (Channing Lab), Dr. Rokho Kim (Channing Lab), Dr. Viji Potula (HSPH Research Fellow), Dr. Barbara Nowak (Visiting Scientist from Silesian University School of Medicine, Poland), Dr. Robert Wright (Channing Lab), Dr. Ming Tsuang Wu (HSPH Research Fellow), Dr. Yawen Cheng (Channing Lab), Dr. Geeta Mathur (neonatology fellow at the Brigham and Women's Hospital), Dr. Sri Hari Bojja (HSPH Research Fellow), Dr. Hae-Kwan Cheong (Visiting Scientist from Dongguk University School of Medicine, S. Korea), Dr. Sahar Elmarsafawy (HSPH Research Fellow), Dr. Jing Lu (Visiting Scientist from the Chinese Academy of Preventive Medicine), Dr. Dieter Affeln (Occ/Env Med Fellow), Dr. Ahmed Gomaa (Occ/Env Med Fellow), Dr. Chris Leffler (Occ/Env Med Fellow), Dr. Ronald Dykeman (Occ/Env Med Fellow), Dr. Uma Dhanabalan (Occ/Env Med Fellow), Dr. Hsien-Wen Hsu (Occ/Env Med Fellow), Dr. Betty Ann Cohen (Occ/Env Med Fellow), Dr. Arvin Chin (Occ/Env Med Fellow),

Dr. Daniel Rhodes (Occ/Env Med Fellow), Dr. Richard Wittman (Occ/Env Med Fellow), Dr. Sun-Dong Lee (Visiting Scientist from Sangji University, Korea), Dr. Ronald Green (Occ/Env Med Fellow), Dr. Erma Lawson (Environmental Health Fellow), Dr. Marc Weisskopf (Environmental Health Fellow), Dr. Bridget Bagert (Occ/Env Med Fellow), Dr. John Jarrell (Visiting Scientist from University of Calgary), Dr. Jennifer Weuve (Environmental Health Fellow), Dr. Karen Chou (Visiting Scientist from Michigan State), Dr. Nitin Jain (Channing Laboratory Fellow), Dr. Adrienne Ettinger (Children's Center Scientist), Dr. Sam Myers (Fellow in Alternative and Complementary Medicine), Dr. Marcelo Targino (Occ/Env Med Fellow), Dr. Manish Arora (Post-doctoral fellow from University of Sydney), Dr. Huiling Nie (Post-doctoral fellow from McMaster University).

Other faculty mentorship:
Elizabeth Rubinstein (HMS Summer research), Alicia Marier (HMS Summer research), Vanitha Janakiraman (HMS Summer research), Young-Sook Lim (Harvard College Summer research), Charles Lin (Harvard College Senior thesis research), Ed Hsieh (Harvard College Summer research), Naveen Thomas (Emory University Medical School Senior thesis research). Shreekrishna Akilesh (Harvard Dental School summer research), Christine Pace (HMS Summer research)

Advisory and supervisory responsibilities

1985-1987	Attending Physician, outpatient general medicine clinic, Boston City Hospital; weekly precepting for housestaff and medical students
1990-2006	Preceptor, Residency in Occupational and Environmental Medicine, Harvard School of Public Health at the Mass Respiratory Hospital
1990-2006	Advisor to general M.P.H. students, Harvard School of Public Health.

2. LOCAL CONTRIBUTIONS (at the University of Michigan, 2006-2012)

2006-	Principles of Environmental Health (EHS-500) Course director and lecturer
2006-	Environmental Epidemiology (EHS-608) Guest lecturer on birth cohorts and environmental epidemiology
2006-	Occupational and Environmental Disease (EHS-501) Guest lecturer on metals exposure and health effects; Course Director (2009-)
2007-	Metals Exposure, Biomarkers and Toxicity: A Multi-disciplinary Environmental Epidemiology Approach (EHS-698 reading course) Course director and lecturer
2008-2009, 2010-2011	Topics in Environmental Health Sciences (EHS-688) Course director and lecturer
2009	Occupational and Environmental Disease (EHS-501) Course director and lecturer
2009-	On-line (Long-distance Foundations in Public Health Certificate Program): Principles of Environmental Health (EHS-500-801) Course director and lecturer
2009	Introduction to Public Health (HMP-200)

	Guest lecturer on environmental health
2009-	Seminars in Aging and Public Health (EPID 813)
	Course director and lecturer
2011	Seminar on Public Health in China (HMP-xxx)
	Guest lecturer on "Environmental Health in China"

Post-doctoral fellow mentor:

Dr. Sung Kyun Park (Environmental Health Sciences Fellow, now Research Assistant Professor), Dr. Brisa Sanchez (Biostats Research Assistant Professor, now Assistant Professor), Dr. Richard Pilsner (Robert Wood Johnson Health & Society Fellow), Dr. Aimin Zhang (Environmental Health Sciences Fellow, Toxicology Training Grant), Dr. Ananya Roy (Environmental Health Sciences Fellow), Dr. David Cantonwine (Reproductive Sciences Fellow).

Doctoral Student Advisor (principal)

David Cantonwine	Ph.D.	Environmental Health Sciences (2009)
Myriam Afeiche	Ph.D.	Environmental Health Sciences (co-mentor with Karen Peterson; 2010)
Yoon-Hyeong Choi	Ph.D.	Environmental Health Sciences (co-mentor with Sung Kyun Park; 2011)
Katie F. Bush	Ph.D.	Environmental Health Sciences (co-mentor with Marie O'Neill; 2011)
Kelly Bakulski	Ph.D.	Environmental Health Sciences (2012)
Gamola Fortenberry	Ph.D.	Environmental Health Sciences (co-mentor with John Meeker; 2013)
Siying Huang	Ph.D.	Environmental Health Sciences (2013)
Deena Thomas	Ph.D.	Environmental Health Sciences (2014)
Rebecca Tutino	Ph.D.	Environmental Health Sciences (2015)
Zishaan Farooqui	Ph.D.	MD-PhD Medical Scientist Training Program (2015)

Masters Student Thesis Advisor

Bradley Lampe (OEE), Troy Meissner (OEE), Pheba Alexander (OEE), Brian Davis (OEE & HBHE), Aaron Leftwich (OJOC program), Suengwon Lee (Nutrition), Allen Zhong (OEE), Graham Newman (OEE), Jacqueline Barkoski (OEE)

Undergraduate Thesis Advisor

Lauren Schwartz (Neuroscience, LSA)

3. LOCAL CONTRIBUTIONS (at the University of Toronto, 2012-2017)

2012	Determinants of Community Health (Faculty of Medicine)
	Guest lecturer on 'The Future of Medicine & Public Health in a Crowded, Diverse, Aging, Stratified, Urbanized, Polluted, Hot, Thirsty, Hungry, Debt-Ridden World".
2012-	CHL5004H Introduction to Public Health

Guest lecturer on "The Future of Public Health (and Your Role !) in a Hot, Flat, Crowded…and Diverse, Aging, Stratified, Urbanized, Polluted, Thirsty, Hungry, Debt-Ridden World". "What is Public Health?", "Climate Change and Health"

2012- CHL 5912F Industrial Toxicology.
Guest lecturer on the "Toxicology of Metals".

2013-2014 Department of Family & Community Medicine "Building Blocks" (short course for International post-graduate primary care trainees); Guest lecturer on "Public Health & Primary Care"

2013- CHL5701H Doctoral Seminar, Collaborative Doctoral Program in Global Health
Guest lecturer on "The Challenges of Environmental Health in a Rapidly-Changing World, from the Molecular to the Global".

2014 JCR1000 "Interdisciplinary Approach to Global Challenges"
Guest lecturer on "Global Environmental Health"

2014- PHS100H1 "Grand Opportunities in Global Health"; Guest lecturer on "Urban Environments"

2015 Public Health & Preventive Medicine Residency Rounds "Physicians, Climate, and other Global Environmental Changes: Our Role"

2016 CHL5004H Introduction to Public Health, Course Co-Director (with Professor Erica DiRuggierro)

2016 CHL 7001H F6 Environmental-Molecular Epidemiology, Course Co-Moderator (with Professor Morteza Bashash)

2016 CHL5701H Doctoral Seminar, Collaborative Doctoral Program in Global Health, Course Co-Director (with Professors Erica DiRuggierro and Abdallah Daar)

2016 Joint Seminar, "The Impact on Intelligence, Behaviour, and Society of Lead Exposure: A Case Study of a Global Pollutant and On-going Research"; Collaborative Program in Neurosciences and Collaborative Global Health Doctoral Program, University of Toronto

2016 CHL5420H "Global Health Research Methods"
Guest lecturer on "The Early Life Exposures in Mexico to Environmental Toxicants Project (ELEMENT): A Global Health Collaboration Case Study"

Masters student research advisor
Maelle Marchand

Doctoral student advisor
Adele Carty

Doctoral student thesis committee member
Laura Bogaert

Doctoral student thesis examination committee member
Claudie CY Wong (doctoral student in epidemiology, Jockey School of Public Health and Primary Care, Chinese University of Hong Kong)
Zilong Zhang (doctoral student in epidemiology, Jockey School of Public Health and

Primary Care, Chinese University of Hong Kong)

Post-doctoral fellow mentor:
Siying Huang, Ph.D.; Morteza Bashash, Ph.D.; Roman Pabayo, Sc.D. (Harvard School of Public Health); Tripler Pell, M.D., M.P.H.

4. LOCAL CONTRIBUTIONS (at the University of Washington, 2017-2020)5

Doctoral student thesis research mentor
Megan Suter

Doctoral student special projects advisor
Rachel Shaffer
Joey Frostad
Rebecca De Buen

5. LOCAL CONTRIBUTIONS (at the University of Southern California, 2020-present)

2020- PM 502 Foundations of Public Health
Guest lecturer on "Global Health and the Global Burden of Disease Study"

2020- PM 601 Basic Theory and Strategies in Prevention
Guest lecturer on "Sociocultural Theories: Health Disparities and Environmental Justice"

2021- Health Justice and Systems of Care curriculum, Keck School of Medicine Year 01
Guest lecturer on "Introduction to Public Health (in a Hot, Crowded, Diverse, Aging, Inequitable, Urbanized, Polluted, Thirsty, Hungry, Debt-Ridden World)"

Medical student research advisor
Kelly Burk (2022-2023; now a Neurology Resident)

6. NIH K-grant mentorship:

Robert Wright, M.D., M.P.H. (K-23 ES000381, "*Neurochemical and Genetic Markers of Lead Toxicity"*), 2000-2005; Dr. Wright is now Professor of Pediatrics, Mt. Sinai School of Medicine
Marc Weisskopf, Ph.D. (K-01 ES012653, "*New Biomarkers of Neurotoxicity*"), 2004-2009; Dr. Weisskopf is now Professor (tenured) of Occup Health, Harvard Sch Public Health
Sung Kyun Park, Sc.D. (K-01 ES016587; "*Environment, Novel Aging Outcomes, and Genetics*"), 2009-2014; Dr. Park is now Associate Prof (tenured), Department of Epidemiology, University of Michigan Sch Public Health
Emily Somers, Ph.D. (K-01 ES019909; *"Immune Dysfunction Associated with Early Life Heavy Metals Exposure"*), 2011-2016; Dr. Somers is now Associate Prof, Division of Rheumatology, Department of Internal Medicine, University of Michigan Medical School

Ashley Malin, Ph.D. (K-99/R00 ES031676; "*Childhood fluoride exposure and sleep patterns*", 2021-2026; Dr. Malin is now an Assistant Professor, Department of Epidemiology, University of Florida School of Public Health.

COMMITTEE, ORGANIZATIONAL, AND VOLUNTEER SERVICE

National/International

1978-1982 Taskforce on Occupational and Environmental Health, Co-coordinator, Am Med Stu Assoc
1989 Ad Hoc Study Committee, National Institute for Environmental Health Sciences Council
1989-2006 Association of Occupational and Environmental Medicine Clinics (AOEC)-- (through the Northeast Specialty Hospital Center for Occupational and Environmental Medicine)
1989-1990 Member, Relative Risk Reduction Strategies Committee, Science Advisory Board, U.S. Environmental Protection Agency
1989-1992 Member, Board of Directors, Physicians for Human Rights, Boston, MA
1991 National Institutes of Health, General Clinical Research Center Program, Site Visit Team
1992-2019 Member, National Advisory Committee, Physicians for Human Rights, Boston, MA
1992 Special Study Section member (R3/S1/B3), National Institutes of Health
1994 Ad Hoc Reviewer, National Institutes of Health, General Dental Research Center Program
1994 Advisory Board, Institute for Energy and Environmental Research
1994-1996 Associate, Project on Global Environmental Change and Health, Physicians for Social Responsibility
1995 Ad Hoc Reviewer, National Institutes of Health, Diagnostic Radiology Study Section
1996- Membor, Editorial Board, Health and Human Rights—an International Journal
1995-1998 Advisory Committee, Consortium for Environmental Education in Medicine, Cambridge, MA.
1996-1997 Reviewer, Agency for Toxic Substances and Disease Registry
1997-1998 Program Committee, Annual Mtg, NIEHS Superfund Basic Research Group Centers
1998-2013 (Founding) Medical Editor (1998-2004); Associated Medical Editor (2004-), Environmental Health Perspectives (official journal of NIEHS)
2001 Ad Hoc Reviewer, National Institutes of Health, R-13 applications
2002-2006 External Advisory Committee, Program Project on Lead and Osteoporosis, University of Rochester
2003-2005 Member, Ad-Hoc Expert Panel to Form Medical Management Guidelines for Lead-Exposed Adults, (supported by NIOSH and AOEC)
2003-2009 Member, Working Group on Lead and Pregnancy, Advisory Committee on Childhood Lead Poisoning Prevention, U.S. Centers for Disease Control and Prevention
2004 Ad Hoc Reviewer, National Institutes of Health, K-23 applications
2004 Ad Hoc Reviewer, Draft of "Immunization Safety Review: Vaccines and Autism" Immunization Safety Review Committee, Institute of Medicine, National Academies of

Science
2004 Finalist (one of 8), Search for Director, National Institute for Environmental Health Sciences, U.S. National Institutes of Health
2005 Member, Strategic Planning Conference, National Institute for Environmental Health Sciences, Research Triangle Park, NC
2006 Ad Hoc Reviewer, Draft of "Preterm Birth: Causes, Consequence, and Prevention" Committee on Understanding Premature Birth and Assuring Health Outcomes, Institute of Medicine, National Academies of Science
2006 Member, External Advisory Committee, NIEHS Center, University of Rochester
2007 Member, Ad Hoc Study Section, Special Emphasis Panel/Scientific Review Group 2007/05 ZES1 JAB-C (DI) (NIEHS Discover Centers)
2007-2010 Member, Board on Population Health and Public Health Practice, Institute of Medicine, National Academies, Washington DC.
2007 Member, Ad Hoc Review Panel, Centers of Excellence Program, Swedish Council for Working Life and Social Research.
2007-2008 Member, Search Committee for Director of Extramural Research, NIEHS
2007 Special Consultant, Ad Hoc Study Section, Special Emphasis Panel/Scientific Review Group 2008/01 ZAR1 CHW-G (NIAMS Arthritis Centers)
2008 Report Reviewer, Draft National Research Council Report, "The National Children's Study Research Plan: A Review", National Academies
2008 Report Reviewer, Draft National Research Council Report, "Gulf War and Health: Updated Literature Review of Depleted Uranium", Institute of Medicine, National Academies
2008-2009 Data Safety Monitoring Board, "d-Penicillamine Chelation in lead-poisoned Children—A Phase II/III Trial" (R01FD003361; PI: Michael Shannon)
2008 Subcommittee to review Draft Report on Bisphenol A, Science Board, Food and Drug Administration
2008 Planning Committee, International Symposium on the Environmental and Health Consequences of Metal Mining and Smelting
2008-2009 Co-Chair, Planning Committee, "Climate Change Impacts on Public Health in India", Workshop that took place in Goa, India in Aug-Sept 2009 co-sponsored by UM Center for Global Health, the US Centers for Disease Control and Prevention and the Indian Council for Medical Research
2008 Finalist (one of 2), Search for Director, National Institute for Environmental Health Sciences, U.S. National Institutes of Health
2009-2012 Member, Board on Environmental Studies and Toxicology, National Research Council
2009 Reviewer, NIH Challenge Grants, Special Emphasis Panel/Scientific Review Group 2009/10 ZRG1 GGG-F
2009-2010 External Member, Academic Program Review Site Visit Committee, Department of Environmental and Occupational Health Sciences, University of Washington School of Public Health
2010-2012 Member, External Advisory Committee, University of Rochester NIEHS P30 Core Center

2010 Member, Ad-hoc review committee, National Health Research Institutes of Taiwan, Special Emphasis Panel—NHRI-Kaoshiung Medical College Program Project on ": "Gene Environment Interaction in the Genesis of Asthma and Allergic Diseases"
2010-2012 Member, Advisory Board, Institute of Public Health, Florida Agricultural & Mechanical University, Tallahassee, FL
2011 Reviewer, NIEHS Career Development Awards, Special Emphasis Panel/Scientific Review Group 2011/05 ZES1 LKB-J (K9)
2011-2016 Member, NIEHS National Advisory Environmental Health Sciences Council
2012 Member, Editorial Board, Journal of Alzheimer's Disease
2015 Member and External Reviewer, School of Population and Public Health Review Committee, University of British Columbia, Vancouver, B.C.
2016-2021 Chair, Board of Directors, Canadian Urban Environmental Health Research Consortium, (National Consortium based out of the Dalla Lana School of Public Health)
2017-2023 Member, Energy Research Committee, Health Effects Institute, Boston, MA
2017-2018 Executive Co-Chair, Workshop on the Global Burden of Disease-Pollution and Health Initiative, March 1-2, 2018, Institute for Health Metrics and Evaluation, Seattle, WA
2017- Executive Co-Leader, Global Burden of Disease-Pollution and Health Initiative
2019-2022 Member, Research Advisory Committee, Centre of Environmental Health, The Public Health Foundation of India and the Tata Institute of Social Sciences, New Delhi, India
2019 Reviewer, draft report on trace metals levels in pregnancy women, Agency for Toxic Substances and Disease Registry, Centers for Disease Control and Prevention, Atlanta
2019 Reviewer, draft report on Concentration-Response Functions between Lead Exposure and Adverse Health Outcomes for Use in Benefits Analysis: Cardiovascular-Disease Related Mortality", EPA National Center for Environmental Economics Office of Policy
2019- Member, Advisory Council, Physicians for Human Rights, New York, NY
2019 Reviewer, Special Emphasis Panel/Scientific Review Group 2020/01 ZES1 LAT-S (K9) Applications, Center for Scientific Review, U.S. National Institutes of Health
2019-2020 Member, Board of Advisors Taskforce, Marilyn Brachman Hoffman Foundation, Dallas, TX
2020-2021 Member, External Advisory Committee, New York University/NIEHS Environmental Health Core Sciences Center, New York, NY
2020 Member, NIEHS DR2 Work Group SARS-CoV-2/COVID-19 Environmental Health Research Needs Panel.
2020- Chair (2020-2024), member, Scientific Advisory Board, the Marilyn Brachman Hoffman Foundation, Dallas, TX
2020 Member, The Lancet Commission on Pollution and Health: Update
2021-2024 Member, Clean Air Scientific Advisory Committee (CASAC) Lead Review Panel, U.S. Environmental Protection Agency
2022 Member, Review Panel, RFA-RM-21-025: NIH Faculty Institutional Recruitment for Sustainable Transformation (FIRST) Program: FIRST Cohort. Office of the NIH Director, Office of Strategic Coordination.
2022- Member, Board of Directors, Pure Earth, New York, NY.
2022- Co-Chair, International Research Council, The Public Health Foundation of India, Delhi,

India
2023- Member, Board of Directors, Wellness Equity Alliance, Los Angeles, CA
2023- Member, Lead Working Group, Pahle Foundation, Delhi, India
2024- Member, Workgroup on Prevention of Lead Exposure in Adults of the Lead Exposure and Prevention Advisory Committee (LEPAC), National Center for Environmental Health/Agency for Toxic Substances and Disease Registry

Regional

1988-1990 Health Facilities Appeals Board, Member, Dept. Public Health, Comm. Of Mass.
1988-2006 Advisory Board, Massachusetts Department of Public Health, Sentinel Event Notification System for Occupational Risks (SENSOR) Project
1989-1995 Advisory Board, Massachusetts Division of Occupational Hygiene, Lead Registry Project
1990-1992 Board of Directors, Member, Health Care for All, Boston, Massachussetts
1993-1995 Faculty Council, Member, Harvard School of Public Health
1995-2006 Faculty Advisory Committee, Public Health Practice Program, Harvard School of Public Health
1996-2006 Advisory Board, Boston VA Environmental Hazards Center, Boston
1997-2001 Faculty Steering Committee, Center for Children's Health, Harvard School of Public Health
1996-2006 Senior Epidemiology Consultant, Massachusetts Veterans Epidemiology Research and Information Center, Boston.
1996-2006 Associate, Center for Health and the Global Environment, Harvard Medical School
1997-2002 Faculty Advisory Committee on Continuing Professional Education, Harvard School of Public Health
1998-2006 Faculty Steering Committee, Masters of Public Health program, Harvard School of Public Health
2001-2003 Board of Directors, New England College of Occupational and Environmental Medicine
2001-2006 Associate Director, Harvard NIEHS Environmental Sciences Center, Harvard School of Public Health
2001-2006 Senior Advisory Council Member, Lowell Center for Sustainable Production, University of Massachusetts, Lowell, MA
2003-2006 Member, Human Subjects Committee, Harvard School of Public Health
2003-2006 Advisory Committee, Occupational Health Services Research Program, Harvard School of Public Health
2006 Study Section Review Committee, Pilot Project Program, Graham Environmental Sustainability Institute, School of Natural Resources and Environment, University of Michigan
2006-2007 Chair, Planning Committee, Health Sector, May 8-10, 2007 National Summit on Coping with Climate Change, University of Michigan
2007-2009 Member, Advisory Committee, SPH Practice Committee, University of Michigan

School of Public Health
2007-2012 Member, Residency Advisory Committee, General Preventive Medicine Residency, University of Michigan School of Public Health
2008-2009 Member, Steering Committee, NIA T32 Training Grant on Aging Research (PI: Mary Haan), University of Michigan School of Public Health
2008-2013 Member, Advisory Committee, Outstanding New Environmental Scientist Awardee (Marie O'Neill), NIEHS
2008-2009 Member, Search Committee for Director of the Risk Science Center, University of Michigan School of Public Health
2009 Co-Chair, Planning Committee, Workshop on Predicting and Preventing Climate Change Impacts on Public Health, Goa, India (Collaboration with the UM Center for Global Health, the US Centers for Disease Control and Prevention, and the Indian Council for Medical Research)
2009-2011 Director and PI, NIA T32 Training Grant on Aging Research, University of Michigan School of Public Health
2009-2010 Member, Planning Committee, University Research Corridor (U of M, Michigan State, Wayne State) symposium on environmental health sciences in January 2010
2009-2012 Faculty Associate, Center for Global Health, University of Michigan
2009-2012 Member, Internal Advisory Board, Cancer Epidemiology Education in Special Populations Program, University of Michigan School of Public Health
2009-2011 Chair, Steering Committee on Global Health, University of Michigan School of Public Health
2010-2012 Member, Executive Committee, Graham Environmental Sustainability Institute, University Of Michigan
2010-2012 Member, Committee on Diversity, University of Michigan School of Public Health
2012-2017 Chair, Executive Committee, Dalla Lana School of Public Health, University of Toronto
2012-2017 Chair, Tenure Committee, Dalla Lana School of Public Health, University of Toronto
2012-2017 Chair, Decanal Promotions Committee, Dalla Lana School of Public Health, University of Toronto
2012-2017 Chair, Executive Advisory Committee, Institute for Global Health Equity & Innovation, Dalla Lana School of Public Health, University of Toronto
2013-2015 Interim Director, Institute for Global Health Equity & Innovation, Dalla Lana School of Public Health, University of Toronto
2013-2014 Co-Chair, Research Committee, Dalla Lana School of Public Health, University of Toronto
2014-2017 Chair, Executive Advisory Committee, Institute for Health Policy Management and Evaluation, University of Toronto
2014 Chair, Ad-hoc Committee to create an Institute for Indigenous Health (based on a $10 million endowment gift made to DLSPH), Dalla Lana School of Public Health, University of Toronto; Chair, Executive Advisory Committee beginning 2015
2015-2017 Chair, Executive Advisory Committee, Joint Centre for Bioethics, University of Toronto
2015-2018 Chair (2015-2017); Member (2017-2018), Taskforce on Environmental Health, Ministry of Health and Longterm Care, Province of Ontario

2016-2017 Chair, Executive Advisory Committee, Centre for Critical Qualitative Health Research, University of Toronto
2017-2018 Executive Co-Chair, Workshop on the Global Burden of Disease-Pollution and Health Initiative (a collaboration between the Global Alliance on Health and Pollution and the Institute for Health Metrics), Seattle, WA
2020-2024 Chair, Executive Committee, Department of Population and Public Health Sciences, Keck School of Medicine, University of Southern California, Los Angeles, CA
2020-2023 Co-Leader, Population Health COVID-19 Pandemic Research Center, Department of Preventive Medicine, Keck School of Medicine, University of Southern California, Los Angeles, CA
2020-2023 Member, Public Health Advisory Committee, Office of the Provost, University of Southern California, Los Angeles, CA
2020- Member, Presidential Working Group on Sustainability, University of Southern California, Los Angeles, CA
2022-2023 Member, Search Committee for the Chair of the Department of Medicine, Keck School of Medicine, University of Southern California, Los Angeles, CA
2022- Co-Leader, Sustainability and Healthcare Research Initiative, University of Southern California, Los Angeles, CA
2023-2024 Co-Organizer and Co-host, the USC Symposium of Global Health, Satellite Session on March 7, 2024 to the Annual Meeting of the Consortium of Universities for Global Health, Los Angeles, CA
2023- Director, Dhablania and Kim Family Global Medicine and Health Fellowship, Keck School of Medicine, University of Southern California, Los Angeles, CA

Hospital

1982-1985 Occupational Safety and Health Committee, Member, Boston City Hospital, Boston
1983-1984 House Officers Association, Treasurer, Boston City Hospital
1984-1985 House Officers Association, Co-President, Boston City Hospital

OTHER PUBLIC SERVICE

1987 Member, Fact-finding tour on "The Health Effects of Massive Exposure to Tear Gas", Seoul, South Korea, July 11-18 (Sponsored by Physicians for Human Rights, American College of Physicians)
1988 Member, Fact-finding tour on "Chemical Weapons and the Iraqi Kurdish refugees", Turkey Oct 6-16 (Sponsored by Physician for Human Rights and the MacArthur Foundation)
1990 Leader, Fact-finding tour on "Health and Human Rights in Burma (Myanmar)", Thailand-Burma Dec. 26-Jan 6 (Sponsored by Physician for Human Rights and the MacArthur Foundation)

2009 Consultant and senior advisor, Fact-finding tour on “Mining and Potential Exposures and Health Effects in Guatemala”, August 2009 (Sponsored by Physicians for Human Rights)

CONSULTING POSITIONS

1987-1989 Consultant, "In-Vivo Total Body Lead Analysis by X-Ray Fluorescence", NIH/SBIR Grant 2R44ES03918-02
1988-1989 Consultant, "Boston Area Health Coalition Demonstration Project", DHHS/MP000003-A1
1993-1995 Consultant, Employee Health Services, Brigham and Women’s Hospital
1994 Consultant, Public Welfare Foundation, Washington, DC (review of Environmental Programs)
1997-2006 Consultant, Pediatric Environmental Health Center, Children’s Hospital, Boston, MA
2000 Consultant, Doris Duke Foundation, New York, NY (review of potential Environment and Medicine programs)
2009-2010 Consultant and Member, Academic Program Review Site Visit Committee, Department of Environmental and Occupationa Health Sciences, University of Washington School of Public Health, Seattle, WA
2011 Consultant, JPB Foundation, New York, NY (review of Environmental Health programs)
2014-2016 Advisor, Hearing Health Sciences, Ann Arbor MI and Amsterdam, Netherlands
2020 Consultant on Environment, Pollution and Health, United Nations Environment Programme, Nairobi, Kenya

VISITING PROFESSORSHIPS

1997 Alice Hamilton Visiting Professor, University of California at San Francisco
2000-2001 Visiting Professor, Sri Ramachandra Medical College & Research Institute, Chennai, India
2004 Visiting Professor, Department of Environmental Medicine, University of Rochester
2013 Visiting Professor, Shanghai Key Laboratory, Shanghai Jiao-Tung University

SEMINARS AND EXTRAMURAL INVITED PRESENTATIONS (last 15 years, since 2009; prior presentations upon request)

2009 Speaker, “Evidence for Lead as an Environmental Stressor of Alzheimer’s Disease and the Role of Epigenetics”, Symposium Panel, Annual Meeting of the Society for Toxicology, Baltimore, MD
2009 Keynote Speaker, “Lead, Late-Life and Early Life Effects, and the Emerging Field of Environmental Epigenetics: Looking Ahead”, Annual Meeting of the American College for the Advancement of Medicine, San Diego, CA

2009 Speaker, "Lead Toxicity and Mechanistically-Oriented Molecular Epidemiology: Targeting the Epigenetics of Alzheimer's Disease", Seminar Series, Institute for Environmental Health Sciences, Wayne State University, Detroit, MI
2009 Speaker, "Climate Change Impacts on Health in the Developing World", Research Discussion Series, University of Michigan Center for Global Health
2009 Speaker, "Autism, Aggressive Behavior, Anxiety, and Alzheimer's: are Environmental Toxicants Playing a Major Etiologic Role?", Department of Psychology, University of Michigan
2009 Speaker, "Early Life Exposures and Endocrine Disruption: Evidence from Molecular Epidemiology", Pediatric Endocrine Seminar, University of Michigan Medical School
2009 Distinguished Speaker, "Lead Toxicity: Twenty Years of Research On The Poison That Keeps on Poisoning" 10th Anniversary of the Department of Microbiology and Environmental Toxicology, University of California at Santa Cruz
2010 Speaker, "The Centers for Disease Control and Prevention & the Environmental Protection Agency: Potential Funding Opportunities for Regional Collaboration in Michigan", University Research Corridor Symposium on Environmental Health, Detroit, MI.
2010 Speaker, "The Future of Public Health", University of Washington School of Public Health
2010 Speaker, "The Environment Meets the Epigenome: Is This Where Autoimmunity Begins?" Symposium on Autoimmunity and Epigenetics, University of Michigan
2010 Keynote Speaker, "A New Twist to an Old Story: The Evidence for Early Life Lead Exposure as a Risk Factor for Alzheimer's Disease through Epigenetic Programming", NIEHS Environmental Health Sciences Center and Toxicology Training Program Retreat, University of Rochester, NY
2010 Speaker, "Lead Toxicity: Twenty Years of Research on The Poison That Keeps on Poisoning" and "Environmental Health Sciences at the University of Michigan", Tianjin Centers for Disease Control, Tianjin, China
2010 Speaker, "Pediatric Lead Toxicity", Xinhua Hospital and the Shanghai Jiao-Tung Medical University Department of Pediatrics, Shanghai, China
2010 Speaker, "Environmental Health Sciences at the University of Michigan", Fudan University, Shanghai, China
2010 Speaker, "Alzheimer's Disease, Epigenetics and the Environment", Symposium Update, Alzheimer's Disease Association, Ann Arbor, MI
2010 Speaker, "Environmental Justice, Progress (and the Lack Thereof) and the Role of Research", Roundtable on Environmental Health Sciences, Research and Medicine, Institute of Medicine, National Academies, Washington DC.
2010 Speaker, "White Coats, Population Science and Poison Gas: A Life Spent at the Intersection of Academic Medicine, Global Health & Human Rights", Robert Wood Johnson Clinical Fellows Program, University of Michigan Medical School, Ann Arbor, MI
2011 Speaker, "The Three Most Difficult Challenges to Molecular Epidemiologic Research on Gene-Environment Interactions: Lead Toxicity as a Case Study." Department of Human Genetics, University of Michigan Medical School, Ann Arbor, MI
2011 Speaker, "The Integration of Data on Environmental Carcinogens with Population and Genetic Resources", "Opportunities & Challenges for Translational Research on Cancer

Prevention", Translational Cancer Prevention & Biomarkers Workshop, Mazamdur-Shaw Cancer Center, Bangalore, India.

2011 Speaker, "Success in the Academy", Faculty Panel, Students of Color of Rackham, Rackham Graduate School, University of Michigan

2011 Speaker, "White Coats, Population Science and Poison Gas: Fact-Finding Missions by Health Professionals for Human Rights" , Sujal Parikh Memorial Symposium, University of Michigan Medical School.

2011 Speaker, "The Analysis of Biomarker Data to Ascertain the Contribution of Environmental Exposures to the Etiology of Disease: Lead Exposure and Toxicity as a Case Study", Department of Computational Medicine and Bioinformatics, University of Michigan Medical School.

2012 Speaker, "Research and Analysis Linking Upstream and Downstream Disparities Work", Webinar hosted by the Health & Environmental Funders Network, Bethesda, MD, with 52 Foundations related Health.

2012 Keynote Speaker, "The Future of Public Health & Medicine in a Crowded, Diverse, Stratified, Hot, Urbanized, Polluted, Thirsty, Hungry and Debt-Ridden World". E.J. Van Liere Memorial Convocation and Health Sciences Center Research Day, West Virginia University, Morgantown, West Virginia

2012 Plenary Speaker, "Transgenerational Impacts of Pollutants on Offspring: Recent Insights and Case Studies", Connaught Global Challenge International Symposium, University of Toronto.

2012 Speaker, "Environmental Impacts on Aging (+ an update on the Dalla Lana School of Public Health)", Community Medicine Rounds, University of Toronto

2012 Speaker, "The Environment & Public Health in a Research-Intensive University: Opportunities for Scholarship in a Crowded, Diverse, Stratified, Hot, Urbanized, Polluted, Thirsty, Hungry and Debt-Ridden World", School for the Environment, University of Toronto

2012 Speaker, "Big Public Health Challenges (& Opportunities) in a Crowded, Diverse, Aging, Stratified, Urbanized, Polluted, Hot, Thirsty, Hungry, Debt-Ridden World", External Advisory Meeting, Public Health Ontario, Toronto

2012 Speaker, "Canadian Public Health Schools (in a Crowded, Diverse, Aging, Stratified, Urbanized, Polluted, Hot, Thirsty, Hungry, Debt-Ridden World): The View from Toronto, External Advisory Board Meeting, Institute for Population and Public Health, Canadian Institutes for Health Research, Toronto

2012 Speaker, "Sustainable Development and Health: The Global Mining Industry", Canadian Society for International Health Annual Meeting, Ottawa

2012 Speaker, "Big Public Health Challenges (& Opportunities) in a Crowded, Diverse, Aging, Stratified, Urbanized, Polluted, Hot, Thirsty, Hungry, Debt-Ridden World", Xinhua Hospital/Shanghai Jiao-Tung University, Shanghai, China.

2012 Speaker, "The Impact of Population-Wide Lead Exposure and Gene-Lead Interactions on Chronic Disease", Genetic Grand Rounds, Sick Kids Hospital, Toronto.

2012 Speaker, "Looking behind the curtain: Lead Toxicity as a Case Study of Methodologic Challenges in Gene-Environment Interactions Research", Strategic Training in Advanced

Genetic Epidemiology (STAGE), Dalla Lana School of Public Health, University of Toronto.

2012 Keynote speaker: “Public Health—the Next Frontier in Health Professions Education”. Council of Health Sciences annual retreat, University of Toronto.

2013 Speaker, “White Coats, Population Science and Poison Gas: Lessons from a Life Spent at the Intersection of Academic Medicine, Global Health & Human Rights”, Joint Center for Bioethics, University of Toronto

2013 Speaker, “Gauging environmental impact on the development of chronic inflammation”, Connaught Global Challenge Workshop, University of Toronto.

2013 Speaker, “The Future of Public Health & Medicine in a Crowded, Diverse, Aging, Stratified, Urbanized, Polluted, Hot, Thirsty, Hungry, Debt-Ridden World”, Grand Rounds, Department of Medicine, University of Toronto.

2013 Speaker, “Metals, Mega-trends, and Me: Reflections on Research and the Vision for the Dalla Lana SPH”, Occupational and Environmental Medicine Grand Rounds, St. Michael’s Hospital, Toronto, ON.

2013 Speaker, “Air pollution and Cardiovascular Disease: Health Impacts, Mechanisms, and Research Opportunities”, UniversityofToronto & FMUSP-InCor SymposiumonCardiology, Sao Paolo, Brazil.

2013 Speaker: “Lead Exposure's Impact on Health and Policy: A History of Neglect and Missed Opportunities”, Public Health Policy Rounds, CIHR Strategic Training Program in Public Health Policy, University of Toronto.

2013 Speaker: “Lead Toxicity: The Long Tail of Health Impacts (and On-going Research Opportunities!) From an Historical Environmental Air Pollutant”, Southern Ontario Centre for Air Pollution and Aerosol Research, University of Toronto.

2013 Speaker: “Water and Sanitation”, Water, Sanitation and Hygiene (WASH) Canada, Toronto, Ontario, Canada

2014 Speaker: “Conflict and Public Health”, Ontario Medical Association, Toronto, Canada

2014 Panelist: “Judging Evidence: Finding a Place for Variation in an Evidence-Based World”, Health Quality Ontario, Toronto, Canada

2014 Speaker: “The Grand Convergence: Creating Health in a Globalized World”, Special meeting of the Canadian Chamber of Commerce in Shanghai

2014 Speaker: “The Grand Convergence: Creating Health in a Globalized World”, Jockey School of Public Health and Primary Care, Chinese University of Hong Kong, Hong Kong, China

2015 Speaker: “The Grand Convergence: Creating Health in a Globalized World”, School of Public Health and the ASEAN Institute, Mahidol University, Bangkok, Thailand

2015 Speaker: “Gene-environment Interactions and the Role of Big Data in Environmental Health” Seminar series, School of the Environment, University of Toronto, Toronto, Canada

2015 Speaker: “Global Health Security”, Ill with Illness—Economic, Social & Security Barriers to the Provision of Global Health, Munk School of Global Affairs, University of Toronto, Toronto, Canada

2015 Speaker: “The Dalla Lana School of Public Health: Big Ideas and Initiatives for Creating Health in a Globalized World”, Speaker Series, University of Toronto Alumni of Toronto.

2015 Speaker: “Unique Scientific Opportunities for the Precision Medicine Initiative National Research Cohort: Exposomics, Data Linkage, and Global Collaborations”. Working group on

President Obama's Precision Medicine Initiative (Chaired by Francis Collins, Director, NIH)

2015 Speaker: "What is the Role of Schools of Public Health in the 21st Century?" 50th Anniversary Celebration of the Department of Epidemiology, Biostatistics and Occupational Health, McGill University, Montreal, Quebec.

2015 Welcoming Address: "Global Public Health and Mental Health", Going Glo-cal for Mental Health conference, Centre for Addictions and Mental Health/Department of Psychiatry/Dalla Lana School of Public Health, Toronto, ON

2015 John Goldsmith Memorial Lecture: "Big Data, Environmental (and Social) Epidemiology, Power and Politics", Opening Plenary Session, International Society for Environmental Epidemiology Annual Meeting, Sao Paulo, Brazil

2015 Inaugural Speaker: "The Future of Public Health and Medicine in a Crowded and Complex World", Global Health Leadership Series, PSG Medical School & the Shanti Ashram Foundation, Coimbature, Tamil Nadu, India

2016 Speaker "The Future of Public Health & Medicine in a Crowded, Diverse, Aging, Stratified, Urbanized, Polluted, Hot, Thirsty, Hungry, Debt-Ridden World", Indian Institutes of Public Health—Hyderabad, Hyderabad, India

2016 Speaker: "Integration of Public Health & Health Care: The Unmet Agenda for a Truly Sustainable Health System", Board of Directors Retreat, Toronto East General Hospital, Toronto

2016 Plenary speaker: "Health Promotion, Prevention and Health Protection: Innovative Initiatives", 6th Asia-Pacific Conference on Public Health | 1st ASEAN Health Promotion Conference Bangkok, August

2016 Speaker: "Big Data, Environmental (and Social) Epidemiology, Power and Politics", Mount Sinai School of Medicine, New York, NY

2016 Plenary Speaker: "The Impact of Environmental Toxicants on Health: Recent Epidemiologic Approaches & Advances", International College of Integrative Medicine Annual Meeting, Toronto, ON

2016 Plenary Speaker: "Big Data and Implications for Environmental Health", 15th Anniversary Conference, Jockey Club School of Public Health & Primary Care, Chinese University of Hong Kong, Hong Kong

2016 Plenary Speaker: "Innovations in Assessing Lead Poisoning and Child Health: Policy & Clinical Implications", Chinese University of Hong Kong-Fudan-Oxford International Symposium on Health Impacts of Environmental Exposures", Hong Kong

2016 Speaker: "Addressing a Changing Environment (and Impacts on Health, AKA Can India Survive Modernization?", Indian Institutes of Technology Alumni, Canada, International Conference 2016, Toronto.

2016 Plenary Speaker, "Hidradenitis Suppurativa: Research Directions from a Population Health Perspective", Symposium on Hidradenitis Suppurativa Advances, Toronto.

2016 Plenary Speaker, "Children's Environmental Health", The 2016 Annual National Conference on Children's Healthcare, Shanghai, China

2016 Special Guest Speaker, "Big Data, Environmental (and Social) Epidemiology, Power and Politics", Shanghai Municipal Center for Disease Control, Shanghai, China

2016 Lecturer, "Lead and Human Health: Recent Research and Associated Lessons for Science &

Policy", Fudan University School of Public Health, Shanghai, China

2017 Lecturer, "The Impact of Environmental Toxicants on Health: Recent Epidemiologic Approaches & Advances", Saw Swee Hock School of Public Health, National University of Singapore, Singapore

2017 Lecturer, "The Future of Academic Public Health", Saw Swee Hock School of Public Health, National University of Singapore, Singapore

2017 Lecturer, "Recent Advances in Understanding, Preventing, and Reversing the Impact of Environmental Factors on Health", Society of Chinese Bioscientists in America, Li Ka Shing Knowledge Institute, St. Michael's Hospital, Toronto, ON

2017 Lecturer, "Environmental Epidemiology in the Era of Exposomics, Lifecourse Epidemiology, Big Data and Big Science", Department of Environmental Health, Harvard School of Public Health, Boston, MA

2017 Speaker, "The Role of a Re-emergent Canadian School of Public Health in a Hot, Hungry, Polluted, Aging, Polarized World Prone to Pandemics, Chronic Disease, and Unsustainable Health Systems", Royal Canadian Institute for Science, Toronto, ON

2017 Speaker, "The Early Life Exposures in Mexico to Environmental Toxicants (ELEMENT) Birth Cohort Study: Current Research on Fluoride and Neurodevelopment", Seminar Series in Environmental Epidemiology, University of Washington School of Public Health, Seattle, WA

2017 Plenary Speaker: "New realities arising from the extractive industries and agri-business: the Pollution and health perspective," Hong Kong Summit of Global Health Leaders. University of Hong Kong, Hong Kong

2018 Plenary Speaker: "The GBD-Pollution and Health Initiative: Challenges & Opportunities", Workshop on the Global Burden of Disease-Pollution and Health Initiative, Institute for Health Metrics, University of Washington, Seattle, WA

2018 Guest Lecturer: "Partnerships, Local Responsiveness, National and Global Impacts", University of Iowa College of Public Health, Iowa City, IA

2018 Plenary Speaker: "Current Research on Fluoride and Neurodevelopment: The Early Life Exposures in Mexico to Environmental Toxicants (ELEMENT) Birth Cohort Study", Annual meeting of the International Academy of Oral Medicine and Toxicology, Denver, CO

2018 Speaker, "Recent Epidemiologic Research on Lead Toxicity: New Surprises regarding an Old Global Pollutant", Department of Environmental and Occupational Health Sciences Seminar Series, University of Washington School of Public Health, Seattle, WA

2018 Speaker: "The Early Life Exposures in Mexico to Environmental Toxicants (ELEMENT) Birth Cohort Study: Current Research on Fluoride and Neurodevelopment", Symposium on Fluoride research, Annual meeting of the International Society for Environmental Epidemiology/International Society for Exposure Science, Ottawa, ON

2018 Panelist, "The Fluoridation Decision: Considering the Evidence for Benefits, Possible Risks as well as Ethical World Views", Annual meeting of the International Society for Environmental Epidemiology/International Society for Exposure Science, Ottawa, ON

2018 Invited speaker: "Grand Opportunities", The UC-Irvine School of Population Health and the Samueli College of Health Sciences, Irvine, CA

2018 Invited speaker, "The Global Burden of Disease-Pollution and Health Initiative", Office of

The Director and the Global Environmental Health Program, U.S. National Institute for Environmental Health Sciences, Research Triangle Park, NC

2019 Invited speaker, "Evaluating, treating and managing disabilities of patients with chemical intolerance", Symposium on Chemical Intolerance—A Way Forward, Marilyn Brachman Hoffman Foundation and the Hoffman Program on Chemicals and Health at the Harvard T.H. Chan School of Public Health, Dallas, TX

2019 Invited Lecturer: "The Global Burden of Disease-Pollution and Health Initiative", Center for Population Health Sciences, Stanford University, Palo Alto, CA

2019 Invited Lecturer: "Lead and Fluoride: Old and New Toxicant Issues and the Global Burden of Disease", British Columbia Centre for Disease Control, Vancouver, BC, Canada

2019 Invited Lecturer: "Lead and Fluoride: Old and New Toxicant Issues and the Global Burden of Disease", University of California, Davis, CA, USA

2019 Invited speaker, "A Framework for Adding Environmental Exposure-Outcome Pairs to the Global Burden of Disease: The Global Burden of Disease-Pollution and Health Initiative", 2019 Annual Meeting of the International Society for Environmental Epidemiology, Utrecht, Netherlands

2019 Invited speaker, "The Global Burden of Disease – Pollution and Health Initiative: Impacts on Human Capital", Air Pollution, Health and Human Capital Nexus in Chinese Cities Scoping Meeting, Institute of Urban Environments, Chinese Academy of Sciences, Xiamen, China

2019 Invited Speaker, "Toxic Chemicals, Human Health, and Human Rights", A Human Right to Health: Pathways and Responses, Seattle University Law School, Seattle, WA

2020 Invited Lecturer: "The Herbert Wertheim School of Public Health at UC San Diego: Grand Opportunities." Universitiy of California at San Diego, San Diego, CA

2020 Invited speaker and panelist, "Health Effects, Historical and Contemporary Use of Tear Gas and Other Riot Control Agents", Environmental Exposure Grand Rounds, Minnesota Department of Health, Health Partners, University of Minnesota School of Public Health, Hennepin Regional Poison Center. (Webinar)

2020 Plenary symposium speaker: "The Pollution, Climate and Global Burden of Disease Initiative: The Challenge of Estimating Exposures in Countries with Little or No Data", Annual meeting (virtual) of the International Society for Exposure Science

2020 Invited Speaker, "The Pollution, Climate and Global Burden of Disease Initiative", the Centre for Air Pollution, Energy and Health Research (CAR), University of Sydney, Australia (Webinar)

2020 Invited speaker, "The ELEMENT birth cohort study, and the Global Burden of Disease-Pollution, Climate and Health Initiative: Two Opportunities for New Collaborations", The NIEHS P30 Southern California Environmental Health Sciences Center, University of Southern California (Webinar)

2020 Presenter, "Sustainability and Population Health: Ideas for an Agenda at USC, Presidential Working Group on Sustainability, University of Southern California

2020 Invited speaker, "The Global Burden of Disease—Pollution, Climate and Health Initiative: A Focus on the Potential Role of Spatial Sciences", the Spatial Sciences Institute, University of Southern California

2020 Invited speaker, "Environment Exposures, Epigenetics, Epidemiology, Etiology, and Cancer: Which "E" is the Weak Link?" Norris Comprehensive Cancer Center, University of Southern California.
2021 Presenter, "Update on the Department of Preventive Medicine", Basic Science and Clinical Chairs Council, Keck School of Medicine, University of Southern California
2021 Invited Speaker, "The changing nature of population health management: The Population Health Perspective", Annual State of Reform Southern California Health Policy Conference, San Diego, CA
2021 Invited Speaker, "Update and Work on COVID-19, Health Inequities, and Social Justice", the 31st meeting of the California Public Health/Prevention Medical Leadership Forum.
2021 Invited Speaker, "The Department of Population and Public Health Sciences: Update and Our Work on Fast- and Slow-Moving Population Health Crises". Keck School of Medicine's 2021 Alumni Day CME program.
2022 Invited Speaker, "Lead Exposure and Non-communicable Diseases", The Impact of Lead Pollution on NCDs Webinar, co-sponsored by the Global Alliance on Health and Pollution, and the World Federation of Public Health Associations.
2022 Invited Speaker, "Environmental Risk Factors for Diabetes an Obesity: Endocrine-Disrupting Chemicals and the Built Environment", USC Diabetes and Obesity Research Institute's 9th Annual Research Symposium, Los Angeles, CA.
2022 Invited Speaker, "Long-lived Endocrine Disrupting Chemicals: Update on the Epidemiology", California Coastal Chloro-Contamination Conference. UC Santa Barbara, Santa Barbara, CA
2022 Invited Speaker, "The Lancet Commission on Pollution and Health: Progress Update", New York University School of Global Public Health, virtual briefing hosted by the Global Alliance on Health and Pollution
2022 Invited Speaker, "Hot Spots of Toxic Pollution in Kenya, Senegal and Tanzania (2016-2020): Data from the Toxic Sites Identification Program conducted by Pure Earth. International Society for Environmental Epidemiology Africa regional meeting (virtual).
2023 Presenter, "Long-term effects of prenatal fluoride and lead exposure on educational delay in Mexico", Annual Meeting of the International Society for Environmental Epidemiology, Kaohsiung, Taiwan
2023 Invited Speaker, "Sustainability and Our Profession: Decarbonizing the Healthcare Industry", Grand Rounds, Kaohsiung Medical University, Kaohsiung, Taiwan
2023 Invited Speaker, "The USC Department of Population and Public Health Science", Department of Occupational & Environmental Health, National Taiwan University, Taipei, Taiwan.
2023 Invited Speaker, "The impact of lead on non-communicable diseases: Why we should be concerned". Bloomberg Philanthropies, New York, NY
2023 Invited Speaker, "Brain Health and Aging-Habits, Prevention and Innovative Treatment", USC Keck School of Medicine Alumni & Reunion event, Los Angeles, CA
2024 Invited Speaker, "Sustainability and Our Profession: Decarbonizing the Healthcare Industry", Mid-Year Event, Patient Safety Movement, Irvine, CA
2024 Invited Speaker, "A Ministerial Dialogue: Preventing Maternal and Child Exposure to Toxic

Lead, 77th session, World Health Assembly, United Nations, Geneva, Switzerland

2024 Invited Keynote Speaker, "The Global Burden of Disease (and the Stark Associated Inequities) from Pollution and Climate Change: A Snapshot of Insights and Progress on Solutions", Los Angeles Global Health Conference, UCLA.

2024 Invited Speaker, "Early lead exposure and its lasting impacts on cognitive development and health outcomes", Addressing Lead Poisoning in South Asia: Impact, Challenges and Policy Solutions; Sanrachna Foundation, Advanced Study Institute of Asia at SGT University, Gurugram, India

2024 Invited Speaker, "Lead Exposure and Its Lasting Impacts on Children's Brain Development and Adult Cardiovascular Disease", International Convening on Lead Poisoning in India The Pahle Foundation, New Delhi, India

2024 Invited Speaker, "The Impact of Lead Exposure on Children's Brain Development and Adult Cardiovascular Disease, and the Indian Context", Roundtable, the World Bank, Delhi, India

2024 Invited Speaker, "Lead in Bone and Blood: An Update on Biomarkers & Their Significance", Assessing Lead Impacts: Effects on People and Society, Montefiore Medical Center, A New York State Regional Lead Resource Center, Bronx, NY

2024 Invited Speaker, "Fluoride and Neurodevelopment: the Evidence, and the Tension between Dental Public Health and Environmental Health", Department of Occupational and Environmental Health, Colorado School of Public Health, Denver, CO

INVENTIONS/PATENTS: n/a

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Abstracts of Work (Upon request)

Exhibit 2

Howard Hu, M.D., M.P.H., Sc.D.
Occupational/Environmental Medicine, Internal Medicine, and Epidemiology
*Professor of Preventive Medicine (Department Chair, 2020-2024)**
Department of Population and Public Health Sciences
Keck School of Medicine, University of Southern California

Consultant Address: 3363 Monterosa Drive, Altadena CA, 91001, USA
Consultant Email: howardhu2225@gmail.com

Consulting rates, as of July 1, 2024

Pre-deposition and pre-trial work (reviewing documents, analyzing data, preparing reports, communications, etc.)

$700 US/hr

Deposition testimony

$1,200 US/hr

Trial testimony (at relevant location)

$10,000 US/day + travel expenses

Travel: $200 US/hr (door to door)

NOTE: Payment to be submitted as a check by mail or wire transfer to a U.S. bank account

* For identification and affiliation purposes only.

Exhibit 3

Howard Hu, M.D., M.P.H., Sc.D.
Consultant in Occupational and Environmental Medicine, Internal Medicine, and Epidemiology[1]
Depositions, Trials, in US federal, state, or county court cases, the last 5½ years (2019-present, as of November 26, 2024)

DESCRIPTION: In each of these cases, Dr. Hu served as either a consultant in occupational and environmental medicine & epidemiology who evaluated a particular individual or individuals and rendered an expert opinion on general causation and/or specific causation, and/or as a consultant in occupational and environmental medicine & epidemiology who reviewed the literature on a particular issue and rendered a scientific opinion on general causation.

DATE	TYPE	CASE	CLIENT
5/16/19	Deposition	A.O.A., et al. v. Doe Run Resources Corporation, et al., Case No. 4:11-CV-00044-CDP	Schlichter, Bogard & Denton, LLP, St. Louis, MO
9/16/19-9/17/19	Deposition	Don Strong et al., v. Republic Services, Inc., et al.	Humphrey, Farrington & McClain, P.C., Independence, MO
9/24/19	Deposition (non-retained fact witness)	Food & Water Watch, Inc., et al, v. United States Environmental Protection Agency (US EPA), et al.	(testified on the work and results of my epidemiologic research team on the potential neurodevelopmental impacts of fluoride, in response to subpoena from the U.S. EPA., arranged by Waters Kraus Paul, P.C., Segundo, CA)
10/9/19	Deposition	Pamela Butler, et al. v. Mallinckrodt, Inc., et al.	Humphrey, Farrington & McClain, P.C., Independence, MO
2/8/20	Trial	USA v. Gary Spengler, M.D.	Oberheiden & McMurrey, Dallas, TX 75240
6/8/20	Trial (non-retained fact witness)	Food and Water Watch v US EPA	(see above)
8/6/20	Deposition	A.O.A. et al. v. Doe Run Resources Corp.	Schlichter, Bogard & Denton, LLP
8/31/20 and 9/1/20	Deposition	Marc Czapla and Jill Czapla v. Republic Services, Inc et al.	Humphrey, Farrington & McClain, P.C., Independence, MO
10/12/20 and 11/5/20	Deposition	Flint Water Cases, Civil Action No. 5:16-cv-10444-JEL- MKM	Weitz & Luxenberg P.C. 220 Lake Drive East, Suite 210 Cherry Hill, NJ
6/8/22 and 6/9/22	Deposition	Teresa Fornek v. Sterigenics, LLC et al.	Smith LaCien, LLP, Chicago, IL

[1] Current academic position, as of July 1, 2020: Professor and the Flora L. Thornton Chair of the Department of Population and Public Health Sciences, Keck School of Medicine, University of Southern California, Los Angeles, CA.

7/1/22	Deposition	Susan Kamuda v. Sterigenics, LLC et al.	Salvi, Schostok & Pritchard P.C., Chicago, IL
7/21/22	Deposition	Heather Schumacher v. Sterigenics LLC et al.	Romanucci & Blandin, LLC, Chicago IL
9/9/22	Deposition	Teresa Fornek v. Sterigenics LLC, et al.	Smith LaCien, LLP, Chicago, IL
10/27/22	Trial	Teresa Fornek v. Sterigenics LLC, et al.	Smith LaCien, LLP, Chicago, IL
11/21/22	Deposition	Flint Water Cases, Civil Action No. 5:16-cv-10444-JEL- MKM	Weitz & Luxenberg P.C. 220 Lake Drive East, Suite 210 Cherry Hill, NJ
2/21/23	Deposition	Kevin Wright v. UNOCAL, UNION OIL, et al.; CASE NO.: 21CV00925	Erin L. Powers, Trial Attorney, 548 Market St PMB 66906, San Francisco, CA 94104
3/29/23	Deposition	Bryan Dick-Ipsen v. Tri-Supply Co., et al.; Cook County, IL; Case No: 2018 L 011367	Jeffrey J. Lowe; Carey Danis & Lowe; 8235 Forsyth Suite 1100, St. Louis, MO 63105
5/16/23	Trial	Kevin Wright v. UNOCAL, UNION OIL, et al.; CASE NO.: 21CV00925	Erin L. Powers, Trial Attorney, 548 Market St PMB 66906, San Francisco, CA 94104
10/13/23	Deposition (non-retained fact witness)	Food & Water Watch, et al. v. U.S. EPA, et al.	See above
1/31/24	Trial (non-retained fact witness)	Food & Water Watch, et al. v. U.S. EPA, et al.	See above
7/3/24	Deposition	FTCA Flint Water Cases, Civil Action No.: 4:17-cv-11218 (consolidated)	Law Offices of Deborah A. LaBelle, 221 North Main Street Suite 300, Ann Arbor, MI 48104