EXPERT REPORT
U.S. v. BP Exploration & Production, Inc., et al.

Human Health Impact of the *Deepwater Horizon* Explosion, Oil Spill, and Response Submitted on Behalf of the United States

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CONFIDENTIAL

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Executive Summary

The *Deepwater Horizon* explosion in April 2010, and the subsequent oil spill and containment and clean-up activities, caused multiple deaths, injuries and illnesses. Although the size and nature of the spill were unprecedented, the health impacts were similar to those seen in workers and communities near previous oil spills. Exposures included volatile organic compounds, polycyclic aromatic hydrocarbons, and dispersants. Health effects included acute respiratory, dermatologic and neurologic effects and potentially endocrine disrupting, psychological and carcinogenic effects; the latter may become manifest in future years. In addition, many employees and volunteers engaged in clean-up activities suffered heat stress and fatigue from stressful work conditions. Many short-term health impacts have already been observed, and long-term health impacts may be identified in on-going studies and surveillance of exposed populations in the Gulf of Mexico.

Professional Background

I am a Professor Emeritus of Public Health at the Boston University School of Public Health. I am an epidemiologist specializing in the study of cancer and other diseases caused by toxic chemicals and other environmental agents.

I received my BA degree from Dartmouth College in 1967 with a major in biology. I received my MPH degree from the Harvard School of Public Health in 1974 with a concentration in what was then called Health Services. In 1989, I received a Doctor of Science degree from Boston University School of Public Health; this degree was in Epidemiology with a specialization in cancer epidemiology. A copy of my resume is

included as Appendix A to this expert report.

As Director of the Massachusetts Cancer Registry from 1980-1989, I was responsible for establishing a statewide cancer incidence reporting system in order to track the patterns of cancer in communities and among working populations. As part of this work, I examined data on malignancies in Massachusetts communities and conducted surveillance studies of workers and military veterans.

From 1989 to 1993, I was employed full-time at the JSI Research and Training Institute; between 1993 and 2001, I was a consultant to the JSI Center for Environmental Health Studies. In this capacity, I provided technical assistance to numerous citizens groups and governmental agencies regarding the health effects of toxic exposures. In 1993, I became employed at Boston University School of Public Health, beginning with the title of Assistant Professor and then advancing to Associate Professor and eventually becoming a full Professor.

Until I retired in December 2010, I worked in the Department of Environmental Health at the Boston University School of Public Health. I taught courses, advised Masters' and doctoral students, and participated in research and administrative committees as a member of the Faculty. I lectured in courses at other Massachusetts universities, including Harvard School of Public Health, Massachusetts Institute of Technology, Tufts University, and the University of Massachusetts; I am currently an Adjunct Professor at the University of Massachusetts – Lowell. I presented and discussed scientific and epidemiologic data regarding the carcinogenicity of chemical substances, including airborne toxic substances, in all of these courses and lectures. As part of this work, I routinely read the epidemiologic literature, and kept abreast of the

current knowledge in the field of environmental epidemiology, including methods for conducting and assessing the statistical meaning of epidemiologic studies.

I am a member of several professional societies, including the Society for Epidemiologic Research, the International Society for Environmental Epidemiology, and the American Public Health Association. I was an Associate Editor of *Environmental Health Perspectives*, and was on the editorial board of *New Solutions*, a policy journal in environmental and occupational health. I have served as a peer-reviewer for several scientific journals, including the *New England Journal of Medicine*, *American Journal of Epidemiology*, *Cancer Research, Cancer Causes and Control, Cancer, Indoor Air, Environmental Research, Statistics in Medicine, Environmental Science and Technology, Toxicology and Industrial Health*, and *Public Health Reports*.

I have been a member of several scientific advisory panels, including the Science Advisory Board to the Toxics Use Reduction Institute at the University of Massachusetts, the Environmental Protection Agency's Dioxin Reassessment Review Panel, the Harvard School of Public Health Occupational Health Program Advisory Board, and the Medical Scientific Advisory Board to the Massachusetts Agent Orange Program. I am currently on the Camp Lejeune Community Assistance Panel established by the Agency for Toxic Substances and Disease Registry. I have also testified before three committees of the U.S. Congress and have made numerous presentations on scientific and epidemiologic topics.

I have over 35 years of experience investigating, obtaining, interpreting and evaluating epidemiologic evidence, as a writer, reviewer, researcher and teacher. I taught students how to calculate and interpret disease rates and prevalence in various courses.

In addition, I have written about and given numerous presentations at national and international scientific meetings about the ways of evaluating disease clusters. My special area of emphasis in my professional work is environmental epidemiology and cancer epidemiology.

EXPERT OPINION

I have been asked to offer an opinion regarding health effects of the *Deepwater Horizon* explosion, oil spill, and response in the Gulf of Mexico in 2010. My opinion is based on my review of documents provided to me by attorneys at the U.S. Department of Justice, and my review of a summary of a June 2010 workshop at the Institute of Medicine. These documents are listed in the References section of this Report and in the list of Consideration Materials attached as Appendix B.

The surface explosion of the *Deepwater Horizon* and the underwater oil spill beginning on April 20, 2010, and continuing through the middle of July of that year, caused eleven deaths, multiple injuries, and unprecedented releases of oil into the Gulf of Mexico. (Phase 1 Deposition Testimony of Douglas Brown; Phase 1 Deposition Testimony of Nick Watson; Phase 1 Deposition Bundle of Michael Williams; Exhibit 4702.) In addition, approximately one million gallons of oil dispersants were applied during the response. (US_PP_RC003483.) These releases of oil and application of dispersants affected employees, volunteers assisting in containing and cleaning up the spill, and communities in five U.S. states bordering the Gulf of Mexico.

Information Known at the Time of the Spill

At the time of the spill, substantial scientific literature was available on chemicals of concern within hydrocarbons and health effects of previous oil spills and controlled oil fires. As summarized in a June 2010 Institute of Medicine workshop (IOM, 2010), previous oil spills caused human and wildlife exposure to volatile organic compounds, polycyclic aromatic hydrocarbons, and heavy metals. Several of these compounds have known health effects including respiratory, neurologic, dermatologic, endocrine disrupting and carcinogenic effects. Benzene was of particular concern because of its ability to cause leukemia and other health effects in exposed humans. (*See*, NIOSH Pocket Guide to Chemical Hazards – Benzene, available at http://www.cdc.gov/niosh/npg0049.html.)

The June 2010 IOM workshop was an opportunity to highlight health concerns that local and Federal agencies should be aware of during the on-going response. In her presentation on short-term physical effects of oil spills at the workshop, Dr. Nalini Sathiakumar cited British researchers who studied community residents exposed to oil spills from ships (Campbell et al., 1993). These researchers noted "evidence of neurological, ocular, and respiratory symptoms but no significant differences in lung, liver or renal function between exposed and unexposed populations." (IOM, 2010, p. 45.) Dr. Sathiakumar cited other researchers, who found that after an oil spill from the *Sea Empress*, "exposed residents were more likely to report symptoms of acute toxicity, including neurological, ocular and respiratory symptoms, than unexposed residents." (IOM, 2010, p. 46.)

With respect to workers exposed to contaminants from oil spills, Sathiakumar cited

a study by Japanese researchers (Morita, et al., 1999) that "found that clean-up workers reported increased toxic symptoms (primarily neurological, ocular, and upper-respiratory symptoms) and physical injuries (lower back pain) compared to the control group." In a study by Spanish investigators of workers exposed to the *Prestige* oil spill (Suarez, et al., 2005; Carrasco, et al., 2006), there were:

> differences in reported toxicity symptoms between seamen and other types of workers, including bird cleaners, volunteers, paid workers. Both studies found that toxic symptoms were higher among seamen than other types of workers, but Carrasco and colleagues found that training about personal protective equipment reduced the risk of toxic symptoms. Additionally, both studies found that injuries (e.g., bruises, deep wounds, sprains, fractures) were greatest among bird cleaners.

(IOM, 2010, p. 46-47.)

The IOM workshop summary listed categories of acute toxic effects associated with human exposure to crude oil (IOM, 2010, Table 3-1, p. 49). These included dermatitis, ocular effects, respiratory effects including cough and wheezing, neurological effects including nausea, headache, dizziness and weakness of extremities. The potential physical injuries related to oil spill response were also listed (IOM, 2010, Table 3-3, p. 50), and included trips and falls, fatigue and lumbar pain, and heat-related health conditions.

The IOM workshop also touched on mental health issues. Those exposed to oil from the *Exxon Valdez* spill and response activities were the subjects of a series of studies by Palinskas and colleagues; these studies were summarized by Palinskas in the June 2010 IOM workshop (IOM, 2010). Those with high exposure reported significantly increased "generalized anxiety disorder, post-traumatic stress disorder and depressive symptoms." (IOM, 2010, p. 65.)

The chemical dispersants used subsequent to the spill, including Corexit EC9500A and Corexit EC9527A, were known to cause skin, eye and respiratory irritation. The NALCO Safety Data Sheet for Corexit EC9500A (C1A002-000055-65) contains the following language: "Skin contact: May cause irritation with prolonged contact," "Eye contact: Can cause mild irritation," and "Inhalation: Repeated or prolonged exposure may irritate the respiratory tract." Similarly, the NALCO Safety Data Sheets for EC 9527A (C1A002-000066-76) contains the following language: "Skin Contact: Can cause moderate irritation. Harmful if absorbed through skin," "Eye Contact: Can cause moderate irritation," and "Inhalation: Harmful by inhalation. Repeated or prolonged exposure may irritate the respiratory tract." The effects of exposure to the combination of oil and dispersants were largely unknown.

Information Gained During and After the Spill

Multiple Federal, State and local agencies, and BP, conducted health and exposure surveillance activities in the immediate aftermath of the explosion and spill and during the subsequent clean-up activities. Periodic reports of findings were made widely available and were summarized in reports by the Centers for Disease Control and Prevention, among other sources.

For example, the BP Deepwater Horizon Incident Response Recordable Injury and Illness Data Report for the period April 22, 2010 to December 3, 2010 (Ex. 12020) summarized 5,986 reportable incidents, of which 2,893 were injuries and 2,172 were illnesses requiring first aid; there were 221 illnesses and 355 injuries requiring medical treatment. The vast majority of these incidents occurred in on-shore contractor

employees in the Houma, Louisiana or Mobile, Alabama areas. The parts of the body affected included head, stomach, finger, arm, back, chest, skin and other individual organs or locations.

In the NIOSH Health Hazard Evaluation of Deepwater Horizon Response Workers Interim Report 6 (NIOSH HHE 6, 2010), NIOSH staff reported results of a study of 74 U.S. Coast Guard meeting attendees compared to other field employees from the same geographic area. They found:

> The prevalences of upper respiratory symptoms and cough among those exposed to oil (Prevalence Rations: upper respiratory – undefined; cough – 11.7) were significantly greater than those not exposed. Likewise, the prevalences of upper respiratory symptoms and cough among those exposed to dispersant (Prevalence Ratios: upper respiratory – 7.3; cough – 9.6) were also significantly greater than among those not exposed . . . The prevalence of skin irritation among those reporting skin contact with oil (50%) was significantly greater than the prevalence for those without skin contact (9%) (Prevalence Ratio=5.6, p=0.02).

(NIOSH HHE 6, 2010, p. 6A-2.) Although not remarked upon, the prevalence of reported headaches in exposed (20%) compared to unexposed (5%) (*id.*) was also consistent with findings in other studies. For example, Diaz cited increased headaches in residents of heavily and moderately oil-contaminated areas near the Heibei Spirit tanker spill in South Korea. (Diaz, 2011, p. 14.) NIOSH also noted increased headaches in those exposed in other oil spill studies in Japan and France. (Ex. 12220, p. 14.)

Furthermore, NIOSH staff summarized medical information on ten hospitalized response workers. "The five response workers who reported exposure to oil, hydrocarbons, or dispersant were hospitalized for 1 to 3 nights. Their medical records did not include information to identify specific chemicals, indicate how they came into contact with those chemicals, or how long they were exposed . . . The fourth worker was

given a diagnosis of probable respiratory toxicity, which was based on his reported exposure to chemicals." (NIOSH HHE 6, 2010, p. 6B-2.)

Although certain Deepwater Horizon response workers may have had substantial exposures to toxic chemicals, the measured air concentrations of specific chemicals sampled for during the response were relatively low. For example, the BP summary of its Personal Sample Results for benzene during the period 27 April 2010 to 15 September 2010 reports that out of 5099 nearshore samples, 275 samples indicated levels of benzene less than 0.05 ppm, 70 samples indicated 0.05-0.900 ppm, 19 samples indicated 0.1 – 0.49 ppm, one sample indicated a level of benzene greater than 1 ppm, and no benzene was detected in 4734 samples. (Ex. 12023.) Furthermore, the authors of a scientific article on air quality impacts by staff at the National Oceanic and Atmospheric Agency (Middlebrook, et al., 2012) noted, "Benzene was never measured at concentrations higher than 0.1 ppbv in the evaporating plume (up to 0.75 ppbv of benzene was found in the smoke from in situ burning). Concentrations of naphthalene were less than 0.5 ppbv." (Middlebrook, et al., 2012, p. 20282). These authors also noted that particulates, including fine particulates of 1micron diameter or less, from in situ burning were periodically elevated, but generally similar to background levels. (*Id.*) However, it is impossible to identify a "safe" level of exposure to low concentrations of carcinogens such as benzene, naphthalene and fine particulate air pollution; in principle, any exposure to carcinogens greater than zero increases the risk of cancer in the exposed population.

In the past three years, additional research on the toxic effects of exposures to the components of weathered oil and dispersants has been conducted. Mechanistic understanding of biologic effects of these exposures in laboratory animals has advanced

and provides plausible support for similar effects in exposed humans. For example, Roberts and colleagues (Ex. 12265) have investigated pulmonary effects after acute inhalation of Corexit 9500 in rats.

The National Institute of Environmental Health Sciences has begun long-term follow-up of tens of thousands of enrolled individuals. (NIEHS, 2014.) In the first phase, nearly 33,000 people completed a telephone interview. In addition, visits to the homes of 11,000 residents of five Gulf Coast states were made to gather background environmental and biological samples. In the future, participants will be invited to take part in more extensive clinical exams and comparisons will be made between the health of those with particular exposures and job stresses and those without such exposures. Subsequent reports will provide further understanding of the health impacts and long-term consequences, including cancer, of those exposed in the Gulf of Mexico in 2010.

A public health physician based in Louisiana (Diaz, 2011) summarized the information on early health effects of the Gulf of Mexico oil spill. He noted the similarities of effects seen in clean-up workers and lesser effects in the general population as seen in prior oil spills. He also concluded that there were sub-populations of workers and the general population who might be particularly susceptible to long-term effects from exposures from the Deepwater Horizon oil spill event. Therefore, there was a need for "long-term surveillance for chronic adverse health effects including cancer, liver and kidney diseases, mental health disorders and fetal alcohol spectrum disorders." (Diaz, 2011, p. 5.)

Based on my public health training, experience and review of materials provided to me, it is my opinion that in addition to the deaths and injuries caused by the

Deepwater Horizon explosion, the subsequent oil spill and containment and clean-up activities caused numerous short-term health impacts on workers and volunteers in the Gulf of Mexico. Long-term impacts may also be observed in on-going follow-up studies of those exposed.

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BP. Personal Exposure Monitoring Results Summary Report, Sept. 15, 2010 (Ex. 12023).

Bundled Deposition Testimony of Michael Williams, In Re: Oil Spill by the Oil Rig "Deepwater Horizon" in the Gulf of Mexico on April 20, 2010, July 20, 2011 (Phase 1 Deposition Bundle of Michael Williams).

Deposition of Douglas H. Brown, In Re: Oil Spill by the Oil Rig "Deepwater Horizon" in the Gulf of Mexico on April 20, 2010, May 3, 2011 (Phase 1 Deposition Testimony of Douglas Brown).

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NIOSH/OSHA. Interim Guidance for Protecting Deepwater Horizon Response Workers

and Volunteers, July 26, 2010 (Ex. 12220).

Roberts J, Reynolds J, Thompson J, et al. Pulmonary effects after acute inhalation of oil dispersant (Corexit EC9500A) in rats. 2011. J Toxicol Environ Health Part A, 74:1381-96 (Ex. 12265).

Roster of All Personnel as of 21 April 2010, DEEPWATER HORIZON (Ex. 4702).

West, C., M. Kawamoto, and J. Eisenberg, Health Hazard Evaluation of Deepwater Horizon Response Workers, Interim Report 6, September 13, 2010 (NIOSH HHE6, 2010) (Ex. 12254).

INFORMATION REQUIRED BY THE FEDERAL RULES OF EVIDENCE

1. This report contains my opinions, conclusions, and reasons therefore.
2. A general statement of my qualifications is contained in the Professional Background section of this report. A more detailed statement of my qualifications, including publications authored in the last ten years is included in Appendix A.
3. My compensation for the preparation of this report and any testimony as an expert witness at trial or deposition is as follows: $100/hr for research, $250/hr for writing, and $500/hr for testimony.
4. In the past four years I have testified in the following cases as an expert at trial or by deposition:
    - 2011 *William Triner v. CSX Transportation*, Circuit Court, Thirteenth Judicial Court, Hillsborough County, Florida
    - 2011 *Beaver, et al. v.Exxon Mobil Corporation, et al.*, United States District Court of Western Wisconsin
    - 2011 *Maytal Stern v. Gasonics, International*, Superior Court of Santa Clara County, CA
    - 2011 *EPA v. Elementis Chromium*, EPA Administrative Court, Washington, DC
    - 2012 *Saldana v. Shell Oil Company*, Superior Court of the State of California, County of San Francisco
    - 2012 *Lawrence, et al. v. Wyeth, et al.*, U.S. Eastern District of Arkansas, Western Division
    - 2012 *Welch, et al., v. Wyeth, et al.*, U.S. Eastern District of Arkansas, Western Division
    - 2013 *Allen, et al., v. Monsanto Company, et al.*, Circuit Court of Escambia County, FL
    - 2014 *DiMarco v. Sears, Roebuck and Co., et al.*, Circuit Court of Jackson County, Missouri

5. The facts and data I considered in forming my opinions are included in the References section of this report and Appendix B.

Appendix A:
Resume of Richard W. Clapp, D.Sc., MPH

RICHARD W. CLAPP, D.Sc., MPH
Email: rclapp@[redacted]

EDUCATION

D.Sc.	Boston University School of Public Health, Epidemiology, 1989.
M.P.H.	Harvard School of Public Health, Health Services, 1974.
B.A.	Dartmouth College, Biology, 1967.

EXPERIENCE

2004-present **Senior Environmental Health Scientist, Environmental Health Initiative, Lowell Center for Sustainable Production, School of Health and Environment, University of Massachusetts, Lowell.**
Conducts and supervises epidemiologic data analyses, literature reviews and technical assistance in community-based environmental health studies. Works on other environmental health projects and training activities as required.

2002-2004 **Senior Environmental Health Scientist, Sustainable Communities Group, Tellus Institute.**
Responsible for the development and conduct of studies concerning the health effects of environmental toxic exposures in communities. Provided expert advice and training programs for citizens groups and interested professionals. Assisted in the strategic planning and development of the Environmental Health Program in the Sustainable Communities Group at Tellus.

2010-present **Professor Emeritus, Boston University School of Public Health, Boston, MA**
2002-2010 **Professor, Boston University School of Public Health, Boston, MA**
1995-2002 **Associate Professor, Boston University School of Public Health, Boston, MA.**
1992-1995 **Assistant Professor, Boston University School of Public Health, Boston, MA.**
Teaches courses in environmental health and environmental epidemiology to masters and doctoral level graduate students. Advises doctoral students on dissertations in environmental health and epidemiology. Participated in departmental committees and research activities, including assessment of health effects of nuclear weapons production, environmental and occupational toxic exposures.

1989-1994 **Director, Center for Environmental Health Studies, JSI Research & Training Institute, Boston, MA.**
1995-2002 **Consultant - JSI Research & Training Institute, Boston, MA**
Responsible for development and conduct of studies of health effects of environmental toxic exposures in communities. Coordinated consultants from Boston University School of Public Health Environmental Health Department providing expert advice and training programs for citizens groups and interested professionals. Managed personnel and budget for variety of projects.

1980-1989 **Director, Massachusetts Cancer Registry, Massachusetts Department of Public Health, Boston, MA.**
Responsible for establishing statewide cancer incidence reporting system, coordinating reports from over one hundred fifteen hospitals and licensed clinics, and centralizing

information in computerized database. Supervised staff and consultants involved in data editing, quality assurance and data reporting activities. Worked with broad-based advisory committees, citizens groups, and epidemiologic researchers conducting studies of cancer incidence in Massachusetts. Involved in numerous Department of Public Health committees and research projects, including leukemia in Woburn, and other cities and towns. Participated in regional and national organizations of cancer registry directors.

1979-1980 **Acting Director of Occupational and Environmental Health Studies, Equifax Health Systems Division, Reading, MA.**
Participated in epidemiologic feasibility study of health effects of low-level ionizing radiation, review of OSHA health standards for lead, cotton dust, and asbestos, review of comments on Federal inter-agency carcinogens policy. Supervised staff involved in evaluating union-based occupational health education grant and surveying U.S. population-based cancer registries.

1977-1978 **Director, Childhood Lead Poisoning Prevention, Massachusetts Department of Public Health, Boston, MA.**
Supervised laboratory, office, field inspector and legal staff of statewide program involved in screening for lead poisoning and investigating possible environmental sources of lead. Coordinated development of job training programs for unemployed persons in the areas of lead paint inspections and lead hazard abatement in dwellings. Reported to Governor's Committee on Childhood Lead Poisoning and managed diverse personnel and budgets. Presented educational programs and videotaped training sessions on childhood lead poisoning.

1975-1976 **Executive Director, Lynn Community Health and Counseling Center, Lynn, MA.**
Responsible for overall management of multi-service center offering comprehensive pediatric and adolescent health services, family planning services, childhood lead poisoning prevention services, individual and family counseling, social service advocacy and a day activity program for mentally retarded adults. Worked with other human services agencies in developing a WIC program, and participated in regional and state-level health planning activities. Reported to community board and managed diverse personnel and budgets.

1974-1975 **Manager, Pediatric and Psychiatric Group Practices, Massachusetts General Hospital, Boston, MA**
Managed conversion of out-patient clinics to hospital-based group practices with salaried staff as part of developing Ambulatory Care Center. Implemented cost centers and program planning and budgeting system and reported to Medical Directors of two specialty groups.

1972-1974 **Deputy Director, Prison Health Project, Massachusetts Department of Public Health, Boston, MA.**
Hired medical and ancillary health staff for five state prisons, supervised survey of prison health conditions in county and municipal correctional facilities, and coordinated establishment of two community-based alternative programs for inmates convicted of drug-related crimes. Established twenty-four hour emergency coverage for maximum security prison, and worked with inmate medical advisory committees at several facilities.

1970-1972 **Program Research Analyst, New York City Health Services Administration, New York, NY**
Analyzed public health programs in City Hospitals, the prison hospital and Houses of Correction. Made recommendations regarding improved operations and staffing levels. Drafted guidelines for affiliation agreement for teaching hospital administration of Riker's Island prison medical services.

TEACHING APPOINTMENTS

2010-present	Professor Emeritus, Boston University School of Public Health.
2004-Present	Adjunct Professor, University of Massachusetts –Lowell.
2002-2010	Professor, Boston University School of Public Health.
1995-2002	Associate Professor, Boston University School of Public Health.
1993-1995	Assistant Professor, Boston University School of Public Health.
1990-1993	Adjunct Assistant Professor, Boston University School of Public Health.
1989-1995	Assistant Clinical Professor, Tufts University School of Medicine

PUBLICATIONS

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Coogan PF, Clapp RW, Newcomb PA, Wenzl TB, Bogdan G, Mittendorf R, Baron JA, Longnecker MP. Occupational Exposure to 60 Hz Magnetic Fields and Risk of Breast Cancer in Women. Epidemiology 7:459-464, 1996.

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Mittendorf R, Longnecker MP, Newcomb PA, Dietz AT, Greenberg ER, Bodgan GF, Clapp RW, Willett WC. Strenuous Physical Activity in Young Adulthood and Risk of Breast Cancer. Cancer Causes Control 6: 347-353, 1995.

Coogan P, Clapp R, Wenzl T, Newcomb P, Longnecker M. Occupational Exposure to 60-Hz Magnetic Fields and Risk of Breast Cancer in Women. Am J Epidemiol 141(11):S32 (abstract), 1995.

Longnecker MP, Newcomb PA, Mittendorf R, Greenberg ER, Clapp RW, Bogdan GF, Baron J, MacMahon B, Willett WC. Risk of Breast Cancer in Relation to Lifetime Alcohol Consumption. J Natl Cancer Inst 87(12): 923-929, June 21, 1995.

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Newcomb PA, Longnecker MP, Storer BE, Mittendorf R, Greenberg ER, Clapp RW, Bogdan GF, Willett WC. Long-term Hormone Replacement Use and Risk of Breast Cancer in Postmenopausal Women. Am J Epidemiol 142:788-795, 1995.

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Longnecker MP, Newcomb PA, Mittendorf R, Greenberg ER, Clapp RW, et al: "The Reliability of Self-reported Alcohol Consumption in the Remote Past." Epidemiology 6:535-539, 1993.

McConnell R, Anderson D, Russell W, Anderson K, Clapp R, et al: "Angiosarcoma, porphyria cutanea tarda and probable chloracne in a worker exposed to 2,3,7,8-tetrachlorodibenzo-p-dioxin-contaminated waste oil." Br J Ind Med 50:699-703, 1993.

Geller A, Koh H, Miller D, Clapp R, Mercer M, and Lew R: "Use of Health Services before the Diagnosis of Melanoma: Implications for Early Detection and Screening." J Gen Intern Med 7:154-7, 1992.

Swartz J, and Clapp R: "New Cancer Theories: Policy Implications for Cancer Prevention." New Solutions 2;4:17-21, 1992.

Koh H, Geller A, Miller D, Clapp R, Mercer MB, Lew R: "Who discovers melanoma? Patterns from a population-based survey." J Am Acad Dermatol 26:914-9, 1992.

Clapp RW, and Olson JR: "A New Review of the Dioxin Literature in the Context of Compensation for Vietnam Veterans." New Solutions 1;4: 31-37, 1991.

Koh HK, Clapp RW, Prout MN, et al. "Systematic Underreporting of Cutaneous Malignant Melanoma in Massachusetts: Possible Implications for National Incidence Figures." J Am Acad Dermatol 24(4): 545-550, 1991.

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Longnecker MP, Clapp RW, Sheahan K. "Associations Between Smoking Status and Stage at Diagnosis of Colo-rectal Cancer, Massachusetts, 1982-1987," Cancer 64: 1372 - 1374, 1989.

Kogan MD, Clapp RW. "Soft Tissue Sarcoma Mortality Among Vietnam Veterans in Massachusetts, 1972 to 1983." Int J Epidemiol 17: 39-43, 1988.

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Dreyer NA, Loughlin JE, Friedlander ER, Clapp RW, Fahey FH. "Choosing Populations to Study the Health Effects of Low-Dose Ionizing Radiation," Am J Pub Hlth 71: 1247-1252, 1981.

Clapp, RW. "The Massachusetts Childhood Lead Poisoning Prevention Program," in Low Level Lead Exposure: The Clinical Implications of Current Research, Needleman HL, ed., Raven Press, NY, NY, 1980.

PRESENTATIONS

"Update of Agent Orange/dioxin and Human Health." American Public Health Association Annual Meeting, Boston, MA, 2013.

"Epidemiologic results of US semiconductor and computer manufacturing worker studies." American Public Health Association Annual Meeting, San Francisco, CA, 2012

"Scientific Inference and Public Policy." International Society for Environmental Epidemiology Annual Meeting, Barcelona, Spain, 2011

"From Science to Policy: Addressing health impacts of institutional and large-scale woody biomass burning." International Society for Environmental Epidemiology Annual Meeting, Barcelona, Spain, 2011

"Epidemiologic studies generated during litigation: Lessons from three plaintiff-supported studies." International Society for Environmental Epidemiology Annual Meeting, Pasadena, 2008

"Trends in melanoma incidence and mortality." International Society for Environmental Epidemiology Annual Meeting, Mexico City, Mexico, 2007

"Mortality in a large computer manufacturing company, 1969-2001." American Public Health Association Annual Meeting, Boston, 2006.

"Recent Epidemiologic Evidence of the Carcinogenicity of Dioxin." American Public Health Association Annual Meeting, Philadelphia, PA, 2005.

"Pesticides and Child Development in Rural KwaZulu-Natal. International Society for Environmental Epidemiology, Johannesburg, SA, 2005.

"Uses and Mis-uses of Epidemiology in Torts." International Society for Environmental Epidemiology Annual Meeting, NY, NY, 2004.

"PCBs, Dioxins and Cancer – an Update." Cancer Prevention Rounds. Boston University School of Medicine, Boston, MA, 2003

"Health Impacts of the Nuclear Fuel Cycle." Epidemiological Society of Southern Africa Annual Meeting, East London, South Africa, 2000.

"Childhood Leukemia in Woburn, MA: Science, Politics and Policy." International Society for Environmental Epidemiology Annual Meeting, Athens, Greece, 1999.

"Incidence of Malignancy in Populations Adjacent to the Pilgrim Nuclear Reactor." Symposium on Recent Studies of Low-Level Radiation and Implications for Medicine and the Nuclear Industry, New York City, 1998.

"Cancer Surveillance of Massachusetts Veterans, 1988-1993". North American Association of Central Cancer Registries Annual Conference, Boston, MA, 1997.

"Update of Cancer Incidence in Massachusetts Veterans, 1988-1993." International Society of Epidemiology in Occupational Health Annual Meeting, Harare, Zimbabwe, 1997.

"The Upper Cape Cancer Incidence Study". Sixth Annual Symposium on Environmental and Occupational Health during Societal Transition in Central and Eastern Europe, Eforie Nord, Romania, June, 1995.

"Popular Epidemiology." Loka Institute Conference on Dissenting Ways of Knowing, University of Massachusetts, Amherst, MA, 1994.

"Agency Responses to the Woburn Leukemia Cluster". Fifth Annual Symposium on Environmental and Occupational Health during Societal Transition in Central and Eastern Europe, Nitra, Slovak Republic, 1994.

"New Carcinogen Threshold Theories: Implications for Prevention," University of Connecticut conference on Incorporating Molecular Mechanisms into Estimates of Cancer Risk, 1992.

"Angiosarcoma, porphyria cutanea tarda and probable chloracne in a worker exposed to 2,3,7,8-tetrachlorodibenzo-p-dioxin-contaminated waste oil," Twelfth International Symposium on Dioxins and Related Compounds, Tampere, Finland, 1992.

"Occupation and Race Data in Central Cancer Registries," American Public Health Association Annual Meeting, Atlanta, 1991.

"Respiratory Cancer by Race and Gender: Selected Occupational Associations in Massachusetts, 1982-85," National Minority Health Conference, Atlanta, 1990.

"Statistical Methods for Analyzing Cancer Clusters." National Conference on Clustering of Health Events, Atlanta, GA, 1989.

"Cancer Statistics and the Right to Know". American Public Health Association Annual Meeting, Boston, 1988.

"Respiratory Disease Mortality and Morbidity, Respiratory Cancer and Mesothelioma Incidence: Occupational Associations in Massachusetts, 1982-1985." American Public Health Association Annual Meeting, Boston, 1988.

"Soft Tissue Sarcoma Incidence in Massachusetts Vietnam Veterans, 1982-1986." American Public Health Association Annual Meeting, Boston, 1988.

"Dealing with Cancer Clusters." American Association of Central Cancer Registries founding meeting, Chicago, IL, 1988.

"Cancer Surveillance in Massachusetts, 1982-1983." International Association of Cancer Registries Meeting, Hartford, CT, 1985.

OTHER INVITED PAPERS

"Contested territory: Research on workers' health." American Public Health Association Annual Meeting, San Francisco, CA, 2012

"Avoidable Occupational and Environmental Causes of Cancer." President's Cancer Panel meeting, East Brunswick, NJ, 2008

"Avoidable Occupational and Environmental Causes of Cancer." Occupational and Environmental Cancer Prevention conference, Stirling, Scotland, 2008.

"Health Effects of the Nuclear Fuel Cycle." Northeast Student Pugwash conference. Cambridge, MA, 2008.

"Occupational and Environmental Causes of Cancer." Second International Congress of the Paris Appeal, Paris, France, 2006.

"Occupational and Environmental Causes of Cancer." Collaborative on Health and Environment Annual Meeting, San Francisco, CA, 2006.

"Industry Influence in the EPA Dioxin Reassessment." Center for Science in the Public Interest, Washington, DC, 2004.

"The U.S. War on Cancer." Cancer, Environment and Society conference, ARTAC/UNESCO, Paris, France, 2004.

"Epidemiology in Toxic Torts." Environmental and Occupational Health Sciences Institute, Robert Wood Johnson Medical School, Piscataway, NJ, October, 2000.

"Global Climate Change and Health." Grand Rounds, Dartmouth Medical School, Lebanon, NH, December, 1999.

"PCBs in Massachusetts: Is There a Cancer Risk?" Cancer Prevention Rounds, Boston University School of Public Health, January, 1998.

"Epidemiologic Studies of the Woburn Childhood Leukemia Cluster." American College of Occupational and Environmental Medicine Annual Meeting, April, 1998.

"Agent Orange and Veterans Health - 1996 Update." Occupational Health Program, Harvard School of Public Health, Boston, March, 1997.

"Surveillance of Cancer in Massachusetts Veterans, 1988-1993." Tumor Registrars Association of New England, St. Elizabeth's Hospital, May, 1997.

"Health Effects of U.S. Nuclear Weapons Production". Slone Epidemiology Unit, Brookline, MA, June, 1997.

"Agent Orange and Veterans Health - 1996 Update." Public Health Forum, Boston University School of Public Health, Boston, November, 1996.

"Agent Orange and Cancer". Cancer Prevention Rounds. Boston University Medical Center, Boston, MA, 1994.

"Patterns of Cancer in Vietnam Veterans". Hematology/Oncology Rounds. Massachusetts General Hospital, Boston, MA, 1991.

"Agent Orange, Health Effects and Government Policy". Health and the Environment Lectureship. Brown University, Providence, RI, 1991.

"Cancer Surveillance of Vietnam Veterans in Massachusetts". Distinguished Lecture Series in Occupational Medicine. Robert Wood Johnson Medical School, Piscataway, NJ, 1989.

HONORS AND AWARDS

Scientific Research Award, Occupational Health and Safety Section, APHA, 2012
Helen Clark Award, Silicon Valley Toxics Coalition, 2008
Research Integrity Award. International Society for Environmental Epidemiology, 2008
Science for the Benefit of Environmental Health. B.U. Superfund Basic Research Program, 2006
Member, Harvard School of Public Health Occupational Health Program Advisory Committee, 2000-2009
Vice-Chair, Greater Boston Physicians for Social Responsibility Steering Committee, 1999-2008
Chair, Massachusetts Toxics Use Reduction Institute Science Advisory Board, 1994-1996; Member, 1994-2003
Marla Frazin Award, Massachusetts Breast Cancer Coalition, 2002
Public Scientist of the Year Award, Association for Science in the Public Interest, 2001
Member, International Society for Environmental Epidemiology Governing Council, 2001
Member, Harvard School of Public Health Alumni Council, 1997-1999

Award for Public Health in the Work Environment, University of Massachusetts Lowell, 1997
Member of Massachusetts Advisory Board on Toxics Use Reduction, 1990-1994
Lemuel Shattuck Award, Massachusetts Public Health Association, 1990
Environmental Health Network 1990 National Award

PROFESSIONAL MEMBERSHIPS

- American Public Health Association
- MassCOSH
- Massachusetts Public Health Association
- Society for Epidemiologic Research
- International Society for Environmental Epidemiology

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Consideration Materials
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Bates, Exhibit, TREX, or Other Description
BP-HZN-2179MDL01822629-BP-HZN-2179MDL01822630
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Deposition Transcript Brown, Douglas
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Deposition Transcript Howard, John
Deposition Transcript Watson, Nick
Michael Keith Williams Deposition Bundle
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Trial Transcript (Mar. 25, 2013 AM)
Trial Transcript (Mar. 5, 2013 AM)
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