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Review of Dr. Andrew Gray's "*AIR QUALITY IMPACTS AND HEALTH EFFECTS DUE TO LARGE STATIONARY SOURCE EMISSIONS IN AND AROUND SOUTH AFRICA'S MPUMALANGA HIGHVELD PRIORITY AREA (HPA)"* (June2019)

June 3, 2019

My name is Peter Orris and I am a board-certified specialist in Occupational and Environmental Medicine; Professor and Chief of Service, Occupational and Environmental Medicine at the University of Illinois School Public Health with an affiliate appointment at the University of Illinois Abraham Lincoln School of Medicine; a Professor of Internal Medicine at Rush University; and an Adjunct Professor of Preventive Medicine at Northwestern University's Feinberg School of Medicine.

I have reviewed Dr. Andrew Gray's report titled "Air Quality Impacts and Health Effects Due to Large Stationary Source Emissions In and Around South Africa's Mpumalanga Highveld Priority Area (HPA)."

Based on my review of Dr. Gray's report I conclude that:

1. The 12 coal fired power plants, the Synfuels facility and the NatRef refinery ("14 facilities") are collectively causing unhealthy levels of air pollution in the Highveld Priority Area and the nearby cities of Johannesburg and Pretoria, and constitute an

immediate and significant public health hazard. Cumulative emissions from the 14 facilities created acute exposures in 2016 that exceeded the World Health Organization's guidelines for daily or hourly average maximums for all pollutants. Implementing the 2020 Minimum Emission Standards (MES) would eliminate the WHO guideline exceedances for 24-hour average PM_{10} and 24-hour average $PM_{2.5}$, but would not eliminate exceedances for 24-hour average SO_2 or one-hour average NO_2 WHO guidelines, despite substantial reductions of those pollutants throughout the modeled area.

2. The 14 facilities were in all likelihood responsible for between 305 and 650 early deaths from $PM_{2.5}$ in the studied area in 2016. It is likely therefore, based on the recorded emissions, that between 182 and 387 premature deaths per year from $PM_{2.5}$ could be avoided if the facilities were required to comply with the 2020 MES.

3. *All* 120 sensitive sites (mostly schools and hospitals) analyzed in Dr. Gray's study were exposed to 24-hour average SO_2 levels from the 14 facilities alone that exceed the World Health Organization guideline of 20 μg/m³. Kwanala Primary School was exposed to more than four times that limit. In 2016, 28 schools and hospitals were exposed to acute (one-hr average) NO_2 concentrations above the World Health Organization guideline of 20 μg/m³ in 2016. Thus thousands of schoolchildren, the elderly and the sick are being exposed to acute pollution concentrations that can cause asthma attacks and permanent lung damage.

4. Reducing SO_2 from the 14 facilities would reduce the formation of secondary $PM_{2.5}$, resulting in major gains in health and reduced sickness and death in the Highveld Priority Area as well as in Johannesburg and Pretoria.

Background and Experience

For 35 years, I practiced inpatient and outpatient general internal medicine at a public hospital in Chicago, USA. I have extensive training and experience in exposure assessment, epidemiology, toxicology, and diagnosing and treating environmentally related diseases. In my medical practice, I have assessed, diagnosed and managed thousands of patients who had developed, or were at risk of developing, a wide range of adverse effects from environmental

and/or occupational exposure to industrial pollutants, heavy metals, solvents and other hazards. I have spent much of my clinical career making determinations as to whether a causal relationship exists between a person's exposure and their health problems.

I extensively read medical, toxicological and epidemiological literature regarding environmental contaminants and pollutants. In doing so, I am routinely interpreting and assessing the strength and weaknesses of individual studies both in terms of study design and results. I also routinely make judgments as to what the body of literature collectively indicates about exposures and their health effects. Details about my background and full CV are below.

I was asked by the Centre for Environmental Rights to comment on the health impact modeling of Dr. Andrew Gray of May 2019. Dr. Gray's modeling (1) assessed the air quality and health impacts of 2016 emissions from 12 Eskom coal-fired power plants, a Sasol Synfuels facility and a NatRef refinery in and around the Highveld Priority Area (HPA), and (2) compared 2016 actual emissions and health impacts from $PM_{2.5}$ with projected emissions and impacts if the 2020 MES were implemented; and (3) modeled pollution concentrations from the 14 facilities on 120 schools and hospitals where residents are particularly vulnerable to the effects of air pollutants.

Coal Plant Emissions and Public Health

The scientific literature of health impacts caused by air pollutants from coal combustion in coal-fired power plants is robust. It documents the profound effects of these pollutants on health, especially of vulnerable individuals including children, the elderly, pregnant women, and those suffering from asthma, heart, and lung disease.

Burning coal releases a variety of toxic compounds into the air. Most prominent are particulates, with particulates smaller than 2.5 micrometers diameter ($PM_{2.5}$) being the most dangerous to health. In addition, sulfur oxides (primarily SO_2), nitric/nitrous oxides (NO_X), as well as ozone are the subject of concern and attention. These are the compounds most frequently measured and discussed, but others are also present, including mercury, arsenic, boron, cadmium, cobalt, chromium, fluoride, lead, lithium, molybdenum, radium, selenium, and thallium. Coal combustion also emits volatile organic compounds (VOCs), polycyclic aromatic hydrocarbons (PAHs), dioxin, and methane (a precursor of ozone), all of which are

known to harm human health.

The World Health Organization (WHO) estimates that 4.2 million deaths in 2016 globally are due to outdoor air pollution, with 25 - 30% produced by energy generation, much of it coming from coal-fired power plants. Exposure to pollutants from coal combustion causes injury to the airways and lungs via oxidative stress and leads to inflammation, cytotoxicity (direct harm to cells), and cell death. Exposure significantly increases the risks of developing cardiovascular disease, strokes, cancer, and respiratory diseases, leading to hospital admissions and deaths.

Pollution from coal burning disproportionally effects children, as they are particularly vulnerable to air pollution: they breathe proportionally more air because of their higher respiratory rate, they spend more time outdoors exposed to pollution, and their lungs and other organs are still developing. Today's youth and their children will experience worsened effects of air pollutants attributable to continued burning of coal.

Coal-fired power plants contribute to the global burden of cardiovascular disease primarily through the emission of PM. As described below, $PM_{2.5}$ has been causally linked to cardiovascular disease and death (US EPA, 2009b). The WHO estimates that worldwide, 5 per cent of cardio-pulmonary deaths are due to PM pollution (World Health Organization, 2013). The mechanism of injury is vascular oxidative stress leading to vessel inflammation and cytotoxicity. Long-term exposure to $PM_{2.5}$ has been shown to accelerate the development of atherosclerosis and increase emergency department visits and hospital admissions for ischemic heart disease and congestive heart failure. The US EPA reports that a majority of the studies it reviewed found a 0.5 to 2.4 percent increase in emergency department visits and hospital admissions for cardiovascular diseases per each 10 μg/m3 increase in annual average $PM_{2.5}$ concentrations (US EPA, 2009b). Lung cancer mortality increases with increasing exposure to combustion emissions (Lewtas, 2007). Studies conducted in China and Latin America confirm the significant link between outdoor air pollution and cardiovascular events (Liu, 2013; Romieu, 2012).

Research has found that exposure to air pollution during pregnancy can cause low birth weight (Sram et al., 2005). Studies that investigated the effects of SO_2 and PM (China, South Korea), and NO_2, CO, and ozone (South Korea), concluded that air pollution containing these

constituents was associated with low birth weight (Sram et al., 2005). Studies have shown infant mortality increased with use of coal in countries that had mid to low infant mortality rates at baseline (1965), such as Chile, China, Mexico, Thailand, Germany, and Australia, although this effect was not seen in those countries with high baseline infant mortality (Smith, 2013; IEA 2007).

Pollutant-specific health effects

Sulfur dioxide

Exposure to SO_2 emitted by coal burning power plants increases the incidence and severity of respiratory symptoms of those living nearby, particularly children with asthma. For adults and children who are susceptible, inhalation of SO_2 causes inflammation and hyper- responsiveness of the airways, aggravates bronchitis, and decreases lung function (US EPA, 2017). Community-level SO_2 concentration is associated with hospitalizations for asthma and other respiratory conditions, as well as emergency department visits for asthma, particularly among children and adults over 75 years (US EPA, 2017).

Inhaled SO_2 is readily absorbed in the nasal passages of people at rest. As physical activity increases, breathing rate and breathing through the mouth increase, resulting in greater penetration of SO_2 into the lungs. Relative to healthy adults, children, and individuals with asthma or allergic rhinitis have an increased amount of oral breathing, and may have greater SO_2 penetration into the lungs (US EPA, 2017).

Acute SO_2 exposure causes asthma attacks, asthma hospital admissions and emergency department visits for children. SO_2 inhalation produces bronchoconstriction in both healthy adults and those with asthma. The response to SO_2 in healthy adults occurs primarily from activation of sensory nerves in the respiratory tract, resulting in neural reflex responses through the vagus nerve. It occurs at higher concentrations than the response in people with asthma. In adults with asthma, the response is partly due neural reflex response and party from involvement of inflammatory mediators. Inhalation of SO_2 increases allergic inflammation in adults with asthma or allergic airways disease. Allergic inflammation and increased airway responsiveness due to short-term SO_2 exposure may be linked to asthma exacerbation seen in epidemiologic studies (US EPA, 2017). .

People with asthma, particularly children, are at increased risk for SO_2-related health effects compared with those without asthma. Children are at increased risk for SO_2-related health effects based on their increased ventilation rates relative to body mass and increased oral breathing. There is also evidence from epidemiologic studies of respiratory hospitalizations, particularly among adults over 75, suggesting of increased risk of SO_2-related health effects for older adults compared to other lifestages (US EPA 2017).

Oxides of nitrogen

Oxides of nitrogen (NO_X) are by-products of fossil fuel combustion in automobiles, coal- fired power plants, and other sources. NO_X react with chemicals in the atmosphere to create pollution products such as ozone in smog, nitrous oxide (N_2O), and nitrogen dioxide (NO_2).

Elevated concentrations of NO_2 may contribute to the development of asthma and increase susceptibility to respiratory infections. People with asthma, as well as children and the elderly are at higher risk for the health effects of NO_2. NO_2 reacts with other chemicals in the air to form particulate matter and ozone, which also have harmful effects on the respiratory system (US EPA 2019).

When asthmatic children are exposed to NO_2, they can experience increased wheezing and coughing (US EPA, 2019). At low concentrations (0.2–0.5 ppm), NO_2 has been found to result in lung function decrements in asthmatics (US EPA, 2008a). Exposure to NO_2 also increases susceptibility to viral and bacterial infections, and at high concentrations (1–2 ppm) can cause airway inflammation (US EPA, 2019). Increases in ambient NO_2 levels (3–50 ppb) are linked to increases in hospital admissions and emergency department visits for respiratory problems, particularly asthma (US EPA, 2019).

Exposure to NO_2 during childhood can decrease children's lung function (Perera, 2019). A study of a cohort of fourth graders found decreased lung function growth in children exposed to higher levels of NO_2 (Gauderman, 2000).

Mercury

When coal is burned, mercury vapor is released into the atmosphere. The United Nations estimates that 26 per cent of global mercury emissions (339–657 metric tons/year) come from

burning coal in power plants (Pacyna et al., 2010). The mercury from coal-burning power plants is deposited into water-ways, converted to methyl-mercury, and passed up the aquatic food chain (Lippmann et al., 2003, National Research Council (US), 2010). Local, regional, and distant mercury emissions contaminate fish. Methyl-mercury-contaminated fish, when eaten by pregnant women, can cause developmental effects in their offspring, such as delayed neurodevelopment, plus subtle changes in vision, memory, and language (World Health Organization, 2007). Epidemiological studies suggest that many newborns and children around the world have levels of mercury in their bodies that put them at risk of these adverse effects. Data from the United States suggest that more than 300,000 newborns each year are born at risk for these effects (Mahaffey et al., 2004). A study in Spain found 42 percent of tested children tested had mercury levels in their hair above the EPA reference concentration for safety of 1 μg Hg/g. A study in Hong Kong estimates that a majority of children exceed safety levels of mercury because of consumption of mercury-contaminated fish (Diez et al., 2009, Lam et al., 2013). Prenatal exposure to mercury can lead to decreased motor and cognitive abilities even at low exposures. (Nat'l Research Council, 2000) Low- level mercury exposures have been linked to higher risks of hypertension, heart disease, heart attack, strokes, renal dysfunction (Houston, 2011; Roman, 2011) and endocrine disturbances (Tan, 2009).

PM2.5

Particulate matter is directly emitted from coal plants (primary PM) and is also formed from conversion of SO_2 and NO_2 emissions into particulates of sulfate and nitrates (secondary PM). In a report evaluating over 40 studies on the health effects of exposure to $PM_{2.5}$, the US Environmental Protection Agency (US EPA) concluded that $PM_{2.5}$ likely causes respiratory symptoms, the development of asthma, and decrements in lung function in children (US EPA, 2009b). The EPA concluded that an annual average 10 μg/m3 increase in $PM_{2.5}$ is associated with a 1 to 3.4 percent decrease in forced expiratory volume (US EPA, 2009b).

The EPA also concluded that exposure to $PM_{2.5}$ increases emergency department visits and hospital admissions for respiratory-related symptoms such as infections and chronic obstructive pulmonary disease. Epidemiological evidence from Australia and New Zealand (Barnett et al., 2005), Mexico (Barraza-Villarreal et al., 2008), Canada (Chen et al., 2004), and Europe (de Hartog et al., 2003) confirm that these effects on the respiratory system are seen

wherever communities are exposed to $PM_{2.5}$.

Pediatric intensive care unit admissions for asthma increase with PM. (Silverman 2010). Asthma is a lung disease that causes wheezing, breathlessness, chest tightness, and nighttime or early morning coughing. In addition to its physical symptoms, childhood asthma causes anxiety and is associated with more severe behavioral problems in children with attention-deficit disorder. Children exposed to $PM_{2.5}$ have decreased lung function growth at age 18 (Avol, 2001). A study of children in New York City found the rates of intensive care unit admissions and hospitalizations increased 26% and 19%, respectively, when $PM_{2.5}$ concentration increased by 12 μg/m3 (Silverman, 2010).

Long-term exposure to $PM_{2.5}$ is causally linked to the development of lung cancer (US EPA, 2009b). Recent research has found that $PM_{2.5}$ correlates with neurological impacts, Alzheimer's and dementia (Underwood 2017; Cacciottolo et al., 2017), delinquent behavior (Younan et al., 2018), diabetes (Bowe et al., 2018), kidney disease (Sellenrich, 2016), and hypertension (Zhang et al., 2016; Zhengmeng et al., 2018).

Comments on Dr. Andrew Gray's Air Quality Modeling and Health Impacts in the Highveld Priority Area in South Africa

I have reviewed Dr. Andrew Gray's full report of May 2019 assessing the air quality and health impacts of 2016 emissions from 12 Eskom coal-fired power plants, a Sasol Synfuels facility and a NatRef refinery in and around the HPA. His health risk analysis estimates mortality from $PM_{2.5}$ exposures. This includes direct PM emissions from the emissions sources, as well as secondary PM formed through the chemical reactions of SO_2 and NO_X emissions in the atmosphere, which accounts for the majority of the $PM_{2.5}$ from the modelled sources. His analysis also includes quantification of how emissions and health impacts would be reduced with implementation of South Africa's 2020 Minimum Emission Standards (MES).

Dr. Gray's health risk analysis uses state of the art methodology based on data from the WHO Global Burden of Disease (GBD) 2010 project and an integrated exposure–response (IER) model developed by Burnett et al. (2014) to predict the relative risk associated with increased levels of exposure to $PM_{2.5}$ for four causes of mortality in adults: ischemic heart disease, cerebrovascular disease (stroke), chronic obstructive pulmonary disease, and lung cancer.

The IER model also assesses relative risk functions for the incidence of acute lower respiratory infection that can be used to estimate mortality in children under five years of age. Total mortality in the IER model is estimated as the sum of the four cause-specific mortality risks for the adult population and the acute lower respiratory infection risk for children.

Health impacts beyond $PM_{2.5}$ are not reflected in Dr. Gray's assessment because integrated exposure-response models and relative risk factors for other pollutants have not been sufficiently developed by the scientific community. In other words, Dr. Gray's health impact findings are conservative relative to the actual health impacts of total emissions from the 14 facilities.

Dr. Gray found that the 14 sources accounted for a significant increase in ambient pollutant concentrations in the region during 2016 and were substantially responsible for causing the ambient air quality to exceed acceptable standards. Dr. Gray's analysis found that actual $PM_{2.5}$ emissions in 2016 from the 14 sources were responsible for between 305 and 650 premature deaths in the modeling area. Lethabo, Kendal, Kriel and Synfuels were the worst offenders, with over 50 premature deaths each. If the 14 sources complied with the 2020 Minimum Emission Standards (MES), between an estimated 182 and 387 premature deaths would likely be avoided every year in the Highveld Priority Area and the nearby cities of Johannesburg and Pretoria; a 60 percent improvement relative to premature deaths from 2016 actual emissions.

In my opinion, Dr. Gray's analysis makes clear that the emissions from the 14 modeled sources pose a serious threat to human health in the study area. Based on global experience and WHO conclusions concerning the health benefits of reducing ambient $PM_{2.5}$, if the modeled sources could be brought into compliance with the 2020 Minimum Emission Standards, in particular reducing SO_2 to reduce formation of secondary $PM_{2.5}$, there would be major gains in health and a decrease in sickness and death in the Highveld Priority Area and the nearby cities of Johannesburg and Pretoria.

It is also my opinion that the high levels of air pollution in and around the Highveld Priority Area constitute an immediate and significant public health hazard that should be remedied to save lives and allow current and future generations of South Africans to live longer and healthier.

Dr. Peter Orris

6/4/19
Date

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CURRICULUM VITAE – JUNE 2019

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NARRATIVE: I am a board-certified specialist in Occupational and Environmental Medicine. I received my medical degree from the Rosalind Franklin University's Chicago Medical School and a Master of Public Health degree from Yale University. I completed a residency in Internal Medicine at Cook County Hospital (now Stroger Hospital) in Chicago, and have practiced inpatient and outpatient general internal medicine on the teaching wards there for 35 years. I have extensive training and experience in exposure assessment, epidemiology, toxicology, and diagnosing and treating environmentally-related diseases.

I have served on the medical staffs of Mercy Hospital, Mount Sinai Hospital, Northwest Community Health Care, Rush University Medical Center, and the University of Illinois Hospital and Health Sciences System where I currently serve as the Chief of Occupational and Environmental Medicine. In my capacity as Chief of Service, I oversee the clinical care of the patients at the clinics staffed by the physicians and advanced practice nurses in our department. These patients are referred primarily due to injury or illness at work or for evaluation of environmental exposures. I have designed, managed and evaluated medical monitoring programs, exposure surveillance and treatment programs, and analyzed their results for exposures such as heavy metals, solvents, silica, asbestos, and other hazards. My colleagues and I see patients as part of the World Trade Center Medical Treatment Program for first responders, restoration, and clean-up workers who where exposed as a result of their exposures at Ground Zero after the towers fell. As part of our World Health Organization's Collaborating Center in Occupational Health, I am a senior member of the faculty group that trains resident physicians preparing for board-certification in Preventive Medicine in Occupational and Environmental Medicine.

I am a Professor of Environmental and Occupational Health Sciences in the University of Illinois School Public Health with an affiliate appointment at the University of Illinois Abraham Lincoln School of Medicine. I am a Professor of Internal Medicine at Rush University, and have held an Adjunct Professorship in Preventive Medicine at Northwestern University's Feinberg School of Medicine for close to 40 years. I hold elected fellowships in the American College of Physicians and the American College of Occupational and Environmental Medicine, as well as elected memberships in Alpha Omega Alpha, the medical honor society, and fellowship in the Chicago Institute of Medicine. I am a member of the American Public Health Association and the American Medical Association.

I was appointed by multiple Governors to serve over 10 years on the State of Illinois' Board of Health, and by the International Joint Commission of the US and Canada to serve as US Co-Chair of its Health Professionals Task Force for over 15 years. I served as well on the Chemical Health Advisory Committee of Health and Environment Canada as the only foreign expert appointed by the Government of Canada. I chaired the Public Health and Environment Committee of the World Federation of Public Health Associations for over 25 years, and recently received its Lifetime Achievement Award. I also serve as Co-Chair of the Environment Caucus of the World Medical Association.

I currently serve on the editorial boards of the American Journal of Industrial Medicine, the Journal of Public Health Policy, Revista Cubana De Salud Y Trabajo, and New Solutions. I have served as a reviewer for the Journal of Occupational and Environmental Medicine; Proceedings National Academy of Sciences; USEPA; World Bank Group; Epidemiology and Air Quality Monitoring (TCEAQM) Department of Health, Republic of South Africa; and the Transportation Research Board of the US National Academies.

I have been an advisor to federal, state and local governments, as well as environmental organizations, labor unions, corporations, and UN agencies. I have extensive experience teaching and lecturing on the health impacts of coal-fired power plants, mercury exposure, epidemiologic studies, causation, and air pollution. I have edited and authored numerous articles, book chapters and governmental reports in the field of Occupational and Environmental Medicine.

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CERTIFICATION AND LICENSES

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CURRENT POSITIONS

2010- Physician Advisor, Retirement Board, Chicago Policemen's Annuity Benefit Fund 2008-
Chair, Research Collaborative, Health Care Without Harm

2000- Chief of Service, Occupational and Environmental Medicine University of Illinois Hospital and Health Sciences System

1999- Director, University of Illinois at Chicago Occupational Health Services Institute

CURRENT ACADEMIC APPOINTMENTS

- Professor of Internal Medicine, Rush University College of Medicine

- Adjunct Professor of Environmental & Occupational Health Sciences University of Illinois at Chicago School of Public Health with affiliate appointment at the Global Health Center, UI Abraham Lincoln School of Medicine
- Adjunct Professor of Preventive Medicine, Northwestern University Feinberg School of Medicine
-

CURRENT HOSPITAL STAFF APPOINTMENTS

2005- Rush University Medical Center (Attending) 1999- U. of I. Hosp & Medical Center (Attending)

1979- Cook County Hospital (Voluntary Senior Attending)

CURRENT APPOINTED OR ELECTED POSITIONS

Hospital:

2000- Executive Committee, Medical Staff, University of Illinois Medical Center 1982- Institutional Review Board, Cook County Health and Hospitals System

(Co-Chair, 1991-4, Chair, 1994-2007)

Professional Societies:

2018- Co-Chair, Environmental Caucus, World Medical Association

2012- Liaison to the World Federation of Public Health Associations for the APHA 2009- Board member, Chicago Physicians for Social Responsibility

1992- Member, Environment Working Group of the World Federation of Public Health Associations (Chair 1992-2018)

2006- Consultant, Doctors Council, Service Employees International Union 2002- Educational Program Director, Medical Directors Club of Chicago

1999- Member, Policy Committee, World Federation of Public Health Associations 1993- Delegate, Illinois State Medical Society

1992- Councilor, Chicago Medical Society

Community or Government:

2016 Grant Reviewer, South African National Research Foundation

2011- Member, National Occupational Research Agenda Healthcare and Social Assistance Sector Council, NIOSH, CDC, USPHS, DHHS, US Government

1998- Advisor, Health Care Without Harm

1993- Medical Advisory Com., International Brotherhood of Teamsters

1991- Hazmat Education Project Adv Bd, International Brotherhood of Teamsters

1975- Advisor, Community Organizations in Chicago, Mossville Norco, and New Sarpy Louisiana, Durban South Africa, Chennai and Bilaspur India, Nairobi Kenya and others

AWARDS AND HONORS

2017 Lifetime Achievement Award, World Federation of Public Health Associations 2016 Elected to Alpha Omega Alpha, Medical Honor Society

2016 Emeritus Status, Illinois State Medical Society

2015 Alice Hamilton-Tony Mazzocchi Award, Occupational Health Section, Amer Pub Hlth Assoc

2015 Paul Cornely Award, Health Activist Dinner at APHA

2014 Environmental Health Hero Award, Health Care Without Harm 2013- Fellow, Institute of Medicine Chicago

2012- Miembro Correspondiente, La Sociedad Cubana de Salud Publica

2012 Selection as the only Occupational Medicine "Top Doctor" in the Chicago Magazine

2011 Selection as a US News and World Report "Top Doctor" in the US

2011 Distinguished Alumnus, Chicago Medical School, Rosalind Franklin University of Medical Sciences

2009 Teacher of the Year, University of Illinois Occupational Med. Residency 2009 Public Service Honor Role, Yale School of Public Health

2009 Selection as one of America's Top Physicians, Consumer Res Council Of America 2007 Letter of Congratulations from the Governor of Illinois

2006 Certificate of Appreciation, World Federation of Public Health Assoc. 2005 Selection as a "Best Doctor" in the United States, Castle Connelly LtD 2005 Outstanding Service Award, Executive Medical Staff of Stroger Hosp. 2004 Certificate of Appreciation, University of the Philippines, Manila 2003 Certificate of Appreciation, Illinois State Medical Society

2001 Certificate of Appreciation, Arab Community Center for Economic and Social Services Community Health and Research Center, Dearborn, MI

2001- Selection (yearly to present) as a "Top Doctor" in Midwest, Castle-Connolly Ltd 2000 Certificate of Appreciation, World Federation of Public Health Assoc. 9th International Congress, Beijing, China

1999 Certificates of Appreciation, American Medical Student Association, APHA Occupational Health & Safety Section, Mt. Sinai Family Practice, Air and Waste Management Association, Certificates of Appreciation- Greenpeace USA, Peace Corps, Chicago Medical Society

1992- Fellow, American College of Physicians

1988- Fellow, American College of Occupational and Environmental Medicine 1984-8 Fellow, American Academy of Occupational Medicine

1981 Certificate of Appreciation, Nat'l Safety Council 1980-9 Fellow, American College of Preventive Medicine 1973 Ciba Community Affairs Award

PROFESSIONAL JOURNAL ACTIVITIES

American Journal of Industrial Medicine (Contributing Editor)

Journal of Public Health Policy (Management Committee & Editorial Board) Revista Cubana De Salud Y Trabajo (Member, Editorial Board)

New Solutions (Member, Editorial Board)

Journal of Occupational and Environmental Medicine (Reviewer) Proceedings National Academy of Sciences (Reviewer)

Environmental Research (Reviewer)

PROFESSIONAL SOCIETY MEMBERSHIPS

Institute of Medicine Chicago

American College of Occupational and Environmental Medicine American College of Physicians

American Medical Association American Public Health Association

Association of Occupational and Environmental Health Clinics Central States Occupational Medical Association

Cook County & Illinois State Medical Societies Illinois Public Health Association

International Commission on Occupational Health Medical Directors Club of Chicago

Physicians for a National Health Program Physicians for Social Responsibility World Medical Association

RESEARCH GRANTS/CONTRACTS:

2016 World Bank Contract #7177859 for a criteria document "Climate Mitigation in the Health Care Sector" to advise its staff on support of health care in low and middle income countries.

2010-11 Grant for a study of the cost effects of greening health care from The Commonwealth Fund

2008-11 Contract with Health Care Without Harm to Direct Research Collaborative Funded by a Grant from the Robert Wood Johnson Foundation, 2004 Contract 200-199-00058, peer review for ATSDR 2002 Contract X97523001-0, peer review for EPA Central Office

TEACHING:

Medical and Public Health School

1998- Environmental & Occupational Health, 1 quarter , Northwestern U. Feinberg School of Medicine

2017 Preceptor, Rush Medical School Continuity Experience

2010-14 Topics In Public Health, Northwestern Feinberg Sch. Of Medicine

2007-13 Ethical Issues in Clinical Research, Northwestern U. Feinberg School of Medicine, 1 quarter

2002-3 International Comparison of Health Care Systems, on one quarter elective, Northwestern U. School of Medicine

1996,7 Occupational Medical Practice Seminar, Rush Medical College

1998 Director, Occupational Disease Course, UIC School of Public Health

1995-7 Annual lecture, Health Administration Program of Rush Medical School

1993-15 Annual lectures in Occupational Epidemiology Course, UIC School of Pub. Health

1990-99 Co Director Occupational Health Weekly Seminar, University of Illinois

1990- Regular lectures on Occupational Health, Environmental Toxins, Global Warming, Health Care Organization, and Epidemiology in several courses, UIC Sch. of Pub. Health, Northwestern U. Feinberg School of Medicine, University of Chicago School of Medicine, Rosalind Franklin University Chicago Medical School, Rush University School of Medicine

1981-94 Occupational Health Practice, one quarter elective seminar, Northwestern U. Med.

1980-93 International Comparison of Health Care Systems, one quarter elective seminar, Northwestern U. Medical School

1979, 80, 91 Cuban Health Care System Research Seminar, ten day field study course, American Medical Student Association

1978 International Health Care Systems, U of Illinois School of Medicine 1977 The Epidemiology of Cardiovascular Disease, UIC School of Medicine

Industrial Hygienists, Nurses, & Physicians

2018 Community Environmental Epidemiology for Policy, Community Monitoring Prgoram India, June 24, 2018

2004 Environmental Health and Nursing, CEI Course 1006.0, APHA 132 Annual Meeting, 11/6/04

2000 Co-Direct Medical Research Ethics, Collaborative Seminar with the Institute for Occupational Hygiene, Russian Academy of Sciences, Moscow

2000 Co-Direct Medical Waste Toxicity, Seminar on Medical Waste, sponsored by the Institute of Occupational Health, Ministry of Public Health, Havana, Cuba as part of the Caribbean Medical Society Meeting

2000-10 Lectures, Research Ethics, Cook County Bureau of Health Services

Residents

1979- Regular lectures to UIC residents on topics in occupational medicine

1979- Grand Rounds or formal departmental lectures at Medical Schools, and teaching Hospitals

1979- Regular supervision of the Occupational Medicine consultation Service and Clinic, Stroger Hospital of Cook County and UIC

1979-'07 Several months a year general medicine ward attending, Cook County Hospital

Continuing Medical Education

2018 Primary Care Physicians and the Environment, Seminar, residents, students, practitioners, Chennai, India June 23, 2918

2018 Hospitalist Grand Rounds Rush University, Climate Change and Health 2014 Central States OEMA, Health Impact of Coal Energy Generation

2005 Central States OEMA, Medical Waste Incineration: Point Counter Point

2004 Rush University, Department of Medicine Grand Rounds, "Malaria Control & DDT Toxicity: A Public Health Dilemma" Mar. 26, 2004

2004 Midwest Clinical Conference, "Fish Consumption: Advise for the General Internist", 3/25/04

2004 Grand Rounds, Evanston Northwestern Hospital, "Mercury Implications for Office Practice", Mar 5, 2004

2004 Mercury, Low Dose Effects, Medical Directors Club of Chicago, Mar 4, 2004 2003 Lecture, Ethics of Occupational Medical Practice: International Codes Institute for Occupational Medicine, Ukrainian Academy of Sciences, Kiev, Dec 9, 2003

2003 Research Ethics of Special Populations at Ethical Issues in Health Research Workshop, June 3-6, Sofia, Bulgaria

2000 Lecture, Persistent Organic Pollutants, Orlando County Medical Society and Florida Physicians for Social Responsibility, Orlando, FL

2000 The Physician's Role Under The Americans With Disabilities Act, Midwest Clinical Conference of the Chicago Medical Society

1999 Monthly Departmental Lectures on Research Ethics at Cook County Hospital and the Cook County Bureau of Health Services

1999 Lecture Series on Occupational and Environmental Health, Roseland Community Hospital

1998 Lecture Series on Occupational Medicine, Holy Cross Hospital

1998 Clinical Management of Toxic Exposures, Michigan State University Kalamazoo Center for Medical Studies, Oct. 15. Three seminars for healthcare providers.

1995,6 Rendering a Medical Opinion in a Legal Case, One day seminar at The American College of Occupational and Environmental Medicine

1994 Clinical Aspects of Environmental Exposures, Bloomington Hospital, Bloomington, IN, ATSDR, US Public Health Service

1990-2 The Physician and the Law, UIC School of Public Health

1991,2 Occupational Medicine for the Primary Care Physician, UIC School of Public Health

1992 Epidemiology for Non-Epidemiologists, Applied Statistics Training Institute, National Center For Health Statistics, CDC, USPHS

1992 Worksite Evaluation & Pre-Placement Screening Schwab Rehab Institute

American College Of Occupational and Environmental Medicine Annual Conference

PAST EMPLOYMENT AND POSITIONS

2019 Consultant, WHO, Public Health Environment & Social Determinant Dept,Geneva,2/12-4

2012-15 Member, Bureau, Strategic Approach to Int. Chemicals Management, UNEP 2011-5 President, District 6, Chicago Medical Society

2006-16 Member, State of Illinois Board of Health

2012-16 Consultant, Health Care Division, Service Employees International Union 2012-15 Member, Bureau, Strategic Approach to Int. Chemicals Management, UNEP 2012-5 Consultant, Illinois Department of Public Health

2012-5 Consultant, Health Promoting Hospitals Task Force on the Environment 2011-3 Expert Consultant, Region V, USEPA

2007-10 Member, Scientific Advisory Committee, World Trade Center Medical Programs, Mount Sinai School of Medicine, New York

2006-16 Member, State of Illinois Board of Health 2000- Medical Advisor, AFSCME Council 31 2000-07 Medical Advisor, Midwest Generation, LLC

2000-13 Director, Global Chemicals Policy Center, Great Lakes Centers For

Occupational & Environmental Safety & Health, UIC School of Public Health, 1995-14 Professor of Preventive Medicine, Rush Medical College, Rush University (dates

approx.)

1995-14 Health Professionals Advisory Board, International Joint Committee of the US and Canada (US Co- Chair 1995-2009)

2010-13 Consultant, United Nations Development Program Medical Waste Project

2008-11 Member, Technical Committee Challenge Advisory Panel, Health Canada, Ottawa

1991-10 Hazmat Education Project Advisory Board, American Fed. of State, County, & Muni

Employees

2008- 9 Scientific Committee 12th World Congress on Public Health

2009-10 National Research Council Committee "Research on the Health and Wellness of Commercial Truck and Bus Drivers: A Conference", Transportation Research Board of the National Academies.

2008-9 Technical Advisory Group: Chemicals, Global Environment Facility, Washington DC

2008-9 National Commission of Inquiry into the Worker Health and Safety Crisis in the Solid Waste Industry

2005-6 Advisor, United Nations Development Program/Global Environmental Facility 2004-6 Healthy Schools Campaign

2004-9 Board of Directors, Safer Pest Control Project

2002-9 Chair, Public Health and Environment Committee, World Fed of Public Health Associations

2001-6 Executive Board, Illinois Safety Council

2001-10 Board of Directors, Hecktoen Institute For Medical Research

2001-9 Member, Working Group on Occupational Health and Safety Intergovernmental Forum on Chemical Safety (IFCS)

1997-02 Director, World Federation of Public Health Associations Persistent Organic Pollutants Project – Human Health Effects of Chemicals Project.

1996-98 Senior Medical Advisor, Greenpeace, USA

1995-07 Rush-Cook County Affiliation Research Committee (Chair, 1996)

1995 Medical Advisory Committee, John Redmond Foundation, International Association of Firefighters, AFL-CIO

1991-14 Hazmat Education Project Adv Bd, Service Employees International Union, AFL-CIO

1979-07 Senior Attending Physician, Div. of Occupational Medicine, Cook County Hospital (Stroger Hospital)

2005-6 International Ad Hoc Reviewer, 11th World Congress on Public Health/8th Brazilian Congress on Collective Health, Rio de Janeiro, Brazil

2002- 4 International Planning Committee, 10th WFPHA International Congress April 19, 2004, Brighton, England

2004 Consultant, National Academy of Science's Board on Global Health, Malaria Control: A Reconsideration of the Role of DDT, Washington, DC, July 21-22, 2004

2003 Advisor, World Health Organization at the Workshop in Preparation of a GEF-Funded Global Medical Waste Project, New Delhi, India,

1999-01 Scientific Program Committee, Global Conference on Children's Environmental Health, HHS/EPA/Health Canada/Env. Canada

1998-02 Cleaner Technologies Substitutes Assessment: Professional Fabricare Processes Technical Peer Review Panel, USEPA (EPA 744-B-98-001)

1992-00 Director, Health Hazard Evaluation Program, University of Illinois School of Public Health and Illinois Dept. of Public Health

1990-9 Director, Research & Interdisciplinary Projects, Great Lakes Center for Occupational and Environmental Health and Safety, University of Illinois School of Public Health

1993-9 Medical Director, Corporate Health Services, Northwest Community Healthcare 1990-9 Internal Medicine, U. of I. Hospital & Medical Center (attending)

1993-6 Associate Professor of Medicine, University of Illinois at Chicago School of Medicine
1983-97 Internal Medicine, Mercy Hospital & Medical Center (consultant)

1984-93 Medical Director, Managed Care Occupational Health Program,

1982-95 Attending Physician Dept. Of Internal Medicine Mt Sinai Hospital, Chicago, Illinois
1980-86 Medical Officer, Region V, Nat'l Institute For Occupational Safety & Health,

U.S.PHS,

1980-88 Attending Physician, Division of General Medicine, Cook County Hospital 1979-80 Medical Director, Southeast Health Plan, Chicago, Illinois

Attending Physician, Div. of Emergency Medicine, Cook Cty Hospital 1972-75 Research

Assist, Div. of Emergency Medical Svcs, IL Dept. of Health 1971-72 Nurse Technician, Trauma Unit, Cook County Hospital, Chicago, IL 1970 Administrative Intern, Hill Health Center, New Haven, Connecticut 1967-68 Research Assist to Dr. J. Hobson, Harvard Med School, Boston, MA

1966-67 Research Assist to Dr. David T. Denhardt, Harvard U, Cambridge, MA

PAST APPOINTED OR ELECTED POSITIONS

2012-16 Consultant, Health Care Division, SEIU

2005-9 Immediate Past President, Stroger Hospital Medical Staff

2001-6 Member, Technical Committee on Epidemiology and Air Quality Monitoring (TCEAQM), Department of Health, Republic of South Africa

2003- 6 President, Wood Street Branch, Chicago Medical Society, AMA 2001-5 President, Medical Staff, Cook County Hospital

2004-6 Member, State of Illinois Panel on Health of Hispanic Workers

1992-05 Global Health Task Force Occupational Health Advisory Com. American Medical Student Association

2002-7 Chair, Public Health Committee, Chicago Medical Society 2004-6 Board Member, Physicians for Responsible Negotiations, SEIU

1997-03 Member, Government Affairs Committee, IL State Medical Society 1993-01 Internal Medicine, Northwest Community Hospital (consultant) 2000-1 President, Wood Street Branch, Chicago Medical Society

1999-01 Secretary, Medical Staff, Cook County Hospital 1998-9 Vice President, Medical Staff, Cook County Hospital

1998-0 Scientific Committee, World Federation of Public Health Association's 9th International Congress, Beijing, China

1997-8 Chair, Ad Hoc Committee on Physician Unionization, Chicago Medical Society 1995-8 Clinical Advisory Committee, Del Amo Occupational Health Clinic, U of California,

Irvine

1996-7 President, Wood Street Branch, Chicago Medical Society 1987-97 Executive Medical Staff, Cook County Hospital

1992-6 Executive Board, Assoc. of Occupational and Env. Clinics (President 1994-5) 1983-96 Self-Assessment Cttee, American College of Occupational and Env Medicine 1996 Consultant, United States Peace Corps

1993-5 Task Force on Environmental Health, University of Toronto

1995 Advisor, Office of Global & Integrated Environmental Health, WHO Geneva, Switzerland

1994 Advisor, Occupational Health Program, WHO, Moscow, Russian Republic

1994 Occupational Medical Advisor, Health & Safety Com., Local 974, United Automobile Workers Union, AFL-CIO, Peoria, Illinois

1992-3 Nominating Committee, Amer Public Health Association, (Chair-1993) 1991-2 Governing Council, American Public Health Association

1991-2 Ad Hoc Task Force on Expert Witness Testimony, Chicago Med. Soc. 1990-2 Alternate Councilor, Chicago Medical Society

1990-1 Consultant, SOYUZMEDINFORM, Ministry of Health, USSR

1989 Consultant, United Steelworkers of America, AFL-CIO, Local 1010,

1988-92 Atomic Radiation & Dioxin Poisoning Victims Advisory Council, State of Illinois
1988-90 AIDS Proj Adv Bd, Service Employees International Union, AFL-CIO

1987-89 Nat'l Sanitation Fdn Drinking Water Additives Health Effects Task Group 1987-9 Health Advisory Committee, National Safety Council, Am Occupational Med

Association

1987-8 Consultant, United Association of Journeymen & Apprentices of the Plumbing & Pipe Fitting Industry of the U S and Canada, AFL & CIO

1986-9 Executive Board, Nat'l Union of Hospital & Health Care Employees/1199, AFL-CIO
1986-8 Governing Council, American Public Health Association

1986-7 Consultant, Local 75, United Assoc of Journeymen & Apprentices of the Plumbing & Pipe Fitting Industry of US & Canada AFL/CIO

1985-7 Advisory Committee, Health Policy Agenda for the American People for the APHA

1985-8 Advisory Committee, Hospital Occupational Safety and Health Program, American Hospital Association

1984-5 Chairman, Program Committee, Occupational Health Section, APHA 1984-7 Research Committee, Dept. of Medicine, Cook County Hospital 1982-4 Action Board, American Public Health Association

1982-4 Joint Policy Committee, American Public Health Association, 1979-82 Program Committee, Medical Care Section, APHA

1978-86 Occupational Health Committee, Cook County Hospital 1978-80 Resolutions Committee, Illinois Public Health Association 1977-80 Com. on Nat'l Health Proposals, Med Care Sect, APHA

1976-9 Chairman, National Health Insurance/Service Com, The Physicians Nat'l House Staff Association

1975-9 Executive Medical Staff, Cook County Hospital

1972-5 Founding member, Chicago Area Cttee on Occupational Safety and Health

BIBLIOGRAPHY

Peer Reviewed Journal Papers:

1. Kaplan, S. Ai, N. Orris, P. Sriraj, P.S. Green Commuting in the Health Care Sector Obstacles and Best Practices JOEM Volume 58, Number 2, February 2016 e34-8
2. Wang, JS Rico Euripidou, Fiona Armstrong, Génon K. Jensen, Josh Karliner , Renzo R. Guinto, Ang Zhao From Extraction to Renewal: A Global Campaign for Healthy Energy New Solut 2015; 25:559-566 doi:10.1177/1048291115610433
3. Bassil, K , Sanborn, M, Orris, P , Lopez, R Integrating Environmental and Human Health Databases: Themes, Challenges and Future Directions *Int. J. Environ. Res. Public Health* 2015, *12,* 3600-3614; doi:10.3390/ijerph120403600

4. Buchanan, S., Burt, E. Orris, P. Beyond black lung: Scientific evidence of health effects from coal use in electricity generation Journal of Public Health Policy 35, 266–277. 5/15/2014

5. Burt, E. Orris, P. Air Pollution: a New Concern. Polycyclic Aromatic Hydrocarbon Endocrine Disrupting Chemicals in Urban Outdoor Air and Children's Health: A Brief Public Health Overview of Recent Literature, World Medical Journal, 57/6, December 2013, P. 220-2 also in Policikliskie aromatiskie ogludeprai pilsetu atmosfera ka endokrinas sistemas graveji un bernu veseliba Latvi'as arsts Nacionalais Medictnas Zurnals, Jan 2014, P 70-1

6. Karliner, J. Cohen, J. Orris, P. Lessons in Forging Global Change, Stanford Social Innovation Rev, Winter 2014

7. S. Kaplan, B. Sadler, K. Little, C. Franz, and P. Orris, Can Sustainable Hospitals Help Bend the Health Care Cost Curve? New York: Issue Brief: The Commonwealth Fund, November 2, 2012, http://www.commonwealthfund.org/Publications/Issue-Briefs/2012/Nov/Sustainable-Hospitals.aspx

8. Evans, V, Orris P. The Use of Alcohol-Based Hand Sanitizers by Pregnant Health Care Workers (Letter) JOEM, Volume 54, Number 1, January 2012

9. Buchanan, S. Orris, P. Karliner, J. Alternatives to the mercury sphygmomanometer, J Public Health Pol, , 32: Nov 25, 2010, 107-120

10. Buchanan, S. Vossenas, P. Shimek, J, Frumin, E. Krause, N. Orris, P. Punnett, L. Occupational injury disparities in the U.S. hotel industry, American Journal of Industrial Medicine, 2010 Feb;53(2):116-25.

11. Karliner, J. Harvie, J. Orris, P. Mercury Free Healthcare World Medical Journal May, 2008, 24:2

12. Aguilar, J. Mas, Pedro, Romero, M. Garcia, R. Sardinas, O. and Orris, P. Niveles de plomo en sangre y factores asociados, en ninos del municipio de Centro Habana, Rev Cubana Hig

Epidemiol 2003, 41:2

13. Higgins, P, Orris P. Providing Employer-Arranged Occupational Medical Care: Conflicting Interests State of the Art Reviews in Occupational Medicine, Oct –Dec, 2002, 17:4, P. 601-6

14. Higgins, P., Ezike, C., Orris, P. Occupational Health Services for Municpal Employees, State of the Art Reviews in Occupational Medicine, Jan. 2001, 16:1, P. 11-23

15. Pye, H., Orris, P. Workers Compensation in the United States and the Role of the Primary Care Physician, Primary Care: Clinics in Office Practice 2000 December; 27(4): 831-844

16. Springs-Phillips, S. Pye, H. Orris, P. A Health Hazard Evaluation, Illinois Morbidity and Mortality Revi1999, P. 10-16

17. Reissman, D., Orris, P., Lacey, R., Hartman, D. Downsizing, Role Demands, and Job Stress, JOEM, 1999 April; 41(4): 289-94

18. Orris, P., Hartman, D., Strauss, P., Anderson, R. Collins, J., Knopp, C., Xu, Y., Melius, J. Stress Amongst Package Truck Drivers, Am J Ind Med, 1997 Feb; 31(2):202-210.

19. Brodkin, C.A., Frumkin, H., Kirkland, K.H., Orris, P., Schenk, M. AOEC Position Paper on the Organizational Code for Ethical Conduct, J Occup Environ Med. 1996 Sep; 38(9): 869-81

20. Thornton, J., McCally, M., Orris, P., Weinberg, J. Hospitals and Plastics. Dioxin Prevention and Medical Waste Incinerators Public Health Rep. 1996 Jul; 111(4): 298-313

21. Higgins, P. , Orris, P. The Mystery of Plum Grove, IL Morb and Mort Rev. 1994: 1(2):15-7.

22. Demers, M., Orris, P. Occupational Aspects of Asthma Mortality in Chicago (Letter) JAMA. 1994 Nov; 272(20): 1575

23. Targonsky, P, Persky, V., Orris, P., Addington, W. Trends in Asthma Mortality

Among Blacks and Whites in Chicago, 1968-1991., Am J Pubic Health. 1994 Nov; 84(11): 1830-3.

24. Demers, R.Y., Kemble, S., Orris, M. and Orris, P. Family Practice in Cuba: Evolution into the 1990's, Fam Pract. 1993 Jun; 10(2):164-68.

25. Strauss, P, Orris, P, Buckley, L. A Health Survey of Toll Booth Workers Am J Ind Med. 1992; 22(3): 379-84

26. Orris, P., Kahn, G., Melius, J. Mortality Study of Chicago Firefighters (Abstract), Revue D'Epidemiologie Et De Sante Publique. 1992; 40 (Supp. 1):S90-1, also in Archives Des Maladies Professionnelles, 1992; 53: 561-2.

27. Marder, D., Targonsky, P., Orris, P., Persky, V., Addington, W. Effect of Race and Socioeconomic Status on Asthma Mortality in Chicago, 1992 Jun; Chest, 101 (6 suppl): 426S-429S.

28. Ugolini, C. Watkins, J. Hessl, SM. Coe, J. Grammar, L. and Orris, P. Chronic Hypersensitivity Pneumonitis Caused by Diphenylmethane Diisocyanate Followed by Acute Hypersensitivity Pneumonitis After Exposure To A Toluene Diisocyanate Alkyd Paint, (Abstract) Am Rev Respir Dis; 145(4 Part 2) 1992 A492

29. Rubin, R. Orris, P., Lau, S., Hryhorczuk, D. Furner, S. and Letz, R. Neurobehavioral Effects Of The On-Call Experience In House staff Physicians, J Occup Med. 1991 Jan; 33(1): 13- 18

30. Himmelstein, D.U. et. al. A National Health Program for the United States: A Physician's Proposal, NEJM, 1989 Jan; 320(2): 102-108.

31. Kahn, G., Orris, P., Weeks, J. Acute Overexposure To Diesel Exhaust: Report of 13 Cases, Am J Ind Med. 1988; 13(3): 405-6.

32. Orris, P., Interview with Antonio Granda Ibarra, M.D., Jour of Occupational Med, 29:3, P. 234-6, March, 1987.

33. Orris, P., Kominsky, J.R., Hryhorczuk, D., Melius, J. Exposure to Polychlorinated Biphenyls From An Overheated Transformer, Chemosphere. 1986; 15(9-12): 1305-12

34. Hyhorczuk, D., Orris, P., Kominsky, J.R., Melius J., Burton, W, Hinkamp, D. PCB,

PCDF, and TCDDExposure Following a Transformer Fire: Chicago, Chemosphere. 1986; 15 (9-12): 1297-1303

35. Rosenstock, L., Orris, P. Research Colloquium On Occupational Respiratory Diseases: A Conference in Cuba(1984), Arch of Environ Health. 1986 Jul; 41(4): 266-268

36. Orris, P., et. al. Chloracne In Firefighters, (Letter), Lancet. 1986 Jan; 1(8474): 210-211

37. Hryhorczuk, D.O., Rabinowitz, M.B., Hessl, S., Hoffman, D., Hogan, M., Mallin, K., Finch, H., Orris, P., and Berman, E. Elimination Kinetics of Blood Lead in Workers With Chronic Lead Intoxication, Am J Ind Med. 1985; 8(1): 33-42

38. Hryhorczuk, D.O., Hogan, M.M., Mallin, K., Hessl, S.M., and Orris, P. The Fall of Zinc Protoporphyrin in Workers Treated For Chronic Lead Intoxication, J Occup Med. 1985 Nov; 27(11): 816-820

39. Layon, J. Idris, A. Warzynski, M. Sherer, R. Brauner, D. Patch, O. McCulley, D. and Orris, P. Impaired Immunologic Function In Hospitalized Intravenous Drug Abusers, Arch Intern Med. 1984 Jul; 144 (7): 1376-1380.

40. Kahn, H.S., Orris, P., The Emerging Role of Salaried Physicians: An Organizational Proposal J Public Health Policy. 1982 Sep; 3(3): 284-292

41. Orris, P. Kennedy, M.J. Guerriero, J. Hessl, S.M. Hryhorczuk, D.O. and Hoffman, D. Activities Of An Employer Independent Occupational Med Clinic Am J Public Health. 1982 Oct; 72(10) 1165-7

42. Orris, P. Sociology of Health and Medical Care: Citizen Involvement in Cuba: 1959-1980 Sociology of Medicine Series, No. 81, Red Feather Institute for Advanced Studies in Sociology, Livermore, Colorado, December, 1980, Revised September, 1981,

43. John, E.R., Kimmelman, D.R, Haas, J., Orris, P.. The Cuban Health System Social Policy. 1971 Jan; 41-46,

Other Refereed Material:

1. Orris, P. (translator) The Introduction to the 1965 Cuban Government's Occupational Health and Safety Manual, With a Statement From Dr. Ernesto Che Guevara NEW SOLUTIONS 29(1) 1–7 February, 2019

2. Orris, P. In Memoriam: Max P. Pepper (Editorial), Journal of Public Health Policy, 38:1, 2017, P.1

3. Brodkin, D. et. Al. Recommended Human Health Indicators For Assessment Of Progress On The Great Lakes Water Quality Agreement in the 2012-2015 Priority Series International Joint Commission Canada And United States June 20, 2015

4. Shimek, J, Emmanuel, J, Orris, P, Chartier, Y Replacement of mercury thermometers and sphygmomanometers

5. in health care: technical guidance , World Health Organization, 2011 ISBN: 978 92 4 154818 2
http://www.who.int/water_sanitation_health/publications/2011/mercury_thermometers/en/inde x.html

6. Halpin, J., Buchanan, S., Orris P., Hotel Housekeeper Injuries: Analysis In The Face Of Incomplete Data, (Abstract) International Commission on Occupational Health, Milan, Italy June 2006

7. Orris, P. Dioxins and Health by Schechter and Gasiewicz, (book review), Journal of Occupational & Environmental Medicine, JOEM, 47:4, April 2005, P. 436

8. Orris, P. Fifty Years of Hope and Concern for the Future Of Occupational Medicine (letter), JOEM, 46:6, June 004, P. 515

9. Meeks, P., Orris, P. Petrochemical Production And Community Health (Abstract) Proceedings, Eighth World Congress on Environmental Health, Durban, South Africa, February 24, 2004

10. Orris, P. Forst, L. Obstacles And Opportunities Presented By Globalization For Occupational And Environmental Health (Abstract) Proceedings, Eighth World Congress on Environmental Health, Durban, South Africa, February 23, 2004

11. Obafemi, A. Orris, P. Lead Toxicokinetics and Treatment, Proceedings International Seminar on Environmental and Occupational Lead Intoxication, Havana, Cuba, May,

1999, (in Press)

12. Frumkin, H., Orris, P., Evidence of Excess Cancer Mortality in a Cohort of Workers Exposed to Polychlorinated Biphenyls (Letter), JOEM, 1999 Sept; 41(9), 741-2
13. Brodkin, CA. Frumkin, H. Kirkland, KH. Orris, P. Schenk, M. Mohr, S. Choosing a Professional Code for Ethical Conduct in Occupational and Environmental Medicine (Editorial), JOEM, 1998 Oct; 40(10), 840-2
14. Connett, P. et. al. Deep Concern about ICEM-CCC Sustainability Agreement (Ltr),New Solutions, 1997;7(3),10-2
15. Orris, P. Asbestos (Letter), Scientific American, Sept. 1997,
16. Orris, P., Book Review: Healing the Masses: Cuban Health Politics at Home and Abroad, Jr of Pub Hlth Pol, 1996; 17(2), 244-6
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Orris P. Climate Change and Health, Hospitalist Grand Rounds, Rush University Medical Center, Chicago October, 2018

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Orris P. Greening of Health Care, Research and Training Centre for Community Development, Hanoi, Vietnam August 23, 2017

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