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SCIENTIFIC SESSION I

Public health preparation for response to an airborne hazard, the expansion of the semiconductor industry & Cancer risks from consumer products: Strategies to reduce risk

1. Implications of the Precautionary Principle for airborne infection pandemic preparedness. *Donald Milton, USA*

2. Emerging PPE considerations for protecting healthcare workers and the general population during public health emergencies. *Jeffrey Stull, USA*

3. Public health preparedness for response to an airborne hazard in Thailand. *Somkiat Siriruttanapruk, Thailand*

4. The international expansion of the semiconductor industry: Challenges to workers and environmental health and possible responses. *Joe LaDou, USA*

5. Health and safety in the semiconductor industry. *Robert Harrison, USA*

6. Continuing to challenge the chip: International interventions on semiconductor work environments and wider environmental health. *Andrew Watterson, United Kingdom*

7. Some consumer products recently evaluated by the IARC Monographs. *Kurt Straif, Spain and USA*

8. The carcinogenicity of electronic vaping fluids and use of electronic nicotine devices. *David Christiani, USA*

9. Exploring the link between everyday chemicals and breast cancer: Unveiling associations with exposure to personal care and consumer products. *Susan Teitelbaum, USA*

Implications of the Precautionary Principle for airborne infection pandemic preparedness

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Background: The toll of illness and death among healthcare and other "essential" workers during the COVID-19 pandemic and the overwhelming evidence for airborne transmission of SARS-CoV-2 created a wave of interest in non- pharmaceutical infection transmission controls – including PPE and engineering controls. The precautionary principle suggests that we should protect vulnerable workforces and populations against the possibility of airborne transmission. But recent policy changes indicate that we may be retreating rather than advancing control efforts.

Brief description of presentation: We will start with a brief review evidence for aerosol inhalation as the dominant mode of transmission of coronaviruses and influenza viruses. Next, we will look at the so called "pragmatic" intervention studies of masks and respirators in healthcare and how the ubiquity of airborne viruses during epidemics complicates control. The "pragmatic" studies have been interpreted to essentially suggest that effective control cannot be achieved resulting in a policy of surrender.

Implications to improve human health or environmental outcomes: The well-known (in occupational health and hygiene communities) problems of reliance on PPE as first-line controls indicate that a new system of integrated infection protection and control policies is urgently needed. In the absence of data clearly demonstrating how to achieve effective control, advocates from labor and academia are losing the policy battles.

Identification of specific steps going forward to improve human health or environmental outcomes (e.g., fill data gaps, needed policies or regulations, dissemination plan): To move forward, we need to design specific, workable, and effective policies for specific work environments, and implement controlled studies that can test and refine them until we can demonstrate clearly what airborne infection control looks like, and that it works.

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Emerging PPE considerations for protecting healthcare workers and the general population during public health emergencies

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Background: The COVID-19 pandemic and prior serious virus outbreaks focused attention on a number of interventions for mitigating disease transmission in both the healthcare sector and for the general population. These events provided scrutiny for using PPE as an intervention approach and identified gaps in product designs, use strategies, and overall awareness of effectiveness, especially as adaptations were made in response to consequent disruptions in PPE availability.

Brief description of presentation: The range of PPE used in major infectious disease events will be described in terms of its positioning for protection, particularly in addressing airborne respiratory hazards when contrasted with historically defined disease transmission modes used in infection control. Examples of studies for assessing PPE performance attributes will be cited as evidence of gaps in protection practice including frequent changes in PPE guidance. The recent case for rapidly creating a new face covering standard with potential workplace protection levels as a mitigation approach will also be highlighted. Specific recommendations will be presented for advancing PPE standards as applied to manufacturers and in addressing end user selection, use, and care that have lacked coordination and consistency.

Implications to improve human health or environmental outcomes: This presentation urges applying the lessons learned from the COVID-19 pandemic and other public health emergencies for developing appropriate PPE product and use requirements as an effective means for controlling disease transmission when coupled with other intervention strategies. An overarching strategy is also needed to educate healthcare workers and other affected individuals to maximize PPE effectiveness and allow for scale-up during future pandemics.

Identification of specific steps going forward to improve human health or environmental outcomes (e.g., fill data gaps, needed policies or regulations, dissemination plan): Global and national regulatory agencies must implement standards, practices, and surveillance programs for better governing appropriate PPE selection/use for both protection and infection control. This implementation should be directed to regulators, PPE manufacturers, and principal end user organizations and include elements of product conformity assessment and training.

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Public health preparation for response to an airborne hazard in Thailand

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Background: An airborne hazard, such as the COVID-19 virus, is one of the major public health problems worldwide including in Thailand. The aims of this presentation are to describe and review the policy and implemented measures from the Department of Disease Control (DDC) and other relevant agencies in Thailand for preparation and response to the COVID-19 infection from the beginning of the outbreak until now.

Brief description of presentation: The DDC has one main function for preparation and response to all health hazards, including an airborne hazard, under the national Emergency Operation Center (EOC). The structure of EOC under DDC consists of an incident commander, strategic & information section, and operation & support section. Since the first outbreak of COVID-19 in China was detected, DDC had set up the EOC to prepare and respond to the disease. The main activities included development of policy and guidelines, disease surveillance and outbreak investigation, implementation of preventive and control measures, health risk communications and information sharing, provision of vaccine, and empowerment of health officers throughout the country. Specific control measures were also developed and supported for some specific groups such as the Bubble and Seal project for workers in enterprises, community isolation for rural communities, and suitable innovations for disease prevention among healthcare workers.

Implications to improve human health or environmental outcomes: Public health preparation and response to an airborne hazard is an important role for the public health authority in every country. The policy, infrastructure, technical know-how and resource support are essential components for prevention and control of the problem.

Identification of specific steps going forward to improve human health or environmental outcomes (e.g., fill data gaps, needed policies or regulations, dissemination plan): Despite the continuously improving COVID-19 situation, strengthening the health system, establishing collaboration of relevant agencies, and improving knowledge and capacity building among staff are still needed. Outcomes and lessons learned from our experiences should be shared and discussed for further development.

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The international expansion of the semiconductor industry: Challenges to worker and environmental health and possible responses

Joseph LaDou
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Background: Semiconductor chips have become the foundation of modern economic prosperity, military strength, and geopolitical power. Over the past half century, the US semiconductor industry exported most of its chip manufacture, primarily to Asia. The offshoring of chip production was in large part a result of the increasing costs of environmental regulation and enforcement in the United States. Environmental issues were simply transferred to other countries.

Brief description of presentation: The most advanced chip research and design technology is dominated by the United States, Europe, and Japan. However, individual companies willing to invest in advanced technology are challenging industry leaders. Taiwan Semiconductor Manufacturing Company (TSMC) now produces 90 percent of the most advanced chips in the world. Advanced Semiconductor Materials Lithography (ASML), a Dutch firm, is the only company that produces and sells extreme ultraviolet lithography systems for chip production reduced to 5 nm and 3 nm. Taiwan's TSMC and South Korea's Samsung Electronics currently produce chips smaller than 5 nm, and they are engaged in a race to produce the 2-nm chip. The United States does not produce any of the highest-performance chips.

Implications to improve human health or environmental outcomes: The new chips will soon reform the computer industry. Quantum computers will have exponential increases in speed and capability. Cybersecurity with quantum computing will be a serious challenge to national security. Under intense pressure from the Department of Defense, the United States passed The CHIPS Act of 2022 to provide $52 billion to US semiconductor companies, to revitalize the country's chip industry. As a result, many semiconductor companies will be making chips for the first time outside of Asia.

Identification of specific steps going forward to improve human health or environmental outcomes (e.g., fill data gaps, needed policies or regulations, dissemination plan): The European Union is advancing its own CHIPS Act to remain competitive. Korea and Japan are greatly expanding their chip industries. China has announced $143 billion in chip subsidies and support for domestic manufacturing to counter US export restrictions and curbs.

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Health and safety in the semiconductor industry

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Background: Chemicals used in the manufacturer of semiconductors pose a risk to the health of workers and the community. Since the advent of the semiconductor industry more than 50 years ago, occupational and environmental exposures to chemical toxicants have increased the risk of many acute and chronic diseases. The use of chemicals in the global semiconductor manufacturing process has largely outpaced the resources, and authority of the scientific community, worker and community organizations to identify and prevent these diseases. Without the requirements to protect the safety and health of workers and the community from chemical exposure, the CHIPS Act of 2022 may cause a range of clinical and health problems.

Brief description of presentation: The scientific evidence for acute and chronic diseases caused by chemical exposure in the semiconductor will be reviewed. In spite of challenges in conducting epidemiological studies in this industry, there is consistent evidence that a range of reproductive, neurological, respiratory and cancer health effects have occurred as a result of acute and long-term exposures to chemicals used in semiconductor manufacturing.

Implications to improve human health or environmental outcomes: The use of toxic chemicals in semiconductor manufacturing is not controlled or regulated in many parts of the world and continues to be a risk to the health of workers and the community. There are many examples of occupational and environmental health practices that can eliminate this threat.

*Identification of specific steps going forward to improve human health or environmental outcomes (e.g., fill data gaps, needed policies or regulations, dissemination plan):*It is imperative that worker and community health be considered as a human health cost as semiconductor manufacturing increases under the CHIPS Act. Investors and manufacturers should be required to establish, implement and fund comprehensive occupational and public health programs that include the monitoring and treatment of occupational diseases.

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Continuing to challenge the chip: International interventions on semiconductor work environments and wider environmental health

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Background: Governments, the electronics industry, regulators, at times professionals and trade unions (TUs) have often failed to protect workers and communities in and around chip plants as earlier presentations in this session have demonstrated.

Brief description of presentation: The focus is on global and local precautionary and preventive upstream and downstream measures available to better protect chip and other workers and communities along supply and disposal chains. Key principles of workplace and environmental justice are outlined with tools for use at different levels. Earlier successful examples of grassroots resistance to chip working conditions provide an effective downstream multi-pronged template for campaigns to guide us now. Workers, their families, TUs, NGOs, sympathetic occupational health professionals, scientists all played a part. Samsung workers and supporters showed how to hold transnational chip companies and their plants to account for workplace ill-health. Disseminating more information already gathered in Asia and US for example by NGOs and TUs on chips will also be critical.

Implications to improve human health or environmental outcomes: Workplace justice principles address occupational, health, safety, labour and environmental conditions in ILO and WHO reports and charters. These can underpin initiatives currently being developed by NGOs and TUs in the US and Europe. They will be strengthened by climate change and sustainability campaigns and IPCC and UNEP reports. Fine principles, however, change nothing in chip factories if they are ignored. Some of the most important tools we can adopt relate to those available to either build or further develop TU workplace organisation and community action. These may connect to effective national Fair Work and Toxics Use Reduction policies more detailed green chemistry research.

Identification of specific steps going forward to improve human health or environmental outcomes (e.g., fill data gaps, needed policies or regulations, dissemination plan): Opportunities now exist to build stronger alliances between SCI workers, community and environmental groups based on greater knowledge about industry impacts on water resources, air pollution, climate change and the threats from such chemicals as PFAS.

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Dr Watterson PhD CFIOSH is Emeritus Professor of Health, Faculty of Health Sciences at the University of Stirling. He has worked on a range of occupational and environmental health subjects for workers and communities, both internationally and nationally, relating primarily to risk assessments, disease recognition, regulation and enforcement.

Some consumer products recently evaluated by the IARC Monographs

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Background: Consumer products are defined as products purchased for personal, family, or household use. Many agents that fall under this definition have been evaluated by the IARC Monographs programme or have been announced for re- evaluation in the near future. This presentation will focus on two relatively recent evaluations of consumer products that attracted some media attention.

Methods: In June 2023, the carcinogenicity of aspartame has been evaluated by the Volume 134 Working Group of the IARC Monographs programme. This presentation summarizes and discusses the conclusion of the WG and the related WHO/FAO JECFA dietary risk assessment and presents results of a multi-cancer case-control study on aspartame and sugar consumption. The second part focuses on the evaluations of processed meat and red meat by the Volume 114 Working Group of the IARC Monographs programme in October 2015 and puts it into the broader perspective of the climate crisis.

Results: Aspartame has been classified as "possibly carcinogenic to humans", Group 2B, based on "limited evidence" in humans, in experimental animals and for selected key characteristics of carcinogens. The summary report in The Lancet Oncology noted an impressive list of statistically significantly increased cancers, in two species and two sexes of rodents. Based on these observations a not further qualified minority of the Working Group evaluated the carcinogenicity in experimental animals as "sufficient". Further, detailed results of a recent case-control study will be presented and discussed in context of the conclusion of the IARC Working Group. Processed meat and red meat have been classified as "carcinogenic to humans" (Group 1) and "probably carcinogenic" (Group 2A).

Conclusions and identification of several uses of the findings to improve human health or environmental outcomes (e.g., share with affected parties and decision makers, community involvement, additional work needed to evaluate scale-up results): While there is no clear evidence on benefits of aspartame in terms of weight control, but an obvious nexus between meat production and the climate crisis, these consumer products are consumed by large proportions of the population and may cause cancer.

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Dr. Kurt Straif is Research Professor at Boston College, MA, USA and Associated Research Professor at ISGlobal, Barcelona, Spain. His research focus is on cancer prevention and more recently expanding to COVID-19 as well as climate crisis and health.

The carcinogenicity of electronic vaping fluids and use of electronic nicotine devices

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Background: Electronic nicotine vaping is of growing concern among youth. In 2019, CDC reported that about 27.5% of US youth vaped; with a slight decline during the pandemic to 19.6%. The cancer-causing potential of Electronic Vaping Devices (ENDS) is an area of active research.

Brief description of presentation: This presentation will review recent data on the carcinogenic properties of ENDS exposures. Studies have detected a complex mixture of exposures that include a number of carcinogens, including formaldehyde, acetaldehyde, acrolein, benzene, solvents, and nitrosamines. Animal studies, in vitro studies and human biomarker studies are all producing results that will inform carcinogenic risk assessment of these products.

Implications to improve human health or environmental outcomes: 1. Reduce cancer risk. 2. Reduce non-cancer associated toxicity.

Identification of specific steps going forward to improve human health or environmental outcomes (e.g., fill data gaps, needed policies or regulations, dissemination plan)

Examples may include:

1. Fill knowledge data gaps on cancer risk.
2. Inform policies re restrictions in sales to youth.
3. Policies for warning labels.
4. Public health messaging regarding warnings not to start vaping if never exposed to nicotine products.
5. FDA regulation of all vaping products.
6. Counter tobacco industry claims regarding risk reduction and professed health benefits of ENDS.

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Exploring the link between everyday chemicals and breast cancer: Unveiling associations with exposure to personal care products

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Background: Personal care products (PCPs) encompass a variety of items like facial cleansers, moisturizers, makeup, hair care products, deodorant, fragrances, nail care products, and personal hygiene products. Women typically use multiple PCPs each day, with estimates ranging from 5 to 15 products. Many PCPs contain endocrine disrupting chemicals (EDCs) such as phthalates, phenols, benzophenones, and parabens. Although many of these chemicals have a short half-life, women's exposure is relatively consistent due the regular and continuous use of PCPs. Concerns about breast cancer risk associated with EDC exposure from PCPs are increasing. *Methods:* To investigate this, the population-based case-control study, Long Island Breast Cancer Study Project, was conducted enrolling newly diagnosed breast cancer cases and frequency age-matched controls who were never diagnosed with breast cancer. Participants provided questionnaire responses during in-person interviews and donated blood and urine samples that were analyzed for EDCs by the CDC. Multivariable logistic regression analysis was used to estimate the associations between different EDC metabolites and breast cancer risk. Effect modification by body mass index (BMI) was also investigated. *Results:* The highest (vs lowest) quintiles of urinary parabens showed associations with increased breast cancer risk (ORs ranging from 1.31 to 1.50). Associations were stronger among women with lower body mass index (BMI). In contrast, several phthalate metabolites were inversely associated with breast cancer risk. *Conclusions and identification of several uses of the findings to improve human health or environmental outcomes (e.g., share with affected parties and decision makers, community involvement, additional work needed to evaluate scale-up results):* Many environmental phenols as well as phthalates are known endocrine disruptors and are thus biologically plausible breast carcinogens. The study results suggest a potential positive association between paraben exposure and breast carcinogenesis, while phthalates did not show an increased risk. However, caution is needed due to the limitations of urine sample collection occurring after breast cancer diagnosis. Prospective studies are needed for confirmation. If confirmed, the findings have implications for the widespread use of these chemicals in personal care products.

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Dr. Teitelbaum is a Professor in the Department of Environmental Medicine and Public Health at the Icahn School of Medicine at Mount Sinai. She is the Director of the Division of Environmental Epidemiology as well the Director of the Human Health Exposure Analysis Resource (HHEAR) Data Center. Her research focuses on exposure to environmental chemicals and human health.

SCIENTIFIC SESSION II

Pesticides: Exposure, health effects, approaches to risk reduction, Asbestos: Past, present and future & Extreme weather: Identifying threats and developing preparedness plans

1. A systematic review and meta-analysis of organophosphate and carbamate insecticide exposure and sperm concentration. *Melissa Perry, USA*

2. Mapping the key characteristics of carcinogens for glyphosate and its formulations: A systematic review. *Luoping Zhang, USA*

3. Glyphosate exposure: A South American exploratory study using the technique of immunoassay. *Amalia Laborde Garcia, Uruguay*

4. Real life exposure to pesticides and its role in improved assessment of health risks. *Paul Scheepers, The Netherlands*

5. Tomato and olive micronutrients as potential population remediation strategy in beta- hexachlorocyclohexane contaminated areas. *Sara Fiorini, Italy*

6. Past, current and future lessons from the study of asbestos. *Arthur Frank, USA*

7. The asbestos experience in Casale Monferato. *Corrado Magnani, Italy*

8. The enforcement of banning asbestos in Brazil: Past mistakes and future challenges. *Fernanda Giannasi, Brazil*

9. Corporate defiance and continued use of asbestos in USA. *Linda Reinstein, US*

10. Does screening for asbestos-related disease matter? *Steven Markowitz, USA*

11. How the legal system in the United States both improves and harms public health. *Christian Hartley, USA*

12. Preparing for severe weather and climate events: Today is not the new normal. *Kristie Ebi, USA*

13. The role of epidemiology and public health in managing flood risks from climate change. *Sari Kovatz, United Kingdom*

14. Wildfire risk and health protection in a changing climate. *Sotiris Vardoulakis, Australia*

15. Extreme events, disasters and health impacts in Indonesia. *Budi Haryanto, Indonesia*

16. Natural disasters: Lessons learned from hurricane Maria. *Carlos Santos-Burgoa, Mexico and USA*

A systematic review and meta-analysis of organophosphate and carbamate insecticide exposure and sperm concentration

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Background: Evidence of the negative impacts of contemporary use insecticides on sperm concentration has mounted over the last few decades but very few systematic reviews and meta-analyses of the epidemiologic evidence have been conducted.

Methods: Scientific and United States governmental databases and five non-governmental organization websites were searched for relevant primary epidemiology studies published in any language through August 11, 2022. Risk of bias and strength of evidence were evaluated according to validated systematic review methodology. Bias-corrected standardized mean difference values were calculated and pooled using a three-level, multivariate random-effect meta-analysis model with cluster-robust variance estimation.

Results: Across 20 studies, 21 study populations, 42 effect sizes, and 1,774 adult men, the standardized mean difference in sperm concentration between adult men more- and less-exposed to organophosphate (OP) and N-methyl carbamate (NMC) insecticides was -0.30 (95% CI: - 0.49, -0.10; PSatt < 0.01). Whereas the pooled association was affected by risk of bias, insecticide class, exposure and exposure and recruitment setting, negative associations persisted across all meta-analyses. The accumulated body of scientific information was found to have sufficient evidence of an association between adult OP and NMC insecticide exposure and reduced sperm concentration.

Conclusions and identification of several uses of the findings to improve human health or environmental outcomes (e.g., share with affected parties and decision makers, community involvement, additional work needed to evaluate scale-up results): This comprehensive investigation found sufficient evidence of an association between OP and NMC insecticide exposure and reduced sperm concentration in adults. While mechanistic studies can fill data gaps, the strength of evidence strongly warrants reducing exposure to OP and NMC insecticides now to prevent continued male reproductive harm.

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Dr. Perry is Professor and Dean of the College of Public Health at George Mason University. Dr. Perry does research in Environmental and Occupational Epidemiology, Reproduction, and Public Health. Her lab investigates chemical impacts on human reproduction, with a focus on pesticide exposures and sperm abnormalities including aneuploidy. Her current work includes legacy and contemporary pesticide exposures in the environment including OCs, glyphosate and neonicotinoids.

Mapping the key characteristics of carcinogens for glyphosate and its formulations: A systematic review

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Background: Glyphosate was classified as a probable human carcinogen by IARC in 2015. Since then, numerous studies of glyphosate and its formulations (GBF) have emerged. Many of them can be evaluated for cancer hazard identification with the newly described approach of ten key characteristics (KC) of carcinogens. Our objective was to assess all human/mammal studies that compared exposure to glyphosate/GBF with low/no exposure counterparts for evidence of the ten KCs.

Methods: A detailed protocol (INPLASY202180045) with PRISMA guidelines was registered. Two blinded reviewers screened all mechanistic studies reporting any KC-related outcome available in PubMed. Studies that met inclusion criteria underwent data extraction conducted in duplicate for each KC outcome reported along with key aspects of internal/external validity, results, and reference information. These data were used to construct a matrix that was analyzed in program R to conduct strength of evidence and quality assessments.

Results: Of the 2537 articles screened, 175 articles met the inclusion criteria. Data analysis revealed strong evidence for five KCs, limited evidence for two KCs, and inadequate evidence for three KCs. Our in-depth quality analyses of genotoxicity (KC2) and endocrine disruption (KC8) revealed strong and consistent positive findings. For genotoxicity, we found studies conducted in humans provided stronger positive evidence than animal studies; GBF elicited a stronger effect in human/animal studies when compared to glyphosate alone; and the highest quality studies in humans consistently revealed strong evidence of genotoxicity. Our KC8 analysis indicated glyphosate's ability to modulate hormone levels. The observed modulations provide clear evidence that glyphosate interacts with receptors, alters receptor activation, and modulates the levels and effects of endogenous ligands/hormones.

Conclusions and identification of several uses of the findings to improve human health or environmental outcomes (e.g., share with affected parties and decision makers, community involvement, additional work needed to evaluate scale-up results): Our findings strengthen the mechanistic evidence that glyphosate is a probable human carcinogen and provide biological plausibility for previously reported non-Hodgkin lymphoma associations. We identified potential molecular interactions and subsequent key events that were used to generate a probable pathway to lymphomagenesis.

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Dr. Zhang is an emeritus professor in toxicology at the Division of Environmental Health Sciences, School of Public Health, University of California at Berkeley, where she has worked for more than 30 years to understand the biological mechanisms of chemical exposure-related human cancer. The work presented conforms with the Preferred Reporting Items for Systematic Reviews and Meta-Analysis (PRISMA) guidelines.

Glyphosate exposure: a South American exploratory study using the technique of immunoassay

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Background: Glyphosate is the most applied herbicide in the South American region in both intensive and extensive farming. The main concern of glyphosate exposure is related to its long-term health effects. Considering the controversial estimations of its potential health impact, the widespread and great magnitude of use, there is a need to investigate the magnitude of human exposure.

Methods: Exploratory study was conducted on a convenience sampling of workers, in rural and urban population areas. ELISA Kit (Araxes®) immunoassay was used, for the quantitative detection of glyphosate in urine. The amniomethylphosphic acid (AMPA) metabolite was not measured.

Results: Glyphosate was detected in all urine samples. Agricultural workers showed a mean of 4.66 μg/L. The rural population mean was 3.03 μg/L (2.86 μg/L in adults and 3.50 μg/L in children) and the urban population showed a mean of 2.60 μg/L.

Conclusions and identification of several uses of the findings to improve human health or environmental outcomes (e.g., share with affected parties and decision makers, community involvement, additional work needed to evaluate scale-up results): Results suggest that in any scenario of exposure, occupational or environmental, glyphosate levels in the studied population are in a higher range. Higher levels in children compared to adults have been also described by other research groups and is consistent with the particular vulnerability of children to chemicals exposures.

More research is needed to scale up results in order to understand the high risk scenarios of exposure in Uruguayan population. The immunofluorescence technique permitted us to find glyphosate levels with the expected differences according to the types of exposures. ELISA test must be considered as a tool for screening and bio monitoring in countries with low laboratory testing capacities.

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Real life exposure to pesticides and its role in improved assessment of health risks

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Background: In the European Union the introduction of new pesticides is not possible without providing safety data, in short 'no data – no market'. Once considered safe and introduced on the market, continued use of marketed pesticides is regulated by authorizations with expiration dates. The value of this approach is the addition of new data after the initial market introduction, including data on new product formulations and field applications. New translocation routes from 'farm to fork' may be discovered that were not initially considered at the stage of pre-market evaluation. To address this issue real life exposure to pesticides was studied in a comprehensive human biomonitoring project in 10 European countries.

Methods: Blood, feces and urine was collected from 725 subjects (farmers, neighbors and consumers) during the growing season of 2021 and analyzed for 198 pesticides in blood, 188 in feces and 50 metabolites in urine by LC-MS/MS and GC-MS/MS.

Results: The median number of pesticides detected per blood sample was 2 (range: 0-10) for all participants. Median concentrations ranged from 0.1 to 1 μg/L for 92 pesticides. p,p'DDE was the most abundant compound with 338 detects (45%). Glyphosate was found in the blood of only five subjects (above an LOQ of 0.1 μg/L). In feces 94 pesticides were detected, typically in the 1-10 μg/kg range, but also 10-100 μg/kg or even higher. Glyphosate, fipronil-sulfone, multiple pyrethroids, and several organochlorine pesticides were most frequently detected. This is the first study to report on such a large number of pesticides in human blood. Most pesticides were observed at levels <1 μg/L. The number of pesticides found in feces was substantially higher than in urine (31 were detected).

Conclusions and identification of several uses of the findings to improve human health or environmental outcomes (e.g., share with affected parties and decision makers, community involvement, additional work needed to evaluate scale-up results): In the assessment of the human health risk of marketed pesticides, blood and fecal data are considered of added value for human exposure assessment of pesticides.

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Paul T.J. Scheepers obtained his MSc in environmental sciences at Wageningen University and his PhD in toxicology at Radboud University where he was appointed associate professor in 2007 in risk assessment and molecular epidemiology. In 2003 he founded Research Lab Molecular Epidemiology. Since 2022 his research group and laboratory became part of the Environmental Science cluster of the Radboud Institute for Biological and Environmental Sciences (RIBES) of the Radboud University, Nijmegen, The Netherlands.

Tomato and olive micronutrients as potential population remediation strategy in beta-hexachlorocyclohexane contaminated areas

Fiorini Sara[1], Minacori Marco[1], Paglia Giuliano[1], Altieri Fabio[1], Eufemi Margherita[1], Natali Pier Giorgio[2]

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Background: The beta-isomer of hexachlorocyclohexane (?-HCH) is one of the most widespread and environmentally persistent organochlorine pesticides. It represents a potentially significant health hazard at contaminated sites. Epidemiological surveillance programs on a global scale demonstrated a high plasmatic concentration of ?-HCH in exposed subjects, such as in the populations living in the Sacco Valley, SIN territory south of Rome. Previous cellular and molecular studies performed by our group on both normal and cancer human cell lines demonstrated that ?-HCH activates a wide range of signaling pathways and act as an endocrine disruptor, promoting cellular processes related to carcinogenesis, tumor progression, and chemoresistance. In spite of its small size, ?-HCH has a relevant impact on cellular homeostasis, making it necessary to explore defense strategies against its multifaceted biological effects. Our purpose is identifying a balanced combination of natural chemoprotective compounds to modulate ?-HCH intracellular effects.

Methods: A screening of natural substances was carried out on the above-enlisted cell targets to test their capability to counteract ?-HCH actions by performing viability assay, flow cytometry, and western blot analysis.

Results: Micronutrients from tomato and olive show a dose-dependent significant chemoprotective activity in cell lines by contrasting ?-HCH induced intracellular responses such as anti-apoptotic and pro-metastasizing events, increase in ROS production, and DNA damage.

Conclusions and identification of several uses of the findings to improve human health or environmental outcomes (e.g., share with affected parties and decision makers, community involvement, additional work needed to evaluate scale-up results): These experimental outcomes identified the chemoprotective effects of tomato and olive-derived micronutrients. Thus we hypothesize that these compounds could represent candidate for a "green therapy" approach as a system of remediation or prevention of the human organism against persistent organic pollutants (POPs). We are evaluating an experimental treatment scheme in populations living in Sacco Valley. We will measure changes of plasma markers indicative of POPs-induced toxicity, such as Sod, Catalase, Malondialdehyde in treated individuals compared to the control group.

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Dr. Fiorini Sara is a PhD student in Biochemistry at Sapienza University of Rome, where she works with normal- and cancer- cell lines to better understand the molecular mechanisms of chemical carcinogenesis, and thus identify natural compounds with chemopreventive action.

Past, current and future lessons from the study of asbestos

Arthur L. Frank
Dornsife School of Public Health of Drexel University, Philadelphia. USA

Background: Asbestos related diseases have been known for more than a century, yet this carcinogenic material is still in wide use around the world. This session will review past, current, and future issues regarding asbestos matters.

Brief description of presentation: Still widely used, some countries have banned asbestos while others are attempting bans, and others continue to mine, sell, and use this material. This set of presentations will review the history of use, past successes and science in dealing with bans, what still needs to be done, and what role law courts have and will yet play in such public health issues. Needed research until disease risks no longer exist will be discussed. Attached are the presentations of the other five presenters.

Implications to improve human health or environmental outcomes: Recent history has taught us that stopping the use of asbestos does indeed save lives.

Identification of specific steps going forward to improve human health or environmental outcomes (e.g., fill data gaps, needed policies or regulations, dissemination plan): There is still the need to have more countries ban the use of asbestos. There is also a continuing need to counter the false science that still too often makes its way into the scientific literature.

* **Presenting author profile:**
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Dr. Frank, a Collegium Ramazzini Fellow, is a Professor of Public Health and Chair Emeritus of Environmental and Occupational Health and Professor of Medicine at Drexel University. He has studied asbestos related issues for more than 50 years and has more than 100 publications related to asbestos.

The asbestos experience in Casale Monferrato

Corrado Magnani
University of Eastern Piedmont, Novara, Italy

Background: An asbestos cement factory was active from 1907 to 1986, owned by Eternit in Casale Monferrato. Awareness of asbestos related neoplasms, especially mesothelioma in the area arose in the 1980s from clinical reports and epidemiological studies. Studies were conducted first by the Cancer Epidemiology Unit of the University of Turin and later by the University of Eastern Piedmont to investigate mortality and incidence of asbestos-related diseases in workers and their wives. Mesothelioma risk was investigated also in the general population. Mesothelioma incidence in the general population of Casale Monferrato in 2013 – 2017 was 54/100000 in men and 32/100000 (yearly rates, age adjusted over the EU population). Most studies were supported by local and regional administrations. No support, either financial or technical, was ever provided by Eternit.

Brief description of presentation: The presentation will review the Casale Monferrato experience.

Implications to improve human health or environmental outcomes: Asbestos pollution effected not only the workforce but also the resident community at large. In 1986 an impressive remediation program was started. Now Casale Monferrato is a city with no residual asbestos contamination, as confirmed by repeated airborne measurement campaigns. The impressive number of incident mesothelioma cases (some 50 per year) forced the Local Health Authority to devise a specific organization for their diagnosis and treatment. The evidence of disaster and manslaughter led to several court trials.

Identification of specific steps going forward to improve human health or environmental outcomes (e.g., fill data gaps, needed policies or regulations, dissemination plan): Community involvement can bring about changes. The citizens of Casale Monferrato, the victims and their families, the Trade Unions and other associations, in close agreement with the City Mayor and the Piedmont region administration, were always determined to stop any attempts to restart asbestos cement production after Eternit closed. An association (AFeVA, Association of Families and Victims of Asbestos) was formed in 1988 and is active to promote awareness on asbestos related risks, demand resources for remediation and therapeutic treatment.

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Prof. Magnani is an epidemiologist, formerly Professor of Medical Statistics and head of the Cancer Epidemiology Unit at the University of Eastern Piedmont at Novara and before that a researcher at the Cancer Epidemiology Unit at the University of Turin. He also trained in occupational medicine. He has been active in studying asbestos related disease patterns in Casale Monferrato area, in asbestos workers and in the general population.

The enforcement of banning asbestos in brazil- past mistakes and future challenges

Fernanda Giannasi

Brazilian Association of the Asbestos-Exposed People (ABREA) / Associação Brasileira dos Expostos ao Amianto (ABREA), Sao Paulo, Brazil

Background: Brazil was, until recently, the third largest producer and exporter of asbestos and the fourth largest consumer of this carcinogen in the world. However, in November 2017, the Brazilian Supreme Court (STF), that had previously catered their decisions to corporate interests, prohibited the use of asbestos chrysotile, the only form still in use in Brazil, radically changing the jurisprudence adopted until then.

Brief description of presentation: This presentation focuses on violation of the ban in the state of Goiás, site of Brazil's last remaining asbestos mine. In total disregard of the court's decision, the state legislature passed a law to ensure mining for export purposes that has yet to be struck down. This presentation argues this dynamic constitutes an immoral double standard that furthers environmental racism.

Implications to improve human health or environmental outcomes: There is an urgent need to improve the official Asbestos-Related Disease (ARD) statistics obscured by corporate subterfuge, including extrajudicial agreements and deliberate under-notification. Such maneuvers promote a vacuum or "epidemiological silence", impeding the adoption of stronger public policy.

Identification of specific steps going forward to improve human health or environmental outcomes (e.g., fill data gaps, needed policies or regulations, dissemination plan): Several steps are necessary in the ongoing fight against asbestos in Brazil. First, the Goiás state law must be declared unconstitutional urgently. Second, medical professionals at all levels—from intake, to diagnosis, to palliative care must be better trained to treat and monitor those suffering from ARDs. This monitoring includes compulsory notification of the ARDs and improvement of morbidity and mortality records throughout Brazil. Finally, communities and policymakers must work together to fully decommission asbestos mining sites and remediate lands polluted by this ecological catastrophe promoted by the asbestos industry. These efforts toward environmental justice will only be possible if victims and families affected by asbestos consistently collaborate with watchdog groups to improve monitoring of likely illegal activity moving forward.

*** Presenting author profile:**

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Fernanda Giannasi is a Fellow of the Collegium Ramazzini and past Ramazzini Award recipient. She has been a leader in the fight to have asbestos banned in Brazil.

Corporate defiance and continued use of asbestos in the USA

Linda Reinstein
Asbestos Disease Awareness Organization, Redondo Beach, CA, USA

Background: Despite the known risks, United States (US) imports and uses asbestos in a number of industries including construction, automotive, and manufacturing. With 20 years of policy and regulatory experience, this presentation explores corporate defiance and its impact on public health, the use of asbestos in the US, and the importance of addressing this issue.

Brief description of presentation: Using corporate documents from Borel v. Fiberboard Paper Products Corporation which established accountability and liability in the failure to warn, it will be discussed how misinformation was submitted to the government in attempts to legitimize asbestos imports, use, and negate liability. It will also discuss the role of public health advocacy within Congress and federal agencies. Using the drafting, enactment and implementation of the Lautenberg Chemical Safety Act to reform the Toxic Substances Control Act (TSCA) as an example, it will expose the 21st century corporate playbook, highlighting the obstacles and opportunities overcome through making asbestos a priority in the risk evaluation and management process. Also discussed will be three ADAO v. US Environmental Protection Agency legal wins to advance rulemaking and protection of public health, as will be the legislative efforts regarding the Alan Reinstein Ban Asbestos Now Act of 2023.

Implications to improve human health or environmental outcomes: These topics have had a profound impact on public health. The implications for this presentation are significant, as it highlights the urgent need for continued activism and regulation to address this issue. There will be a discussion of the best practices for raising public awareness, advocating for stronger regulations and safer alternatives to the use of asbestos, and corporate accountability.

Identification of specific steps going forward to improve human health or environmental outcomes (e.g., fill data gaps, needed policies or regulations, dissemination plan): There will be discussion of how to improve data, develop and implement stronger policies and regulations, disseminate educational materials to lawmakers, media, vulnerable communities, and the general public to prevent asbestos exposure to be able to prevent future all asbestos-related diseases.

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Reinstein Linda - E-mail contact: linda.reinstein@gmail.com
Since 2004, Linda Reinstein has been dedicated to preventing asbestos exposure and eliminating all asbestos- related diseases. As president and cofounder of Asbestos Disease Awareness Organization (ADAO), Linda leads global strategic educational efforts, engages with lawmakers, and established the influential "Asbestos: Art, Advocacy and Academia" project to drive significant change. ADAO's current focus is the passage of the Alan Reinstein Ban Asbestos Now Act, named after Linda's late husband, Alan, who tragically succumbed to mesothelioma.

Does screening for asbestos-related diseases matter?

Steven Markowitz[1], Albert Miller[2]

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Background: Asbestos causes lung and pleural fibrosis and lung, mesothelioma, laryngeal, ovarian, and likely selected gastrointestinal cancers. Prevention of exposure is paramount, but secondary prevention (early detection), tertiary prevention (limiting disease impact) and treatment are of great importance to the many people who have been exposed to asbestos in the past.

Brief description of presentation: Randomized clinical trials of occupational disease, including those caused by asbestos, are few to none, necessitating the extrapolation of screening and treatment trials of other diseases or diseases with other causes to occupational diseases. Pirfenidone and nintedanib have been shown to lower functional progression in people with idiopathic pulmonary fibrosis (IPF), a rapidly progressive form of pulmonary fibrosis, but have only been used sporadically in people with asbestosis and other non-IPF pulmonary fibroses. Annual low dose chest computerized tomography (CT) scan is effective at detecting lung cancer at early stages with associated reduction in lung cancer mortality. Low dose chest CT scan is also more sensitive and specific than the chest x-ray in the assessment of asbestos-associated lung and pleural fibrosis. Further reduction in the radiation dose of chest CT scan, increasing availability of CT scanners, and price reduction may promote the periodic use (every 3 to 5 years) of low dose chest CT scan in the surveillance of asbestos-related fibrosis. Neither low dose chest CT scan nor blood, pleural fluid or exhaled breath biomarkers have emerged as valid means of early detection of malignant mesothelioma.

Implications to improve human health or environmental outcomes: Progress has been achieved in the surveillance and detection of selected asbestos-related diseases, especially its most common cause of mortality, lung cancer.

Identification of specific steps going forward to improve human health or environmental outcomes (e.g., fill data gaps, needed policies or regulations, dissemination plan): Identifying and enrolling asbestos-exposed populations in well-organized screening and surveillance programs that use periodic low dose chest CT scanning will reduce lung cancer mortality and promote improved identification of people with asbestos-related fibrosis.

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Dr. Markowitz is a physician specializing in occupational and environmental medicine and is Director of the Center for the Biology of Natural Systems and Professor of Environmental Sciences at Queens College, City University of New York. He currently directs the Worker Health Protection Program, a medical screening program for former Department of Energy workers. He is a Fellow of the Collegium Ramazzini.

How the legal system in the United States both improves and harms public health

Christian Hartley
Maune, Rachle, Hartley, French and Mudd Law Offices, Mount Pleasant, SC, USA

Background: The unique system of civil justice in the United States, based loosely on the legal premise that money can compensate for injuries, has had both positive and negative effects on the state of public health, both in the United States and worldwide. In addition to the systems for civil compensation, the United States (US) legal system has impacted the regulation of public health and the environmental regulations in positive and negative ways.

Brief description of presentation: There will be a review of how science can influence public health.

Implications to improve human health or environmental outcomes: By its very nature, the US legal system and regulations relating to public health and the environment have trailed the development of medical and scientific knowledge. More recently, wealthy interests have sought to influence civil litigation and regulations through outcome-oriented publications in relation to a variety of exposure, including asbestos. The main issues are the carcinogenicity and potency of chrysotile asbestos for causing mesothelioma. This presentation focused on some positive and negative outcomes that illustrate the positive and negative developments resulting from the interaction between public health and the US legal system.

Identification of specific steps going forward to improve human health or environmental outcomes (e.g., fill data gaps, needed policies or regulations, dissemination plan): With honest science public health will be benefitted.

*** Presenting author profile:**
Hartley Christian - E-mail contact: chartley@mrhfmlaw.com
Mr. Hartley is an attorney practicing asbestos-related law for many years and currently his firm, of which he is a partner, only handles cases of mesothelioma. His work involves cases all over the United States.

Preparing for severe weather and climate events: Today is not the new normal

Kristie L. Ebi
University of Washington, Seattle, WA, USA

Background: In recent decades, heatwaves worldwide increased in frequency, intensity, and duration. Heatwaves cause excess morbidity and mortality as well as increase adverse pregnancy outcomes and negatively affect mental health. High heat stress also can reduce physical work capacity and motor-cognitive performances.

Methods: Statistical methods termed detection and attribution were used to determine the extent to which climate change increased the intensity of these events; some events were deemed virtually impossible without anthropogenic climate change.

Results: Projections under a range of climate and development scenarios indicate that greenhouse gas emissions from anthropogenic activities will likely make future heatwaves more extreme, with shorter return periods. The world will soon enter an era where climate change affects all heatwaves. Few regions are prepared for the heatwaves of today; even fewer are prepared for the more extreme events that are emerging.

Conclusions and identification of several uses of the findings to improve human health or environmental outcomes (e.g., share with affected parties and decision makers, community involvement, additional work needed to evaluate scale-up results): Adverse health outcomes are potentially preventable with effective heat action plans that include sustainable cooling strategies at the level of individuals, communities, urban infrastructure, and landscape. Conducting stress tests of heat actions plans will help increase resilience to future, more extreme heatwaves, including compound heatwaves, heatwaves combined with wildfire smoke exposure, and other climate-related hazards. Projections of a hotter future suggest that without investment in research and risk management actions, heat-related morbidity and mortality are likely to increase.

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Kristie L. Ebi, Ph.D., MPH has been conducting research on the health risks of climate variability and change for more than 25 years, focusing on estimating current and future health risks of climate change; designing adaptation policies and measures to reduce the risks of climate change in multi-stressor environments; and quantifying the health co-benefits of mitigation policies.

The role of epidemiology and public health in managing flood risks from climate change

Sari Kovats
London School of Hygiene and Tropical Medicine, London, United Kingdom

Background: Flood risk to people from rivers, surface water and coastal flooding remains a significant current and future risk across all regions of the world. Climate change will increase risks of heavy rainfall and sea level rise and additional investment is needed. Countries are moving from a risk focused approach that relies on protection to a more holistic resilience based approach that recognises the need to live with water.

Brief description of presentation: The presentation will discuss recent evidence for the impact of flooding on physical and mental health. Deaths may occur from drowning and physical injury through contact with flood waters. Mortality attributable to flooding can include hypothermia, and injuries associated with cleaning up (including carbon monoxide poisoning). Flood exposure is associated with long term burden of increased depression, anxiety, and post-traumatic stress disorder. Mental health outcomes are made worse by displacement, the extent of flood damage, a lack of warning and difficulties dealing with insurance. Methods for quantifying the health and social implications for flooding are discussed and how health research can be used to improve decision making.

Implications to improve human health or environmental outcomes: The costs of flooding on human health is increasing. Better quantification of the health impacts can be used to support the economic argument for flood defences and local interventions to address surface water flooding. Flood risk is exacerbated by poor planning decisions, ageing infrastructure and poor maintenance, coastal degradation, low uptake of property measures, loss of greenspace, and lack of effective and inclusive flood warnings.

Identification of specific steps going forward to improve human health or environmental outcomes (e.g., fill data gaps, needed policies or regulations, dissemination plan): Effective flood response requires coordinaton with health agencies. Robust measures to identify individuals at risk is needed, with better and more targeted advice for high risk persons for preparing for flooding. Investment in information systems to support surveillance of flood impacts on mortality, injuries and mental health, both in real time or to allow for research and evaluation retrospectively.

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Sari Kovats is an Associate Professor in the Department of Public Health, Environments and Society in the Faculty of Public Health and Policy. She has been researching the effects of weather, climate and climate change on human health for more than 20 years. She has contributed to national and international assessments of the health impacts of climate change.

Wildfires risk and health protection in a changing climate

Sotiris Vardoulakis
Australian National University, Canberra, Australia

Background: Catastrophic wildfires, fuelled by climate change, have resulted in the direct loss of human and animal life, and the destruction of thousands of properties and habitats in Australia, Southern Europe, North Africa, Southeast Asia, and North and South America in recent years. For example, the unprecedented wildfires of the Australian Black Summer killed 34 people in 2019/2020, with millions more being exposed to hazardous bushfire smoke that lingered for weeks over large population centres.

Brief description of presentation: This paper presents an overview of the health impacts of wildfires in Australia and internationally, and explores related communication tools, media and community engagement effort to protect human health. The Australian National University (ANU), in collaboration with other organizations involved in the HEAL National Research Network, have developed policy briefings, factsheets, infographics, media articles, interviews and podcasts on how we can protect the public's physical and mental health from wildfires. The ANU factsheets have been translated into twelve languages and promoted through all media, reaching a very wide audience in Australia and overseas.

Implications to improve human health or environmental outcomes: This paper analyses and discusses approaches and challenges in public health communication, air quality reporting and health messaging in relation to wildfires. It also points to the need for greater public awareness of climate related health hazards, as well as of the need for health protective behaviours, adaptive infrastructure, and policy action to mitigate climate change.

Identification of specific steps going forward to improve human health or environmental outcomes (e.g., fill data gaps, needed policies or regulations, dissemination plan): Further work is currently ongoing to adapt the HEAL Network wildfire and air pollution communication materials for diverse audiences, such as First Nations, children, and patient and professional groups.

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Sotiris Vardoulakis is a Professor of Global Environmental Health and the Director of the Healthy Environments And Lives (HEAL) Network at Australian National University. Previously he was Director of Research at the Institute of Occupational Medicine, Edinburgh, and Head of the Environmental Change Department at Public Health England. His work focuses on climate change, air pollution, and extreme events. He is a Coordinating Lead Author of the United Nations Environmental Program Global Environmental Outlook (GEO7).

Extreme events, disasters, and health impacts in Indonesia

Budi Haryanto, Fatma Lestari, Triarko Nurlambang
Universitas Indonesia, Depok City, Indonesia

Background: Extreme weather events caused by climate change may destroy many components of the environment and facilities, and cause direct physical harm, loss of income, psychological stress, and other direct and indirect human health outcomes.

Brief description of presentation: In Indonesia, disasters due to climate change during 1998-2018 were > dominated by flooding (39%), heavy wind/storm (26%), landslides (22%), and drought (8%). In 2017, there were 2,263 events and 198 of these events were considered a health crisis. There were 305,837 persons impacted; this included, major injuries to 2,314 persons, minor injury to 63,578 persons and 243,691 persons became refugees in 2017. By 2050, the annual cost of climate change to the Indonesian economy is estimated at Indonesian Rupiah 132 trillion, or United States $8.8 billion, with substantial variation both across sectors and across provinces. The United States Agency for International Development estimates the agriculture sector will account for the majority (53%) followed by health sector (34%) and sea level rise sector (13%).

Implications to improve human health or environmental outcomes: In particular, work that can consider the macroeconomic or multiplier implications of the loss of key urban infrastructure will be essential to set priorities for investments in adaptation or strategies to minimize the harm caused by such storms. The private sector must anticipate these problems as well; every company whose business relies on transportation through the harbor or airport should create plans for continuity of its operations in the face of such extreme storms.

Identification of specific steps going forward to improve human health or environmental outcomes (e.g., fill data gaps, needed policies or regulations, dissemination plan): It is suggested:

1. Re-orientation of the institutional arrangements for DRR and CCA
2. DRR and CCA activities needed to be stronger supported at the local level
3. Non-government organizations play a very important role in integrating DRR and CCA through community-based initiatives.
4. Reorient the institutional structure of the national government, strengthen technical and financial support to local governments, and recognize the importance of NGOs and community based initiatives.

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Dr. Haryanto is a professor in the Department of Environmental Health, Faculty of Public Health, and chair of the Research Center for Climate Change at Universitas Indonesia where he has worked with residents in several areas to better understand and then adapt to address health impacts of climate crisis and environmental health.

Natural disasters: Lessons learned from Hurricane Maria

Carlos Santos-Burgoa[1], Pablo Mendez-Lazaro[2], Ralph Rivera[2], Ann Goldman[1], Bernardo Hernandez[3], Maria Jose Talayero[1]

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Background: The impact of Hurricane Maria on Puerto Rico's population presents a challenge for science to identify the context and conditions that drive an extreme natural event to a disaster. Winds, floods, and landslides get combined with the physical, social and governance infrastructure. To understand this system is key given the increased frequency and intensity of hurricanes in the Caribbean basin and throughout the world, and the large underestimation of their impact on human lives.

Brief description of presentation: We will integrate the existing research on the total excess mortality and known cause specific mortality, and the conditions driving such impact, with special emphasis on the preparedness, communication, governance, and response capacity. We will show the complexity of the current investigation to identify the complexity of the relations. Emphasis will be done on the use of total excess mortality for rapid assessment, and the development of tools for identification the social and environmental conditions.

Implications to improve human health or environmental outcomes: Risk protection needs to take precedence, and current approaches have proven limited. We need to understand the factors leading to the excess mortality and morbidity after these events. We must account for the real impact on mortality and morbidity and avoid underestimating climate variability and change effects.

Identification of specific steps going forward to improve human health or environmental outcomes (e.g., fill data gaps, needed policies or regulations, dissemination plan): Recommendations to the local government and organizations range from the community organization to impact communication and governance. Total Excess mortality for surveillance is essential for short term management, impact assessment - including for IPCC -, as is the standardized medical attribution in death certification. Federal government needs to consider infrastructure standards resilient to extreme events, and the identification of deaths related to floods and wind events. Research needs to be finished in understanding the causal path to specific cause of death, so interventions can be implemented. The steps towards this will be presented, as advanced in the current investigation.

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Dr. Santos-Burgoa is a Mexican Medical Doctor and Epidemiologist, former Dean and Professor at the School of Public Health of Mexico, Director General at the Ministry of Health, and Senior Advisor at PAHO/WHO. He is Director of the Global Health Policy program at the George Washington University School of Public Health. He is the PI of Hurricane Maria Mortality Study for the Government of Puerto Rico, and for the National Institute of Standards and Technology.

SESSION III

Chemicals management: Current guidelines, regulatory approaches and challenges; Health effects at the bottom of globalization: Migrancy, informal mining, electronic scrap & Select US federal agency responses to a changing world

1. The bane of chemical regulation: Post market burdens of proof create information gaps and protective chasms. *Carl Cranor, USA*

2. The 'manufactured hubris' factory: Inside the latest attacks on environmental epidemiology and toxicology. *Adam Finkel, USA*

3. Obligations and solutions in chemical management in occupations settings in Poland: Endocrine disrupting chemicals management. *Joanna Katarzyna Jurewicz, Poland*

4. Unlocking public health protection through regulatory institutions. *Carlos Santos-Burgoa, Mexico and USA*

5. Health risks of migrant work. *Krishna Gopal Rampal, Malaysia*

6. Occupational health and safety challenges for migrant workers in construction and informal jobs-Indian perspective. *Krishna N. Sen, India*

7. Global electronic waste hazards in vulnerable populations. *Amalia Leborde Garcia, Uruguay*

8. Balancing act: Navigating environmental health and justice in artisanal and small-scale mining (ASM). *Ian von Lindern, USA*

9. Occupational safety and health impacts of climate and NIOSH activities. *Brenda Jacklitsch, USA*

10. NIH efforts to address the rising tide of climate and health impacts on workers and impacted communities. *Aubrey Miller, USA*

11. Clean Cookstoves: An adaptive option to reduce the impacts of climate change. *Claudia Thompson, USA*

The bane of chemical regulation: Postmarket burdens of proof create information gaps, and protective chasms

Carl F. Cranor
University of California, Riverside

Background: Most environmental health laws in the US are postmarket regulatory laws. Chemical products enter commerce with little or no toxicity data. To reduce or eliminate risky products, administrative agencies must satisfy a legal burden of proof with a postmarket, post-exposure, and (often) ambient exposure legal actions. This legal structure places near total risk bearing, plus cost and health externalities on the public, exemplifies moral hazards, and poorly protects the public. It also encourages companies to delay, foster scientific doubt with misleading studies, demand for "ideal" science for regulation, and (sometimes) cheat in studies or journal publications.

Brief description of presentation: An "ideal" correction would be laws that approached premarket testing of new products and expedited testing of existing products. These need not replicate all details for premarket testing of pharmaceuticals. They could include a "tiered strategy" for reviewing toxic substances prior to commercialization (or those in commerce) to identify the most risky agents for greater review.

Implications to improve human health or environmental outcomes: We should modify postmarket laws to remove "protection time gaps" between identifying a toxicant and protecting the public.

Identification of specific steps going forward to improve human health or environmental outcomes (e.g., fill data gaps, needed policies or regulations, dissemination plan): In addition to wholesale premarket testing (above), the use of legal presumptions provides some ideas. Mimic aspects of the Vaccine Injury Compensation Program with charges on new chemicals used to assist compensation for injured parties and reduced legal barriers for redress. Or, mimic Presumptive Disability Decision-making Process for Veterans' Compensation to ease legal proof burdens compared to tort law actions. In addition, agencies could make greater use of presumptions between toxicologically similar substances, e.g., epoxide and epoxide forming substances, or toxicity equivalency factors (for dioxin and dioxin-like compounds) to expedite regulatory steps. Developing group identification of substances also seems promising substances with significant exposure potential as well as similar structures and functions. These suggestions could be explored to begin to address the shortcomings of postmarket laws.

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Dr. Carl Cranor is Distinguished Professor Philosophy and Faculty Member Environmental Toxicology Program at the University of California, Riverside. Ph.D. MSL (Yale Law School) He has written papers and books at the intersection of philosophy, law and science with concerns to reduce cancers, other chronic afflictions, and diseases that arise during human development. He has also written reports and testified in some toxic tort cases and an occasional criminal law case.

The "manufactured hubris" factory: Inside the latest attacks on environmental epidemiology and toxicology

Adam M. Finkelaa
University of Michigan School of Public Health, Ann Arbor, USA

Background: Much of the literature on how vested interests thwart regulation, and escape liability for past damages, has focused on the personal and financial dots connecting industries to "hired guns," and less on the specific arguments made. Stepping back, I examine here two general lines of attack that are both superficially compelling and deeply misleading, and that are being used today to muddy attempts to control hazards as widespread and disparate as chemical pollutants in the workplace and the general environment, repeated head impact in contact sports and other occupations, and SARS-Cov-2.

Brief description of presentation: I will dissect two common arguments against sensible regulation: (1) The claim that all dose-response functions have thresholds is now being misused to trivialize current and real exposures that should clearly be seen as intolerable regardless of whether hypothetical "lower" exposures might in fact be subthreshold. This agenda also has a retrograde effect on science: it has delayed the mainstream recommendation that we modernize non-cancer risk assessment, and instead it has helped to "dumb down" the more scientific cancer risk assessment paradigm; and (2) new tests for "causality" are inappropriately offered as superior to face-value evidence from epidemiology and toxicology, again in order to cast doubt on policies that are likely (but not absolutely guaranteed) to provide substantial health and environmental benefits.

Implications to improve human health or environmental outcomes: We should continue to improve the science of risk assessment, but resist "manufactured hubris" and realize that inaction in the face of probable harms is a dangerous and value-laden action.

Identification of specific steps going forward to improve human health or environmental outcomes (e.g., fill data gaps, needed policies or regulations, dissemination plan): Regulatory agencies should promulgate guidelines for risk analysis that welcome new science but that are respectful of precaution, explicit in accounting for interindividual variability in susceptibility and exposure, and unwilling to discard sensible procedures in favor of unproven and illogical "innovations du jour."

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Obligations and solutions in chemical management in occupational settings in Poland: Endocrine disrupting chemicals example

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Background: Endocrine disrupting compounds are substances that have the ability to interact with the endocrine system by interfering with its proper functioning, leading to disorders in the synthesis, function and/or metabolism of hormones and may have a negative impact on health. These compounds belong to a broad group called in the English literature "endocrine disrupting chemicals" (EDCs). The increase in global industrial activity has led to increased exposure of people to a wide range of modern endocrine disrupting chemicals such as phthalates, bisphenol A, triclosan, polybrominated diphenyl esters and many others. Due to mass production, these compounds can be found in the work environment, but also commonly in the natural environment. Exposure occurs through contact with these compounds in food, water, air, through contact in the production of plastics, cosmetics or pesticides. Due to the fact that these are new compounds, which are to a small extent regulated by law, it becomes important to know their properties and their impact on health.

Methods: A review of epidemiological studies on the impact of selected EDCs on health in terms of occupational and environmental exposure will be presented. In addition, information on sources of exposure, occurrence, properties, registration, legal regulations and OEL values in Poland for these compounds has been collected.

Results: Knowledge about the impact of factors from the group of endocrine disrupting chemical is still limited. Only in the case of some of the chemicals we have data that unequivocally show a negative impact on human health.

Conclusions and identification of several uses of the findings to improve human health or environmental outcomes (e.g., share with affected parties and decision makers, community involvement, additional work needed to evaluate scale-up results): Due to the widespread exposure, there is a need for a reliable risk assessment and the introduction of possible regulations regarding the use of these compounds.

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Unlocking public health protection through regulatory institutions

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Background: A prolonged under-investment in public health systems, and lack of exercise public health authority has limited action on the causes of chronic diseases, the sound management of toxic chemicals, unsafe food and environment, and public health emergencies and crises, such as during the COVID-19 pandemic. Deficient knowledge translation in unequal benefits of science for health protection. Lack of transparency in decision-making fosters politicization and mistrust. A health system designed for health care foregoes public health functions.

Globally, the Public Health Protection function that tackles upstream causal factors, is the least developed of the PH functions, most notably in low and middle-income countries (LMICs). This impacts morbi-mortality, social and development inequities. We need to recognize its constraints, the universal deficiency of Public Health Regulatory Science and competencies and innovate this field of knowledge and practice.

It is urgent to "Unlock" the potential of Public Health Protection and reimagine its health value.

Brief description of presentation: We will present advances on the components of this project: conceptual reframing regulatory institutions, review of priority setting, and institutions case studies, and topics such as chemicals in food.

Implications to improve human health or environmental outcomes: We seek to establish a scholarly field of knowledge and organizational development. We aim to advance its conceptual framing and methodologic options, identify professional competencies, describe the distribution of public health authority in different settings, areas, and levels of government, and compare selected institutional organizational arrangements in model institutions and struggling areas. This initiative recovers from the procedural to the public health fora (no school of public health has a formal program), the actual organizational development challenges of these institutions and their social value.

Identification of specific steps going forward to improve human health or environmental outcomes (e.g., fill data gaps, needed policies or regulations, dissemination plan): We will outline the next steps in the initiative, outline the potential recommendations for implementation of changes in professional competencies, expansion of research, increase in transparency, and invite to innovate how we actually perform regulatory interventions.

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Occupational health and safety challenges for migrant workers in construction and informal jobs - Indian Perspective

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Background: Across the occupations, most vulnerable people are the migrant workers who mostly get engaged in construction and other informal jobs. Global migrant workers constitute around 4.9 % of the labour force of destination countries. Though certain ambiguity looms over the exact number of internal migrant workers; Some estimates suggests that there are over 194 million migrant workers in India. Majority of these migrants are associated with informal sector which employs around 89% of total Inidan labour force.

Brief description of presentation: As per reports 9.6 % of labour are employed as informal workforce in construction works compared to Sub- standard working conditions, job security, poor understanding of workplace hazards and risks, lack of proper job skills, no formal training, unavailability/poor PPE, absence of emergency medical services are some of the common, yet serious issues faced by the migrant workers. 2.5% of formal workers, making construction majorly an unorganized industry.

Implications to improve human health or environmental outcomes: Owing to the typical intrinsic features of construction works they are subjected to heightened level of occupational health and safety risks such as physical fatigue, mental health issues, musculoskeletal disorders etc. To take care of safety, health, and welfare of these migrant workers in the construction and informal jobs, there is a definite need for multi-pronged approach. Other informal sectors too pose serious OSH concerns.

Identification of specific steps going forward to improve human health or environmental outcomes (e.g., fill data gaps, needed policies or regulations, dissemination plan): Legislative framework plays key role in improving OHS with "Vision Zero" for improving OSH culture by fostering leadership commitment and Implementation of control measures. As per the hierarchy of control, initiation of various steps such as improving working environment, welfare facilities, training and awareness on OSH, ensuring PPE etc. are crucial. Stringent monitoring and follow-ups could substantially improve the level of occupational health and safety standards in construction and informal jobs.

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Dr Sen is working for OSH in Construction for over 35 years. Presently leading EHS Department of L&T Construction M&M SBH with over 200 OSH professionals in his team.
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Global electronic waste hazards in vulnerable populations

Amalia Laborde García
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Background: Over the last decades, the globaly increasing turnover of electric and electronic products revealed a particularly complex health risk for vulnerable populations. More than 57 million tons of e-waste were produced globally in 2021. More than 80% of e-waste goes to landfills, dump sites or informal recycling made in poor communities. E-waste is dismantled and especially valuable elements such as gold and copper are captured through primitive recycling procedures as open cable burning, acid baths, and "cooking" circuit boards.

Brief description of presentation: Adult workers, pregnant women and children are exposed to hundreds of chemicals contained in plastics and metallic materials. Many of them have been detected in water, air, and soil around recycling activities. A growing body of evidence confirms exposure for both workers and surrounding communities to heavy metals, POPs, complex particulate materials, dioxins and other combustion contaminants. Lead exposure has been associated with a significant impact on children's health as a result of informal e-waste recycling.

Several chemicals from e-waste recycling are known to be neurodevelopmental toxicants, endocrine disruptors and carcinogens. Many of them have been associated with common non-communicable diseases.

Implications to improve human health or environmental outcomes: Countries on all continents have developed legal and regulatory frameworks for waste management, but less than 50% have specific legislation for e-waste. Scientists, governments, NGOs and the electric and electronic industry have driven initiatives for developing a framework of sustainable and socially equitable process to protect health and the environment.

Identification of specific steps going forward to improve human health or environmental outcomes (e.g., fill data gaps, needed policies or regulations, dissemination plan): Considering that informal activities are carried out by populations with higher social vulnerability, initiatives aimed at tackling this global environmental crisis need to be based on social inclusion, education and safer technologies availability.

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Dr. Amalia Laborde Garia is Professor of Toxicology at the School of Medicine of the University of the Republic in Uruguay. She established the occupational and environmental toxicology clinic at the University Hospital, where she works with students, medical doctors, workers and community organizations in clinical care, training, field interventions and research.

Balancing act: Navigating environmental health and justice in artisanal and small-scale mining (ASM)

Ian von Lindern[1], *Simba Tirima*[2]

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Background: In the economically critical informal mining sector, ASM spans 80 countries employing 13 million people, equivalent to the global formal mining workforce. It supplies 20% of global gold, 80% of sapphire, 20% of diamond, 30% of cobalt, 25% of tin extraction, and significant contributions to critical electronics and energy transition metals. However, ASM's contributions are overshadowed by associated environmental, health, and human rights issues that intertwine opportunity and exploitation narratives.

Brief description of presentation: This presentation examines two ASM human tragedies and attempted reform efforts in the context of the 2021 Collegium Ramazzini Statement. ASM is an essential income source for rural communities in 23 Sub-Saharan African countries. Despite this, the sector often lacks formal structure or legal recognition and is frequently marked by catastrophic health and human rights abuses. This reality is glaringly evident in the Democratic Republic of the Congo, where cobalt driven ASM flourishes. Workers, especially women and children, endure hazardous, exploitative, often brutal conditions. This situation highlights the disconcerting truth that one region's technological progress often hinges on another's suffering. In 2010, a lead poisoning crisis in Zamfara, Nigeria, led to the deaths of several hundred children. A subsequent halt to ore processing activities by Emirate leadership precipitated a collaborative response, aiming to treat the poisoned children, remediate the villages, and promote safer mining practices.

Implications to improve human health or environmental outcomes: In Nigeria, a decade-long reform effort culminated in a Presidential Executive Order to legalize and regulate ASM. The treatment/remediation/safer mining initiative led to an 89% reduction in environmental exposures and a decrease in mean blood lead levels from 149 μg/dl in 2010 to 15 μg/dl by 2013.

Identification of specific steps going forward to improve human health or environmental outcomes (e.g., fill data gaps, needed policies or regulations, dissemination plan): These communities continue to face significant challenges, including climate change, malnutrition, endemic disease, ethnic violence, terrorism, and other threats. Consequently, while ASM offers economic hope, it becomes a target for those seeking to exploit the population.

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Dr. von Lindern co-founded TerraGraphics International Foundation (TIFO), a non-profit humanitarian environmental response organization. He works with marginalized mining/recycling communities to address pollution-related health and environmental issues. He has developed and implemented projects in countries with high levels of childhood morbidity and mortality including Russia, China, Peru, Bangladesh, Dominican Republic, Senegal, Nigeria, Uzbekistan, and Kyrgyzstan. He has served as a USEPA Science Advisory Board and Clean Air Scientific Advisory Committee (CASAC) Member.

NIH efforts to address the rising tide of climate and health impacts on workers and at-risk communities

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Background: Climate drivers affect human health outcomes directly through weather events such as extreme heat, wildfires, droughts, storm surges, and floods, and indirectly through a series of exposure pathways such as air and water quality, food quality, and infectious diseases. Such direct and indirect impacts increasingly pose disproportionate impacts on workers who face growing health and safety risks associated with evolving exposures, hazards, and shifting work conditions. Important new efforts by health agencies, academia, and others to address the health consequences are forming but expanded collaborations on a global scale are needed.

Brief description of presentation: While, the U.S. National Institutes of Health (NIH) has supported climate change and health (CCH)-relevant research for decades, efforts have greatly increased with the launch of the NIH Climate Change and Health Initiative (CCHI) in 2021. The CCHI is a unique NIH-wide effort led by seven institute directors and a working group of over 150 staff focused on furthering needed transdisciplinary research, capacity building and training, health equity, interventions, and partnerships to better understand and address the health consequences of climate change in the U.S. and globally. Newly evolving efforts to build a health-focused "community of practice" include research coordination, community engagement, and exploratory centers, as well as funding to spur needed areas of research (e.g., disaster response, adaptation research, predictive modeling) and broadening engagement by the health research community.

Implications to improve human health or environmental outcomes: Funding and leadership by NIH is an encouraging signal, however, given the immense and growing health challenges, additional investments and global collaborations are vital to creating the knowledge and evidence-based solutions and strategies that protect the health of workers and other disparate populations globally.

Identification of specific steps going forward to improve human health or environmental outcomes (e.g., fill data gaps, needed policies or regulations, dissemination plan): Stronger coordination, leadership, and partnerships between public and private sectors are needed to expand the scientific community, engage workers and at-risk communities, and inform policies to address adverse health outcomes and further impactful interventions.

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Dr. Miller is the Co-Chair of the NIH Climate Change and Health Working Group and serves as Deputy Director for the NIEHS Office of Scientific Coordination, Planning, and Evaluation, where he furthers the development and implementation of priority environmental health programs, as well as strategic planning and engagement with government agencies, academia, and other stakeholders.

Clean cookstoves: An adaptive option to reduce the impacts of climate change

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Background: Nearly 3 billion people heat their homes and cook with solid biomass fuels contributing to deforestation, increasing atmospheric CO2 and PM, and polluting living spaces. Household air pollution is responsible for over 2.3 million premature deaths annually. Exposure to cookstove smoke is associated with many health problems, including respiratory and heart disease. In addition to the potential health consequences from cooking with biomass fuels, populations in low- and middle-income countries (LMICs) are also most vulnerable to the impacts of climate change. Evidence exists that shifting to cleaner fuels benefits both health and climate.

Brief description of presentation: Over the past decade several intervention trials have been launched to assess the impact of cleaner fuels such as liquefied petroleum gas (LPG) on health. These include the Household Air Pollution Intervention Network (HAPIN), an international multi-center study located in Guatemala, India, Peru and Rwanda; and the Ghana Randomized Air Pollution and Health Study (GRAPHS). Findings demonstrate that LPG cookstoves were readily adopted and produced lower PM and black carbon emissions. Short-term health benefits from improved air quality, however, have been mixed and recent reports suggest that early life reduction in exposure can have longer term health benefits. Scalable and sustainable transitions to LPG or electrification in LMICs have the potential to reduce global climate temperatures and improve health but will require more research employing implementation science to understand effective strategies to achieve full transitions.

Implications to improve human health or environmental outcomes: Applying intervention trials and implementation science can provide the evidence-base for evaluating the effectiveness of switching to cleaner fuel alternatives for global climate and health related mitigation.

Identification of specific steps going forward to improve human health or environmental outcomes (e.g., fill data gaps, needed policies or regulations, dissemination plan): Understanding the complexity and time needed to implement and evaluate climate and health related interventions is vital to creating new evidence-based solutions to protect the most vulnerable populations from the effects of household air pollution and climate change.

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Dr. Claudia Thompson is Chief, Population Health Branch (PHB) that supports portfolios of population-based, laboratory-based, and community-engaged research related to environmental exposures and their effects on human health. She is the Program Director for the Environmental Health Sciences Core Centers and co-director of the Human Health Exposure Analysis Resource. Claudia manages the cookstove research portfolio and more recently represents NIEHS on a NIH-wide steering committee for the NIH Climate Change and Health Initiative.

SESSION IV

Climate change, pollution and health: Threats, mitigation, adaptation; Disaster preparedness: An 'all hazards' approach & Screening for occupational lung cancer: An unprecedented opportunity

1. Climate change and human health: The need for urgent action. *Maria Neira, Switzerland*

2. Dynamics of solar energy entrepreneurship in rural areas of the State of Bihar in India. *Praveen Kumar, India and USA*

3. Climate change and health nexus: Activities by the health sector for adaptation and mitigation in Sri Lanka. *Inoka Suraweera, Sri Lanka*

4. Ocean pollution, climate change and human health. *Hervé Raps, Monaco*

5. Plastics, petrochemicals and human health. *Phil Landrigan, USA*

6. Medecins Sans Frontieres (MSF) response to 2023 Turkey-Syria earthquakes. *Martins Dada, Amsterdam; Hanna Majanen, Amsterdam*

7. Lessons learnt from past disasters - commonalities. *Elisabeth Cardis, Spain*

8. Worker training for disaster preparedness. *Nicole Pollo, USA*

9. Recommendations for all hazards preparedness - proposed statement of Collegium Ramazzini on disaster preparedness and management statement. *Roberto Lucchini, USA and Italy*

10. Early lung cancer detection in the building trades national medical screening program. *Knut Ringen, USA*

11. LUSCO: French pilot trial of lung cancer screening with low-dose computed tomography in a population exposed to occupational lung carcinogens. *Fleur Delva, France*

12. Screening of Brazilian underserved workers exposed to asbestos in loco with mobile low dose computed tomography. *Henrique CS Silveira, Brazil*

13. Lung cancer screening in the Western Australian asbestos review program. *Fraser JH Brims, Australia*

14. Twenty years of CT-based screening for lung cancer among nuclear weapons workers in the United States. *Steven Markowitz, USA*

Climate change and human health: The need for urgent action

Maria Neira
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Background: Climate change is already impacting human health in myriad ways, including death and illness from increasingly frequent extreme weather events, such as heatwaves, storms and floods; the disruption of food systems; increases in zoonoses, foodborne, waterborne, and vector-borne diseases; and mental health issues.

Brief description of presentation: Climate change is undermining many of the social determinants for good health, such as livelihoods, equality and access to health care and social support structures. These climate-sensitive health risks are disproportionately felt by the most vulnerable and disadvantaged, including women, children, ethnic minorities, poor communities, migrants or displaced persons, older populations, and those with underlying health conditions.

Implications to improve human health or environmental outcomes: The health benefits of climate actions are well documented and offer strong arguments for transformative change. This is true across many priority areas for action, including adaptation and resilience, the energy transition, clean transport and active mobility, nature, food systems, and finance. The health sector and health community are a trusted and influential - but often overlooked - climate actors that can enable transformational change to protect people and planet.

Climate interventions such as strengthening resilience and building adaptive capacity can lead to health benefits by protecting vulnerable populations from disease outbreaks and weather-related disasters, by reducing health costs and by promoting social equity. In addition, climate interventions are highly cost-effective with the public health and economic benefits resulting from ambitious mitigation efforts far outweighing their cost.

Identification of specific steps going forward to improve human health or environmental outcomes (e.g., fill data gaps, needed policies or regulations, dissemination plan): For all these reasons, there are no excuses for lack of action.

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Dr Maria Neira is WHO's Director of Environment, Climate Change and Health. She was previously Vice- Minister, Health and Consumer Affairs, Spain and President, Spanish Food Safety and Nutrition Agency. She has worked in Mozambique, Rwanda, El Salvador, and Honduras, starting her career with Médecins Sans Frontières. Dr. Neira is a physician specialized in Endocrinology and Metabolic Diseases. She has received multiple awards, including the "Médaille de L'Ordre National du Mérite", Republic of France.

Dynamics of solar energy entrepreneurship in rural areas of the State of Bihar in India

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Background: Energy access in rural areas contribute to sustained well-being and economic development. Despite ubiquitous grid- based electricity infrastructure in rural India, the quality and reliability of electricity supply is below par. In rural and energy-poor areas, alternative technology solutions such as solar off-grid products, storage systems and energy- efficient devices can complement the unreliable electric grid to fulfil energy needs. This also contributes to the overall push to leapfrog to cleaner energy systems. Localized entrepreneurship in rural areas can play a significant role in increasing energy access. However, studies on the dynamics of rural entrepreneurship and low-cost energy access in poor households are scarce. This study explores local entrepreneurs' perception of social, economic, and technological factors that impact entrepreneurship dynamics in rural poor communities of India, and to identify strategies to help further improve the existing institutional support.

Methods: CBSD was used to engage participants in modelling their perspective of drivers and impacts of solar entrepreneurship. CBSD activities led to the development of a causal loop diagram that was subsequently translated into a stock-flow simulation model.

Results: Results indicate that training and subsequent experience in the project and business helped reinforce the entrepreneur's skills. Repair service and sales of energy products contributed in building trust and awareness in the community, thereby increasing demand for solar and energy-efficient products. The simulation-based scenario analysis shows the positive impact of better business practices, bulk procurement, and continued repair services on the income of the solar entrepreneurs.

Conclusions and identification of several uses of the findings to improve human health or environmental outcomes (e.g., share with affected parties and decision makers, community involvement, additional work needed to evaluate scale-up results): Recent push to sustainable energy transition in the wake of reduction in carbon emissions has received a lot of traction. Thriving local markets and entrepreneurship in rural areas are crucial to for the energy transition in rural areas. Findings from this study can inform subsequent energy entrepreneurial development in rural Bihar.

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Dr. Praveen Kumar is an associate professor at the Boston College School of Social Work. His research is at the intersection of climate and environmental justice, system sciences, and global health. He is currently an NIH Climate Change and Health Scholar, working with the Fogarty International Center contributing to their climate adaptation and health research initiatives.

Climate change and health nexus: Activities done by the health sector for adaptation and mitigation in Sri Lanka

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Background: Climate change has been producing and is expected to produce severe direct and indirect impacts on human health. It is considered the most significant health threat currently facing humanity. Sri Lanka, a tropical nation, is highly vulnerable to adverse impacts of climate change.

Methods: Desk review and key informant interviews were conducted to understand the activities performed by the health sector in Sri Lanka on climate adaptation and mitigation.

Results: The Sri Lanka health sector recognizes the importance of addressing climate-change-related health impacts in a systematic manner due to the nation's great vulnerability. A focal unit has been identified in the health sector to work in this area. The importance of climate adaptation as a key strategy has been recognized. A Health National Adaptation Plan 2016-2025 has been developed and incorporated into the National Climate Adaptation Plan for Sri Lanka. Nationally Determined Contributions for health sector have been developed and being implemented. Advocacy, capacity building and awareness-raising are being carried out. Activities are ongoing to build the resilience of the health facilities to respond to climate related events. Streamlining health care waste management, shifting to non-incineration techniques for infectious and sharps waste management, construction of solar panels are some of the activities done to reduce greenhouse gas emissions from health sector at national and sub national levels in Sri Lanka.

Conclusions and identification of several uses of the findings to improve human health or environmental outcomes (e.g., share with affected parties and decision makers, community involvement, additional work needed to evaluate scale-up results): The health sector needs to take a lead role in addressing climate action. Vulnerability assessments should be conducted on a regular basis and health sector actions on adaptation and mitigation should be based on evidence. In- depth studies on traditional knowledge and experience to withstand climate threats should be conducted and used for planning adaptive measures.

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Dr Inoka Suraweera graduated from the Faculty of Medicine, University of Colombo, with second class honours. She holds Masters and Doctoral Degrees in Community Medicine from the University of Colombo. She had post-doctoral training at Monash Centre for Occupational and Environmental Health, Australia. She is currently Consultant Community Physician and technical head of the Environmental and Occupational Health Unit of the Ministry of Health. She is actively engaged in undergraduate and post graduate medical education

Ocean pollution, climate change and human health

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Background: Ocean pollution is a growing threat to human health, both directly and through its impacts on ecosystem services. Climate change is a threat multiplier that worsens the health impacts of ocean pollution.

Brief description of presentation: Ocean pollution has many sources: chemical pollutants (heavy metals, hydrocarbons), organic pollutants (phosphorus, nitrogen) and plastics. 80% of marine pollution originates on land and comes from human activities. Ocean pollution has worsening negative impacts on human health and well-being, both directly and indirectly through degradation of ecosystem services provided by the ocean (food, economic). Ocean pollution disproportionately affects the most vulnerable populations and communities. Climate change acts as a threat multiplier for ocean pollution. It does so directly by increasing the intensity, frequency and geographical distribution of toxic algal blooms and accelerating the spread of Vibrio bacteria into previously uncontaminated waters through increasing sea surface temperature and changing salinity. Climate change also worsens ocean pollution indirectly by increasing extreme weather events and floods in coastal and riverine areas that can result in influx of pollution into the ocean, particularly if waste storage or treatment plants are submerged.

Implications to improve human health or environmental outcomes: The fight against climate change, with reductions in greenhouse gas emissions and the transition to renewable energy, must be accompanied by specific measures to reduce and control ocean pollution. Interventions that have proven effective include: the development of marine protected areas (MPAs), efficient wastewater and effluent treatment systems, protection of coastal waste treatment infrastructure areas against extreme events, and above all, the reduction of waste at source: agricultural release, industrial discharge and plastic pollution.

Identification of specific steps going forward to improve human health or environmental outcomes (e.g., fill data gaps, needed policies or regulations, dissemination plan): National actions and support for international regulations, such as the Global Plastics Treaty now in development, is a guarantee of success of those measures.

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Hervé Raps, MD is a physician with expertise in environment and human health, clinical trials, medical informatics and quality control in healthcare processes. At the Monaco Scientific Centre in the Principality of Monaco, he is responsible for the program on "Ocean and Human Health", conducting awareness-raising and capacity-building activities on environmental health issues, particularly those related to the oceans, for a range of stakeholders.

Plastics, petrochemicals and human health

Philip Landrigan[1,2], Sarah Dunlop[3], Hervé Raps[2]

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Background: Plastics convey many benefits but also cause great harms. These harms have not been systematically examined.

Methods: To examine plastics' harms to health across the entire plastic life cycle.

Results: 98% of plastics are made from coal, oil and gas. They contain thousands of chemicals, mostly petrochemicals, and include carcinogens, neurotoxicants and endocrine disruptors. Production is increasing exponentially - from under 2 million tons in 1950, to 460 million tons today, and is on track to triple by 2060. Single-use plastics account for 40%. Recycling is ineffective, with rates below 10% globally. An estimated 22 million tons of plastic waste enters the environment each year. Much ends up in the ocean. Plastic endangers human health across its entire life cycle – production, use, and disposal. Production workers, including coal miners, oil and gas workers, transport workers, chemical workers, and recyclers suffer excess cardiovascular, pulmonary, metabolic and neurologic diseases, and cancer. In use and disposal, plastics release microplastic particles and toxic chemicals. These materials increase risk for premature births, neurodevelopmental disorders, male reproductive birth defects, infertility, obesity, cardiovascular disease, renal disease, and cancer. Workers as well as children and environmental justice communities are especially at-risk. Plastic production further endangers health by discharging nearly 2 gigatons of CO2 to the atmosphere annually – more than the contribution of Brazil. The health-related costs of plastic production, including climate costs, exceed $250 billion globally. The costs of disease, disability and death caused by plastic chemicals exceed $920 billion annually in the USA alone.

Conclusions and identification of several uses of the findings to improve human health or environmental outcomes (e.g., share with affected parties and decision makers, community involvement, additional work needed to evaluate scale-up results): The Minderoo-Monaco Commission supports urgent adoption of a legally binding Global Plastics Treaty, pursuant to the resolution of the 2022 United Nations Environment Assembly. A global cap on plastic production, bans on single-use plastics, comprehensive regulation of plastic chemicals, and Extended Producer Responsibility need to be core provisions of this Treaty.

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Philip J. Landrigan, MD, MSc is a pediatrician, epidemiologist, and occupational physician. He is a Professor at Boston College where he directs the Program for Global Public Health and the Common Good and the Global Observatory on Planetary Health. He recently chaired the Minderoo-Monaco Commission on Plastics and Human Health, which examined plastics' negative impacts on human health, the environment and the economy across the plastic life cycle.

Medecins Sans Frontieres (MSF) response to 2023 Turkiye-Syria earthquakes

Hanna Majanen, Martins Dada
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Background: On February 6, 2023, severe earthquakes struck southeast Turkey and northwestern of Syria in the early morning. The initial earthquake with an epicenter in the Pazarcik District of Kahramanmaras affected 11 provinces in Turkey, as well as the Idlib and Aleppo provinces in Syria. Despite downplayed official figures, the death toll is estimated at around 60,000 people. Almost 900,000 buildings were damaged or completely collapsed. Some 15 million people were affected in Syria and Turkey.

Brief description of presentation: Five Medecins Sans Frontieres (MSF) sections responded in the earthquake-affected areas in Turkey and/or Syria. MSF Operational Centre Amsterdam (OCA) teams were able to initiate an exploratory team which arrived in Hatay within the first 24 hours after the earthquake. During the emergency response, MSF conducted activities in collaboration with local partners, mainly focusing on mental health, water, sanitation, and hygiene promotion activities, as well as distributions of items.

Implications to improve human health or environmental outcomes: Natural disasters, like the earthquake in Turkiye and Syria, can have a devastating impacts on populations. Clean water, healthcare, and transport are also often casualties in these disasters, making the immediate phase of the responses even more difficult. The adverse effects are the immediate deaths and injuries, as well as the trauma from losing homes, neighbors, and loved ones. These effects can overwhelm the entire populations long after the disaster.

Identification of specific steps going forward to improve human health or environmental outcomes (e.g., fill data gaps, needed policies or regulations, dissemination plan): A timely response is essential in natural disasters, such as earthquakes. Preparedness and the ability to mobilize quickly and adapt to different contexts and requirements using innovative approaches are needed for effective responses to save lives.

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Lessons learnt from past disasters - commonalities

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Background: Disaster preparedness and response has long been a scientific-technical issue with privileged involvement of experts and administrative bodies and siloing of hazards. The COVID-19 pandemic highlighted important gaps and difficulties in this approach to preparedness and response, at all levels. These are not unique to pandemics: similar challenges have been encountered following other types of crises: nuclear, chemical/industrial, natural hazards (including related to climate change), and wars. *Brief description of presentation:* We will briefly review lessons learnt from different types of crises, identifying commonalities and describing needs and challenges. These include the long-term indirect health and societal effects of the disasters and risk reduction measures; the acceptability of these measures; deficiencies in epidemiological intelligence systems; difficulties in identifying, tracking and adequately monitoring the impacted populations; challenges in real time exposure measurements; difficulties in communication and consequent loss of trust in authorities; fragmentation of response and resources leading to lack of coordination. *Implications to improve human health or environmental outcomes:* The commonalities encountered suggest an all-hazards approach would be beneficial and more cost-effective. While such an approach is already taken in some countries, a more global application is needed. *Identification of specific steps going forward to improve human health or environmental outcomes (e.g., fill data gaps, needed policies or regulations, dissemination plan):* This approach needs to be developed in peace time and requires multi-disciplinary and multinational collaborations and stakeholder engagement and the creation of an international network of subject matter experts to serve as a reference in case of crisis. It would include in particular: common core epidemiological protocols for environmental and public health crises, adaptable to particular crises; development of needed processes and procedures to facilitate implementation of the protocols in emergency situations, addressing legal and ethics barriers to conducting research; stakeholder engagement at all levels of actions to facilitate the integration of individual responsibilities; improving communication and education strategies to efficiently communicate the best knowledge to date; development of an all-hazards preparedness culture in peacetime; adequate and sustainable political and financial support in the long run.

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Professor Cardis is an epidemiologist, head of the Radiation Group at ISGlobal and co-director of the ISGlobal Hub on Preparedness, Response, Recovery and resilience (PR3). She has been extensively involved in studies of the consequences of the Chernobyl nuclear accidents and in drawing recommendations for preparedness and response to nuclear accidents based on lessons from the Chernobyl and Fukushima accidents.

Worker training for disaster preparedness

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Background: Workers and their communities face multiple hazards during and after human-made or natural disasters, leaving their health and safety at risk.

Brief description of presentation: The United Steelworkers Tony Mazzocchi Center found that workers, which include union and worker center members, their management, day laborers, and their communities, needed more training to prepare for disastrous events. These conclusions were drawn after previous deployments and an interview project conducted during the COVID-19 pandemic. USWTMC's team of Specialized Emergency Response Trainers (SERTs) have a mission to provide disaster preparedness and mental health awareness training to affected communities, and in the multitude of areas where disastrous events may occur, which lately is anywhere. This proactive focus allowed the SERTs to learn more about the hazards faced, but also to assist workers and communities in preparing for the inevitable next disaster or pandemic.

Implications to improve human health or environmental outcomes: Workers and communities are at risk for injury and illness caused by disastrous events. Preparedness training can mitigate the consequences. For example, it is imperative that someone who may experience a hurricane or flooding understands the long-term health effects from exposure to mold, as they are likely to be presented with it at their workplace or home. In the short-term, training on which chemicals to use when cleaning up mold and how to use personal protective equipment is necessary to prevent exposure to hazardous chemicals. Mental health and resiliency training are important to those who have already experienced one or more disastrous events because they are likely to experience more during their lifetime.

Identification of specific steps going forward to improve human health or environmental outcomes (e.g., fill data gaps, needed policies or regulations, dissemination plan): Through awards from the National Institute of Environmental Health Sciences, the USWTMC SERTs team can continue their initiative, helping workers and communities with disaster preparedness and response, and mental health awareness. The team will continue to provide outreach and training in regions across the United States, Puerto Rico and Virgin Islands.

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Nikki Pollo is a training coordinator for the United Steelworkers Tony Mazzocchi Center, where she mainly coordinates the HAZMAT Disaster Preparedness Training Program grant awarded to the USWTMC by the National Institute of Environmental Health Sciences. Her main focus is working with the USWTMC's Specialized Emergency Response Trainers, or SERTs, team to provide disaster preparedness and response training to workers and their communities across the United States, Puerto Rico and U.S. Virgin Islands.

Recommendations for all hazards preparedness - proposed statement of Collegium Ramazzini on disaster preparedness and management

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Background: Emergency preparedness of a variety of disasters is still largely suboptimal. In post-COVID19, emergency plans must be revised according to new and old lessons. A holistic approach to emergency preparedness, disaster management, and public health intervention is needed to anticipate and, where possible, prevent disasters and mitigate short and long-term impacts on responders and communities.

Brief description of presentation: This statement considers the status of emergency and preparedness on a global scale, highlighting the suboptimal level of infrastructures that are available today. It is based on a review of major accidents and emergencies including infectious epidemics, nuclear, chemical and other accidents, disasters related to climate change, such as extreme weather events, wildfires and increased air pollution, and natural disasters including earthquakes, and volcanoes emissions. The analysis of various types of situations yields a constant process of lesson learning, and opportunities for improved policies and procedures at national and global levels.

Implications to improve human health or environmental outcomes: Immense negative consequences, especially for the vulnerable, arise from the inadequate response and management of disasters on population health and society's development. Most impacts are all modifiable and can be significantly reduced by emergency and all-hazards preparedness plans.

Identification of specific steps going forward to improve human health or environmental outcomes (e.g., fill data gaps, needed policies or regulations, dissemination plan): Rigorous establishment and continuous curation of disasters databases shall contribute to improved and timely response guided by the incremental lessons learned from response analyses to new events when compared with the overall existing knowledge from different forms of disasters. Combined holistic approaches to disasters of different individual origin should lead to optimized resources and better coordination among agencies. Epidemiological surveillance will help identify physical and mental health impacts and yield personalized prevention and care. Disaster response plan must also recognize that there are large inequalities in resilience and social capital to address.

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Dr. Lucchini is an MD, Professor of Occupational and Environmental Medicine at the University of Modena and Reggio Emilia, Italy, and Florida International University. His research interests are on the brain impacts from neurotoxicants across the life course. He investigates children, workers, elderly and patients with neuro-degenerative disorders residing in industrial areas of Italy, and the 9/11 responders who were impacted by the exposure to neurotoxic chemicals and intense psychological trauma.

Early lung cancer detection in the building trades national medical screening program (BTMed.org)

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Background: BTMed is a national medical screening program for older US construction trades workers with a 40% increase in lung cancer mortality over the general population. In 2011 BTMed started an early lung cancer detection (ELCD) program.

Methods: BTMed participants completed occupational and medical interviews, a physical examination, spirometry (PFT), and chest radiograph (CXR). Criteria for ELCD eligibility are age 50-79; 30 years of smoking and less than 15 years since quitting, or 20 years of smoking and 5 years of occupational exposures, or PFT (COPD) or CXR (fibrosis) findings. The screenings are provided by radiology centers of excellence. Abnormal findings are assessed by multi- disciplinary expert committees. Results are classified by ACR Lung-RADS.

Results: Over 7,700 BTMed participants were invited for ELCD with resultant enrollment of 2,000 (26%), receiving over 10,000 LDCT scans. The program has detected 54 (2.7% yield) lung cancers and one mesothelioma. In addition, it has detected 1,532 conditions referred for medical follow-up.

Conclusions and identification of several uses of the findings to improve human health or environmental outcomes (e.g., share with affected parties and decision makers, community involvement, additional work needed to evaluate scale-up results): The detection rate for lung cancer in the BTMed population is higher than the 1.0-1.5% found in most lung cancer screening programs that follow the NLST criteria, although only 43.5% of BTMed ELCD participants met the NLST smoking criteria. Besides smoking, a CXR-based ILO profusion score of 1/0 was the strongest predictor of risk. These findings support inclusion of occupational risk factors to establish tailored eligibility criteria in well- defined populations, or for referral of individual patients. The use of community-based ELCD providers has strengths (participant familiarity; continuity of care) and weaknesses (maintaining consistency in quality; variable referral networks; finding providers outside urban centers; level of effort to manage and review performance). Adverse medical outcomes include two post-surgery deaths. There have been no radiation dose overexposures.

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LUCSO: French pilot trial of lung cancer screening with low-dose computed tomography in a population exposed to occupational lung carcinogens

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Background: In 2015, clinical practice guidelines in France recommended a trial of low dose chest computed tomography (LDCT) for lung cancer screening in workers at high-risk of occupational lung cancer. The primary objective is to evaluate the performance of lung cancer screenings in a high risk population according to these clinical practice guidelines.

Methods: An interventional study in two French departments (Gironde and Val de Marne) targeted a population of smokers, aged from 55 to 74, with current or previous exposure to occupational lung carcinogens (IARC Group 1). The lung cancer relative risk of eligible subjects is estimated to exceed the risk of subjects in the National Lung Screening Trial. Trial steps included: 1) Identification of subjects aged 55 to 74 years (in the first phase, 65 to 74 years) with current or previous exposure to lung carcinogens and subsequent mailing of a screening invitation letter by health insurance funds; 2) Evaluation of occupational lung carcinogen exposure by specialized practitioners and verification of eligibility; 3) LDCT scans at baseline, years 1 and 2, in certified centers using NELSON Study criteria; and 4) Follow up of findings suspicious for lung cancer.

Results: In this initial stage, 236,000 letters were sent to subjects aged 65 to 74 years, of whom 9.1% (n=21,400) expressed interest in screening. Expert evaluation identified 509 (2.3%) people who were eligible, and 309 (60.7%) were screened. Screening was positive in 18 (5.8%) with 5 (1.6%) lung cancer diagnoses. LDCT screening was indeterminate in 70 (22.6%) subjects. Among participants with no evidence of lung cancer, 180 (58.2%) had coronary arterial calcification.

Conclusions and identification of several uses of the findings to improve human health or environmental outcomes (e.g., share with affected parties and decision makers, community involvement, additional work needed to evaluate scale-up results): LDCT screening is feasible in a high risk population. Age at eligibility will be expanded to 55 to 74 years. For subjects with no occupational risk, smoking eligibility criteria of the NELSON study is under consideration.

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Fleur Delva is physician in public health and researcher in occupational health.

Screening of Brazilian underserved workers exposed to asbestos in loco with a mobile low dose computed tomography

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Background: In Brazil, the extraction and usage of asbestos was only recently banned. Therefore, cases of pulmonary fibrosis an asbestos-related malignancy are still expected to increase due to the long latency period of disease development. This scenario requires awareness and structured surveillance, but also access to medical screening and diagnostic methods, which are restricted and unequally available in Brazil. The Low Dose Computed Tomography (LDCT) is an effective tool to screen for malignancy in asbestos-exposed workers. We performed chest disease screening with a mobile LDCT unit in an undeserved population of former asbestos manufacturing workers.

Methods: In partnership with ABREA (Associação Brasileira dos Expostos ao Amianto) workers from Pedro Leopoldo, Minas Gerais, Brazil were offered LDCT screening in September 2019. Workers who had a history of direct or indirect asbestos exposure, regardless of exposure duration or respiratory symptoms, were offered a LDCT examination. Thoracic radiologists used a structured report to report pleural plaques or nodules, pleural effusions, parenchymal fibrosis, and lung nodules. Pulmonary nodules were managed according to Lung Rads 1.1. Necessary supplementary diagnostic and treatment follow-up was provided at a tertiary care oncology center.

Results: Two hundred and three men and twenty women, of whom 89% were directly engaged in asbestos manufacturing with median exposure time of 13.5 years, underwent LDCT screening. Median age was 57 years. Pleural plaques or nodules were identified in 19% of individuals. Five individuals had moderate or marked signs of pulmonary fibrosis, and one was diagnosed with an early stage pulmonary adenocarcinoma. None of these findings had been identified by usual health care.

Conclusions and identification of several uses of the findings to improve human health or environmental outcomes (e.g., share with affected parties and decision makers, community involvement, additional work needed to evaluate scale-up results): Despite political interference that precluded full attendance of participants, proper treatment was guaranteed with the aid of Labor Prosecutor Office. The mobile LDCT unit successfully provided screening and increased awareness in this exposed and underserved worker population.

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Dr. Silveira is head of the Environmental Factors and Occupational Cancer Group from Molecular Oncology Research Center at Barretos Cancer Hospital where he has worked with population exposed to several carcinogens to better understand of carcinogenesis in the exposome context.

Lung cancer screening in the Western Australian asbestos review program

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Background: Asbestos exposure increases lung cancer risk, especially in smokers. Low dose CT (LDCT) screening reduces lung cancer mortality. Of various proposed screening eligibility criteria, only the Liverpool Lung Project (LLP) model accounts for asbestos exposure. This study compares eligibility criteria for lung cancer screening in our asbestos- exposed population over a 10-year period.

Methods: Participants include former asbestos miners, former asbestos mining township residents, and anyone with >3 months cumulative occupational asbestos exposure. We set no age limits, and any smoking status was accepted. All participants had an annual LDCT scan with annual health questionnaire. Different criteria for lung cancer screening programs were analysed. Date of censoring 19 Aug 2022.

Results: 11,834 LDCT scans were performed on 2,131 individuals of median age 70 years (IQR 63-75), 1,819 (85.4%) were male and 1,357 (63.7%) were ever-smokers. 52 lung cancers were diagnosed in 50 participants (2.3% of cohort). Median age at diagnosis was 78.2 years (IQR 71.5-82.3).

40/48 (83.3%) had stage 1 disease, and 37/48 (77.1%) participants underwent surgery or stereotactic radiotherapy with curative intent. Lung cancer was prevalent in 28 (53.8%) individuals. Of smoking-related cases (n=40), median pack year exposure was 30.5. At censoring date, 29 (55.8%) cases were alive, with median (IQR) survival of 707 (298-1495) days. If alternative screening eligibility criteria were applied to our study population, including USPSTF2021, PLCOm2012, LLPv2 or the proposed Australian criteria, only 5% to 40% of our study population would have been screened and only 4% to 50% of the lung cancers that we detected would have been detected.

Conclusions and identification of several uses of the findings to improve human health or environmental outcomes (e.g., share with affected parties and decision makers, community involvement, additional work needed to evaluate scale-up results): LDCT screening is effective at diagnosing early-stage lung cancer in this population. Occupational exposure(s) should be considered when assessing risk for lung cancer, regardless of smoking status, and should be incorporated into future lung cancer screening programs.

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Twenty years of CT-based screening for lung cancer among nuclear weapons workers in the United States

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Background: Screening blue collar workers for lung cancer deserves high priority due to frequent exposure to occupational lung carcinogens and high rates of cigarette smoking. Implementation can be challenging.

Methods: Since 2000, in partnership with labor unions, we have applied low dose CT scan (LDCT) for early lung cancer detection to screen former and current nuclear weapons workers who were employed in previous decades by the U.S. Department of Energy (DOE). Eligibility criteria and program protocol have evolved over the program period. Since 2014, we have offered annual low dose CT (LDCT) screening to workers aged 50 to 80+ years, who smoked > 20 pack-years (with no limit on years since quitting) and worked > 2 years in production, maintenance, engineering, or science/laboratories at DOE facilities. Workers with asbestos-related pleural or parenchymal fibrosis were also eligible. Participants had to be free from terminal illness and sufficiently healthy to undergo treatment for lung cancer. The LDCT scans are offered free of charge at local CT scanning facilities.

Results: We have screened ~14,000 DOE workers at 12 DOE sites, mostly in rural or non-metropolitan areas in the United States. We have detected 209 lung cancers, or 1.5% of all people screened at least once. 71% of detected lung cancers are early or limited stage [121 (60%) Stage I; 16 (8%) Stage II; 7 (4%) Limited small cell cancer; and 58 (29%) Stage III or IV]. Since mid-2014, when we began to offer annual LDCT screening, we have enrolled >65% of eligible people into screening and have achieved very good adherence from one year to the next, though the cumulative dropout proportion increases substantially over time.

Conclusions and identification of several uses of the findings to improve human health or environmental outcomes (e.g., share with affected parties and decision makers, community involvement, additional work needed to evaluate scale-up results): LDCT-based lung cancer screening is endorsed by blue collar workers when offered free of charge by a trusted high quality program at a convenient location.

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SESSION V
Attended Poster Session

1. A mixed-method assessment of a company-based occupational injury surveillance system in Mexico. *Miranda Dally, USA*

2. A comparison of regulations for higher levels of respiratory protection for wildland firefighters. *Margaret Murray, USA*

3. Exposure patterns to phthalates and risk assessment in an infant cohort in Modena, Italy. *Lucia Palandri, Italy*

4. Neurodevelopment trajectory of children and adolescents in the industrialized area of Taranto, Italy. *Alessandra Patrono, Italy*

5. Cadmium exposure and cardiovascular disease risk: a systematic review and dose-response meta-analysis. *Pietro Verzelloni, Italy*

6. Are fibre analyses in human lung tissue reliable in diagnoses of asbestos-related diseases? *Xaver Baur, Germany*

7. Impact of pesticide exposure among Syrian refugee greenhouse agricultural workers on neurobehavioral performance, accounting for social stressors: A GEOHealth-MENA research study. *Rima R Habib, Lebanon*

8. An innovative strategy to curb air pollution in the National Capital Region. *Tushar Kant Joshi, India*

9. Out of balance: conflicts of interest persist in food chemicals determined to be generally recognized as safe. *Maricel V. Maffini, USA*

10. Threats to health and safety regulations for children under age 18 in the United States: Using rhetoric to address labor shortages using child labor. *Celeste Monforton, USA*

11. High prevalence of professional exposure to environmental toxicants amongst patients with complicated metabolic dysfunction-associated steatotic liver disease. *Francesco Tovoli, Italy*

A mixed-method assessment of a company based occupational injury surveillance system in Mexico

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Background: Recent research has suggested a relationship between climate change related increases in temperature and traumatic injuries in the workplace. A major limitation of the research is the ability to disentangle the complex epidemiology of traumatic injuries and elucidate the role of heat in the causal pathway. The Haddon Matrix is a commonly used tool to identify the causal factors related to injury. In this study we demonstrate how a modified Haddon Matrix can be utilized to identify causal factors of workplace injuries.

Methods: We conducted a mixed-methods analysis of five years of occupational injury records from an agribusiness operating in Veracruz, Mexico. Incidents were self-reported by workers and a narrative description of the accident was recorded by safety personnel. To qualitatively assess the data, we developed a codebook using inductive, data- driven content analysis with a modified Haddon Matrix as our framework. We allowed our codes to focus on causal factors related to human, object, environment, and organization levels that contributed to the injury.

Results: Injuries occurred at a rate of 3.9 per 100 FTE for the study period. The most common injury types were falls (0.7 per 100 full time equivalent (FTE)), entrapment (0.5 per 100 FTE), and extreme temperatures (0.4 per 100 FTE). Qualitative analysis suggested that impeded walkways and building conditions were common causal factors for falls. Extreme heat related injuries were often the result of insufficient use of PPE during welding, while fainting due to climatic conditions was also noted.

Conclusions and identification of several uses of the findings to improve human health or environmental outcomes (e.g., share with affected parties and decision makers, community involvement, additional work needed to evaluate scale-up results): This study provides a comprehensive way to consistently collect and analyze data across multiple occupational surveillance systems. There is a need to develop a schematic that can be used as a set of guidelines when taking an occupational injury narrative to provide better insight into the impact climate change will have on occupational injury.

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Miranda Dally, MS, is a senior research instructor at the Center for Health, Work and Environment at the Colorado School of Public Health where she works with agricultural workers internationally to examine the impact of climate change on their health, safety and wellbeing. She is s conducting her research to complete the requirements for a PhD at University of Colorado.

A comparison of regulations for higher levels of respiratory protection for wildland firefighters

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Background: Firefighting in California (CA) is a hazardous occupation with exposure to fine particulates (PM2.5) and toxic chemicals associated with respiratory disease. Moreover lung function decline in firefighters is associated with a cumulative exposure over an occupational lifetime. Since 2000 the number of CA wildfires has increased, likely a manifestation of climate change. Now firefighters are frequently exposed to the wildland-urban interface, resulting in a cumulative higher level of exposure to particulate matter. Respiratory protection in CA wildland firefighters is considered impractical, due to the physical demands of the occupation. As the number of wildfires increase in CA, wildland firefighters will continue to be exposed to higher levels of carcinogens and PM2.5.

Brief description of presentation: This policy analysis aims to analyze the risks and benefits of respiratory protection for these workers based on expert interviews and a comparative analysis on two policies for respiratory protection in other occupations with similar exposures.

Implications to improve human health or environmental outcomes: One benefit of protection is decreased exposure to the toxic chemicals and PM2.5, associated with respiratory diseases and decreased lung function. Powered air purifying respirators (PAPRs) ensure adequate protection against the exposures wildland firefighters typically encounter. Respiratory protection in this workforce faces administrative and physical constraints. Wildland firefighters are known to have an increased risk of heat-related illness compared to other workers due to the physical demands of their job. As temperatures continue to rise, this risk will increase. Finally, wildland firefighters must accept these protective measures. Therefore, collaboration with the firefighting community on safety regulations is necessary.

Identification of specific steps going forward to improve human health or environmental outcomes (e.g., fill data gaps, needed policies or regulations, dissemination plan): Overall there are multiple risks and benefits. An evaluation of the effectiveness and acceptance of respiratory protection in this workforce is necessary before any such regulation can be passed. To mitigate workers exposure to wildfire smoke both administrative controls and variation in type of respiratory protection are needed.

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Dr. Murray is a research fellow of Occupational, Environmental, and Climate Medicine at the University of San Francisco, California and is also a family medicine physician. Her primary research interest is how climate change impacts high-risk working populations.

Exposure patterns to phthalates and risk assessment in an infant cohort in Modena, Italy

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Background: Phthalates are ubiquitous pollutants whose antiandrogenic effects have been widely studied. Therefore, their usage in toys, cosmetics and kitchenware manufacturing has been restricted to reduce exposure in susceptible populations such as infants. Understanding their phthalate exposure patterns might help shed light on the primary exposure sources.

Methods: Between 2019 and 2020, 197 mother-child couples were enrolled in a prospective cohort study at the University Hospital of Modena (Italy). Urine samples were collected at birth, 3 and 6 months. 8 phthalates metabolites of 6 phthalates were analysed. Descriptive statistics, overall time trends and interclass correlation were calculated. Agglomerative hierarchical clustering was performed to assess exposure patterns in phthalate excretion. Risk assessment (Risk Quotients and Hazard Indices) was performed.

Results: Investigated phthalates were detected in all samples showing an increased trend over time. DnBP and BBzP were higher in newborns while DEHP was higher in 6-month-old infants. Samples collected at 3 months showed overall lower concentrations. Mothers and infants were interclass-correlated. Clustering analysis showed how 3- and 6- months infants had stricter clusters than their mothers. Most risk quotient and hazard indices were below reference levels yet higher values than the threshold were detected at each follow-up visit.

Conclusions and identification of several uses of the findings to improve human health or environmental outcomes (e.g., share with affected parties and decision makers, community involvement, additional work needed to evaluate scale-up results): Infants' phthalate exposure in Modena is still high, even for those more toxic and strictly regulated. Furthermore, our findings show how some mother-child pairs or infants tend to excrete higher levels of metabolites than others. These findings suggest that different domestic exposure patterns exist and that they tend to involve all family members. Finally, the results of the clustering analysis suggest that the increase in environmental interactions may result in a loss in stricter patterns due to more widespread environmental exposure. Public health campaigns addressing childbearing-age women about endocrine disruptors and how to avoid their exposure should be considered.

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Neurodevelopment trajectory of children and adolescents in the industrialized area of Taranto, Italy

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Background: Neurodevelopmental disorders affect 15% of births. It is a priority to study the consequences of environmental pollutants and socio-economic status on cognitive functions. In this study of children in the industrialized area of Taranto, we investigated the trajectory of neurodevelopment of potentially healthy children to identify differences in cognitive functions based on the areas of residence at incremental distance from emissions and within the socio- economic context.

Methods: From 2014 to 2020 a total of 600 participants (ages 6 to 15) were involved in IQ assessments using the Wechsler Intelligence Scale for Children (WISC). The socio-economic data were collected through a questionnaire. To evaluate the influence of residential location, three areas at an increasing distance from the industrial source were considered. *Results:* Cognitive indices with scores below the norm in the area closest to the industrial source compared to the area furthest away were as follows: verbal comprehension (33% v. 13%); visual-perceptual reasoning (33% v. 3%); working memory (42% v. 9%); machining speed (27% v. 4%). Although the screening phase included undiagnosed subjects, the following diagnostic profiles were collected among those who continued the evaluations: learning disorders; language disorders; intellectual disability. The results of the socio-economic survey showed that 74.2% mothers and 82.6% fathers have not completed post-secondary education; 66.1% have an annual income of less than €50,000; 51.4% of mothers were not formally employed.

Conclusions and identification of several uses of the findings to improve human health or environmental outcomes (e.g., share with affected parties and decision makers, community involvement, additional work needed to evaluate scale-up results): Given the importance of early diagnosis, being able to grasp these factors quickly helped facilitate dispensatory methods. This had direct effects on the functional aspects and the emotional well-being profile. The aid measures should also be oriented according to the perception of the problem as functional or linked to difficulties in the socio- economic context.

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Alessandra Patrono is a psychologist-psychotherapist, PhD student in Biomedical Sciences and Translational Medicine, Neurosciences at the University of Brescia. She works on the relationship between exposure to environmental pollutants and neurocognitive development.

Cadmium exposure and cardiovascular disease risk: a systematic review and dose-response meta-analysis

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Background: Exposure to toxic metals in the environment is a major global public health concern due to its severe adverse effects on human health. Multiple studies have reported an increased risk of developing cardiovascular diseases (CVD), the leading cause of mortality in the developed world, associated with exposure to cadmium. The purpose of this meta- analysis is to assess the correlation between different levels of cadmium exposure and the risk of stroke and overall CVD.

Methods: To identify eligible articles, we searched three databases (PubMed, Web of Science, and Embase) from their inception up to July 24, 2023. We used MeSH terms and keywords related to 'cadmium', 'cardiovascular diseases', and 'stroke', while excluding reviews. The PECOS statement determined the criteria to include the adult population, varying levels of cadmium exposure from occupation, smoking, food, and water, as well as the risk of overall CVD and subgroups in observational studies (cohort, cross-sectional, or case-control) at increasing levels of cadmium exposure. We employed the one-stage approach with a random-effects model to conduct a dose-response meta- analysis.

Results: The current results indicate a clear link between higher levels of cadmium and increased prevalence, incidence, and mortality of CVDs and its specific outcomes. When assessing blood as a biomarker, a direct, positive correlation emerged between overall CVD risk, mortality, and cadmium exposure. When using urine as a biomarker, there was a positive but not entirely linear association for the same outcomes, with a plateau at high level of exposure. The only exception is the incidence of ischemic stroke, which showed no association. The analysis, even when stratified by sex, indicates a positive association.

Conclusions and identification of several uses of the findings to improve human health or environmental outcomes (e.g., share with affected parties and decision makers, community involvement, additional work needed to evaluate scale-up results): These results highlight the need for implementing further measures to reduce environmental cadmium pollution, a significant factor associated with CVD.

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Dr. Pietro Verzelloni, MD, is attending the first year of the Residency program in Public Health at the University of Modena and Reggio Emilia. He previously obtained a diploma in General Medicine and worked in Community Medicine as a general practitioner. He is now studying the relation between environmental and dietary risk factors and risk of chronic diseases at CREAGEN-Environmental, Genetic and Nutritional Epidemiology Research Center, Department of Biomedical, Metabolic and Neural Sciences.

Are fibre analyses in human lung tissue reliable in diagnoses of asbestos- related diseases?

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Background: To estimate past asbestos exposure in the workplace some pathologists have analysed fibre counts in human lungs. However, such analyses are questionable because asbestos, especially chrysotile, undergoes translocation, clearance and degradation in the lungs.

Methods: We quantified the asbestos fibre and ferruginous (asbestos) body (FB) content in human lung tissue of 177 patients with various asbestos-related diseases (ARD)--28 with asbestosis, 105 with primary lung cancer due to asbestos, 44 with diffuse malignant pleural mesotheliomas)--and 46 controls.

Results: As shown in the figures, lung concentrations of chrysotile and amphibole fibres and of FBs depend on the year of examination and especially on the interim period since last exposure. As the interim increases, the asbestos fibre burden decreases. There was no relationship between FB and chrysotile asbestos fibre concentrations and only a weak correlation between FB and crocidolite fibre concentrations. FBs correlated poorly with the disease type and severity of asbestosis.

Conclusions and identification of several uses of the findings to improve human health or environmental outcomes (e.g., share with affected parties and decision makers, community involvement, additional work needed to evaluate scale-up results): After an interim period of about 20 years, elevated chrysotile asbestos fibre concentrations cannot be detected in the lung tissue of chrysotile-exposed workers. We also show for the first time, that the more biologically stable amphibole (crocidolite) fibres are also subject to elimination kinetics. Therefore, false-negative results of lung fibre analysis must be expected for all asbestos types. Thus, a negative light or electron microscopic lung analysis is not capable of overturning a reliable occupational history of asbestos exposure.

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Dr. Baur is retired chair of the Occupational Department of the University of Hamburg, Gemany, and current president of the charity European Society for Environmental and Occupational Medicine, Berlin, Germany.

Impact of pesticide exposure among Syrian refugee greenhouse agricultural workers on neurobehavioral performance, accounting for social stressors: A GEOHealth-MENA Research Study

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Background: This poster is provides further information linked to the session Panel session 'Calls for action in occupational and environmental health from the Global South'. Lebanon, a country of 4 million, face various economic and political challenges and hosts >1.5 million Syrians refugees. Most refugees work in agriculture and live in tented settlements. Syrian agricultural workers are exposed to high levels of pesticides and heat stress during summer. *Brief description of presentation:* As part of the Global Environmental and Occupational Health Hub for Research Training in the Middle East and North Africa Region (GEOHealth-MENA Hub) program, this research evaluates the pathways of pesticide exposure among greenhouse agricultural workers, association of such exposure with neurobehavioral outcomes, explores the role of social factors in this association, and assesses heat stress and health-related symptoms among these workers. Specific aims are: 1) build a cohort of 150 Syrian refugee greenhouse agricultural workers and 150 non-agricultural workers and quantify exposure to pesticides. A comprehensive exposure assessment of all participants will be conducted over two consecutive summers (2024, 2025), using three exposure assessment methods: field observation, quantitative environmental exposure using wearable individual passive samplers, and biological measures of urinary pesticide metabolites [TCPy for chlorpyrifos (organophosphate) and 3-PBA for pyrethroid exposures]. 2) characterize workers' social stressors and evaluate how they change over time and how they relate to pesticide exposure. 3) assess relationships between exposure to pesticides and neurobehavioral performance, focusing on temporal relationships (cross-sectional, over two waves, and dose-response) and explore the role of social stressors in these associations. 4) assess heat stress and heat-related physiological indicators and health symptoms among agricultural and non- agricultural workers. *Implications to improve human health or environmental outcomes:* Agricultural workers worldwide are affected by pesticide exposure and heat stress, leading to impaired physical and cognitive function. Extreme temperatures are predicted to worsen and challenge population's livelihoods. *Identification of specific steps going forward to improve human health or environmental outcomes:* Research findings will inform intervention/implementation science studies and agricultural health safety practices and policies.

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Dr. Rima R. Habib is a professor of Occupational and Environmental Health at the Faculty of Health Sciences at the American University of Beirut, Lebanon. Her research focuses on workers in marginalized communities, including refugees working in the agricultural sector. She conducted one of the largest studies on child labor including 3477 Syrian children working in agriculture in Lebanon. Dr. Habib is a Fellow of the Collegium Ramazzini.

An innovative strategy to curb air pollution in the National Capital Region

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Background: Controlling air pollution is an overriding priority of the Indian government. During the peak winter period the entire north India, mainly the Indo Gangetic plain, reels under appalling levels of PM 2.5, PM 10 and ozone. The government announced the Air Quality Index (AQI) with six categories in September 2014. Thereafter, a National Climate Action Plan, National Clean Air Programme (NCAP), revision of PM10, PM 2.5, and ozone standards followed.

Brief description of presentation: The first Global Burden of Disease Study in 2019 claimed that 1.67 million deaths occurred due to air pollution (95% uncertainty interval 1·42–1·92). This represented 17·8% (15·8–19·5) of overall deaths in India. The significant fraction of these deaths was attributed to ambient particulate matter pollution (0·98 million [0·77–1·19]) and household air pollution due to biomass burning (0·61 million [0·39–0·86]). Surprisingly, the death rate due to household air pollution were down by 64·2% (52·2–74·2) from 1990 to 2019, but the death rate caused by ambient particulate matter pollution increased by 115·3% (28·3–344·4) and was attributed to ambient ozone pollution which increased by 139·2% (96·5–195·8). Lost output from premature deaths and morbidity due to air pollution accounted for economic losses in 2019 of US$28·8 billion ($21·4–$37·4). The city of Delhi registered the highest per-capita economic loss due to air pollution.

Implications to improve human health or environmental outcomes: The Graded Response Action Plan (GRAP) implementation led to the improvement of AQI. This paper presents the strategy and its success and failures.

Identification of specific steps going forward to improve human health or environmental outcomes (e.g., fill data gaps, needed policies or regulations, dissemination plan): Delhi is the seat of power and a place from where India is administered. To protect the key functionaries and citizens Commission for Air Quality launched an innovative strategy of GRAP (Graded Response Action Plan).

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Threats to health and safety regulations for children under age 18 in the United States: Using rhetoric to address labor shortages using child labor

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Background: United States (U.S.) employers are struggling to find people who will accept low paying jobs and working conditions as offered. Lawmakers have failed to adopt a humane immigration system which is a factor related to the labor shortage. In response, businesses are illegally hiring children to work in hazardous jobs and beyond the allowed hours of work. Simultaneously, efforts are underway to repeal U.S. child labor protections by business groups promoting the rollbacks.

Brief description of presentation: Our poster will present information on these efforts and provide examples of the rhetoric used to persuade lawmakers to weaken child labor rules.

Implications to improve human health or environmental outcomes: Comprehensive child labor laws were adopted in the U.S. in 1938. The goal was to improve the health and well- being of children by requiring school attendance and limiting opportunities for work. It was meant to reduce educational disparities which are means to advance public health through greater equality and economic security. Children's lives have been saved and health protected because of limits on legal age for work, work hours and prohibitions on employment in hazardous work. The first update of the safety protections for young farm workers was proposed in 2010 by the Obama administration. They abandoned the plan because of (misleading) claims that the regulations would destroy family farms. Use of rhetoric that invokes "American values" is prevalent in current efforts to scale back child labor and other protections for youth in the U.S.

Identification of specific steps going forward to improve human health or environmental outcomes (e.g., fill data gaps, needed policies or regulations, dissemination plan): Public health advocates need current data on the state of child labor in the U.S. The most recent comprehensive examination of U.S. employment trends for young workers and adequacy of child labor regulations was published 20 years ago. Systemic changes and updated policies are needed to improve jobs for adults and address implement humane immigration policies which influence the prevalence of child labor in the U.S.

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Celeste Monforton, Dr.PH, MPH is a lecturer in public health at Texas State University. Her research includes assessment of worker health and safety laws and policies, and their effectiveness in preventing injuries and illnesses. She has written about strategies used by business groups to manipulate evidence in order to delay regulatory protections. Her current projects include community-based research involving Latino day laborers in Houston, Texas and securing a United States ban on asbestos.

High prevalence of professional exposure to environmental toxicants amongst patients with complicated metabolic dysfunction-associated steatotic liver disease

Francesco Tovoli[1,2], Bernardo Stefanini[1], Daniele Mandrioli[3], Andrea Vornoli[3], Daria Sgargi[3], Fabiana Manservisi[3], Fabio Piscaglia[1,2], Luigi Bolondi[1]

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Background: Increasing evidence shows that environmental toxicants increase the risk of metabolic dysfunction-associated steatotic liver disease (MASLD). Studies about the potential contribution of the same chemicals to the progression of MASLD to advanced chronic liver disease (ACLD) or hepatocellular carcinoma (HCC) are virtually non-existent. Workers professionally exposed to toxicants represent an ideal population to detect potentially hazardous exposures and develop preventive strategies.

Methods: We conducted a hospital-based prospective study including 201 consecutive MASLD participants. Exposures to workplace toxicants were assessed using a structured questionnaire. The characteristics of ACLD/HCC patients were compared with those of patients with uncomplicated MASLD using logistic regression models. These models included crude estimates and inverse probability weighted (IPW) –based adjustment for confounders (age, sex, smoking status, diabetes, hypertension, and obesity).

Results: Increased rates of long-term exposures to workplace chemicals (especially metals, halogenated refrigerants, viscose, colourants, and fuels) were found amongst ACLD/HCC patients and confirmed after correction for confounders, with adjusted odds ratios (aORs) of 2.31 (95% CI 1.09-4.88, p=0.029) for 21-30 year-long exposures and 4.47 (95% CI 2.57-7.78, p<0.001) for > 30 year-long exposures. These effects were largely confirmed in study subgroups (Figure). Proximity to farms with probable use of pesticides was also more often referred by ACLD/HCC patients (aOR 4.66, 95% CI 2.36-9.19, p<0.001).

Conclusions and identification of several uses of the findings to improve human health or environmental outcomes (e.g., share with affected parties and decision makers, community involvement, additional work needed to evaluate scale-up results): Patients with the most severe complication of MASLD (including ACLD and HCC) had an increased probability of > 20 years exposure to workplace toxicants. Our results warrant future multicenter confirmatory studies, as implementing prevention policies might reduce the risk of life-threatening liver diseases among exposed populations.

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Dr. Francesco Tovoli is assistant professor in the Department of Medical and Surgical Sciences at the University of Bologna where he has worked with residents in several areas of hepatology, including steatosic liver disease and chemicals-induced liver damage.

SESSION VI

Calls for action in occupational and environmental health from the global South, Occupational cancer in the fire service: A historical perspective and overview, 'Everything, Everywhere, All at Once': Per- and polyfluoroalkyl (PFAS) substances & New poverties and new responsibilities

1. Pesticides exposure and health in South America: Occupational and environmental exposure of the rural families. *Amalia Laborde Garcia*, *Uruguay*

2. Increasing the visibility of pesticides handling practices with detrimental health effects in small-scale horticultural farming in Tanzania. *Aiswerasia Vera Ngowi*, *Tanzania*

3. Asbestos related disease cluster investigation in the context of limited health information: The Sibaté study. *Juan Pablo Ramos-Bonilla*, *Colombia*

4. The GEOHealth-MENA hub for research and training on environmental, occupational and social stressors in a low-resourced and rapidly changing setting. *Iman Nuwayhid*, *Lebanon*

5. Science to policy: A contribution to the rational management of chemicals and waste to prevent pollution: Critical scientific aspects of health in the current South/North scenario. *Lilian Corra*, *Argentina*

6. Occupational cancer in the fire service: A historical perspective and overview. *Richard Duffy*, *USA*

7. Findings from NIOSH studies of firefighter cancer incidence and mortality. *Thomas Hales*, *USA*

8. Firefighter medical monitoring and enhanced cancer screening. *Ellen R. Kessler*, *USA*

9. Mesothelioma in the fire service: The role of cancer registries for monitoring incidence and preventing disease. *Alessandro Marinaccio*, *Italy*

10. Health impacts from World Trade Center exposure on NYC fire fighters and EMS workers. *David Prezant*, *USA*

11. Changing protection priorities for firefighters and other first responders. *Jeffrey Stull*, *USA*

12. 'Everything, Everywhere, All at Once': Per- and polyfluoroalkyl (PFAS) substances. *Patrick Breysse*, *USA*; *Philippe Grandjean*, *Denmark and USA*

13. Interpretation of epidemiological evidence of PFAS toxicity. *Philippe Grandjean*, *Denmark and USA*

14. PFAS removal and destruction: Overview of research considerations and status. *Bruce Rodan*, *USA*

15. Uses of PFAS and their alternatives: Cases studies for uses of fluoropolymers and fluorinated gases. *Ian Cousins*, *Sweden*

16. An integrated approach for managing PFAS risks and contamination. *Francesco Dondero*, *Italy*

17. Regulatory efforts to control per- and polyfluoroalkyl substances in the European Union, United States, and worldwide. *Gretta Goldenman*, *Belgium*

18. The Precautionary Principle: Environmental medicine's gift to genocide prevention. *Elihu Richter*, *Israel*

19. Pandemics, plenty and poverty: The fight against malnutrition and food insecurity. *Elliot Berry*, *Israel*

20. Conscription and enlistment of child soldiers: The impact of COVID-19 and inadequacies of international law and policies. *Ruth Amir*, *Israel*

21. An emerging threat for human health: Exposure to artificial light at night—time to reconsider the widespread exposure to artificial light at night among night-shift workers. *Tommaso Flippini*, *Italy*

22. The plasticene (plastic) epoch: health and environmental consequences and a way forward. *Ilana Belmaker*, *Israel*

Pesticides exposure and health in South America: Occupational and environmental exposure of rural families

Amalia Laborde García[1]
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Background: There is an increasing body of evidence showing that agricultural practices based on intensive use of pesticides in South America (SA), should be a public health concern. Even though the per capita use of pesticides in the region is one of the most elevated, pesticides exposure research and health surveillance programs are practically nonexistent.

Brief description of presentation: Rural families in SA are the most vulnerable group since they are usually poor, live with very limited services but have simultaneous occupational, para-occupational and environmental exposure. At the same time they represent the core group to manage actions not only for self-protection, but also for global food safety and environmental care.

Implications to improve human health or environmental outcomes: There have been different preventive programs as well as regulations proposed to reduce or minimize pesticides occupational and environmental exposure within the region. However, they have barely reached the rural workers and their families.

Identification of specific steps going forward to improve human health or environmental outcomes (e.g., fill data gaps, needed policies or regulations, dissemination plan): Public policies designed to the wellbeing of the rural population is key to their empowerment and involvement in agricultural practices that protect themselves, their families, and the general population from pesticides exposure.

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Dr. Amalia Laborde Garcia is professor of toxicology at the School of Medicine of the University of the Republic in Uruguay. She established the first occupational and environmental toxicology unit in 1999, where she works with students, medical doctors, workers and community organizations in clinical care, training and research.

Increasing the visibility of pesticides handling practices with detrimental health effects in small-scale horticultural farming in Tanzania

Aiwerasia Vera Ngowi[1], Dorothy Ngajilo[2], Baldwina Olirk[3]

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Background: The use of pesticides in agriculture is growing in Tanzania, raising increasing concerns about their damaging effects on human health and the environment. Last year the government identified 44 highly hazardous pesticides (based on carcinogenicity and reproduction effects) on the market but has yet to ban or remove them from use. Over the last decades, Tanzania has developed agricultural policies favoring the use of chemical inputs, among which are pesticides.

Brief description of presentation: New pesticide regulations and revamped institutions are an attempt to relax enforcement of control rules, and to establish clearer, quicker approved channels for pesticide sale. To loosen the control of pesticides makes them more accessible to people who are not competent on safe pesticide use. Today, there is evidence that the use of some pesticides causes long-term severe negative effects on human health and the environment. Health concerns associated with the handling and use of pesticides are greater in developing countries because farmers are often unable to read labels that are usually the only source of safety instructions and rely on pesticide retailers for advice.

Implications to improve human health or environmental outcomes: Although a transition away from exclusive reliance on chemical pesticides has gained critical importance in many countries, with support from international organisations such as FAO, WHO and UNEP, the pesticide industry has greater influence against such efforts in Tanzania.

Identification of specific steps going forward to improve human health or environmental outcomes (e.g., fill data gaps, needed policies or regulations, dissemination plan): Building awareness of the hazards associated with pesticides as well as of the benefits of alternatives is an approach that is needed. It is also important to consider advocating for the amendment of regulations to prevent harmful effects as well as pushing for safer policies and regulations. To understand how public policies and regulations in Tanzania are designed to control pesticide trade and to what extent they effectively prevent the detrimental public health and environmental effects of those substances is presented.

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Dr. Ngowi is retired Senior Lecturer, Muhimbili University of Health and Allied Sciences. She was Research scientist at Tropical Pesticides Research Institute. She was Chairperson for the Africa Stockpiles Programme, Tanzania Network of NGOs and CSOs. She led collaborative research with institutions in Eastern and Southern Africa, North America, Scandinavia, assessing the health hazards posed by pesticide handling, storage and use on large and small-scale farms and developing action on pesticide impact in Tanzania.

Asbestos related disease cluster investigation in the context of limited health information: the Sibaté study

Juan Pablo Ramos-Bonilla[1], Margarita Giraldo[1], Daniela Marsili[2], Roberto Pasetto[2], Benedetto Terracini[3], Agata Mazzeo[4], Corrado Magnani[5], Pietro Comba[3], Benjamin Lysaniuk[6], María Fernanda Cely-García[1], Valeria Ascoli[7]

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Background: Asbestos has been extensively used in Colombia since the establishment of an asbestos-cement facility in Sibaté, Cundinamarca, in 1942, the country's first and largest facility, which manufactured corrugated sheets, pipelines, and water tanks. Despite hosting one of the largest asbestos industries in Latin America, Colombia lacks a reliable epidemiological surveillance system to monitor the health effects of asbestos exposure. An asbestos ban came into effect in Colombia on January 1, 2021, and the facility of Sibaté continues to operate with asbestos substitutes.

Brief description of presentation: To study the potential health effects of asbestos use in Sibaté, an active surveillance strategy was implemented between 2015 and 2019, in the framework of an international collaboration that includes institutions from Colombia, Italy, and France. This included door-to-door structured interviews to identify asbestos-related diseases (ARDs), review by a panel of physicians of the medical records of mesothelioma cases identified following the criteria proposed by the Italian National Mesothelioma Register (ReNaM), and communication of findings to local, regional, and national authorities and the general population.

Implications to improve human health or environmental outcomes: The active surveillance strategy identified a mesothelioma cluster in Sibaté, composed of 15 cases diagnosed at really young ages. This implied the inadequacy of the existing health information system in monitoring ARDs. The study underscored the urgent need for Colombia to establish a reliable epidemiological surveillance system for ARDs, not only for Sibaté but also for all the additional regions where four asbestos-cement facilities, a friction products plant, and a chrysotile mine operated (i.e., Yumbo, Manizales, Barranquilla, Campamento and Bogotá).

Identification of specific steps going forward to improve human health or environmental outcomes (e.g., fill data gaps, needed policies or regulations, dissemination plan): The study demonstrated that active surveillance strategies could play a crucial role in identifying mesothelioma clusters and understanding the health effects of asbestos exposure. These strategies can be of critical importance in low- and middle-income countries with limited governmental institutions and resources.

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Dr. Ramos-Bonilla is Associate Professor at the Department of Civil and Environmental Engineering at Universidad de los Andes in Bogotá, Colombia. Since 2009 he has lead research efforts in Colombia aiming to understand the health risks associated with asbestos use at both the occupational and population levels.

The GEOHealth-MENA hub for research and training on environmental, occupational, and social stressors in a low-resourced and rapidly changing setting

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Background: In the wake of numerous protracted humanitarian crises in the Middle East and North Africa (MENA) region (e.g., armed conflicts, devastating natural disasters, socioeconomic collapse, mass displacements, climate change), the Global Environmental and Occupational Health Hub for Research and Training in the MENA region (GEOHealth- MENA) emerged to build capacity in environmental and occupational health (EOH) research and recommend an action plan to deal with these complexities.

Brief description of presentation: Centered at the American University of Beirut (AUB), the GEOHealth-MENA Hub has adopted an ambitious agenda for research and training in collaboration with four US-based academic institutions: Yale University, the University of Iowa, the University at Buffalo, and the University of Washington. The Hub's research will examine the interplay between environmental, occupational, and social stressors in low-income communities. It will focus on the health impacts of pesticide exposure in Syrian refugee agricultural workers in Lebanon accounting for social stressors. The Hub's research agenda also includes the health impacts of climate change, specifically exposure of agricultural workers to heat stress. The GEOHealth-MENA's training program includes offering four PhD and four MS Epidemiology scholarships at AUB to qualified professionals (Egypt:2, Lebanon:4, Sudan:2). The MS trainees are medical doctors who will pursue a clinical fellowship in Occupational Medicine. Furthermore, the program will offer focused short-term training in Agricultural Health and Safety addressed to farmers, workers, and health professionals.

Implications to improve human health or environmental outcomes: The Hub, with universities from across the MENA region (e.g., Egypt and Sudan), will develop a relevant regional EOH research agenda and will test low-cost tools for exposure assessment for use in low-income settings.

Innovative approaches analyzing the interactions between environmental and social stressors, especially relevant in local contexts, will be adopted.

Identification of specific steps going forward to improve human health or environmental *outcomes (e.g., fill data gaps, needed policies or regulations, dissemination plan):* The Hub's research will provide evidence-based solutions to inform policy in the agricultural sector.

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Iman Nuwayhid is a professor of Environmental and Occupational Health at the Faculty of Health Sciences at the American University of Beirut, where he served as dean (2008- 2020). He is a Collegium Ramazzini Fellow and a co-editor of the landmark book on "Public Health in the Arab World" (2012). He served on the WHO-EMRO Commission on Social Determinants of Health and the Scientific Advisory Group for the World Report on Social Determinants of Health Equity.

Science to policy: A contribution to the rational management of chemicals and waste to prevent pollution - critical scientific aspects of health in the current South/North scenario

Lilian Corra
International Society of Doctors for the Environment, Buenos Aires, Argentina

Background: In 2021 the United Nations Environment Assembly (UNEA) decided that a science-policy panel should be established to contribute further to the sound management of chemicals and waste and to prevent pollution. Science is a central factor to strengthen informed decision-making processes on the environment and health but scientific knowledge is not easily accessible to policy makers.

Brief description of presentation: UNEA stressed the urgent need for a multi-stakeholder participation to support and promote science-based local, national, regional and global action on the sound management of chemicals and waste and pollution prevention.

Implications to improve human health or environmental outcomes: According to UNEA: "Reaffirming that the sound management of chemicals and waste is crucial for the protection of human health and the environment and that air pollution is the single greatest environmental risk to human health, convinced that a science-policy panel could support countries in their efforts to take action, including to implement multilateral environmental agreements and other relevant international instruments, promote the sound management of chemicals and waste, and address pollution by providing policy- relevant scientific advice on issues, and that it could further support relevant multilateral agreements, other international instruments and intergovernmental bodies, the private sector and other relevant stakeholders in their work…"

Identification of specific steps going forward to improve human health or environmental outcomes (e.g., fill data gaps, needed policies or regulations, dissemination plan): In this presentation, opportunities for collaboration and involvement of the Collegium.

Ramazzini (CR) under this new scenario will be analyzed, to increase the presence of the CR fellows in decision- making forums (both international, national and regional) on chemicals and waste and air pollution by fulfilling the natural commitment of the CR to protect health and quality of life, so well expressed in the phrase "Primun non nocere."

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Dr. Corra is a physician with specialty as a neonatologist, environmental health senior expert and consultant. She participates in the WHO experts working groups on children's environmental and chemicals and UNEP negotiation of international chemical processes (Stockholm, Basel, Minamata Conventions and Plastic Pollution). She participated in the Forum Standing Committee of the Intergovernmental Forum on Chemical Safety (WHO), in the Bureau of the Strategic Approach to the International Chemical Management SAICM (UNEP) and UNEP Mercury Partnership.

Occupational cancer in the fire service: A historical perspective and overview

Richard Duffy
International Association of Firefighters (retired). Washington, DC, USA

Background: The profession of firefighting is and has always been a hazardous occupation. Firefighter line-of-duty fatalities have ranked firefighting among other publicized hazardous occupations in the private sector. Every emergency situation encountered by a firefighter has the potential for exposure to carcinogenic agents. The list of potential carcinogenic agents to which firefighters can be exposed is almost as long as the list of all known or suspected carcinogens. Firefighters are exposed to toxic and carcinogenic substances at fire scenes as well as other emergencies such as hazardous chemical events. Further, they experience exposures to carcinogens in their fire stations as well as from their protective clothing. The long-term health effects of exposures may not be apparent to firefighters until after the memory of such incident or exposure. Despite the ominous risk of exposures, firefighters enter potentially toxic atmospheres without adequate protection or knowledge of the environment.

Brief description of presentation: Firefighters continue to respond to the scene to save lives and reduce property damage without regard to the potential hazards that may exist. A fire emergency is an uncontrolled environment that is managed by firefighters using personal protective equipment that is often inadequate. The experience is not only physically demanding, but also involves exposures that are known to cause cancer. The nature of these exposures continues to be defined.

Implications to improve human health or environmental outcomes: We have assembled a group of experts that have defined the nature of many of these exposures and have assisted in the development of firefighter occupational health programs to address the firefighter cancer experience.

Identification of specific steps going forward to improve human health or environmental outcomes (e.g., fill data gaps, needed policies or regulations, dissemination plan): We have assembled a group of experts that have defined the nature of many of these exposures and have assisted in the development of firefighter occupational health programs to address the firefighter cancer experience.

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Mr. Duffy has been involved with worker occupational health and safety issues for over 45 years. In January 2013, he retired from the International Association of Firefighters after 36 years of service. He was responsible for the all the IAFF's activities addressing occupational medicine, safety and health. He holds BS degrees in environmental health and in business management from Davis and Elkins College and a MS in occupational and environmental health sciences from Hunter College.

Findings from NIOSH studies of firefighter cancer Incidence and mortality

Thomas R. Hales
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Background: Between 2014 and 2020, the National Institute for Occupational Safety and Health (NIOSH) published three research papers examining the potential association of firefighter service and cancer. The most recent paper, published in 2020, updated the mortality experience of 29,992 urban career firefighters in the United States (US) compared with the US general population and examined exposure-response relationships within the cohort.

Methods: The vital status was obtained of firefighters from three large urban departments employed since 1950 and followed through 2016. The cohort mortality compared with the US population was evaluated via life table analyses.

Exposure-response associations between select mortality outcomes and exposure surrogates (exposed-days, fire- runs and fire-hours) were analyzed using the Cox proportional hazards regression. Models were adjusted for a potential bias from healthy worker survivor effects by including a categorical variable for employment duration.

Results: Compared with the US population, mortality from all cancers, mesothelioma, non-Hodgkin's lymphoma and cancers of the esophagus, intestine, rectum, lung, and kidney were modestly elevated. Positive exposure-response relationships were observed for deaths from lung cancer, leukemia, and chronic obstructive pulmonary disease.

Conclusions and identification of several uses of the findings to improve human health or environmental outcomes (e.g., share with affected parties and decision makers, community involvement, additional work needed to evaluate scale-up results): The 2020 update confirms previous NIOSH findings of excess mortality from all cancers and several site-specific cancers, as well as positive exposure-response relations for lung cancer and leukemia. These findings were reviewed by the IARC expert panel evaluating the carcinogenicity of occupational exposure as a firefighter.

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Dr. Hales is a senior medical epidemiologist with the CDC – NIOSH and a member of CDC's emergency response team. For the past 10 years, Dr. Hales has been the Team Leader of the NIOSH Firefighter Program- Cardiovascular He received his BA from Stanford University, his MD from Case Western Reserve University in Cleveland, Ohio, and his MPH from University of California – Berkeley in epidemiology. He is board certified in internal medicine and occupational/environmental medicine.

Firefighter medical monitoring and enhanced cancer screening

Ellen R. Kessler
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Background: Occupational exposure as a firefighter causes cancer, as recently determined by the International Agency for Research on Cancer. However, there are no uniform guidelines for cancer screening in firefighters. The US Preventive Services Task Force addresses cancer surveillance for the general population but has not directly acknowledged that the firefighter population warrants a more enhanced approach. As a result, the cost of screening for some cancers at an earlier age or employing more novel testing modalities will not typically be covered by the firefighter's health insurance. In the US, some jurisdictions have the financial resources to provide their members with enhanced cancer screening as part of a comprehensive annual physical. There are also companies that travel to the jurisdiction and provide targeted ultrasound imaging (Thyroid Ultrasound • Liver, Gall Bladder, Spleen, & Kidney Ultrasounds • Bladder Ultrasound • Pelvic Ultrasounds for Women (Ovaries and Uterus) • Prostate and Testicular Ultrasounds for Men). To date, the potential for false positive and false negative results have not been fully evaluated

Brief description of presentation: Below are some jurisdictions with enhanced cancer screening and preliminary outcomes: • Fairfax County, Virginia; • Phoenix, Arizona; • Boston, Massachusetts; • New York City, New York.

Implications to improve human health or environmental outcomes: Inova is Northern Virginia's leading nonprofit healthcare provider. The Inova Health System's Occupational Medicine Department is working in partnership with the Hospital System's Schaar Cancer Institute and its cancer wellness center (Saville Center) and firefighter cancer researchers to develop a tiered approach to firefighting cancer screening based upon family risk, years in service and age.

Identification of specific steps going forward to improve human health or environmental outcomes (e.g., fill data gaps, needed policies or regulations, dissemination plan): The screening is open to all career firefighters and funding will be via a combination of the firefighter's private insurance, the use of available data from the annual firefighter exam and contributions from a private foundation. The number of enrollees is expected to be at least 200.

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Ellen Kessler, MD, MPH, FACP FACOEM is the past Medical Director of Inova Occupational Health Services in Fairfax County, Virginia. She brings more than 25 years of occupational health experience and directorship and is board certified in occupational medicine and internal medicine. Dr. Kessler received her medical and internal medicine residency training from Georgetown University. She completed an MPH and her occupational medicine residency at the Johns Hopkins Bloomberg School of Public Health.

Mesothelioma in the fire service: The role of cancer registries for monitoring incidence and preventing disease

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Background: Italy issued an asbestos ban in 1992 and a national mesothelioma registry has been progressively established for monitoring the occurrence of mesothelioma cases and conducting a case-by-case evaluation of asbestos exposure.

Methods: The Italian mesothelioma registry (ReNaM) is an epidemiological surveillance system, organized as a network of regional operating units (COR). The CORs actively search and register incident cases from healthcare services that diagnose and treat cases. Occupational history, lifestyle habits, and residential history are investigated using a standardized questionnaire. From ReNaM archives, all mesothelioma cases with occupational exposure as firefighters have been selected and analysed, focusing on the demographic, clinical and occupational characteristics.

Results: In ReNaM, 49 MM cases in firefighters are present (among the collected case-list of more than 30,000 mesotheliomas between 1993 and 2018). Median age at diagnosis is 64 years old and all cases are males and histologically confirmed). Almost all cases are in the pleural form (1 and 1 case for the peritoneal and pericardial forms). The modalities of exposure have been assessed qualitatively, by the means of a direct interview (36 cases, 73.5%) or of indirect interview (to a next of kin). The presence of asbestos in the protective suits and anti-fire overalls and blankets has been proven and extensively reported in the anamnestic analyses of the mesothelioma patients with an occupational period of work as firefighters. Gloves containing asbestos has been frequently in use until 1992.

Conclusions and identification of several uses of the findings to improve human health or environmental outcomes (e.g., share with affected parties and decision makers, community involvement, additional work needed to evaluate scale-up results): The epidemiological mesothelioma surveillance is a fundamental tool for producing scientific knowledge, for supporting the effectiveness of the insurance and welfare systems, and for contributing to the asbestos exposure prevention policies in countries where asbestos has been banned. There is a need to improve the epidemiological surveillance of the asbestos related diseases in the countries where asbestos is still used.

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Alessandro Marinaccio is Head of the Unit of Occupational and Environmental Epidemiology at the Italian National Workers Compensation Authority (INAIL). He heads the Italian mesothelioma register (RENaM) and of the Italian sinonasal cancer register (ReNaTuNS). He holds a Bachelor of Statistics and has completed Postgraduate work at La Sapienza University, Rome.

Health impacts from World Trade Center exposures on NYC firefighters and EMS workers

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Background: Exposure to dust/smoke from the World Trade Center (WTC) attack caused increased rates of pulmonary and cancer illnesses in FDNY rescue and recovery workers. 10% of the cohort experience greater than twice the age- related decline in lung function (FEV1). We compared disease incidence and mortality rates in WTC-exposed FDNY firefighters with (1) similarly healthy, non-WTC-exposed/non-FDNY firefighters, and (2) the general population.

Methods: 10,786 male WTC-exposed FDNY firefighters and 8,813 male non-WTC-exposed firefighters from other urban fire departments who were employed on 9/11/2001 (9/11) were included in the analyses. Only WTC-exposed firefighters received health monitoring via the WTC Health Program. Follow-up began 9/11/2001 and ended at the earlier of death date or 12/31/2016. Death data were obtained from the National Death Index, and demographics from the fire departments. We estimated standardized mortality ratios (SMRs) in each firefighter cohort vs. US males using demographic-specific US mortality rates. Poisson regression models estimated relative rates (RRs) of all-cause and cause-specific mortality in WTC-exposed vs. non-WTC-exposed firefighters, controlling for age and race.

Results: Between 9/11/2001-12/31/2016, both cohorts had reduced all-cause mortality compared with US males (SMR[95%CI]=0.30 [0.26-0.34] and 0.60 [0.55-0.65]) in WTC-exposed and non-WTC-exposed, respectively). WTC-exposed firefighters had lower rates of all-cause mortality (RR=0.54, 95%CI=0.49-0.59) and cancer-, cardiovascular- and respiratory disease-specific mortality compared with non-WTC-exposed firefighters. For WTC- exposed FDNY firefighters, those with FEV1 decline ?64 ml/year had higher all-cause (HR=2.91; 95% CI=2.37-3.56) and cancer-cause mortality (HR=2.68; 95% CI=1.90-3.79).

Conclusions and identification of several uses of the findings to improve human health or environmental outcomes (e.g., share with affected parties and decision makers, community involvement, additional work needed to evaluate scale-up results): Both firefighter cohorts had lower than expected all-cause and cancer-related mortality rates than the general population. Baseline and longitudinal lung function decline were associated with increased risk of all-cause and cancer-cause mortality. Further investigation is needed to define the pathways by which WTC-exposure, firefighting, the healthy-worker effect and greater access to free health monitoring/treatment interact to affect incidence and mortality rates.

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Dr. David Prezant is the Chief Medical Officer for the Fire Department of the City of New York and the Special Advisor to the Fire Commissioner for Health Policy. Dr. Prezant received his BS from Columbia College and his Doctor of Medicine from the Albert Einstein College of Medicine. He continues as a Professor of Medicine at the Albert Einstein College of Medicine and a pulmonary physician at Montefiore Medical Center.

Changing protection priorities for fire fighters and other first responders

Jeffrey Stull
International Personnel Protection, Inc., Austin, Texas, USA

Background: Firefighting and other forms of emergency response often involve a wide range of severe hazards under mainly uncontrolled, dynamic, and diverse exposure conditions. Over the last several decades, the personal protective equipment (PPE) items worn by fire fighters and other first responders have evolved with a changing focus on different requirements that address current and emerging threats, different mission responsibilities, and operational expectations. The priorities for protection have generally been established by successive versions of consensus standards that balance responder needs with available technology but have become increasing complex as new hazards are given greater attention.

Brief description of presentation: A short history of fire fighter PPE evolution in North America will be presented that shows how PPE technology has advanced through a series of significant changes based on what were perceived to be the principal protection needs and how current concerns related to minimizing exposure hazards leading to cancer and other serious health issues has now become one of the paramount issues facing emergency services. The specific impacts of selected research on PPE standards will be highlighted with insights as to how contemporary exposure concerns now warrant tradeoffs for balancing protection, functionality, and long-term health.

Implications to improve human health or environmental outcomes: The comprehensive revision of requirements in existing standards related to PPE manufacture, its selection and use, and overall care and maintenance is perceived to provide one of the best means to address contamination control.

Part of this approach must entail a reanalysis of current criteria to better inform PPE design and performance that is coupled with practical, health-based operating practices that do not compromise protection from acute and chronic exposure threats.

Identification of specific steps going forward to improve human health or environmental outcomes (e.g., fill data gaps, needed policies or regulations, dissemination plan): A specific multi-step approach for revising standards is recommended to establish optimized forms of PPE that better account for cancer and disease causative factors.

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Jeffrey Stull, MS in Chemical Engineering, is President of International Personnel Protection, Inc. in Austin, Texas that has been providing over 40 years of subject matter expertise, research, product testing, and standards development in the promotion of improved PPE for healthcare, first responders, and industry. He has been engaged in numerous projects for evaluating fire fighter protection tradeoffs.

Interpretation of epidemiological evidence of PFAS toxicity

Philippe Grandjean[1,2]
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Background: The PFASs illustrate key issues in public health where protection against adverse exposures relies on proper documentation. During the decades of PFAS production and dissemination, little research evidence was released. Only during the recent two decades has impartial documentation materialized, and regulatory limits have been lowered by a factor of about 1,000. The question to be asked today is whether we now have sufficient information to judge the true extent of PFAS toxicity or at least some of the most relevant aspects of it.

Brief description of presentation: The relevance and quality of the epidemiological studies of course needs to be scrutinized, but the evaluation is not just a matter of, e.g., statistical power, or risk of bias. Given that PFASs can accumulate in the body over time and that vulnerability to PFAS toxicity is likely age-dependent, the assessment of PFAS exposure needs to be considered in the research design and in evaluating the study results. Likewise, the outcome parameters need to be carefully chosen and assessed.

Implications to improve human health or environmental outcomes: Regulatory agencies have prudently decided to focus the control on long-term exposures, and that PFASs are transferred from adults to the vulnerable next generation via the placenta and via human milk. This approach is innovative and allows the dose-dependent risks in early life be translated into limits for population exposures. The adverse outcome chosen is the decreased formation of specific antibody response to childhood vaccinations. Although this effect seems to occur at very low PFAS exposure levels and may therefore be considered critical, it is possible that other adverse effects, if represented by sensitive and continuous outcomes, may lead to lower limits. While carcinogenicity has been suggested, metabolic effects may also be a candidate.

Identification of specific steps going forward to improve human health or environmental outcomes (e.g., fill data gaps, needed policies or regulations, dissemination plan): Although recent epidemiological PFAS research therefore is supporting cautious interventions, critiques emphasize potential weaknesses and stress that correlations may not be causal.

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Philippe Grandjean is Professor of Environmental Medicine at the University of Southern Denmark and Research Professor at the University of Rhode Island, where he co-leads the STEEP superfund center that focuses on PFAS.

PFAS removal and destruction: Overview of research considerations and status

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Background: Similar to other problematic pollutants of the past, many of the beneficial commercial properties of PFAS also pose barriers to environmental degradation, necessarily to mineralization rather than just to shorter perfluorinated compounds.

Brief description of presentation: The focus of this presentation is on US EPA drivers and considerations in prioritizing and conducting research on PFAS removal and destruction, and on latest research results. Drivers include environmental sources and occurrence, and the legal and policy mandates for action.

Implications to improve human health or environmental outcomes: Considerations focus on the commitment to address the totality of pathways and potential for transfer across media and locations – notably to not burden disadvantaged populations – and the desire to achieve "complete" destruction without, for instance, emitting products of incomplete destruction (PIDs).

Identification of specific steps going forward to improve human health or environmental outcomes (e.g., fill data gaps, needed policies or regulations, dissemination plan): Research results will summarize latest information on removal and destruction technologies, and identify research underway along with the critical need for future collaborations on field testing at full-scale commercial facilities.

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Dr. Bruce Rodan is the Associate Director for Science for the Office of Research and Development (ORD). Dr. Rodan is a physician with Masters Degrees in Environmental Studies and Public Health, with duties centered on advancing EPA's broad spectrum of human health and ecological research activities. He previously served eight years under the Obama and Bush Administrations as the Assistant Director for Environmental Health at the White House Office of Science and Technology Policy (OSTP).

Uses of PFAS and their alternatives: Cases studies for uses of fluoropolymers and fluorinated gases

Ian T Cousins
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Background: In total, more than 200 use categories of PFAS were identified by Glüge et al. for more than 1400 individual PFAS. In further ongoing work, my research group is developing a database of alternatives for the identified uses of PFAS. For uses of PFAS in consumer products, safer and fit-for-purpose alternatives are often available. However, for some uses of PFAS, often industrial uses, it is claimed by industry that no alternatives to PFAS are currently available. Examples of uses of PFAS that are considered challenging to replace are fluorinated-gases (F-gases) used for refrigeration and the use of fluoropolymers in, for example, lithium ion batteries. It is not surprising that industry protects and defends the continued use of F-gases and fluoropolymers because these PFAS have by far the largest production volumes of any subgroup of PFAS within the PFAS class. Moreover, claims by industry regarding the lack of alternatives for F-gases and fluoropolymers are often overstated.

Brief description of presentation: In this presentation, I will demonstrate that, even for these more challenging use cases, safer and fit-for-purpose alternatives are already available.

Implications to improve human health or environmental outcomes: The risks associated with fluoropolymers and F-gases are, on the other, understated by industry. Fluoropolymer manufacturing results in the emissions of a large number of PFAS into the environment and only a few of these PFAS are currently regulated. Modern F-gases such as hydrofluorolefins add to another environmental problem, namely they degrade to form trifluoroacetic acid (TFA). Although TFA is relatively non-toxic, it has been accumulating in the environment for decades so that regional precipitation levels can sometimes exceed German drinking water guidelines.

Identification of specific steps going forward to improve human health or environmental outcomes (e.g., fill data gaps, needed policies or regulations, dissemination plan): One effective solution to both these environmental problems is the phaseout of the many non-essential uses of fluoropolymers and F-gases. The essential uses of fluoropolymers and F-gases are far fewer than currently claimed by the PFAS manufacturing industry.

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Dr. Cousins is Professor of Environmental Chemisty at Stockholm University. His specific expertise is on the the sources, uses, transport and fate processes, and exposure pathways of organic pollutants. Much of his current research focuses on per- and polyfluoroalkyl substances (PFAS).

An integrated approach for managing PFAS risks and contamination

Francesco Dondero
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Background: Per- and polyfluoroalkyl substances (PFAS) pose an unprecedented challenge to our society and future generations. Known as "forever chemicals," these compounds resist biodegradation and disperse globally, persisting indefinitely in the environment. Europe has experienced widespread PFAS contamination, including well-known cases like the Veneto Region in Italy, resulting in irreversible pollution of critical resources such as water, air, soil, and food. This contamination exposes individuals to unpredictable health risks and threatens ecosystem functioning.

To effectively address this challenge, we must prepare for PFAS mitigation. The H2020-SCENARIOS project serves as the basis for this presentation, focusing on three research pillars.

Methods: The first pillar develops user-friendly approaches for detecting PFAS in environmental matrices and human fluids. The second pillar embraces the One Health concept, recognizing the interconnectedness of human and environmental well-being. The third pillar aligns with the European Union's zero-pollution ambition by mitigating PFAS exposure risks.

Results: Significant progress is being made in sensor-based detection methods, such as electrochemical and Raman-based spectroscopic techniques, using PFOA as a test bed. Advanced in vitro 3D cellular models simulate human alveolar regions and intestine models with microbiomes, enhancing our understanding of PFAS effects. A systems toxicology framework categorizes and prioritizes 34 PFAS congeners based on their toxicological dynamics, enabling more sensitive risk assessments for populations near contamination hotspots. For remediation and risk mitigation, Surface Activity Foam Fractionation shows promise by using air bubbles to strip PFAS to the air/water interface. This method achieves high removal efficiencies, exceeding 99% for legacy PFAS, and shows potential for short-chain PFAS with appropriate amendments.

Conclusions and identification of several uses of the findings to improve human health or environmental outcomes (e.g., share with affected parties and decision makers, community involvement, additional work needed to evaluate scale-up results): By exploring these research pillars, the presentation aims to advance our understanding of PFAS, develop effective risk mitigation strategies, and contribute to a future with minimal PFAS pollution.

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Dr. Dondero is Professor of Ecology at the Department of Science and Technological Innovation, where his primary research focus revolves around the investigation of the biological effects of noxious chemicals within the framework of the One Health approach.

Regulatory efforts to control PFAS exposures in the EU, US and worldwide

Gretta Goldenman
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Background: Regulatory efforts to control exposures to PFAS are gaining momentum in Europe, North America and other regions of the world. Until recent years, policies and regulations on PFAS focused primarily on PFOA and PFOS. But evidence of harmful impacts from other PFAS is growing also, and new approaches are being applied.

Brief description of presentation: The presentation will outline the trend of using more comprehensive regulatory approaches to control exposures to PFAS, including consideration of PFASs as a class and how to control impacts over their entire life cycles. For example, the European Union's drinking water standards include parameters covering groups of PFAS, including for total organic fluorine (TOF). Moreover, the EU is considering a far-reaching restriction under its framework REACH Regulation that will, if adopted, cover all uses of all PFAS, unless specific time-limited exemptions are agreed at EU level. In the United States, regulatory action on PFAS has been mainly at state level, with individual states setting health-based standards and restricting PFAS in certain products. Recently the federal government has stepped up, with USEPA proposing stringent enforceable standards for six PFAS in drinking water. In other regions with significant PFAS production, notably China, regulatory measures to address PFAS contamination and exposures are still lacking. For these middle- and low-income countries, the Stockholm Convention is important, but insufficient to address the thousands of PFAS on the global market.

Implications to improve human health or environmental outcomes: The various tools available to policymakers and regulators for limiting exposures to PFAS will be reviewed, including health-based quality standards and restrictions on emissions and uses, and their effectiveness analyzed.

Identification of specific steps going forward to improve human health or environmental outcomes (e.g., fill data gaps, needed policies or regulations, dissemination plan): The presentation will also discuss some of the challenges facing regulators of PFAS today, including the wide use of PFAS in industries working on the energy transition and the need for alternatives, to prevent lock-in of PFAS- dependent technologies in these areas.

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Gretta Goldenman is the founder of Milieu Law & Policy Consulting, a Brussels-based firm that carries out studies on EU and international law and policy for the public sector. Her work has included multiple studies on the EU regulatory framework for chemicals, including The Cost of Inaction: A socioeconomic analysis of environmental and health impacts linked to exposure to PFAS, for the Nordic Council of Ministers. She is co- coordinator of the Global PFAS Science Panel.

The Precautionary Principle: Environmental medicine's gifts to genocide prevention

Elihu D. Richter
Hebrew University, Jerusalem, Israel

Background: Failure to promote the core values of respect for human life and dignity is an ethical poverty. The big isms of the 21st century: Fascism, Communism, and Jihadism, are extreme examples of such a failure. A population-wide exposure to the motifs of these doctrinal ideologies has been shown to lead to mass murder, political violence, and genocide. Eugenics, Social Darwinism, racial selection, and Racial Hygiene led to Nazi Medicine and the Holocaust.

Brief description of presentation: We review why incitement to genocide is an ethical poverty and make a case for action.

Implications to improve human health or environmental outcomes: The UN Convention of Genocide (1948) specifies that both genocide and its incitement are crimes against humanity. Incitement to genocide is a recognized early warning sign, marker, catalyst, and promoter of genocide. It includes Dehumanization, Demonization, Delegitimization, and support for extreme violence. The most pressing issues today are the rise of Antisemitism—including Iranian incitement—and the totalitarian war by Russia against Ukraine. In the latter case, there was a failure to recognize the early warning signs and act preemptively. This bystander indifference is an ethical poverty that makes genocide possible.

Identification of specific steps going forward to improve human health or environmental outcomes (e.g., fill data gaps, needed policies or regulations, dissemination plan): The precautionary principle (PP) is environmental medicine's gift to genocide prevention. Respect for life and human dignity is the core ethical value and is essential to genocide prevention. The PP states that it is better to be safe than sorry. It shifts the burden of proof from those suspecting a catastrophic risk to those denying it. It advances the temporal locus of intervention from proof of intent after the event to predict and prevent before the event. We use the PP to prevent genocide by preventing incitement to genocide. Moral agency requires us to apply the PP to exercise human choice and overcome bystander indifference.

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Elihu D. Richter MD, MPH, Associate Professor directed the Unit of Occupational and Environmental Medicine at Hebrew University- Hadassah School of Public Health. He currently heads the Jerusalem Center for Genocide Prevention. the center uses the models and tools of public health for the prediction and prevention of genocide.

Pandemics, plenty and poverty: The fight against malnutrition and food Insecurity

Elliot M Berry
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Background: The current geo-political situation, following so soon after the COVID pandemic, has led to major food, energy, water and humanitarian crises for which the world is poorly prepared. The on-going war in the Ukraine shows how food and energy may be used as political weapons of war, prolonged by human choice and bystander indifference.

Brief description of presentation: Both Poverty and War may be considered as epidemics leading to food insecurity and malnutrition in a world where one-third of food is wasted, yet there is enough food to feed everyone. Approximately, equal numbers (two billion) suffer from Under-nutrition and Over-nutrition, the latter a pandemic far greater than COVID. Unequal food distribution and economic interests are given higher priorities than equity and social justice.

However, this grave situation may be leveraged to produce positive responses at national and international levels to align food systems with the Sustainable Development goals. Operationally, a major re-thinking is required of the policies and science included in these multi-disciplinary activities. We discuss these challenges and suggest some new approaches using the sociotype framework.

Implications to improve human health or environmental outcomes: In practical terms, we do not need more recommendations but actions on the following points: 1) Responsibility: Food Security should be seen as a fundamental human right and a basic Government responsibility, providing access for all to affordable, safe and healthy food. 2) Prevention and Preparedness: Multi-disciplinary teams and partnerships, with defined leadership and dedicated budgets, are required to mitigate the next pandemic / crisis – which will surely come 3) Policies: Long-term SYSTEMIC policies must deal with Complex Adaptive Sustainable Food Systems. 4) Resilience building through the Sociotype Framework – at Individual, Societal and Institutional levels.

Identification of specific steps going forward to improve human health or environmental outcomes (e.g., fill data gaps, needed policies or regulations, dissemination plan): The goals are to eradicate hunger, prevent disease and promote well-being, with fewer conflicts in a more harmonious world - all crucial to combat malnutrition and food insecurity.

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Dr Berry, MD, FRCP, is actively involved in the science - policy interface of Sustainable Food Systems.

Conscription and enlistment of child soldiers: The impact of COVID-19 and inadequacies of international law and policies

Ruth Amir
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Background: Conscription and enlistment of child soldiers (C&E) is a war crime prohibited in several international and regional humanitarian and human rights treaties. It occurs in the poorest countries during internal and external conflicts.

Child soldiers' use devastates the lives of children, families, communities, and regions. These conflicts spill over to the region and the Global North through migration and refugee crises. Civil wars cost the annual Global North to South economic assistance; their longevity is fourfold compared to inter-state conflicts.

Brief description of presentation: We will present evidence on the occurrence of C&E and direct and indirect adverse effects, map the deficiencies of the current legal mechanisms and policy tools, and propose policies to end this grave violation against children.

Implications to improve human health or environmental outcomes: Although the root causes of civil wars are severe economic inequalities and centralized hybrid or authoritarian political regimes, they are hardly addressed by current policies. The COVID-19 pandemic introduced new challenges and pinpointed the flaws of current policies. These deficiencies concern the narrow legal definition of the crime, incompatibility with other humanitarian law and human rights instruments, and lesser capabilities to deter non-state armed groups. Whereas criminalization and other current policies yielded some success with states, non- state armed groups continue C&E.

Identification of specific steps going forward to improve human health or environmental outcomes (e.g., fill data gaps, needed policies or regulations, dissemination plan): Reducing inequalities, poverty alleviation, and political reform would shift the focus from punishment to prevention, empower communities, and address old and new poverties.

A. Amend the legal definition of C&E to include children under 18.
B. Revise the definition of C&E to include all non-combat activities, such as sex slavery, kitchen duty, etc.
C. Ban arms sales to state and non-state parties using child soldiers and tight enforcement.
D. Empower communities through capacity building and the development of self-monitoring mechanisms.

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Dr. Ruth Amir is chair of the Department of Multidisciplinary Social Sciences and teaches at the Public Policy Administration Graduate Program at Yezreel Valley College. Her research focuses on the intersection of law, contemporary history, and policies. Her recent publications engage with grave violations against children in war and genocide, genocidal forcible child transfer, transitional justice policies, and tools, and global governance institutions.

An emerging threat for human health: Exposure to artificial light at night – time to reconsider the widespread exposure to artificial light at night among night-shift workers

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Background: Nowadays, the majority of the world population live under light-polluted skies and are exposed to artificial light at night (ALAN). In addition, nearly 7-8% of the working population perform night work (any time between 9:00 pm and 08:00 am). Both ALAN and night-shift work have increased in recent years in developed and especially developing countries. ALAN exposure may occur both outdoors e.g. buildings with exterior lighting and streetlights, and indoors due to electronic devices related also to working activities. Both ALAN and night-shift work may disrupt the circadian rhythm, thus impairing several metabolic and hormonal system affecting human health.

Brief description of presentation: We will present evidence from the scientific literature on adverse health effects from ALAN exposure and night- shift work on human health, focusing especially on vulnerable categories like women and children.

Implications to improve human health or environmental outcomes: Several reports indicate that ALAN and night shift work are associated with adverse effects on human health, including sleep problems, metabolic diseases including obesity and diabetes, cancer, especially breast cancer, and possibly cognition. Working at night is associated with higher risk of sleep deprivation, and decreasing alertness, also leading to higher risk of accidents, especially industrial environmental disasters. Some of the most devastating environmental health disasters occurred at night and have been partially related to performance failures during night working.

Identification of specific steps going forward to improve human health or environmental outcomes (e.g., fill data gaps, needed policies or regulations, dissemination plan): The widespread use of night lighting and 24/7 working activities should be considered a serious health concern, especially after the recognition of night-shift work as probable human carcinogen (Group 2A). Health policy should reconsider the economic and health benefits of 24/7 society, going one step back to go two steps forward.

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Prof. Filippini is Associate Professor in Public Health at the Department of Biomedical, Metabolic and Neural Sciences at University of Modena and Reggio Emilia where he works in the study of health effects of environmental and dietary risk factors, specifically regarding risk of chronic diseases as neurodegenerative diseases and cancer.

The Plasticene (plastic) Epoch: Health and environmental consequences and a way forward

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Background: There is exponential increase in the manufacture and use of plastics worldwide. Most plastics are chemically inert and non-degradable, causing a huge problem of plastic waste. Plastic disintegrates into microplastics, which are widely dispersed throughout the environment, contaminating air, food, and water, thereby threatening the Web of Life. Microplastics have been found in many marine animals and in multiple organs of the human body. Chemical additives are added to the plastic during their manufacture, including Endocrine-Disrupting Chemicals (EDC), which have major adverse health effects.

Brief description of presentation: We will present evidence from the scientific literature on adverse health effects from exposure to plastic, microplastics and their additives and propose policies that can help contain these threats.

Implications to improve human health or environmental outcomes: Since they are indestructible, microplastics that enter cells will remain there and accumulate over time as exposure increases. Additives can migrate out of the microplastic into tissues and the circulatory system. EDC additives threaten the basic biology of our reproductive system and are associated with increased risk of disorders of growth and development, obesity, diabetes and cancer. Populations suffering from poverty are more likely to suffer from adverse health effects from exposure to plastic.

Identification of specific steps going forward to improve human health or environmental outcomes (e.g., fill data gaps, needed policies or regulations, dissemination plan): The UN is leading the Intergovernmental Negotiating Committee for Plastics, with a goal to achieve a legally- binding treaty to end plastic pollution by 2040. The negotiators emphasis development of a circular economy for plastic. In parallel, nations and communities need to develop policies promoting reduction in use of plastic by reuse and replacement by safe alternatives. These activities are essential for the protection of future generations! It is our moral imperative to act now!

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Prof. Belmaker is an Associate Professor of Public Health at Ben-Gurion University (BGU) and was the Chief Public Health Officer (CPHO) for the Southern Region of the Ministry of Health in Israel for 25 years. As CPHO, she led the team that handled many environmental health emergencies and challenges. She has lectured and published widely in the field.

SESSION VII
Pandemics: Duty of care: Lessons from Ebola and COVID-19, Cancer care and prevention & Childrens environmental health

1. The employer 'duty of care': A safety metric in a pandemic response. *Melissa McDiarmid*, *USA*

2. Duty of care in humanitarian settings: Safeguarding health and safety during infectious disease outbreaks. *Mark Sherlock*, *The Netherlands*

3. Duty of care and the Ebola response: The United States Public Health Service Monrovia medical unit. *Boris Lushniak*, *USA*

4. The COVID-19 pandemic in a large university hospital in Milano and a renewed role for occupational health. *Claudio Colosio*, *Italy*

5. Airborne infectious virus and the right to a safe workplace: The employer duty of care during COVID-19. *Robert Harrison*, *USA*

6. Should gender-specific effects of xenoestrogen exposure toward cancer risk be better incorporated in occupational health? *Alexandra Fucic*, *Croatia*

7. Old dogs can learn new tricks. *Kurt Straif*, *Spain and USA*

8. Missed opportunities for childhood cancer prevention. *Ruth Etzel*, *USA*

9. The Mediterranean Task Force for Cancer Control (MTCC): In the fight against cancer. *Pier Giorgio Natali*, *Italy*

10. The Hokkaido Study on Environment and Children's Health: Overview of study profile and findings up to school age. *Atsuko Ikeda*, *Japan*

11. Protecting children and justice in a changing climate. *Nsedu Witherspoon*, *USA*

The employer "Duty of Care": A safety metric in a pandemic response

Melissa McDiarmid, Hanna LeBuhn
University of Maryland School of Medicine, Baltimore, Maryland, USA

Background: The duty of care principle has roots in both ethics and the law and is broadly defined as an obligation to conform to certain standards of conduct to protect others against unreasonable risk of harm. It appears in professional codes of ethics for health workers to provide care for their patients, including during pandemics. However, after the first severe acute respiratory syndrome (SARS) epidemic in 2003, with the notable loss of life among health workers, some authors raised the ethical need to consider the added risk workers assumed when gauging society's expectations of their service. These authors suggested that employers had a reciprocal obligation to their employees to provide the needed training, work organization and protective equipment to make hazardous work as safe as possible.

Brief description of presentation: A recent publication has suggested that the strong duty of care disposition of the Médecins Sans Frontieres (MSF) agency, compared to that of other responding agencies was a possible explanation for the dramatically lower Ebola Virus Disease incidence rate of MSF responders at 1.4/1000 persons versus 30-44/1000 persons depending on job title, for other agency-convened teams.

Implications to improve human health or environmental outcomes: MSF operationalized their duty of care commitment through four actions: performing risk assessments prior to deployment, organizing work and work practices to minimize exposure, providing extensive risk communication and training of staff and providing medical follow-up for staff exposures.

Identification of specific steps going forward to improve human health or environmental outcomes (e.g., fill data gaps, needed policies or regulations, dissemination plan): We will examine the overlap between these MSF actions with safety climate and safety behavior measures to argue that an organization's duty of care commitment is an indicator of safer work during pandemic responses.

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Dr. McDiarmid is a Professor of Medicine, Epidemiology and Public Health at the University of Maryland School of Medicine where she directs the Division of Occupational and Environmental Medicine. She studies the hazards of the health sector and their mitigation in both well-resourced and limited-resource settings.

Duty of care in humanitarian settings: Safeguarding health and safety during infectious disease outbreaks

Mark Sherlock, Martins Dada, Jean Christophe Dolle
Médecins Sans Frontieres, Amsterdam, The Netherlands

Background: Médecins Sans Frontières (MSF) plays a crucial role in responding to infectious disease outbreaks, safeguarding the health and well-being of both their staff and the communities they serve. MSF has extensive experience in providing healthcare in challenging environments. This presentation focuses on MSF's duty of care approach and its significance in infectious disease outbreaks, with a specific focus on the Ebola virus.

Brief description of presentation: This presentation examines the comprehensive duty of care framework implemented by MSF in the context of infectious disease outbreaks. It delves into the preventive, mitigation, and protective measures undertaken by MSF to support their collaborators exposed to work-related risks during their assignments. The content highlights the continuous monitoring of risks, raising awareness among staff, and managing risks within the organization's capacity.

Implications to improve human health or environmental outcomes: Infectious disease outbreaks pose significant threats to the health and safety of both humanitarian workers and the affected communities. The presentation discusses the specific health risks faced by MSF staff, including potential exposure to the virus, mental health challenges, and the impact of working in resource-constrained settings. The threats to the health of both staff and patients during these outbreaks emphasize the need for effective duty of care measures.

Identification of specific steps going forward to improve human health or environmental outcomes (e.g., fill data gaps, needed policies or regulations, dissemination plan): MSF's duty of care approach offers valuable insights into best practices for ensuring the health and safety of both staff and patients. This presentation contributes to the solution by highlighting the importance of continuous risk assessment, awareness raising, and risk management strategies. It emphasizes the need for balancing compliance with rules and regulations while maintaining an environment that enables informed risk-taking.

By examining MSF's duty of care approach in infectious disease outbreaks, this presentation aims to provide a comprehensive understanding of the challenges faced by humanitarian organizations and the measures taken to protect the health and safety of their staff and patients.

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Dr. Sherlock is a physician and public health expert who works as a health advisor for Médecins Sans Frontieres, managing humanitarian medical programs in diverse contexts around the world.

Duty of care and the ebola response: The United States Public Health Service Monrovia Medical Unit

Boris D. Lushniak
University of Maryland School of Public Health, College Park, MD, USA

Background: Duty of care, in the occupational setting, refers to being responsible for your people's health, safety and well-being. This usually means protecting the welfare of your team members while they are at their regular workplaces, or while they are on official business off-site and even abroad. This typically involves providing and maintaining safe physical work environments; ensuring compliance with appropriate industry standards and statutory safety regulations; ensuring that people work a reasonable number of hours, and have adequate rest breaks; conducting work-based risk assessments; and, protecting people from discrimination, bullying, and harassment.

Brief description of presentation: Infectious disease disasters present special challenges to protect responder's health. This presentation will focus on the duty of care responsibilities in the midst of a very unique and dangerous work setting – within a field medical unit treating patients with ebola virus disease in a rural setting in Liberia. Specific challenges, successes, failures, and lessons learned will be presented from this real-life experience.

Implications to improve human health or environmental outcomes: Part of the responsibilities of leadership in such a setting includes providing individuals with clear job descriptions detailing their work responsibilities and the limits of their roles, providing appropriate training, and providing team members with opportunities to raise concerns and offer feedback.

Identification of specific steps going forward to improve human health or environmental outcomes (e.g., fill data gaps, needed policies or regulations, dissemination plan): Lessons learned in such a crisis response can be implemented in multiple other occupational settings. Most importantly is the implementation of duty of care activities from the theoretical to actual field settings. The ultimate goal is to protect, promote, and advance the health and safety of the working population.

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Rear Admiral (retired) Boris D. Lushniak, MD, MPH is Dean of the School of Public Health. University of Maryland. He was the United States (US) Deputy Surgeon General (SG) from 2010-15, and Acting SG from 2013-14. He attended Northwestern (BS, MD) and Harvard (MPH) and trained in family medicine, dermatology, and preventive medicine (occupational). During the ebola response in 2015 he commanded the US Public Health Service Monrovia Medical Unit in Liberia.

The COVID-19 pandemic in a large university hospital of Milano, and a renewed role for occupational health

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Background: During the COVID-19 pandemic the public health system became a source of renewed and modified occupational risks, not only biological, but also psychological, related to the very high burden of work affecting health care personnel. The goal of this study was to analyze the variables that influenced the development of the pandemic and its control, with particular attention to the role of occupational medicine in a university hospital of Milano.

Methods: We evaluated variation in the incidence, sources and severity of the infection in the workers of the Santi Paolo e Carlo Hospital of Milan considering the period between March 2020 and December 2021, describing the preventive measures adopted and their results.

Results: In the "first wave" the infection originated almost exclusively within the hospital, from worker to worker, whilst in the second wave the extra-hospital component progressively increased, due to factors such as greater availability of personal protective equipment, information/training initiatives for workers, screening programs and contact tracing. Finally, the introduction of the COVID-19 vaccination brought a significant reduction of the infection compared to the general population: risk and severity were higher outside the hospital. Since the beginning of the pandemic, our Occupational Health (OH) Unit created, together with the Psychological Unit, "Decompressing Rooms" where the workers had the possibility of relaxing, listening music and watching movies of landscapes and wild life. The possibility of having talks with the psychologist was also created.

Conclusions and identification of several uses of the findings to improve human health or environmental outcomes (e.g., share with affected parties and decision makers, community involvement, additional work needed to evaluate scale-up results): Occupational medicine has actively participated in risk assessment and management in close collaboration with the hospital manager, the prevention and protection service and the psychological Unit. The pandemic was really a unique chance to show to the workers s substantial role of OH in health prevention instead of a bureaucratic role of only ascertainment of fitness to work of the employees according to law requests.

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Claudio Colosio MD, PhD, is Professor in Occupational Health, and the Director of the Occupational Health Unit of the University Hospital Santi Paolo and Carlo of Milano. Dr. Colosio directs the International Centre for Rural Health, a World Health Organization Collaborating Centre specialized in agriculture. He is author of more than a hundred publications in occupational health and several book chapter and monographs.

Airborne infectious virus and the right to a safe workplace: The employer duty of care during COVID-19

Robert Harrison
University of California, San Francisco, CA, USA

Background: Airborne infection with COVID-19 from workplace exposure caused one of the largest occupational diseases in modern history, with thousands of workers infected and dying worldwide. Principles of worker protection with the hierarchy of controls were often inadequate or ignored by many employers, including necessary ventilation, respiratory protection, testing and paid sick time.

Brief description of presentation: California is the largest State in the United States, ranking 6th in the global economy with over 18 million workers. The California Occupational Safety and Health Administration (Cal/OSHA) Aerosol Transmissible Diseases (ATD) standard was adopted in 2009 to protect employees who are at increased risk of contracting airborne infections due to their work activities. Starting in November 2020, California approved Cal/OSHA emergency temporary standards on COVID-19 infection prevention. These standards embody principles of worker protection with comprehensive employer duties to provide a workplace free from infectious diseases. In addition, labor standards provided for paid sick time for many workers.

Implications to improve human health or environmental outcomes: Although work-related COVID-19 outbreaks occurred throughout high-risk industries in California, the California ATD standard provided an important framework for improving worker protections and enforcing the employer duty of care. Specific workplace standards and guidance globally to prevent work-related infections should be a critical element of planning for the "next pandemic".

Identification of specific steps going forward to improve human health or environmental outcomes (e.g., fill data gaps, needed policies or regulations, dissemination plan): Multiple gaps in workplace health programs were evident during the pandemic in California, including on-site trained industrial hygiene, nursing and medical personnel; free and accessible testing resources; data tracking systems for occupation and industry; and public health outbreak investigation teams. Enforceable ATD standards must be accompanied by robust government, academic, employer and worker capacity to reduce work-related infections and deaths.

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Dr. Robert Harrison is Clinical Professor of Medicine at the University of California, San Francisco where he has been teaching occupational specialists and designing and implementing health care worker safety and health programs.

Should the gender-specific effects of xenoestrogen exposure toward cancer risk be better incorporated in occupational health?

Aleksandra Fucic
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Background: All cancer types are associated with disturbances in the estrogen/testosterone ratio, and their biology depends on estrogen and androgen receptor levels. As a result, cancer susceptibility exhibits gender specificity, with a higher incidence in men for cancer types associated with occupational exposure. The gender-specific cancer risks associated with environmental xenoestrogen exposure have been well-documented.

Brief description of presentation: A significant portion of xenobiotics in occupational environments act as xenoestrogens such as metalloestrogens (aluminum, cadmium, chromium, cobalt, lead), some pesticides and PCBs while for example trichlorethylene and aniline disturb testosterone levels. Despite these facts, gender-specific susceptibility to exposure and gender-specific cancer risks are often overlooked in occupational health epidemiological studies or treated as anecdotal evidence.

Moreover, it is important to emphasize that women working within the same industry but performing other activities than men may have different cancer risks than men due to the bimodal effects of endocrine disruptors as lower doses may have more pronounced effects than higher doses. The higher risk of cancer in men compared to women for cancer types associated with occupational health may stem from the inherent higher sensitivity of men to disturbances of estrogen/xenoestrogen levels. Current changes in the definition or personal expression of gender do not contradict the suggested approach, as brain gender specific lateralization during intrauterine development and body hormonal profiles may not necessarily align.

Implications to improve human health or environmental outcomes: Addressing gender-specific cancer risks in occupational health can aid in (a) developing targeted prevention strategies, (b) introduction of new biomarkers or their gender specific application and (c) improving workplace safety measures.

Identification of specific steps going forward to improve human health or environmental outcomes (e.g., fill data gaps, needed policies or regulations, dissemination plan): Recalculating cancer risk for men and women using available data could provide significant insights into whether cancer risk in occupational health should be presented separately for each gender. The increasing use of new hybrid materials (nano plastic/metal) and technologies in industry necessitates introduction of early evaluation of possible gender-specific cancer risks.

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Dr. Fucic is a retired scientific advisor at the Institute for Medical Research and Occupational Health, with nearly 40 years of dedicated work in studying cancer risks related to radiochemical exposures in occupational settings. Throughout her career, she has focused on investigating the pathways of endocrine disruptor mechanisms in cancer development, as well as gender-specific health risks.

Old dogs can learn new tricks

Kurt Straif [1,2]
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Background: In the early 1960s, after a long scientific debate, heavily undermined by BIG TOBACCO, several national committees finally reached a scientific consensus that tobacco smoking causes lung cancer. Since then, each re- evaluation of the carcinogenicity of tobacco smoking by the IARC Monographs Programme added more cancer sites with "sufficient evidence", now encompassing a total of 16 cancer sites; also, second-hand smoke was classified as carcinogenic to humans. A similar pattern evolved for several multi-site carcinogens, such as ionizing radiation, human papilloma virus and alcohol consumption.

Methods: The SYNERGY project pooled 14 case-control studies to investigate joint effects of well-established occupational lung carcinogens, and the carcinogenicity of emerging risks; in addition, the developed quantitative job-exposure matrix SynJEM was applied to other pooling projects, such as INHANCE. Regarding occupational exposure to asbestos the NOCCA database was analysed for biliary tract cancer, and a systematic review was undertaken for gastro-intestinal cancers.

Results: Results from Scandinavian cancer registry data, pooling projects and systematic reviews on asbestos, silica and benzene and associations with lung, larynx and gastro-intestinal cancers will be presented.

Conclusions and identification of several uses of the findings to improve human health or environmental outcomes (e.g., share with affected parties and decision makers, community involvement, additional work needed to evaluate scale-up results): Results demonstrate a similar pattern of expanding cancer risks of well-established occupational carcinogens to additional cancer sites. The increasing burden of occupational cancer calls for additional preventive efforts at all levels.

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Dr. Kurt Straif is Research Professor at Boston College, MA, USA and Associated Research Professor at ISGlobal, Barcelona, Spain. His research focus is on cancer prevention and more recently expanding to COVID-19 as well as climate crisis and health.

Missed opportunities for childhood cancer prevention

Ruth A. Etzel
The George Washington University, Washington, D.C.

Background: Each year, about 400,000 children develop cancer. The WHO website states "Childhood cancer cannot generally be prevented." This is a misleading narrative.

Brief description of presentation: Although several risk factors for childhood cancer have been identified, the dominant narrative results in little focus on primary prevention. In the U.S., all NIH funding is to study treatment of childhood cancer. In 2021 the National Cancer Institute received US$50 million for the Childhood Cancer Data Initiative and US$28 million for Childhood Cancer Survivorship, Treatment, Access, and Research Act. The Childhood Cancer Data Initiative facilitates a connected data infrastructure and integrates multiple data sources to make data work better for patients, clinicians, and researchers. The Childhood Cancer Survivorship, Treatment, Access, and Research Act of 2018 expands existing biorepositories for childhood cancer patients enrolled in clinical trials to collect and maintain relevant clinical, biological, and demographic information on children, and to continue to conduct pediatric cancer survivorship research. Neither NIH initiative funds primary prevention. In the U.S. CDC there is ongoing work to promote reducing children's exposures to tobacco and ultraviolet light in order to prevent cancer in adulthood, but scant attention to preventing childhood cancer. Yet many childhood cancers are preventable. The first childhood cancer to be prevented was scrotal cancer. In Britain, the Chimney Sweepers Act was passed in 1788, forbidding master sweeps from employing children under 8 years old. (The age was raised to 14 in 1834 and to 16 in 1840.) Primary prevention of childhood cancer is not new, but it has been largely overlooked for more than 230 years.

Implications to improve human health or environmental outcomes: It is time to embrace primary prevention of childhood cancer.

Identification of specific steps going forward to improve human health or environmental outcomes (e.g., fill data gaps, needed policies or regulations, dissemination plan): The Collegium should develop a statement addressing missed opportunities for childhood cancer prevention.

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Dr. Etzel is a pediatrician, environmental epidemiologist, and courageous leader in bringing public attention to childhood environmental health hazards and working collaboratively towards prevention. She was elected to the Collegium in 2010. For speaking truth to power, she is known as an "inconvenient pediatrician".

The Mediterranean Task force for Cancer Control (MTCC): In the fight against cancer

Pier Giorgio Natali
Mediterranean Task Force for Cancer Control (MTCC), Rome, Italy

Background: Although cancer knowledge is rapidly advancing, a paradoxical gap remains between what is known and what is implemented as best practices (2008 CR Statement, 2008). While cancer mortality is decreasing through primary/secondary prevention policies and therapeutic advancements, an increase in global cancer incidence is foreseen. Indeed, the widening of socio-economic, and cultural disparities is imputable for the rise in the incidence of hard-to-treat "advanced disease", thus undermining the sustainability of cancer care even of "rich" healthcare systems.

Brief description of presentation: Since 2005, MTCC has recognized that cost-effective prevention strategies remain not fully exploited. Also, general practitioners, who are key providers of cancer control services, are becoming an endangered species. Health and wealth are closely interconnected and MTCC has constantly advocated in the medical arena as well as at cultural, social, and political levels against misinformation disseminated through uncensored information.

Implications to improve human health or environmental outcomes: Since cancer "cannot be fought in solitude" (UNESCO: Chart of Paris, 2002), MTCC has pursued increasing networking with civilian and military medicine, governments, educators, families, religious centers, and charitable/cultural associations. New awareness strategies are explored. MTCC has developed multilingual messages free of "compassionate fatalism" and conducive to "aggressive optimism" and advocating "personal responsibility".

Identification of specific steps going forward to improve human health or environmental outcomes (e.g., fill data gaps, needed policies or regulations, dissemination plan): At MTCC, we firmly believe that much can be done even with limited resources if we recognize that we have medical, ethical, and political obligations to prioritize public health beyond any disparity. In this framework, MTCC advocates that "health should be regarded as a safe space for dialogue between Countries of different cultures, faiths, economic strength having the power to unite because of common goals and challenges".

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Dr. Natali, Past President of the Italian Cancer Society and Director of the National Cancer Institute in Rome, Italy is Secretary General of MTCC an NGO founded in 2005 devoted to primary and secondary cancer prevention.

The Hokkaido Study on Environment and Children's Health: Overview of study profile and findings up to school age

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Background: The Hokkaido Study on Environment and Children's Health is an ongoing study consisting of two birth cohorts of different sizes, the Sapporo cohort and the Hokkaido cohort, which were established in 2001.

Methods: Prenatal environmental exposure to chemicals such as polychlorinated biphenyls and dioxins, organochlorine pesticides, per-and polyfluorinated compounds (PFAS), and phthalates has been measured. Cord blood biomarkers, such as adiponectin, leptin, thyroid, and reproductive hormones were also measured. Information on physical growth, neurodevelopment, allergy and infections, and onset of puberty has been collected to analyze health outcomes. We have also conducted exposure measurements in children. Phthalate metabolites, bisphenols, and phosphate flame retardants metabolites in children's urine collected at age of seven were examined. Recently, Electronic Magnetic Field around children has been also examined.

Results: In this presentation we focus on children's exposure to plastic additives: phthalates, phosphate flame retardants and plasticizers (PFRs), bisphenols, and nonylphenol (NP). We have also examined the prevalence of asthma and allergies by ISAAC questionnaire. When comparing the levels of these chemicals in the urine collected from 2012 to 2017, increasing secular trend of PFRs and BPS was found, while decreasing trend in BPA and NP. The levels of legacy phthalates did not show any secular trends, whereas phthalate alternatives, DEHTP and DINCH show increasing trend. Single metabolite as well as mixture of phthalates were positively associated with increased risk of wheeze and eczema of 7 years old children.

Conclusions and identification of several uses of the findings to improve human health or environmental outcomes (e.g., share with affected parties and decision makers, community involvement, additional work needed to evaluate scale-up results): Our study highlights the need for ongoing biomonitoring studies to closely monitor the increasing trends, investigate any potential health impacts, and enable prompt response if necessary. For further examination and life course approach, we are now conducting face-to face health check-up with blood and urine sample collections at one's adolescence.

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Atsuko Ikeda, Ph.D, is Professor of Faculty of Health Sciences, and adjunct Professor of Center for Environmental and Health Sciences at Hokkaido University. Dr. Ikeda's interests focus on exposure to environmental chemicals, such as PFAS, phthalates, organophosphate flame retardants, bisphenols, and their effects on children's health. She has also experience in indoor environmental quality and inhabitants' health studies. Dr. Ikeda is in charge of promoting international cooperation and actively collaborates with WHO and other WHOCC.

Protecting children and justice in a changing climate

Nsedu Obot Witherspoon[1], I. Leslie Rubin[2], Martha Berger[3]

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Background: Climate change is a significant threat to human health as greenhouse gases accumulate, temperatures/sea levels rise, and extreme weather events become more intense and frequent. In communities throughout the world, those most often and severely affected by climate change are those with the least means to protect themselves and recover when disaster strikes. The effects of climate change on health are not the same for all. Children are vulnerable to the effects of climate change in ways that adults are not. They are sensitive to environmental threats in ways that adults are protected, and have fewer adaptive capacities. Studies of early life environmental exposures confirm that the effects of climate change on children and future generations will endure. While childhood is a uniquely vulnerable life stage for experiencing the health effects of climate change, not all children are affected the same. Children in marginalized or neglected communities suffer disproportionately. The need to take meaningful protective action is urgent.

Brief description of presentation: The Climate Equity Collaborative (CEC) is a public private partnership launched with the Children's Environmental Health Network in 2022 to center on youth education, health, career choices, and leadership in these under- resourced communities. Examples of key programs such as the Eco-Healthy Child Care program, Break the Cycle of Climate Change, and Global Children's Environmental Health Network will be highlighted.

Implications to improve human health or environmental outcomes: Climate change is a multigenerational and intersectional issue. Focusing on the health of children provides solid and actionable information to ensure that today's children can safely enter the world, learn, grow, and thrive into adulthood. Living with and potentially solving the climate crisis is not possible without considering the plight of those most vulnerable and affected.

Identification of specific steps going forward to improve human health or environmental outcomes (e.g., fill data gaps, needed policies or regulations, dissemination plan): Identification of the need to center children, justice, and climate change protections by considering them collectively as key drivers to systemic shift and needed child-protective policies.

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Nsedu Obot Witherspoon, MPH, is the Executive Director for the Children's Environmental Health Network, extending partnerships, organizing, leading, and managing policy, education/training, and science-related programs. Among various leadership positions, Ms. Witherspoon is a leader in the field of children's environmental health, serving as the lead for the NIH Children's Environmental Health Research Translation Coordinating Center and on the External Science Board for the Environmental Influences on Child Health Outcomes (ECHO) NIH Research work.

SESSION VIII
Legacy exposures: Assessment and follow-up & Vulnerable populations

1. Roundtable: Aspartame and why the Collegium Ramazzini is vital

2. Understanding the health impacts of the Aral Sea crisis: Preliminary results of an environmental health investigation in Karakalpakstan, Uzbekistan. *Casey Bartrem*, *USA*

3. Evolution of asbestos control and abatement procedures in the USA. *William Ewing*, *USA*

4. 90-year history of occupational medicine in the Czech Republic. *Daniela Pelclova*, *Czech Republic*

5. Criminal prosecution of toxic corporate crime in Italy. *Barry Castleman*, *USA*

6. Concurrent Session VIII.C Saturno A. *Chairs: Iman Nuwayhid*, *Lebanon*; *Oledele Ogunseitan*, *USA*

7. Role of epigenome in translating neighborhood disadvantage into disparities in health. *Kenneth Olden*, *USA*

8. Conflicts, food and humanitarian crises: Innovations for short-term mitigation and long-term prevention. *Joachim von Braun*, *Italy and Germany*

9. Circular low-wage migrant labour and occupational ill-health: Global lessons from the South African gold mining industry. *Rodney Ehrlich*, *South Africa*

10. Healthcare waste management in Sri Lanka: Methods, challenges and the way forward. *Inoka Suraweera*, *Sri Lanka*

Roundtable: Aspartame and why the Collegium Ramazzini is vital

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Background: The historical conflict over artificial sweeteners is long (110+ years!) and vicious, over the meaning of risk, in which different standards in chemical toxicology and food safety have been used to create confusion, and in which health science has been repeatedly attacked and brought into doubt by the chemical manufacturers, food industries and even the food safety regulators.

This struggle has been over a fundamental question: how much health risk should society accept from a product for which there is no observed evidence of health benefit? When the Ramazzini Institute reported in 2006 and 2007 that aspartame (1) even at low exposure levels causes malignant tumors in in rats and mice, and (2) prenatal exposures caused increased malignancies in rodent offspring at lower doses than in adults, it set off a particularly vitriolic response.

Brief description of presentation: This roundtable will discuss the struggle for scientific integrity and legitimacy by several CR fellows engaged in it.

Co-chairs: Morando Soffritti and Knut Ringen Panel participants:

Daniele Mandrioli: Ramazzini Institute Perspective

Linda Birnbaum: National Institute of Environmental Health Sciences/National Toxicology Program Perspective
Kurt Straif: International Agency for Research on Cancer (IARC) Perspective

Philip Landrigan: Concluding Comments

Implications to improve human health or environmental outcomes: The scientists were attacked for their motives and the quality of their work. Yet, they persevered. After 15 years of struggle, their work triggered listing of aspartame as a high priority subject for evaluation by IARC). The IARC review panel concluded that based on the limited human epidemiology data available, aspartame is possibly carcinogenic to humans.

Identification of specific steps going forward to improve human health or environmental outcomes (e.g., fill data gaps, needed policies or regulations, dissemination plan): The outcome should be a framework for a Collegium Ramazzini Statement.

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During this roundtable, each participant will present an introduction of their involvement with aspartame research and the Collegium Ramazzini efforts.

Understanding the health impacts of the Aral Sea crisis: Preliminary results of an environmental health investigation in Karakalpakstan, Uzbekistan

All authors and affiliations
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Background: For decades, the rivers flowing into the Aral Sea in Central Asia were diverted to irrigate cotton fields. By the 1980s, the rivers no longer reached the sea and it rapidly began to reduce in size. Once the 4th largest inland body of water in the world, it is now 10% of its original size. The dramatic reduction in surface water and excessive use of agricultural chemicals resulted in severe environmental degradation and health impacts. The crisis is widely recognized as one of the world's worst ecological disasters.

Methods: TerraGraphics International Foundation, Doctors Without Borders, and the Ministry of Health are assessing critical health issues related to the disaster. Partners are working in Karakalpakstan, a semi-autonomous region of Uzbekistan where salinization of drinking water, pesticide contamination, and airborne dusts are all likely contributors to elevated rates of cancer, kidney failure, respiratory disease, and other illnesses. In March-April 2023, partners collected 68 soil, 82 water, 23 sediment, and 27 air samples at 80 discrete locations throughout Karakalpakstan, analyzing samples for organochlorinated and organophosphorus compounds, as well as saline and heavy metal concentrations. Particulate air monitors were installed in three locations, and a weather station was installed in the capital city.

Results: Results from this study are being analyzed and will be presented in the context of identifying the most critical human health risks to both residents and agricultural workers.

Conclusions and identification of several uses of the findings to improve human health or environmental outcomes (e.g., share with affected parties and decision makers, community involvement, additional work needed to evaluate scale-up results): Due to a complex geopolitical context, this investigation is providing the first set of comprehensive data from the region in more than 20 years. Environmental results will inform the development of a realistic and sustainable program that tackles health impacts by targeting exposure reduction for the most vulnerable and susceptible subpopulations.

*** Presenting author profile:**
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Dr. Casey Bartrem is Executive Director of TerraGraphics International Foundation, where she directs programs that address health issues related to mining and other hazardous industries. Her work and research focus on environmental assessment, human health risk assessment, and environmental health. Dr. Bartrem has led projects in Uzbekistan, Kyrgyzstan, Bangladesh, Nigeria, and the United States in close collaboration with local stakeholders, government representatives, humanitarian organizations, and other NGOs.

Evolution of asbestos control and abatement procedures in the USA

William M. Ewing
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Background: In 1990 the Collegium Ramazzini convened a conference in New York City on "The Third Wave of Asbestos Disease: Exposure to Asbestos in Place." At that point effective asbestos control and abatement techniques had largely been developed and implemented. Some papers covered the emerging disease among maintenance and service personnel, but none considered the new class of asbestos abatement worker and their exposures. These abatement procedures did not erupt overnight but evolved over two decades. Many workers of the 1970s received heavy asbestos exposures which generally ebbed with improved work practices in the 1980s.

Brief description of presentation: The early efforts to control exposures to in-place asbestos were largely adaptations of methods employed in mining, product manufacturing, and shipyards. Industrial sites such as power stations, refineries, foundries, and chemical plants began implementing controls during the 1970s. This was mostly in response to new OSHA and US EPA regulations. The rising concern over asbestos in schools during the early 1980s, publicity, insurance issues, and litigation prompted improved control measures. Work areas once roped off were now sealed with plastic barriers. An asbestos abatement industry emerged followed by state licensing and regulations. Organizations, including the National Asbestos Council (NAC) and the Association of the Wall and Ceiling Industries (AWCI) disseminated information through its courses, publications, and conferences. By the end of the 1980s these improved asbestos abatement practices were widely accepted and incorporated into new and revised federal and state regulations.

Implications to improve human health or environmental outcomes: The asbestos abatement techniques refined over the years are now being employed and adapted to control other hazards in buildings. Some are legacy hazards such as lead-based paint and PCBs.

Identification of specific steps going forward to improve human health or environmental outcomes (e.g., fill data gaps, needed policies or regulations, dissemination plan): Today we need to gather and disseminate exposure data representative of workers during the 1970s and 1980s.

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Mr. Ewing is a certified industrial hygienist with 45 years of experience in the field of asbestos detection and control. He was formerly the director of the US EPA-sponsored Asbestos Information Center at the Georgia Tech Research Institute and helped establish the National Asbestos Council in 1983. He is a member of the American Conference of Governmental Industrial Hygienists and a Fellow of the American Industrial Hygiene Association.

90-year history of occupational medicine in the Czech Republic

Daniela Pelclova, Zdenka Fenclova
Charles University and General University Hospital in Prague, Prague, Czech Republic

Background: The first outpatient Department of Occupational Medicine in the Czech Republic was started in 1932 in Prague, when the president of the Republic signed the first List of Occupational Diseases with 25 items. In 1947, an in- patient department with 27 beds was opened; in 1999 it was comprised of 15 beds. In 2011, it became out-patient only. In 2011, the List of Occupational Diseases contained 85 items and in 2021 it was increased to 88.

Methods: Statistical data were searched from the publications and data of the Czech Institute of Health Information and Statistics, and State Institute of Public Health.

Results: The first complete statistical data from 1956 reported 3,111 occupational disease cases. The first peak was in 1962 with 4,658 cases, followed by gradual decline to 1,042 in 2013 and 1,222 in 2018. A second peak appeared in 2022, with a total of 7,439 with COVID-19 disease cases representing 91%. The structure of occupational diseases significantly changed over the 90 year period. Pneumoconioses decreased from 56% of cases in 1957 to 8% currently. Prior to COVID-19, the majority of disease cases (54%) were caused by overload of upper extremities.

Illnesses from toxicants declined from 10% in 1973 to 3 cases in 2022. Most common causes of disease in the first few decades were poisonings from carbon monoxide, solvents, pesticides, and lead. In 1965-1968, 80 chemical workers developed "chloracne" and/or porphyria due to 2,3,7,8-tetrachlorodibenzo-p-dioxin, and consequently neuropsychological impairment, hyperlipidemia, and diabetes. In 1977-1989, about 50 rotogravure printers were exposed to excess toluene and experienced acoustic hallucinations and some developed chronic toxic encephalopathy.

Conclusions and identification of several uses of the findings to improve human health or environmental outcomes (e.g., share with affected parties and decision makers, community involvement, additional work needed to evaluate scale-up results): The List of Occupational Diseases was gradually extended despite political pressure and enabled the technical preventive measures to lower life-threatening diseases in the country.

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Dr. Pelclova is full professor at the Toxicological Information Centre of the Department of Occupational Medicine, Charles University and General University Hospital, focusing on occupational toxicology and pneumology, including nanoparticles.

Criminal prosecution of toxic corporate crime in Italy

Barry Castleman
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Background: Italy has considered death on the job a possible criminal matter and has prosecuted business executives for causing occupational cancer since the 1970s. Swiss Eternit Group operated "Eternit" asbestos-cement manufacturing plants in Italy and in many other parts of the world. Starting in 1976, the owner and CEO of Eternit was Stephan Schmidheiny. He has been convicted in four trial courts for creating an environmental disaster and aggravated manslaughter. He has been represented by able counsel but has never appeared in court in Italy. All three convictions for manslaughter are being appealed.

Brief description of presentation: The evidence showing Schmidheiny directed a cover-up and the status of the appeals will be reviewed. Schmidheiny's rebranding as a "green" businessman, promoting "sustainable development," donating to the Rio 1992 Earth Summit in Brazil and receiving an honorary doctorate from Yale University in 1996 came just as Italian prosecutors were moving to charge the asbestos billionaire. Current Italian and alumni efforts to get Yale to return Schmidheiny's gifts and rescind the honorary degree will be discussed. Forbes magazine, which had praised Schmidheiny as a great philanthropist in 2009, reported on the verdict in 2023, when Schmidheiny was sentenced to 12 years in jail for the aggravated manslaughter of hundreds of people, employees and plant neighbors who died from mesothelioma.

Implications to improve human health or environmental outcomes: The criminal prosecution of corporate owners and executives has rarely been used in preventing occupational and environmental death and disease. Patently criminal conduct has been revealed in legal discovery of internal corporate documents and testimony. But in most cases, the corporate officials involved bear no personal responsibility for their business decisions. Humiliation and incarceration can add to the preventive efforts of information, regulation, and financial compensation.

Identification of specific steps going forward to improve human health or environmental outcomes (e.g., fill data gaps, needed policies or regulations, dissemination plan): Criminal prosecution of toxic corporate crime would make the world safer.

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Dr. Castleman has testified as an expert and worked with prosecutors in criminal cases against asbestos industry executives in Italy since 2010.

Role of epigenome in translating neighborhood disadvantage into disparities in health

Kenneth Olden
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Background: The environmental conditions under which people are born, live, work and play—the so-called social determinants of health (SDOH)—play a significant role in the etiology of human diseases. For example, our social and economic policies determine who gets to breathe clean air, drink water free of lead and other toxic chemicals, acquire a good education, and earn a living wage.

Brief description of presentation: Durable and environment-specific epigenetic modifications provide a plausible mechanism to explain how different SDOH exposures can become embedded with long-term, and even possibly transgenerational effects on human health. These epigenetic modifications can be reversed representing targets for precision medicine/public health.

Implications to improve human health or environmental outcomes: Socio-behavioral phenotypes and epigenetic signatures can be targeted based on potential to ameliorate risk posed by SDOH and incorporated into screening tools and stored in the electronic medical records. The SDOH factors can be used to develop a socio-behavioral profile or phenotype of the patient, and used to determine which SDOH is most likely to be effective in ameliorating specific health risks. Health equity is fundamentally a socioeconomic problem not caused by genetic variation, but by the cumulative effect of living in under resourced, polluted, stressful neighborhoods.

Identification of specific steps going forward to improve human health or environmental outcomes (e.g., fill data gaps, needed policies or regulations, dissemination plan): To achieve health equity, we should first, change our social and economic policies to ensure that all people have access to resources (e.g., nutritious food, safe housing, clean air and water, living wages, and health care) critical for human health and wellbeing and second, we should expand the Precision Medicine Initiative to include SDOH as actionable targets for use in the prevention or treatment of diseases and develop new tools and infrastructure to integrate SDOH into clinical medicine. For example, development and implementation of the social needs screening database and the social services referral system will require extensive collaborations and partnerships with local communities and public health agencies.

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Kenneth Olden, Ph.D. is the former Director of the National Institute of Environmental Health Sciences and the National Toxicology Program, National Institutes of Health, US Department of Health and Human Services (1991-2005). He was the founding dean of the School of Public Health at the Hunter College Campus of the City University on New York (2008-2012), and Director of the National Center for Environmental Assessment, US Environmental Protection Agency (2012-2016).

Conflicts, food and humanitarian crises: Innovations for short-term mitigation and long-term prevention

Joachim von Braun[1,2]

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Background: There is urgent need for more engagement and actions to overcome the growing number and intensity of food and humanitarian crises. It is imperative that we address the causes and consequences of these problems comprehensively and innovatively. The world is facing the highest number of violent conflicts since the Second World War. These conflicts are major triggers of humanitarian and food crises, causing livelihood and environmental destructions, reducing access to production factors, social safety nets and trade, and causing forced displacement. Under global climate change, extreme weather events have become a further important trigger of humanitarian and food crises worldwide. World food and water security and resilience is seriously threatened, partly due to climate disruption.

Brief description of presentation: Resilience building must rest on three pillars: Mitigation, Adaptation & Transformation. The latter calls for change of lifestyle, transformation of society and ecosystems. This transformation is akin to an ecological conversion and must integrate actions on the triplet of crises: climate, biodiversity, and inequality. Science has an important role to play in addressing food and humanitarian crises, because they are problems of complexity.

Implications to improve human health or environmental outcomes: To prevent food and humanitarian crises, we need context-specific and appropriate international and regional engagement, local peacebuilding, and multilateral conflict resolution.

Identification of specific steps going forward to improve human health or environmental outcomes (e.g., fill data gaps, needed policies or regulations, dissemination plan): The structures, governance and management of humanitarian and food crises require comprehensive reform. Women's roles and leadership in these contexts must be strengthened. We need increased and more flexible financial resources at an international level, along with redesigned emergency aid interventions. Without such reforms, we will continue to deal with symptoms rather than addressing the root causes.

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Prof. Joachim von Braun is president of the Pontifical Academy of Sciences, The Vatican, and Distinguished Professor for Economic and Technological Change Center for Development Research, Bonn University, Bonn, Germany.

Circular low-wage migrant labour and occupational ill-health. Global lessons from the South African gold mining industry

Rodney Ehrlich
University of Cape Town (UCT), Cape Town, South Africa

Background: Circular low-wage migrant labour is a global phenomenon. Perhaps nowhere have as many records been kept as on the low-wage migrant goldminers of Southern Africa and their triple burden of silicosis, tuberculosis and HIV. These records were kept by the state and industry in a racialised system in which the fate of migrants post- employment was largely unknown. Litigation, ex-miner organisation, and the work of historians and health researchers have enabled a critical perspective providing lessons for occupational health globally.

Brief description of presentation: We inquired into the structural features maintaining the ill-health of migrant ex-goldminers in Southern Africa for so long.

Implications to improve human health or environmental outcomes: Features include roots in racially based colonial systems, inadequate control of work hazards, surveillance for productivity and contagion prevention rather than worker protection, externalization to home regions with limited surveillance and health care capacity, resistance of employers and host governments to responsibility for departing migrants, and the "healthy migrant" effect in research - a narrative influenced by employer and government interests and absence of migrant voice. The combined result is the gross understatement of the true burden of disease and injury. Most occupational health research and activism has been directed at the plight of working migrants in destination countries, but little on their life-course. There are numerous international/bilateral "instruments" designed to protect circular migrants' rights and health, but with low levels of compliance.

Identification of specific steps going forward to improve human health or environmental outcomes (e.g., fill data gaps, needed policies or regulations, dissemination plan): As occupational health researchers we should adopt a whole-of-journey perspective which takes into account the externalisation of disease and injury to home countries. This will require historical and ethnographic inquiry into the roots of these systems and the migrant experience; support for home country researchers and health professionals in documenting the nature and burden of illness/injury in returning migrants; and political pressure on host and home countries for expansion and portability of social security benefits.

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Emeritus Prof. Ehrlich is Senior Research Scholar in the Division of Occupational Medicine, School of Public Health at UCT. His research interests include the clinical features and epidemiology of silicosis and tuberculosis in miners, worker's compensation for the large number of former gold miners throughout Southern Africa, and an understanding of the institutional history of this public health disaster.

Healthcare waste management in Sri Lanka: Methods, challenges and the way forward

Inoka Suraweera
Ministry of Health, Colombo, Sri Lanka

Background: Proper management of healthcare waste is an essential component in the provision of quality patient care. Its mismanagement poses a significant threat to public and environmental health and Sri Lanka is no exception.

Methods: An assessment was conducted to understand the methods, challenges and the way forward in healthcare waste management in the health sector in Sri Lanka using desk reviews, focus group discussions, checklists, questionnaires and field visits.

Results: Healthcare waste management has been identified as a programme under the environmental health programme of the Ministry of Health. The Environmental and Occupational Health Unit provides technical guidance for national and sub-national level healthcare settings in this regard. Policy, guidelines, national and subnational level action plans are available for management of healthcare waste. Capacity building programmes, audits and reviews are being conducted. Gaps have been identified in the areas of financial allocations for waste management, final disposal of infectious, sharps and mercury waste, healthcare waste management infra-structure, information management, inter-sectoral coordination, and complying with regulations pertaining to its management. Food waste, and inadequacies in sewerage and waste water management are identified as significant issues needing urgent attention.

Conclusions and identification of several uses of the findings to improve human health or environmental outcomes (e.g., share with affected parties and decision makers, community involvement, additional work needed to evaluate scale-up results): Healthcare waste management should be considered a priority in the health sector. Every effort should be made to reduce the waste generation. Costs associated with its mismanagement should be calculated and presented to obtain the support for its management since it is considered a competing priority especially in resource poor settings.

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Dr Inoka Suraweera graduated from the Faculty of Medicine, University of Colombo, with second class honors. She holds Masters and Doctoral Degrees in Community Medicine from the University of Colombo. She had post-doctoral training at Monash Centre for Occupational and Environmental Health, Australia. She is currently Consultant Community Physician and technical head of the Environmental and Occupational Health Unit of the Ministry of Health and actively engaged in undergraduate and postgraduate medical education.

SESSION IX
Hazards in expanding enterprises, Work of the Cesare Maltoni Cancer Research Center & Community exposures

1. Exposure to cleaning products and disinfectants in Latinx housecleaners in New York. *Homero Harari*, *USA*

2. Fast-tracked lithium extract in our territories where Indigenous Peoples are not recognized as decision makers. *Brian Mason*, *USA*; *Marissa Snapp*, *USA*

3. Emerging occupational and environmental health risks associated with the green transition. *Florencia Harari*, *Sweden*

4. Lead contaminated consumer products in low and middle income countries: Rapid Market Screening toolbox. *Stephan Bose-O'Reilly*, *Austria*

5. Addressing exposure and health outcomes with and for residents of East Palestine, Ohio following the train derailment disaster. *Erin Haynes*, *USA*

Exposure to cleaning products and disinfectants in Latinx housecleaners in New York

Homero Harari[1], *Lukas McHugh*[1], *Ana Gonzalez*[1], *Josephine Dorsey*[1], *Daniel Aguilar*[1], *Sherry Baron*[2], *Gerald Mastroianni*[1]

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Background: Housecleaning work is precarious in the United States and widely performed by female immigrant workers. Housecleaners are exposed to chemical hazards due to the variety of cleaning chemicals and disinfectants (CP&D) in their jobs. The objective of this study was to 1) identify the most common cleaning chemicals and disinfectants used by Latinx housecleaners in New York and 2) quantify their inhalation and dermal exposures while performing common cleaning tasks.

Methods: As part of the Safe and Just study, we surveyed 402 Latinx housecleaners to identify the most common CP&D used in their job. Using the most common CP&D reported during common simulated bathroom and kitchen cleaning tasks; we assessed personal inhalation and dermal exposure to volatile organic compounds (VOCs) and quaternary ammonium compounds (QACs).

Results: Despite the large amount of CP&D available in the US market, our methodology allowed us to identify products commonly used by Latinx housecleaners. We found that some products and combinations of products exposed workers to higher levels of VOCs.

Conclusions and identification of several uses of the findings to improve human health or environmental outcomes (e.g., share with affected parties and decision makers, community involvement, additional work needed to evaluate scale-up results): Latinx housecleaners in New York are exposed to mixtures of volatile chemicals. More language-appropriate training materials are necessary for immigrant workers and clients to increase awareness about health hazards related to chemical ingredients in CP&D. Increased policy efforts are needed to increase cleaning product transparent labeling.

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Fast-tracked lithium extract in our territories where Indigenous Peoples are not recognized as decision makers

Brian Mason, Marissa Snapp
Shoshone Paiute Tribes, Owyhee, NV, USA

Background: Often referred to as the "Green Economy," extraction of minerals to fuel low-carbon energy can have negative effects on the rights of Indigenous Peoples. The Shoshone Paiute (Sho-Pai) Tribes have seen firsthand the impacts of mining dating back to the creation of the U.S. State of Nevada. This region is now ground zero for lithium extraction in the US. Lithium is critical for electric vehicle batteries and energy storage. Negative environmental and social impacts of the current Green Economy model are externalized to our homelands and Peoples.

Brief description of presentation: The Sho-Pai advocate for recognition of the ways in which minerals have already impacted their environment, culture, and ways of life. The risks for further impacts soars. Development of a lithium mine at Peehee Mu'huh (Rotten Moon), also known as Thacker Pass, is the definitive example.

Implications to improve human health or environmental outcomes: Rotten Moon is the site of a massacre of Indigenous families by the US military in 1865 and is a sacred area. It is also now home to the largest known lithium deposit in the US. It was granted fast-track approval for mining, despite strong opposition by Tribes and environmental experts. In May 2023, the Biden Administration announced that the U.S. Bureau of Land Management has established mineral rights on the land adjacent to Thacker Pass, expanding further into our lands.

Identification of specific steps going forward to improve human health or environmental outcomes (e.g., fill data gaps, needed policies or regulations, dissemination plan): The Sho-Pai submitted a declaration to the United Nations Special Rapporteur on the Rights of Indigenous Peoples about the wave of 'Green Colonialism,' calling for immediate actions needed to address the crisis. First, governments must recognize Indigenous Peoples as decision makers regarding access to our territories and resources. Second, we require full and fair remuneration. Failure to do so violates international law and constitutes a perverse subsidy. Finally, governments must remove all environmentally harmful subsidies from mining, especially from lithium extraction, processing, and production.

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Brian Mason is the Shoshone Paiute Tribes Chairman. He worked with Placer Dome Inc. and Barrick Gold Corporation as an environmental engineer and an environmental superintendent. Mason was elected to the Shoshone Paiute Tribes Business Council where he served as council member, vice chairman and tribal chairman. He has bachelor's degrees in marketing management and in business management. Mason served in the United States Marine Corps possessing many military decorations and personal awards.

Emerging occupational and environmental health risks associated with the green transition

Florencia Harari[1,2]

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Background: As a result of the global climate change crisis a so-called green transition is ongoing worldwide. To achieve climate neutrality within the coming decades, a rapid transition to a resource-efficient and circular economy is needed.

Electrification of the vehicle fleet is one of the key measures to reduce traffic-generated air pollution and to phase out fossil fuels from the energy systems. Rechargeable lithium-ion batteries are the prominent technology used in electric vehicles which implies a considerably high demand for raw materials (mostly metals) globally.

Brief description of presentation: At present, the metals used in the production of lithium-ion batteries are mostly extracted in countries outside Europe. An overview will be presented of the health risks of the metals involved in the production of lithium-ion batteries, ethical aspects of this part of the industrial green transition, as well as the knowledge gaps where more research is warranted.

Implications to improve human health or environmental outcomes: Metals are a limited natural resource. Mining of some of the metals needed to produce lithium-ion batteries has large socio-environmental impacts and are to some extent considered ethically problematic. Several gigafactories for manufacturing and recycling of lithium-ion batteries are underway in Europe, USA and Asia. In these novel workplaces, thousands of workers will be exposed to chemical health risks, including metals, in new, unknown occupational contexts. In addition to the technically challenging development of processes, this growing industry faces challenges regarding a healthy and safe working environment.

Identification of specific steps going forward to improve human health or environmental outcomes (e.g., fill data gaps, needed policies or regulations, dissemination plan): Responsible mining is needed to reduce the exposure of workers and communities to metals. At present, research on the working conditions and health risks associated to the production and recycling of lithium-ion batteries is scarce. Regulations for producers on taking the responsibility for the batteries from the very beginning till the end-of-life are needed.

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Lead contaminated consumer products in low and middle income countries: Rapid Market Screening toolbox

Stephan Bose-O'Reilly[1,2], Aelita Sargsyan[1], Emily Nash[1], Sarah Berg[1], Gordon Binkhorst[1], Gabriel Sanchez Ibarra[1], Andrew McCartor[1]

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Background: Lead exposure can have serious consequences for the health of children. The neurological and behavioral effects of lead are believed to be irreversible. Young children are particularly susceptible to lead poisoning. In 2020, Pure Earth and UNICEF published "The Toxic Truth", reporting that one in every three children has elevated blood lead levels above 5 µg/dL. Given that lead exposure sources can vary considerably by location, it is important to identify local sources of lead exposure, especially for young children and particularly within their homes.

Methods: To identify potential sources of exposure in low- and middle-income countries (LMICs), Pure Earth developed the "Rapid Market Screening" program. In 25 LMICs, Pure Earth collected and analyzed a total of more than 6,000 consumer products (metal cookware, ceramics, cosmetics, paint, toys, medicines), foods (starch, spices), and water and soil samples. The items were analyzed with a XRF locally, including quality control measurements with ICP- MS in the USA. The project was funded by Effective Altruism Global Health and Development Fund, GiveWell and Open Philanthropy.

Results: The final analysis is being performed at the time of the submission of this abstract. Preliminary results suggest several interesting trends. The well-known sources of exposure, like lead in paint and lead in ceramics are still an important source of lead exposure in some countries. Less known, but very important are lead in adulterated spices and lead in metal cookware. Toys and cosmetics showed high peak levels in several countries. Lead exposure of children is not limited to lead in paint, or lead-contaminated sites.

Conclusions and identification of several uses of the findings to improve human health or environmental outcomes (e.g., share with affected parties and decision makers, community involvement, additional work needed to evaluate scale-up results): The exposure in LMICs can be diverse, and consumers in LMICs lack proper protection from avoidable lead sources. Rapid Market Screening is an innovative, simple and useful tool to identify the specific local pathways of lead exposure in children's homes.

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Prof. Stephan Bose-O´Reilly, Senior Technical Director at Pure Earth /USA, is professor for Environmental and Public Health at the University Hospital, Ludwig-Maximilians-University (LMU), Munich. He is a pediatrician whose main interest is to prevent children from disease by helping to reduce their exposure to toxic substances, such as lead and mercury. His special interests are introducing micro-sampling methods, transferring knowledge and capacities, and training of scientists and experts to improve children's environmental health.

Addressing exposure and health outcomes with and for residents of East Palestine, Ohio following the train derailment disaster

Erin N. Haynes[1], Warren Jay Christian[1], Judy Westrick[2]

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Background: On February 3, 2023, a freight train comprised of approximately 150 rail cars derailed and caught fire in the town of East Palestine, Ohio home to about 4,700 residents. Approximately 20 rail cars were listed as carrying hazardous materials, including vinyl chloride, butyl acrylate, ethylhexyl acrylate, and ethylene glycol monobutyl ether, which were released into the air, soil, and water; five rail cars of vinyl chloride were breached.

Methods: To address these exposure concerns, a community advisory board was formed, an on-line East Palestine Health Tracking Survey was launched to learn more about the experiences, health symptoms, and environmental health concerns of residents in the impacted area. A pilot study will take place in July 2023 to collect blood and urine on 20 adult participants living near the derailment site. Urine will be analyzed for metabolites of chemicals associated with the derailment, and blood will be processed for serum for clinical measures of kidney and renal function and multiple cytokine and chemokine biomarkers using the Luminex technology.

Results: Nearly 300 residents have completed the survey. Initial responses to the survey have demonstrated elevated levels of physical and mental health symptoms. Residents living within one mile of the train derailment reported cough (75%), headaches (89%), sinus irritation (75%) and rash (39%). A screening tool indicated 45% of all survey participants were at risk of post-traumatic stress disorder (PTSD). The mean score on the Perceived Stress Scale (PSS4) was 8.0; values above 6 are typically considered as high levels of stress. Urinary metabolites and clinical markers will be presented during the presentation.

Conclusions and identification of several uses of the findings to improve human health or environmental outcomes (e.g., share with affected parties and decision makers, community involvement, additional work needed to evaluate scale-up results): Results from the survey are being shared broadly. Pilot study data and survey results will inform next steps by the research team and other researchers interested in assessing and improving health of those impacted by the disaster.

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Dr. Haynes is the Kurt W. Deuschle Chair of Preventive Medicine and Environmental Health and Chair of the Department of Epidemiology and Environmental Health in the College of Public Health, University of Kentucky (UK) where she has worked with communities to address their exposure concerns through research for nearly two decades. She is Deputy Director of UK's NIEHS Environmental Health Sciences Core Center and director of the UK Center for the Environment.

SESSION X
Health and environmental impacts of war, We should better protect the brain from occupational and environmental neurotoxicants & Addressing the rising tide of climate and health crises on workers and at-risk communities

1. The effectiveness of the public health during the defensive war of Ukraine. *Mykola Prodanchuk*, *Ukraine*

2. The indirect health impacts of war. *Barry Levy*, *USA*

3. Chemical, biological, radiological, nuclear, explosives (CBRNE) warfare: Lessons learned from Syria & Ukraine. *Tim Erickson*, *USA*

4. War as a complex public health emergency. *Boris Lushniak*, *USA*

5. Ecocide: The environment as the silent victim of war. *Daniel Hryhorczuk*, *USA*

6. Neurodevelopment trajectory of children and adolescents in the industrialized area of Taranto, Italy. *Allessandra Patrono*, *Italy*

7. Cognitive neuroscience and the CNS effects of neurotoxicant exposures from the womb to adulthood: A history and future perspective in occupational and environmental health. *Roberta White*, *USA*

8. Neurological impacts of mercury contamination across indigenous populations. *Donna Mergler*, *Canada*

9. Attention deficit disorder and developmental manganese exposure: Mechanisms and therapeutic treatment. *Donald Smith*, *USA*

10. Preliminary evidence of clinical neurodevelopmental impacts from combined low socioeconomic status and exposure to environmental neurotoxicants in Taranto, Italy. *Roberto Lucchini*, *USA* and *Italy*

11. Impact of exposure reduction recommendations on health outcomes in children with asthma during high desert dust season in Greece and Cyprus: Results of the MEDEA randomized trial. *Panayiotis K. Yiallouros*, *Cyprus*

12. Impacts of climate change on disproportionately impacted workers. *Mitchel A. Rosen*, *USA*; *Janelle Rios*, *USA*

13. Proactive policies for migrant workers in the time of climate change. *Kevin Riley*, *USA*; *Arturo Archila*, *USA*

14. Resiliency and climate change. *Janelle Rios*, *USA*

15. Disaster research response (DR2) asia: Increasing threats on firefighters' health due to climate change related forest fires. *Shoji F. Nakayama*, *Thailand*

The effectiveness of public health during the defensive war of Ukraine

Mykola Prodanchuk
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Background: A peacetime public health system must be prepared for the challenges of full-scale war. It must fully provide all disease prevention programs, especially vaccination, prevention of outbreaks and epidemics of infectious diseases, mass poisoning and radiation exposure.

Brief description of presentation: This presentation focuses on the threats of chemical aetiology that arose in connection with the aggression of the Russian Federation against Ukraine. Among the chemical threats, in addition to the danger of using chemical weapons, the apparent consequences of hostilities were the impact of mixtures of highly toxic substances that are formed during the explosion of various types of ammunition (artillery shells, aerial bombs, cruise and ballistic missiles, attack drones), the use of phosphorous ammunition and riot control chemicals agents, oil storage combustion products, transformer oils, industrial process chemicals, agricultural chemicals and others. Similar situations in armed conflict zones in other countries will be analysed.

Implications to improve human health or environmental outcomes: In the public health model of Ukraine during the war, along with the need to provide tertiary prevention (first of all, closer to the front line), it is especially necessary to provide primary and secondary prevention of infectious diseases and poisoning in the rear. Without ensuring a stable epidemic situation in the rear, it is impossible to be sure of the stability of the front. Measures that the Public Health system should provide during martial law and after the end of the war will be discussed.

Identification of specific steps going forward to improve human health or environmental outcomes (e.g., fill data gaps, needed policies or regulations, dissemination plan): Proposals will be presented on models of tertiary prevention of the consequences of chemical stress to ensure diagnosis, treatment and rehabilitation of affected people and possible approaches to assessing the effects of chemical contamination of territories due to military actions.

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Professor Mykola Prodanchuk is a physician, and medical toxicologist (preventive and regulatory toxicology). He is a Director of Medved's Research Center. He has been working for over forty years in toxicology, environmental and occupational health, food and chemical safety. He is a member of EUROTOX, IUTOX, SOT, APHA, and ERT.

The indirect health impacts of war

Barry S. Levy
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Background: Russia's invasion of Ukraine has caused profound impacts on health, human rights, and the environment. While the direct health impacts of the war are readily apparent, the indirect health impacts are less recognized and less frequently reported, but, based on data from many other wars, are likely to be occurring more frequently.

Brief description of presentation: The indirect health impacts of war include malnutrition, communicable diseases, exacerbation and new onset of noncommunicable diseases, maternal and infant disorders, and mental and behavioral disorders. These impacts result largely from population displacement and damage to infrastructure, including food and water supply systems, medical care and public health facilities, and transportation, communication, and electricity networks. These impacts also result from and injuries and deaths of health care workers and other workers who support the health of populations. This presentation will review the indirect health impacts of Russia's war in Ukraine.

Implications to improve human health or environmental outcomes: War causes profound, widespread, and long-lasting health impacts. The Collegium can play important roles in raising awareness about and reducing the occurrence of these impacts.

Identification of specific steps going forward to improve human health or environmental outcomes (e.g., fill data gaps, needed policies or regulations, dissemination plan): The Collegium should advocate for an end to Russian's war in Ukraine and collaborate with Ukrainian scientists and policymakers to assess the health impacts of the war.

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Dr. Levy, an Adjunct Professor of Public Health at Tufts and a Past President of the American Public Health Association, has written and spoken extensively on the health impacts of war. He wrote the book "From Horror to Hope: Recognizing and Preventing the Health Impacts of War" and co-edited two editions of "War and Public Health" and 18 other books. He co-authored a New England Journal of Medicine paper on the war in Ukraine.

Chemical, biological, radiological, nuclear, explosives (CBRNE) warfare: Lessons learned from Syria & Ukraine

Timothy B. Erickson
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Background: The past indiscriminate use of chemical, biological, radiological, nuclear, or explosive (CBRNE) weapons in previous conflicts (WWI, WWII, Syrian War) and potential use in the current Russian-Ukraine War could trigger consequences that will reverberate globally and cause long-term human health effects and extensive environmental damage. In response, a team of subject-matter experts from the US and Ukraine developed a comprehensive hands- on CBRNE training program.

Brief description of presentation: During 2022-2023, the team conducted 160 CBRNE and trauma courses over multiple deployments training over 4000 personnel in the key Ukrainian cities of Kyiv, Chernobyl, Zaporizhzhia, Dnipro, Kharkiv, and Odesa. The instructional team consisted of 20 international course leaders, supplemented by local translators and logisticians, and 45 Ukrainian nationals who completed CBRNE instructor courses. The objective was to evaluate the change in knowledge and skill confidence after implementation of a wartime CBRNE training course throughout Ukraine.

Implications to improve human health or environmental outcomes: Implications, successes, and challenges faced during the previous Syrian conflict and by our US/Ukrainian team in developing and delivering CBRNE training for frontline healthcare workers and civilians conducted during an active war will be discussed. The presentation will chart a path forward in building CBRNE, disaster, and emergency management capacity strategies and policies for Ukraine and bordering countries while also highlighting the human health and environmental impacts of CBRNE warfare.

Identification of specific steps going forward to improve human health or environmental outcomes (e.g., fill data gaps, needed policies or regulations, dissemination plan): We intend to use this model for future work in other countries and low resource, austere settings globally to address the growing threat of CBRNE weapons on human health and environmental consequences worldwide.

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Timothy B. Erickson, MD, FACEP, FACMT, is Chief, Division of Medical Toxicology, Mass General Brigham, Harvard Medical School, Harvard Humanitarian Initiative, in Boston, MA. Dr. Erickson's areas of expertise include environmental toxicology, crisis in climate change, wastewater epidemiology, CBRNE terrorism, and acute injuries in global conflict settings such as Syria and Ukraine.

War as a complex public health emergency

Boris D. Lushniak
University of Maryland School of Public Health, College Park, Maryland, USA

Background: Peace is amongst the fundamental conditions necessary for health promotion. War, therefore, presents a major challenge to the physical, mental, and social well-being of the population.

Brief description of presentation: This presentation will initially focus on the definitions of health, public health, one health, and the elements of health promotion. Taking an approach of looking at war as a complex public health emergency, the top priorities of responding to such a public health emergency will be presented. These priorities include assessments, immunization, water and sanitation, food and nutrition, shelter and site planning, health care, public health surveillance, control of communicable diseases and epidemics, human resources and training, and coordination.

Data from the war in Ukraine will be presented with a focus on specific assessments of impact and health care needs in the midst of this war.

Implications to improve human health or environmental outcomes: In a public health model, primary prevention of war is critical. However, once a war begins, the health of the population will be adversely affected and we can only resort on tertiary prevention which aims to reduce the effects of the disease (war in this model) once established in an individual (the population/society). Strategies of this tertiary prevention approach will be discussed.

Identification of specific steps going forward to improve human health or environmental outcomes (e.g., fill data gaps, needed policies or regulations, dissemination plan): Lessons learned from labelling war as a complex public health emergency will be presented. Most importantly is the implementation of complex emergency priorities in an active war time scenario. The ultimate goal is to protect, promote, and advance the health and safety of the population, even under the extreme circumstances of war.

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Rear Admiral (retired) Boris D. Lushniak, MD, MPH, has been Dean of the School of Public Health at the University of Maryland since 2017 after serving as Department Chair of Preventive Medicine and Professor of Dermatology at the Uniformed Services University. He was the US Deputy Surgeon General (SG) from 2010-15, and Acting SG from 2013-14. He attended Northwestern (BS, MD) and Harvard (MPH) and trained in family medicine, dermatology, and occupational medicine.

Ecocide: The environment as the silent victim of war

Daniel Hryhorczuk[1], *Alex Hryhorczuk*[2]
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Background: Environmental harm during armed conflict can be an unintended consequence of military activity or part of a wartime strategy. Duties under International Humanitarian Law and International Human Rights Laws provide avenues to seek justice for widespread, long-term and severe damage to the environment.

Brief description of presentation: The protection of the environment during wartime is governed by several international treaties, including the Geneva Conventions of 1949 and Additional Protocols of 1977, the Environmental Modification Convention of 1976, and the 1998 Rome Statute of the International Criminal Court (ICC). The prosecution of crimes against the environment during wartime is complicated by several factors, including issues of attribution, non-signatory states and balancing considerations of necessity and proportionality in wartime. The severe environmental damage inflicted on Ukraine by Russia's invasion, including the destruction of Nova Kakhovka dam, likely presents a violation of the thresholds established by these international conventions.

Implications to improve human health or environmental outcomes: The severe and widespread environmental damage caused by Russia's invasion has been well documented. While international law governing use of force inevitably falls short of its goal, it nonetheless plays an important regulatory role in holding bad actors accountable and preventing future atrocities. States have expressed clear intentions to expand the protection of the environment under international law. Russia's unprovoked aggression may provide the collective political will to more comprehensively hold state and individual actors accountable for crimes against the environment.

Identification of specific steps going forward to improve human health or environmental outcomes (e.g., fill data gaps, needed policies or regulations, dissemination plan): The ICC limits its jurisdiction to "the most serious crimes of concern to the international community as a whole." Given the interdependence of human and ecosystem health, advocates have proposed adding the crime of ecocide as the fifth international crime within the Court's jurisdiction, both in times of war and peace.

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Dr. Hryhorczuk is a Professor Emeritus of Environmental and Occupational Health Sciences and Epidemiology at the University of Illinois School of Public Health. He is an international member of the Ukrainian Academy of Medical Sciences and for the past 30 years has worked on research and capacity-building in environmental and occupational health in Ukraine.

Neurodevelopment trajectory of children and adolescents in the industrialized area of Taranto, Italy

Alessandra Patrono[1], Donatella Placidi[1], Stefano Renzetti[1], Giuseppa Cagna[1], Roberto G Lucchini[1,2]

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Background: Neurodevelopmental disorders affect 15% of births. It is a priority to study the consequences of environmental pollutants and socio-economic status on cognitive functions. In this study of children in the industrialized area of Taranto, we investigated the trajectory of neurodevelopment of potentially healthy children to identify differences in cognitive functions based on the areas of residence at incremental distance from emissions and within the socio- economic context.

Methods: From 2014 to 2020 a total of 600 participants (ages 6 to 15) were involved in IQ assessments using the Wechsler Intelligence Scale for Children (WISC).The socio-economic data were collected through a questionnaire. To evaluate the influence of residential location, three areas at an increasing distance from the industrial source were considered.

Results: Cognitive indices with scores below the norm in the area closest to the industrial source compared to the area furthest away were as follows: verbal comprehension (33% v. 13%); visual-perceptual reasoning (33% v. 3%); working memory (42% v. 9%); machining speed (27% v. 4%). Although the screening phase included undiagnosed subjects, the following diagnostic profiles were collected among those who continued the evaluations: learning disorders; language disorders; intellectual disability. The results of the socio-economic survey showed that 74.2% mothers and 82.6% fathers have not completed post-secondary education; 66.1% have an annual income of less than €50,000; 51.4% of mothers were not formally employed.

Conclusions and identification of several uses of the findings to improve human health or environmental outcomes (e.g., share with affected parties and decision makers, community involvement, additional work needed to evaluate scale-up results): Given the importance of early diagnosis, being able to grasp these factors quickly helped facilitate dispensatory methods. This had direct effects on the functional aspects and the emotional well-being profile. The aid measures should also be oriented according to the perception of the problem as functional or linked to difficulties in the socio- economic context.

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Alessandra Patrono is a psychologist-psychotherapist, PhD student in Biomedical Sciences and Translational Medicine, Neurosciences at the University of Brescia. She works on the relationship between exposure to environmental pollutants and neurocognitive development.

Cognitive neuroscience and the CNS effects of neurotoxicant exposures from the womb to adulthood: A history and future perspective in occupational and environmental health

Roberta F. White
Boston University, Boston, MA, USA

Background: Assessment of brain damage caused by exposures to toxicants has historically been a challenge, especially for subclinical or preclinical effects. However, understanding such effects is of great public health importance in protecting the central nervous system (CNS) health of children and adults. Assessment of exposure-related effects on brain structure and function has been greatly enhanced by the application of the knowledge and tools associated with cognitive neuroscience and its antecedent and associated fields These include behavioral neurology, neuropsychology, behavioral psychometric methodology, and neuroimaging.

Brief description of presentation: This presentation provides an overview of the application of the methods developed by these fields to epidemiologic research into understanding neurotoxicant effects. We will begin with a brief overview of the evolution of the application of specific types of cognitive neuroscientific knowledge and methods to answer these questions. We will review the different but now converging methods applied to research on environmental exposures during neurodevelopment and occupational and environmental exposures in adults.

Implications to improve human health or environmental outcomes: These will include behavioral observations, psychometric testing, and various types of neuroimaging. These methods will be compared with regard to their sensitivity for etiologic research into the existence and structural brain determinants of neurotoxicant effects. In addition, clinical versus research applications will be compared.

Identification of specific steps going forward to improve human health or environmental outcomes (e.g., fill data gaps, needed policies or regulations, dissemination plan): Their utility for effective public health messaging concerning the dangers of neurotoxicant exposures will be considered. Finally, future directions for enhancement of cognitive neuroscience tools will be discussed.

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Dr. White is Professor Emerita of Environmental Health and Neurology at Boston University Schools of Public Health and Medicine. She was Chair of the Department of Environmental Health from 2003-2017. A scientist- clinician, she directed neuropsychology clinics and training for many years. She began her research on behavioral toxicology in 1980, studying occupational lead exposure, and continues to investigate exposures throughout the lifespan. Her work has focused on many toxicants and has been international in scope.

Neurological impacts of mercury contamination across Indigenous populations

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Background: World mercury production and use peaked between 1960 and 1980, increasing mercury uptake in the aquatic food chain. During this period, fish, shellfish and/or fish-eating birds and mammals constituted the dietary mainstay of many Indigenous peoples around the globe. Although since that time, food consumption patterns have changed, persons exposed during that period may still suffer from delayed toxicity. Key animal studies have demonstrated neurotoxic effects of prenatal and early methylmercury exposure in adults. While the socioeconomic impact of colonization on Indigenous populations' health is widely acknowledged, the contribution of long-term mercury exposure is rarely considered once environmental concentrations are below guideline levels.

Methods: Epidemiological studies are being carried out in partnership with the Anishinaabe community of Grassy Narrows First Nation, Ontario, exposed to mercury since 1962, when a chlor-alkali plant began discharging mercury into their territorial waters. Current neurological, neuropsychiatric and vision outcomes are examined with respect to retrospective biomarkers of mercury exposure (1970 – 1997), and umbilical cord mercury concentrations (1970-1992).

Results: Significant associations are observed between longitudinal biomarkers of mercury exposure and ongoing symptoms of nervous system dysfunction, visual field constriction, colour vision and contrast sensitivity loss and cognitive deficits in adults. There is evidence of inter-generational impacts of mercury poisoning on today's children and youth risk for attempted suicide.

Conclusions and identification of several uses of the findings to improve human health or environmental outcomes (e.g., share with affected parties and decision makers, community involvement, additional work needed to evaluate scale-up results): For the past 50 years, this community has relentlessly fought for recognition of the consequences of their mercury poisoning. Collaboration with scientists is based on the OCAP (ownership, control, access and possession) principles, as laid out by the First Nations Information Governance Centre. Recently, Grassy Narrows obtained government funding for mercury remediation of the river system and a community-led Mercury Care and Wellness Health Centre. Their struggle serves as an example for other Indigenous communities.

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Dr. Donna Mergler is a professor emerita at the Université du Québec à Montréal. The primary focus of her research has been on the neurotoxic effects of occupational and environmental contaminants, using an interdisciplinary ecosystem approach, integrating community participation, gender and social equity. For the past seven years, she has been involved in collaborative research with the Indigenous Anishinaabe community of Grassy Narrows on the long-term health effects of their mercury poisoning.

Attention deficit disorder and developmental manganese exposure: Mechanisms and therapeutic treatment

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Background: Attention deficit hyperactivity disorder (ADHD) and associated symptoms are associated with environmental risk factors. Developmental manganese (Mn) exposure is associated with deficits in attention, inhibitory response control, and psychomotor function in children and adolescents, though the causal relationship(s) between Mn exposure and these deficits, their underlying mechanisms, and efficacy of potential for therapeutic treatments are not known. Our objectives are to 1) demonstrate whether developmental Mn exposure causes lasting deficits in attention, impulse control, and sensorimotor function, 2) determine the mechanisms underlying the lasting Mn deficits, and 3) determine whether pharmacologic interventions with methylphenidate (MPH, Ritalin) ameliorates those deficits. *Methods:* We used a rodent model of developmental Mn exposure, the 5-CSRTT and Montoya staircase tasks of attentional and sensorimotor function, catecholamine receptor-specific antagonists, raclopride PET imaging, in vivo microdialysis, and proteomics, transcriptomics, and methylomics to elucidate the neural mechanisms underlying the Mn deficits. Additionally, we determined the efficacy of MPH to ameliorate the Mn deficits. *Results:* Developmental Mn exposure causes lasting impairments in attention, learning, and sensorimotor functions, and prolonged (but not acute) oral MPH treatment is efficacious in ameliorating these impairments. Antagonism of specific D1, D2, or ?2A receptors does not alter the attentional impairment seen in the Mn animals, or the MPH efficacy to improve Mn-induced attentional dysfunction. The Mn deficits are associated with a proinflammatory cellular environment and a hypofunctioning catecholaminergic system (gene and protein expression, neurotransmitter release) in fronto-striatal regions. Disrupted mTOR and Wnt signaling is identified as a key regulatory pathway underlying the lasting catecholaminergic system deficits caused by developmental Mn exposure. *Conclusions and identification of several uses of the findings to improve human health or environmental outcomes (e.g., share with affected parties and decision makers, community involvement, additional work needed to evaluate scale-up results):* These findings significantly advance understanding of the causal relationship between developmental Mn exposure and lasting attentional and sensorimotor deficits and their underlying mechanisms, and they demonstrate that a clinically-relevant oral MPH regimen is fully efficacious in ameliorating these deficits.

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Dr. Smith is Distinguished Professor of Microbiology and Environmental Toxicology at the University of California, Santa Cruz. He has worked with basic scientists, epidemiologists, and clinicians to better understand the causal relationship(s) between environmental neurotoxicant exposure and attentional and psychomotor disorders in children and adolescents, their underlying neural mechanisms, and the efficacy of therapeutics to ameliorate the executive function deficits.

Preliminary evidence of clinical neurodevelopmental impacts from combined low socioeconomic status and exposure to environmental neurotoxicants in Taranto, Italy

Roberto Lucchini[1,2], Alessandra Patrono[3], Giuseppa Cagna[3], Stefano Renzetti[3], Marco Peli[3], Donatella Placidi[3]

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Background: The city of Taranto lies in the South of Italy and its port delivers raw material to the largest steel plant of Europe. Mixed exposure to neurotoxic metals measured in biomarkers and environmental media was associated to impaired neurodevelopmental functions in previous studies and is inversely related with distance from point sources.

Methods: Six hundred (600) children aged 6-15 years were examined with neurobehavioral testing assessing learning abilities, attention, behavior, socioeconomic status (SES), biomonitoring and environmental measures. The exclusion criteria included existing clinical diagnosis of neurodevelopmental disturbances. Nevertheless, the neuropsychological assessment revealed that 92 children (15.3%) exhibited borderline scores indicating potential for clinical diagnosis. The families were informed and referred to the children's neuropsychiatric department of the local public hospital for clinical evaluation.

Results: The clinical suspicion was confirmed for 63 cases (10.5%). Only 21 children were immediately examined with diagnostic protocols. For the remaining ones, the families avoided or delayed the clinical assessment for months, in some cases forced by the schools that reported the observation of disturbances. The majority of the 92 clinical cases are residing in the neighborhood closest to the point emissions that also show the lowest SES levels. Treatment conducted in the early stages resulted in substantial improvement and regression.

Conclusions and identification of several uses of the findings to improve human health or environmental outcomes (e.g., share with affected parties and decision makers, community involvement, additional work needed to evaluate scale-up results): Clinical neurodevelopmental impacts associated to environmental exposure to neurotoxicants were observed in addition to evidence of early non-clinical changes. Unrecognized disturbances represent a major problem that must be approached with substantially increased communication and awareness about the need to recognize potential deficits, so that early treatment can be mostly effective. The interaction between exposure and SES data will be further analyzed to yield the most appropriate public health interventions.

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Dr. Lucchini is an MD, Professor of Occupational and Environmental Medicine at the University of Modena and Reggio Emilia, Italy, and Florida International University. His research interests are on the brain impacts from neurotoxicants across the life course. He investigates children, workers, elderly and patients with neuro-degenerative disorders residing in industrial areas of Italy, and the 9/11 responders who were impacted by the exposure to neurotoxic chemicals and intense psychological trauma.

Impact of exposure reduction recommendations on health outcomes in children with asthma during high desert dust season in Greece and Cyprus: Results of the MEDEA randomized trial

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Background: Desert dust storms (DDS) are associated with reduced precipitation and are possibly increasing with climate change. Exposure to DDS is known to exacerbate childhood asthma. The MEDEA randomised trial assessed the impact of indoor air filtration and outdoor exposure reduction recommendations on control of childhood asthma during high DDS season in Cyprus and Greece.

Methods: Schoolchildren with asthma aged 6-11 years were randomised into three groups: (a) No Intervention (controls) (b) Outdoor Intervention (early warning dissemination, guidance to stay indoors and limit outdoor physical activity), (c) Combined Intervention (same as (b) in combination with indoor air purification in households and classrooms). Monthly asthma symptom control was quantified using the childhood Asthma Control Test (c-ACT), while lung function (FEV1, FVC) and Fractional exhaled Nitric Oxide (FeNO) were assessed at the start, middle and end of study period.

Results: A total of 182 children with asthma (mean age: 9.5 years) completed the study. Outdoor intervention significantly reduced time spent outside classrooms and homes, between non-DDS and DDS days by -62.4 min (p-value<0.001), in comparison to 37.2 min (p-value=0.098) in the control group. Indoor intervention led to significantly lower indoor PM2.5 and PM10 concentrations in comparison to the control group, for both the non-dust (PM2.5: 55% less, PM10: 48% less) and desert dust (PM2.5: 47% less, PM10: 40% less) days. By the end of the study period and compared to controls, the combined intervention group demonstrated significant improvement in cACT (?: 2.63, 95%CI: 0.61-4.65, p-value=0.011), FEV1% predicted (?: 4.26, 95%CI: 0.35-8.17, p-value=0.033) and FVC1% predicted (?: 3.88, 95%CI: 0.11-7.64, p-value=0.044), but no change in FeNO.

Conclusions and identification of several uses of the findings to improve human health or environmental outcomes (e.g., share with affected parties and decision makers, community involvement, additional work needed to evaluate scale-up results): During high DDS season, exposure reduction recommendations, especially indoor air purification, have been proved effective to improve asthma control in children. This evidence can inform decision-making and strategic planning for mitigation of DDS health effects in Mediterranean Europe.

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Dr. Yiallouros is the Professor of Pediatrics and Pediatric Pulmonology at the Medical School of the University of Cyprus. Among his research interests is the study of the effects of air pollution and desert dust storms on respiratory diseases in childhood. He has been the coordinator of the EU funded MEDEA project, which aimed to demonstrate the feasibility and effectiveness of an adaptation strategy to Desert Dust Storms events and better inform EU policy making.

Impacts of climate change on disproportionately impacted workers

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Background: Climate change is a pressing global issue that significantly impacts aspects of work and disproportionately impacts some workers. Disproportionately impacted workers often face economic, social, and political disadvantages and are particularly susceptible to the adverse impacts of our changing climate. *Brief description of presentation:* Disproportionately impacted workers often respond to disasters caused by climate change. Increasing hurricanes, tornados, wildfires, and winter storms lead to devastation and destruction requiring significant person-power to respond and recover. These workers face known and unknown hazards with limited or no training to cleanup mold- infested homes, clear hazardous debris, and help recover from impacts of the disaster. This presentation will discuss how climate change exacerbates existing inequalities, widening the gap between privileged and marginalized groups. Disproportionately impacted workers, such as those engaged in informal or low-wage sectors, are more likely to experience negative impacts due to limited access to resources, social protection, and decision-making power. They often work in sectors heavily influenced by weather conditions, such as agriculture, fisheries, and construction, making them more vulnerable to extreme weather events and rising temperatures, impacting health and well-being. Increased heat impacts physical health and mental cognition, increases illness and injuries, and spreads vector-borne diseases. Additionally, the psychological toll of climate- related disasters, displacement, and uncertainty about the future contribute to mental health issues among this population. *Implications to improve human health or environmental outcomes:* Addressing the impacts of climate change on disproportionately impacted workers requires a comprehensive approach that integrates social, economic, and environmental interventions, including a focus on enhancing social protection measures, promoting sustainable and inclusive economic development, providing access to education and training, and ensuring meaningful participation and representation of disproportionately impacted workers in decision-making processes. *Identification of specific steps going forward to improve human health or environmental outcomes (e.g., fill data gaps, needed policies or regulations, dissemination plan):* Utilizing examples of training materials, educational resources, and lessons learned developed by NIEHS Worker Training Program grantees, this discussion will assist others to develop strategies for protecting disproportionately impacted workers from climate impacts.

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Proactive policies for migrant workers in the time of climate change

Kevin Riley[1], *Arturo Archilla*[2]
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Background: Changing climate patterns have led to increased temperatures and more severe weather events in many parts of the world, with migrant workers often among the populations at high risk for exposures to these environmental hazards.

Brief description of presentation: This presentation will examine the impacts of climate-related hazards on migrant workers in the United States, many of whom face elevated climate-related occupational risks in the cleanup and rebuilding efforts by virtue of sociodemographic characteristics, work settings, and/or informal employment arrangements. We will consider how regulatory and policy measures can play a role in addressing the needs of these workers while protecting their rights. The presentation will highlight three policy models in the current U.S. context – OHS standards that establish requirements for employers to follow; access to training that informs workers about their rights and protections and focuses on specific high-risk hazards in the workplace around safety and health; and immigration reform measures extended to workers who experience violations of state and federal labor law. We will also discuss proposed measures for migrant communities that can support climate-displaced workers and just transition initiatives.

Implications to improve human health or environmental outcomes: The presentation helps to address some of the vulnerabilities and labor abuses including retaliation faced by migrant workers in the work settings and shares remedies provided to these workers. We will note the role that academic programs, community organizations and labor organizations can play in supporting these policy measures, focused on addressing the risks faced by workers when raising health and safety concerns in the workplace and the importance of required safety and health trainings to create awareness of workers' rights and protections.

Identification of specific steps going forward to improve human health or environmental outcomes (e.g., fill data gaps, needed policies or regulations, dissemination plan): We will consider lessons learned from efforts with migrant climate workers in the United States that can be extended to other regions of the world.

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Kevin Riley is Director of the Labor Occupational Safety and Health Program at the University of California, Los Angeles, where he leads training, research and leadership development initiatives to promote health and safety for workers in Southern California.

Resiliency and climate change

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Background: As the frequency and severity of extreme weather events intensify, the ability to recover becomes increasingly important. We refer to this ability as resiliency. Some people and communities are more resilient than others. Why? What factors make workers vulnerable to (or better able to withstand) extreme weather events? Hurricane Harvey, a category 4 storm that killed more than 100 people and devastated much of southeast Texas and western Louisiana in 2017, created a situation in which resiliency could be observed, in real people and in real time. At its peak, Hurricane Harvey attained winds of 130 miles per hour and, over four days, Hurricane Harvey dropped approximately 50 inches of rain in southeast Texas, flooding hundreds of thousands of homes and displacing more than 30,000 residents.

Brief description of presentation: In this session, we will examine the resiliency of three of those residents, each with different backgrounds, educational levels, ethnicity, and income and resiliency levels. Our examination will follow the impact of Hurricane Harvey immediately after landfall. We will describe the factors that impacted the resiliency of these residents, including the influences that too often contribute to the vulnerability of individuals and communities, such as limited access to resources, inadequate social protection, low wages, and limited decision-making power.

Implications to improve human health or environmental outcomes: I will (1) describe the factors that contributed to the health (including mental health) and well-being of these residents and (2) illustrate the impact these factors had on the resiliency of these residents post Hurricane Harvey.

Identification of specific steps going forward to improve human health or environmental outcomes (e.g., fill data gaps, needed policies or regulations, dissemination plan): We will consider historical policies and then look towards the future to discuss potential methods to enhance the resilience of disproportionately impacted residents, including optimizing efforts to prepare for, respond to, and recover from climate impacts. Hopefully, this discussion will spark the development of strategies, policies, and systems that promote resiliency.

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Dr. Rios is a faculty associate at University of Texas School of Public Health. For the last 14 years, she has served as the principal investigator and director of the Prevention, Preparedness, and Response (P2R) Consortium, a large multi-program training project funded by the US NIH's National Institute of Environmental Health Sciences (NIEHS) Worker Training Program. Prior to her faculty position, Dr. Rios served the State of Texas as an environmental investigator for 10 years.

Disaster research response (DR2) asia: Increasing threats on firefighters' health due to climate change related forest fires

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Background: National Institute of Environmental Health Sciences of the United States (NIEHS) and the National Institute for Environmental Studies of Japan (NIES) have been collaborating to improve national and global capacity for disaster research response (DR2) to reduce the health impacts from disasters for at-risk populations. Wildfires, one of the common disasters all over the world, present threats not only to the public, but also to first responders, firefighters, farmers, and other exposed workers. NIES has been collaborating with the Chiang Mai University to elaborate the risk of smoke haze on community in northern Thailand.

Methods: During the smoke haze season, from February to April, people in the vicinity community have a special mission to volunteer to cope with the fires and are referred to as community fire fighters. A cross sectional study was conducted just after smoke-haze pollution on around May 2019. The fire fighters were recruited from 10 villages of northern Thailand. Questionnaires were used for data collection such as demographic status, firefighting and health status. Approximately 50 ml of a spot urine sample was collected at recruitment for oxidative stress biomarker (MDA) metabolite analysis. Particulate matter (PM) was analyzed for metals, polycyclic aromatic hydrocarbons, ions and oxidative potentials to perform source apportionment.

Results: Sixty participants including equal numbers of firefighters and non-firefighters were included in the study. Firefighters had a significantly higher prevalence of difficulty in breathing. PM2.5 and PM10 levels were associated with oxidative stress (MDA) among firefighters. The community was affected by the wildfires.

Conclusions and identification of several uses of the findings to improve human health or environmental outcomes (e.g., share with affected parties and decision makers, community involvement, additional work needed to evaluate scale-up results): Community firefighters were affected by their work on wildfire fighting. The research led municipal officials to provide community volunteers with personal protection equipment. DR2 can be an effective tool to enable public officials to make evidence-based decisions.

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Dr Nakayama holds MD and PhD degrees and is trained as an occupational physician. He is currently Deputy Director of the Japan Environment and Children's Study Programme Office at the National Institute for Environmental Studies where he has worked on environmental health research including a birth cohort study and disaster research response.

SESSION XI

Solutions and challenges for prevention of heat-associated occupational illnesses and injuries, Environmental sentinel species: addressing global threats of chemical exposure & Aspartame update

1. How can scientific research inform occupational heat stress policymaking? *June Spector*, *USA*

2. Implementing heat-related policy interventions in low and middle income countries (LMICs): Opportunities and challenges. *Vidhya Venugopal*, *India*

3. Understanding heat-related injuries in the workplace: Empirical evidence and opportunities for intervention. *Miranda Dally*, *USA*

4. Developing practical solutions to benefit workers at-risk for chronic kidney disease of unknown cause (CKDu) in Latin America. *Jaime Butler-Dawson*, *USA*

5. Addressing impact of climate-change induced heat stress on workers' safety and health through collective action: insights from ILO's Vision Zero Fund. *Dupper Ockert*, *Switzerland*

6. The importance of being sampled: The case of metazoan nuclear receptor diversity in chemical hazard assessment. *Ruivo Raquel*, *Portugal*

7. Active biomonitoring to reveal the impact of chemical contamination on macroinvertebrate ecology in freshwater streams. *Arnaud Chaumot*, *Country unspecified*

8. Known and suspected impacts of electromagnetic fields (EMF) to birds and bats: A review. *Albert Manville*, *Blake B Levitt*, and *Henri Lai*, *USA*

9. Understanding the link between aspartame and cancer. *Morando Soffritti*, *Italy*

10. Epidemiological evidence of cancer risk in humans exposed to aspartame. *Eva Schernhammer*, *Austria* and *USA*

How can scientific research inform occupational heat stress policymaking?

June T. Spector [1,2]

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Background: Science is a key element that should be integrated into the development of occupational heat stress policies. Policymaking processes and requirements are different in different countries, jurisdictions, and organizations. However, there are several potential common opportunities and solutions for optimizing integration of science into heat stress policymaking processes, with the aim of reducing the burden of occupational heat stress.

Brief description of presentation: This presentation will review potential entry-points and considerations for integration of science into heat stress policymaking, using local examples and solutions, but with consideration of broader generalizability. The importance of, and approach to, compiling and disseminating occupational heat stress research to stakeholders and diverse working populations in advance of policymaking will be described. Policy-relevant considerations for research on the burden of occupational heat stress, including quality and local applicability and relevance to specific working populations, will be discussed. The utility of intervention effectiveness research will be described in the context of other common policymaking aspects such as feasibility and economic considerations.

Implications to improve human health or environmental outcomes: Effective occupational heat stress policies have the potential to protect workers from heat stress. Depending on scope, purpose, implementation, and enforcement, these policies have the potential to contribute to reductions in adverse heat-related health outcomes, including heat-related illness, heat-related traumatic injuries, acute and chronic kidney disease, and exacerbations of underlying diseases such as cardiovascular disease.

Identification of specific steps going forward to improve human health or environmental outcomes (e.g., fill data gaps, needed policies or regulations, dissemination plan): Research on the relationship between heat stress and occupational health outcomes and intervention effectiveness research should be disseminated to stakeholders in advance of occupational heat stress policymaking to inform occupational heat stress policymaking processes. Evaluation research on the effectiveness of policies in reducing adverse health effects from occupational heat stress should also be conducted.

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Dr. Spector is a researcher at the Washington State USA Safety & Health Assessment & Research for Prevention (SHARP) Program and an Associate Professor of Environmental & Occupational Health Sciences and Medicine at the University of Washington. Her research and work focuses on the prevention and management of heat stress, particularly among outdoor working populations.

Implementing heat-related policy interventions in low and middle income countries (LMICs): Opportunities and challenges

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Background: Despite heat mitigation efforts in the workplace, heat remains a significant health concern in Low- and Middle- Income Countries (LMICs), especially among informal workers. Numerous LMICs have implemented workplace and regional Heat Action Plans (HAPs) to reduce the heat burden.

Brief description of presentation: In this presentation, we examine the challenges associated with implementing HAP policies in the workplace from the perspective of various stakeholders.

Implications to improve human health or environmental outcomes: For this qualitative study, we conducted in-depth interviews with approximately 500 stakeholders in 2022. Researchers on heat, policy advisors, policymakers, safety officers, workers, business owners, and supervisors were identified using purposeful sampling techniques. The interviews were conducted in either English or the native language. The data were evaluated through qualitative content analysis.

Identification of specific steps going forward to improve human health or environmental outcomes (e.g., fill data gaps, needed policies or regulations, dissemination plan): The participants identified four major types of obstacles to the implementation of HAPs and protective labor policies. Inadequate resources, a lack of trained personnel, ineffective supervision and mentoring of staff, and personnel turnover in the government are the first structural challenges. Second, the unilateral implementation of policies without input from stakeholders and oversight of enforcement. Thirdly, a lack of understanding of local sociocultural factors hindered the effective implementation of evidence-based and tested HAPs that were successful elsewhere. The fourth category, insufficiently informed policy development, involves a lack of channels to engage stakeholders and a top-down approach to policy design that affects worker and management acceptance. All policymakers must recognize that insufficient support for the policy objectives creates a gap execution. Thus, policy- making and implementation should be seen as holistic, interdependent and interactive processes. To overcome these difficulties and assist HAPs in LMICs, it is crucial to assess local implementation challenges for specific HAPs in order to transform them into opportunities.

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Dr. Vidhya Venugopa, Professor in the Faculty or Public Health, is a climate change specialist and occupational hygienist. With post-doctoral experience in occupational heat stress research from Australia, Germany, and Sweden, Dr. Venugopal has supervised students and conducted large-scale epidemiological studies in Southeast Asia. Being a passionate occupational heat and health researcher, she collaborates with health experts around the world and is a member of climate change and health organizations, including the Indian government's climate mission.

Understanding heat-related injuries in the workplace: Empirical evidence and opportunities for intervention

Miranda Dally
University of Colorado, Aurora CO, USA

Background: Climate change has caused annual temperatures to rise worldwide resulting in higher incidence of heat-related illness in the workplace. This is especially true for agricultural workers who work long hours outdoors. Emerging evidence from Italy and Australia suggest that increasing temperatures may also rise occupational traumatic injury rates. These studies leave unresolved (1) the specific impact on agricultural workers in less temperate climates and (2) the specific physiological pathways underlying this relationship.

Methods: Occupational injuries recorded for the 2014/2015 to 2017/2018 harvest seasons were collected from a large agribusiness employing male sugarcane harvesters in Southwest Guatemala. Wet Bulb Globe Temperature (WBGT) for the same periods were calculated from the El Balsamo weather station in 15-minute increments. Using a Poisson generalized linear model we assessed the relationship between daily average WBGT and reported occupational injury rate. Logistic mixed effects models were used to test the association between average WBGT during hour of the workday and injury occurrence.

Results: We observed a 3% increase in recorded injury risk with each degree increase in daily average WBGT above 30°C (95% CI: -6%, 14%). Forty percent of injuries were recorded between 14:00 and 16:00 hours. There was no association between hourly average WBGT and injury occurrence (OR: 1.00; 95%CI: 0.94, 1.05).

Conclusions and identification of several uses of the findings to improve human health or environmental outcomes (e.g., share with affected parties and decision makers, community involvement, additional work needed to evaluate scale-up results): In this setting agricultural workers are at an increased risk of occupational injury with increasing daily average outdoor temperatures. This study demonstrates that outdoor temperatures do not independently predict the complex epidemiology of occupational injuries. There is an urgent need to increase occupational injury surveillance, identify the correct measures of heat exposure, and understand the underlying pathways that generate the observed relationship between occupational heat exposure and traumatic injury.

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Miranda Dally, MS, DrPH(c) is a senior research instructor at the Center for Health, Work and Environment at the Colorado School of Public Health where she works with agricultural workers internationally to examine the impact of climate change on their health, safety and wellbeing.

Developing practical solutions to benefit workers at-risk for chronic kidney disease of unknown cause (CKDu) in Latin America

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Background: There is growing evidence that extreme heat stress and repeated dehydration is likely one of the contributors to the epidemic of CKDu. Many hypotheses regarding the disease's cause have emerged including multiple occupational, environmental, and social factors—in particular, heat stress, dehydration, heavy metals, agrochemicals, and medications. Sugarcane workers, in affected communities, may be especially vulnerable to exposure to multiple nephrotoxicants, specifically particulate matter, heavy metals, and silica, which may exacerbate CKDu in addition to heat.

Methods: The Center for Health, Work and Environment (CHWE) partnered with a Guatemala sugarcane agribusiness to both investigate the etiology of CKDu and to develop enhanced preventive activities and interventions to protect sugarcane workers. Our interventions have included encouraging workers to drink electrolytes in addition to promoting water, rest, and shade; educating workers on ways to reduce heat stress and dehydration as well as avoiding anti-inflammatory medications, which are harmful to the kidneys when dehydrated; and performing enhanced kidney health surveillance and clinical monitoring for workers during the season.

Results: During our current study in Guatemala, we have collected two years of personal air samples from sugarcane workers as well as Individual-level biomonitoring of heat stress. We observed median breathing zone personal particulate matter exposure concentrations of nearly 450 μg/m3, levels that were up to 8 times higher local ambient levels and found amorphous silica in the air samples. We observed that almost half of the workers reached core body temperatures of 38.0 degrees Celsius during the work shift.

Conclusions and identification of several uses of the findings to improve human health or environmental outcomes (e.g., share with affected parties and decision makers, community involvement, additional work needed to evaluate scale-up results): The results of our research are being used to inform interventions to reduce occupational and environmental exposures among workers populations in Latin America.

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Dr. Jaime Butler-Dawson is an epidemiologist at the Colorado School of Public Health. Her work in global health research and practice focuses on improving the health of vulnerable populations, especially in relation to worker health and safety, agriculture, climate, and environmental exposures. She is currently examining environmental and occupational risk factors contributing to kidney disease among workers in Latin America, with an emphasis on the development of prevention strategies.

Addressing the impact of climate-change induced heat stress on workers' safety and health though collective action: insights from the International Labor Organization's (ILO) Vision Zero Fund

Ockert Dupper
International Labor Organization, Geneva, Switzerland

Background: Vision Zero Fund is a Group of Seven (G7) initiative and is administered by the ILO. The aim of the Fund is to reduce accidents, injuries, and diseases in global supply chains. In 2022, the G7 asked the VZF to address the impact of climate change on occupational safety and health in its project countries with a particular focus on climate change induced heat stress.

Brief description of presentation: The Fund has adopted a 4-phased approach to develop, implement, and evaluate appropriate climate change adaptation measures. The first phase involves mapping, assessing, and identifying preventive and protective measures to be implemented by governments, employers, and workers; during Phase 2, the Fund facilitates a process of social dialogue with project stakeholders in line with its collective action approach; third, it supports the implementation of appropriate workplace adaptation measures and related policy and legal reform; finally, the Fund will adapt and expand the model to other countries and supply chains.

Implications to improve human health or environmental outcomes: The Fund's work has the potential to protect the health of workers and communities globally through the implementation of appropriate policies, regulations, and workplace adaptation measures in line with international labor standards and with the active involvement of governments, employers, and workers.

Identification of specific steps going forward to improve human health or environmental outcomes (e.g., fill data gaps, needed policies or regulations, dissemination plan): It is recognized that there is no "one size fits all". Policies and programs to address the impact of climate-change- induced heat stress on workers' health and safety need to be designed in line with the specific conditions of countries, including their stage of development, economic sectors and types and sizes of enterprises. The Fund intends to use its convening power to bring global stakeholders together to reflect on lessons learned, facilitate knowledge exchange, and promote good practices.

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Ockert Dupper is the Global Program Manager of the Vision Zero Fund (VZF, the Fund) at the International Labour Organization (ILO) in Geneva, Switzerland. Before joining the ILO, he was Director of Monitoring and Vice-president of Programs at the Fair Labor Association (FLA) in Washington, D.C. (2012-2014), and Professor of Law at the University of Stellenbosch, South Africa (1996-2012), where he specialized in labor law and social security law.

The importance of being sampled: The case of metazoan nuclear receptors diversity in chemical hazard assessment

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Background: Deducing the potentially hazardous effects of chemicals relies on the extrapolation of physiological responses: from model species to the ecosystem scale. Yet, increasing evidence emphasises the need for adequate sampling of such responses across the metazoan tree. In fact, external stimuli may elicit both conserved and divergent physiological outcomes in animals, but the underlying genetic diversity is far from fully understood. This is particularly relevant for Nuclear Receptors (NRs), a family of transcription factors participating in crucial physiological processes throughout an organism's life cycle: from development to the maintenance of adult endocrine systems. Importantly, NRs are mostly triggered by ligands and are thus often highjacked by environmental chemicals. Such susceptibility has been translated into tools with some NRs included in EPA and OECD test guidelines for endocrine-disrupting chemicals. Yet, despite their relevance in hazard assessment and monitoring, significant knowledge gaps still exist. First, NR gene repertoire is not stable across metazoan lineages; secondly, the presence of specific NRs does not strictly imply conserved responses. Additionally, the current vertebrate bias in NR-based testing likely impairs a metazoan-inclusive assessment.

Methods: Here, we use phylogenetic inference methods coupled to cell-based functional assays to explore the conserved and divergent sensitivities of selected metazoan NRs to exogenous compounds.

Results: Such phylogeny-informed case studies, allowed us to explore the applicability of NRs as decisive tools to understand the mechanisms of action of environmental chemicals, test their hazardous potential across species, or even contribute towards the screening of novel, and more environmentally friendly active compounds.

Conclusions and identification of several uses of the findings to improve human health or environmental outcomes (e.g., share with affected parties and decision makers, community involvement, additional work needed to evaluate scale-up results): Our results corroborate the necessity of phylogeny-informed sampling of metazoan NRs, including functional characterization, to establish precision hazard assessment at an ecosystem scale.

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Dr. Ruivo is a researcher at the Interdisciplinary Centre of Marine and Environmental Research (CIIMAR), Portugal, and is currently the co-PI of the Endocrine Disruptors and Emerging Contaminants team. She has developed research on the evolution, physiology and environmental disruption of nuclear receptors.

Active biomonitoring to reveal the impact of chemical contamination on macroinvertebrate ecology in freshwater streams

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Background: Chemical exposure of aquatic communities and subsequent ecological impacts are still difficult to assess quantitatively. This limits our understanding of the consequences for the functioning of aquatic systems, and the implementation of effective management plans. This limitation is partly explained by the difficulty to translate present water contamination data into exposure levles of biological communities. With the French Biodiversity Agency and the Water Agencies, active biomonitoring assay with the crustacean Gammarus fossarum has been developed for the chemical contamination monitoring of the Water Framework Directive (WFD). Biota offers many advantages to quantify priority substances (metals, PAH, PCB, pesticides, PFAS…). Caging allows to control biological parameters of test organisms and the exposure duration, making it possible to reliably compare bioaccumulation data obtained between stations and over time.

Methods: This study proposed multi-contaminant indicators for characterizing chemical pressure in ecosystems based on bioaccumulation data recorded during in situ biotests implemented throughout the French river monitoring network. We also exploited ecological monitoring data (invertebrate inventories) collected in the same rivers for the regulatory implementation of the European WFD.

Results: We have been able to map bioavailable chemical contamination on a national scale, covering 218 rivers. We have identified a drop in sensitive invertebrates' abundances due to contamination by specific compounds of the aquatic environment. We have also highlighted relationships between chemical pressure and macroinvertebrate diversity, with a decrease in species richness along a gradient of metal contamination, and the replacement of sensitive species by tolerant species that mainly compensate the loss of functional diversity between uncontaminated and contaminated sites.

Conclusions and identification of several uses of the findings to improve human health or environmental outcomes (e.g., share with affected parties and decision makers, community involvement, additional work needed to evaluate scale-up results): This study demonstrates the value of the use of sentinel species to characterize the chemical pressure relying on biological communities. The main perspective is to consider measurements of toxic effects, which are today recorded at the national scale following the same in situ biotest methodology.

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Dr. Chaumot is a senior ecotoxicologist at the French Research Institute for Agriculture, Food and the Environment (INRAE), where he has developed research on the ecological effects of aquatic chemical contamination, based on the large-scale deployment of active biomonitoring (caging of invertebrate sentinel species) in river networks.

Known and suspected impacts of electromagnetic fields (EMF) to birds and bats: A review

Albert. Manville[1], Blake Levitt[2], Henry C. Lai[3]

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Background: From 1980 to the present, we've witnessed at least a 70-fold increase in ambient nonionizing electromagnetic fields (EMF), and growing. While there is only limited field research on effects of nonionizing EMF on wildlife, including on birds and bats, many negative effects from EMF have been observed in laboratory research animal models. The results can be extrapolated as predictors to wildlife. The biological effects of EMF have been seen broadly across all taxa, including at low intensities. EMF exposures are growing exponentially, found in virtually all habitats from urban to rural to wilderness.

Brief description of presentation: In a cutting-edge, 3-part paper published in 2021 by Levitt et al. in Reviews on Environmental Health, we summarize the key findings about impacts to birds and bats from nonionizing EMF, including next steps to begin addressing the impacts and ideally reversing some of the problems.

Implications to improve human health or environmental outcomes: While there is much yet to learn about effects of nonionizing EMF on wildlife, we already know much about radiation impacts, a subject of growing concern.

Identification of specific steps going forward to improve human health or environmental outcomes (e.g., fill data gaps, needed policies or regulations, dissemination plan): 1. Continue to fill data gaps through peer-reviewed and rigorous scientific research — including in the field — and use the extensive amount of peer-reviewed, published information already available to the public to affect wildlife and environmental policy. 2. Get the U.S. Federal Communications Commission and all affected U.S. Federal agencies to conduct meaningful and rigorous scientific reviews of the known and suspected impacts of electromagnetic fields (EMF) on wildlife which could also improve human health and safety. These should include Environmental Impact Statements detailed under the U.S.'s National Environmental Policy Act. 3. Develop guiding principals for wildlife, especially for Threatened and Endangered/imperiled species and threatened habitats, that develop and implement human radiation safety standards "as low as reasonably achievable" (ALARA).

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Dr. Manville is a part-time Senior Lecturer and Adjunct Professor, School of Arts and Sciences, Advanced Academic Programs, Johns Hopkins University, Washington DC Campus, United States (23 yrs). He is also a retired Senior Wildlife Biologist with the Division of Migratory Bird Management, U.S. Fish & Wildlife Service, Washington DC (17 yrs), and is a Certified Wildlife Biologist by The Wildlife Society.

Understanding the link between aspartame and cancer

Morando Soffritti
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Background: Aspartame is an intense artificial sweetener with a sweet taste approximately 200 times that of sucrose. It is an additive in more than 6,000 products including more than 500 pharmaceutical products for children.

Brief description of presentation: Aspartame was invented by GD-Searle in 1965 and submitted for pre-marketing safety evaluation in early1980s. The studies conducted by GD-Searle to evaluate the potential carcinogenic risks of aspartame did not show any effect. Because of the wide commercial use of aspartame, in 1997 the Ramazzini Institute started a large experimental project on rodents to test the carcinogenic effects of aspartame. It involved the Institute's experimental model with more sensitive characteristics, namely a large number of rats and mice, start of the treatment from prenatal life, and observation until natural death. Overall, the project included the study of 2,270 rats and 852 mice starting the treatment from prenatal life or in mature age and lasting all life.

Implications to improve human health or environmental outcomes: These studies have shown that aspartame is a carcinogenic agent inducing a significant dose-related increased incidence of several types of malignant tumors, including hematological neoplasias and liver cancer. These effects have been confirmed by epidemiological studies. A comment on the recent evaluation by the International Agency for Research on Cancer of the carcinogenic potential of aspartame will be reported.

Identification of specific steps going forward to improve human health or environmental outcomes (e.g., fill data gaps, needed policies or regulations, dissemination plan): The results of the studies of the Ramazzini Institute on aspartame has opened a real front on the evaluation of health risks of artificial sweeteners and food additives in general. For industry, aspartame is an artificial sweetener to defend at all costs. Adequate long term carcinogenicity bioassays on other diffuse artificial sweeteners as acesulfame-k. sucralose, saccharine and others, including their blends, are urgently needed.

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Morando Soffritti, MD, is the secretary General of the Collegium Ramazzini. He is also Honorary President of the Ramazzini Institute where he previously served as Scientific Director. His research focuses on the identification of the causes of cancers, particularly those of industrial and environmental origin. He is the author of more than 170 publications. In 2007 he was honored with the Irving Selikoff Award and in 2022 he was the Ramazzini Award Recipient.

Epidemiological evidence of cancer risk in humans exposed to aspartame

All authors and affiliations
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Background: Aspartame, which has been widely used as an artificial sweetener since the mid 1980s, has a long history of debate surrounding its potential carcinogenic effects.

Methods: Starting in 2022 and culminating in an expert meeting in Lyon, France, in June 2023, the International Agency of Cancer Research (IARC) set out to assess aspartame's carcinogenicity as part of their Monograph program. As typical in these Monographs, the evaluation of a given exposure with potential carcinogenic effects, such as aspartame, was based on three main pillars: (1) evidence from animal studies, (2) from human studies, and (3) supporting mechanistic evidence.

Results: In this presentation, the processes and decisions underlying each of these three pillars will be discussed with a specific emphasis on human studies. Strength and limitations of the major contributing human studies, and surrounding considerations pertaining to the exposure definitions of the respective studies, along with the potential for bias in these observational studies aim at providing a succinct summary of the factors that led to the decisions reached during this Monograph meeting.

Conclusions and identification of several uses of the findings to improve human health or environmental outcomes (e.g., share with affected parties and decision makers, community involvement, additional work needed to evaluate scale-up results): The presentation will conclude with recommendations for future studies addressing the association between aspartame use and cancer risk.

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Dr. Schernhammer is chair of the Department of Epidemiology at the Medical University of Vienna, and adjunct Professor of Epidemiology at the Harvard T.H. Chan of Public Health, where she obtained her Doctorate in Epidemiology in 2003.