Keynote

K-01 OCCUPATIONAL CANCER EPIDEMIOLOGY – FROM HAZARD IDENTIFICATION TO CANCER PREVENTION
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Introduction Occupational cancer epidemiology has been a core activity of the International Agency for Research on Cancer (IARC), the World Health Organization’s specialized cancer agency, for more than 50 years. The aim of today’s Occupational Cancer Epidemiology Team at IARC is to conduct studies worldwide and to synthesize evidence contributing to the prevention of occupation-related cancers among workers and their offspring.

Material and Methods International collaborations are needed to establish large-scale studies examining occupational exposures and risks that cannot otherwise be adequately studied, and both community-based and industry-based studies are useful to identify and quantify risks.

Results The Occupational Cancer Epidemiology Team gathers scientists and early career scientists from various Branches at IARC, as well as international experts and collaborators. The specific objectives are to 1) identify occupational carcinogens; 2) characterize effects of known and suspected occupational carcinogens, including exposure-response and joint effects with other exposures (e.g. tobacco smoking); 3) estimate the cancer burden due to occupational exposures, based on high-quality data and standard methodology; 4) enhance the development of exposure and risk assessment tools and registries in low- and middle-income countries, so that carcinogenic hazards or risks associated with work in these countries can be identified; 5) encourage epidemiological studies and cancer registers to collect and record occupational data in a standardized manner; 6) build capacity and facilitate knowledge exchange in occupational cancer epidemiology, including in under-researched settings, via close collaborations with local partners and by hosting internships at IARC; and 7) develop a long-term strategy for occupational cancer research at IARC, including standard operating procedures and recommendations adaptable to different settings for future studies.

Conclusions The Occupational Cancer Epidemiology Team’s on-going key programmes and projects are presented on https://www.iarc.who.int/teams-oce/

K-320 BAD ACTORS AND GOOD ACTIONS: THE UTILITY OF CAUSAL INFERENCE FOR EXPOSURE MIXTURES
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Epidemiologists are often interested in questions such as ‘how does this exposure affect this disease in this population?’ Exposure mixtures often yield seemingly similar questions such as ‘how do these exposures affect this disease in this population.’ Large-scale efforts have been undertaken to overhaul the methodology for exposure mixtures. We often hear comments from colleagues such as ‘did you consider your exposure in a mixtures analysis?’ The emphasis on ‘mixtures analyses’ suggests that the traditional epidemiologic toolbox is at risk when we transition from one exposure to multiple exposures.

However, I propose that what is often most at risk is the study question itself. Many new methods have arisen to address statistical issues of exposure mixtures, but innovation solely in the realm of statistical analysis can have unintended consequences:

1) methods that overcome statistical issues can obscure causal inferential issues about whether the study question is even answerable and
2) models can force researchers to ask questions that emphasize convenience over relevance.

Should we abandon the search for further sophistication? No. Instead, analysis of exposure mixtures needs a framework that puts methods into perspective and provides guidance on the answerability of questions about mixtures. Causal inference provides one such framework.

I argue that the principles of this field can 1) help guide us toward answerable and relevant questions about health effects of exposure mixtures; 2) assist in the triangulation of statistical evidence and 3) provide analytic tools to harness recent statistical innovations without sacrificing the relevance of a study question. I highlight some recent and developing examples in which causal inference has provided an effective framework for harnessing novel statistical methods to answer questions of crucial public health importance.

Plenary symposium ‘EPICOH lifetime achievement award’

P-04 ADVANCING GLOBAL HEALTH WITH OCCUPATIONAL EPIDEMIOLOGY
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This presentation will explore the essential role of occupational epidemiology in global health. Our field provides critical perspectives – relevant not only for the identification of health hazards at work but in global health more broadly – on the identification of risk factors for disease in populations, the weighing of evidence for causality, and the design and implementation of public health interventions. This presentation is informed by analyses of recent health crises including the COVID-19 pandemic, the epidemic of ‘deaths of despair’ in the U.S. and the increasing toll of heat illnesses on a warming planet.

In addition to study design and data analytic methods, occupational epidemiologists are trained to understand the physical and social environments in which work is conducted as well as the biological processes that link exposure to disease, and how all this impact population health. This multi-disciplinary training enables occupational epidemiologists to identify hazards and interventions that may be overlooked by other disciplines. Occupational epidemiologists learn that economic and political forces have powerful effects on the work environment, and this shapes their perspective on how evidence is weighed in public health.
decision-making. Rather than using rigid evidence to decision frameworks inspired by randomized controlled trials, evaluating evidence for action uses triangulation among diverse types and qualities of evidence to guide prevention. In occupational epidemiology, the precautionary principle can be understood as one aspect of the fundamental perspective that there is no pre-defined level of certainty that is needed before taking preventive action; instead, there are different amounts and qualities of evidence that are sufficient for each specific proposed intervention.

A continuing supply of occupational epidemiologists is needed to respond to future global health challenges. Professional training programs are needed to ensure this workforce; training which includes epidemiology and biostatistics, physiology, occupational hygiene, engineering and the social and economic aspects of work and health. Occupational epidemiology should be core training in global health programs.

Semi-plenary symposium

**SP-01 CHALLENGES AND OPPORTUNITIES FOR OCCUPATIONAL HEALTH RESEARCH IN DEVELOPING COUNTRIES**

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**Current Situation** Despite many advances in working conditions in developing countries, general awareness about occupational health, safety and hygiene is low among the workforce and community. Occupational Health Research (OHR), in India for example, is complicated by child labour, poor legislations, vast informal sector, low attention to industrial hygiene and poor data surveillance or dissemination.1 Again in the Indian context (as also in many developing countries) agriculture is predominant but research in this sector is sparse due to practical difficulties including the fact that a majority of those employed in agriculture belong in the unorganised sector.

**Challenges** Some of the challenges in facing OHR in the developing countries include

- The difficulty in gaining access to the data from large workplaces
- Expenses involved in the research and the lack of funding for the same
- The lack of dedicated trained research personnel
- Research priorities being driven by management needs
- Most of the research is descriptive and there is a genuine lack of quality interventional studies
- Most of the occupational health researchers are old and young professionals are hesitant to come into a doubtful career path
- Research priorities are not always met by research output, its impact or their funding
- Developing countries do not have means to convert OHR findings into effective policies as compared to developed nations
- Professional isolation: OHR is predominantly the domain of the medical officer in that workplace without any collaborations with other sectors of sociology, economics or political sciences
- Majority of occupational health journals want research done in workplace alone and not the ones covering socio-political effects of work on the community
- Research fundings may be product driven to prove necessity rather than demand driven
- The nature of various study-designs, control groups, interview procedures, self-reporting biases and statistical techniques used in those studies made the interpretations very complex, pose difficulties to generalize the conclusions about occupational risks

**Opportunities** More robust occupational health laws and a team which includes occupational health researchers to support it at the ground level is the need of the day. Therefore, the need for trained occupational health physicians with a penchant for research cannot be over-emphasized. This ‘future leadership’ in the field of occupational health should secure political will and thereby funding for research. Occupational Health researchers need to demonstrate the value of robust research findings to the stakeholders like funders and policy makers. They should build international and local collaborations including public private partnerships as well as look into intersectoral coordination.4 Gender sensitivity should be integral to OHR; not merely comparing between men and women but on a broader scale of how anthropometry, ergonomics, mental health plays a role in their occupational health.2 7

Nuwayhid5 suggests that research should move on from identifiable and measurable workplace hazards to a more system-based approach on how the risk factors could affect the family and society. On the other hand, instead of considering the workplace as a threat to health, a different perspective of positive impact of workplace on health and family should also be recognised. A shift in approach from measuring exposures and injuries to economic evaluations on workplace interventions. OHR should prioritize validity and strength of occupational health interventions rather than the economic constraints and socio-political feasibility. There is also a need to rethink the indicators of occupational health not forgoing the classic morbidity, mortality, and productivity numbers, but to add return on investments, occupational health researchers trained, newer interventions designed and implemented and to report on the validity and effectiveness of those interventions.

**REFERENCES**