PMC form 2018–2020'), the software will also have the potential to identify new patterns and relationships within the corpus (e.g. 'the most sampled industry/occupation in literature with benzene measurements in PMC from 2018–2020'). The document-level method uses automated keyword searches with optional filters to highlight documents with potential relevant information. Once highlighted by the search algorithm, the documents may be screen manually or with other automatic software to extract relevant information and data. We are currently focusing on exposure to diesel engine exhaust but plan to expand to other substances. The protocol will form part of the EPHOR toolbox being developed as part of the project.

S-492

A RESEARCH PROGRAM TO PROVIDE A COMPARATIVE CONTEXTUALIZED ANALYSIS OF OCCUPATIONAL COVID-19 AMONG HEALTH WORKERS: PRELIMINARY INSIGHTS FROM A SOUTH AFRICAN-CANADIAN COLLABORATION

¹Jerry M Spiegel, Annalee Yassi, Muzimkhulu Zungu, Sipho Senabe, Spo Kgalamono, David Jones, Nisha Naicker, Arnold Okpani, Jennifer Grant, Rodney Ehrlich, Andrés Delgado-Ron, Hillary Mukuduh. ¹University of British Columbia, Canada

10.1136/OEM-2021-EPI.446

A research program to provide a comparative contextualized analysis of occupational COVID-19 among health workers: Preliminary insights from a South African-Canadian Collaboration.

Objective The COVID-19 pandemic has demonstrated that healthcare workers (HCWs) in many settings are at high risk of occupational exposure to infectious diseases, especially where attention to occupational protection was lacking. In July 2020 our World Health Organization (WHO) collaborating centres in Canada and South Africa launched a joint Rapid Response Research program in partnership with local government health service delivery agencies in both countries to better understand how local contexts affect policies and practice; scrutinize their respective scientific and contextual rationales as well as outcome; grasp why and how these change over time; and understand organizational factors that enhance implementing resilient policies.

Methods The collaboration includes cohort studies, in the Vancouver Coastal Health (VCH) region in Canada, and Gauteng province in South Africa respectively, to assess risk factors for SARS-CoV-2 infection among HCWs as well as evaluate the effectiveness of SARS-CoV-2 infection prevention and control measures. It also includes a cross-sectional study in Gauteng to explore mental health of HCWs during the pandemic and identify areas for intervention; a quasi-experimental study of the role of information systems in strengthening occupational health services for healthcare workers; and global policy analyses including an analysis of a global survey of HCWs from 161 countries.

Results The global survey revealed considerable variations in the degree to which prevention and control measures were deemed adequate; the South African baseline audit of 42 hospitals also revealed considerable variations in implementing occupational health protection. We demonstrated the utility of information systems to assess risk by occupation and setting in VCH; preliminary results of the VCH case-control study

demonstrated the feasibility of this design; and, importantly, we identified challenges in leveraging operational research to inform policy, practice and world-knowledge in both VCH and South Africa.

Conclusion Our research activities showed the impact of vaccine roll-out and new variants on rates of COVID-19 among HCWs within different healthcare settings and occupational groups and how policies to protect HCWs have evolved (e.g., masking policies and vaccine protocols for HCWs). We conclude that lessons regarding procedural barriers to data acquisition and sharing must be addressed with an ethical framework in mind.

S-493

ARTIFICIAL INTELLIGENCE AND OCCUPATIONAL HEALTH

¹R Vermeulen. ¹Utrecht University, Netherlands

10.1136/OEM-2021-EPI.447

The multitude and complexity of data in health sciences has given rise to the increasing use of artificial intelligence (AI). AI technologies of importance include machine (ML) and deep (DL) learning, natural language processing (NLP) and rule-based expert systems (RBES). These AI technologies have also found their way into occupational health in the analyses of structured and unstructured data varying from application in job-codings (e.g. NLP), exposure assessment (e.g. NLP and RBES), data analyses (e.g. ML, DL and Neural networks), and risk assessment (RBES). Examples of AI technologies in Occupational Health will be presented including efforts on job-codings, job-exposure-matrix construction from the EPHOR project, high-dimensional (ML) data analyses within UK-Biobank and the Synergy project, and the application of RBES in risk assessment of benzene. Ethical issues in the application of AI in occupational health will also be discussed.

S-494

MECHANISTIC EVIDENCE FROM POPULATION STUDIES OF WELDING FUME EXPOSURE AND CANCER RISK

¹D Christiani. ¹Harvard School of Public Health, United States

10.1136/OEM-2021-EPI.448

Objectives to describe evidence from human studies of welding fume associated responses predisposing to cancer.

Methods The process of evaluating potential carcinogenicity of occupational exposures entails comprehensive evaluation of in vitro and in vivo studies of cells, animals and human populations. With advancements in our ability to assess exposure-related health affects in humans, we can use molecular epidemiologic methods to study pre-clinical disruptions in homeostasis that can lead to cancer. Welding fumes were evaluated recently in IARC Monograph #118 (2017).

Results With respect to the key characteristics of human carcinogens, adequate data from in vitro and in vivo studies were available to evaluate if welding fumes: induce chronic inflammation; are immunosuppressive; are genotoxic; induce oxidative stress; alter cell proliferation, cell death, and nutrient supply; and modulate receptor-mediated effects. There is

strong evidence that mild steel welding fumes, in addition to stainless steel, induce chronic inflammation and are immunosuppressive, and this was confirmed in molecular epidemiology studies of workers. We continued studies using metabolomic approaches in a repeated measures design and found welding fume exposure-related changes in blood in pathways related to disturbances in unsaturated fat metabolism, as in the signaling lipids Sphingosine 1-phosphate (S1P) and sphingosine 1-phosphate (SA1P). Global metabolomic profiling also revealed several metabolic changes after welding fume exposure, mainly involved in the lipid pathway [glucocorticoid class (cortisol, corticosterone, and cortisone), acylcarnitine class, and DiHOME species (9,10-DiHOME and 12,13-DiHOME)], amino acid utilization (isoleucine, proline and phenylalanine), and S-(3-hydroxypropyl) mercapturic acid (3-HPMA): compounds are all associated with inflammation.

Conclusion There is strong mechanistic evidence in humans for inflammatory and metabolic changes that promote carcinogenicity of welding fumes in humans.

S-495

INTRODUCTION TO THE KEY CHARACTERISTICS APPROACH TO INTERPRETING MECHANISTIC DATA

¹Martyn Smith. ¹University of California, Berkeley School of Public Health, United States

10.1136/OEM-2021-EPI.449

The key characteristics (KCs) of human carcinogens were recently introduced as the basis of a uniform approach for searching, organizing, and evaluating mechanistic evidence to support cancer hazard identification (PMID:30521319). The KCs comprise the properties of known human carcinogens, including their ability to, be genotoxic; be immunosuppressive; or modulate receptor-mediated effects (PMID: 26600562). Established human carcinogens commonly exhibit one or more of these characteristics, and therefore, data on these characteristics can provide independent evidence of carcinogenicity when human data are lacking (PMID: 29562322). Such data can also help in interpreting the relevance and importance of findings of cancer in animals and in humans. In its 2017 report on 'Using 21st Century Science to Improve Risk-Related Evaluations', the NRC opined that the KCs approach 'avoids a narrow focus on specific pathways and hypotheses and provides for a broad, holistic consideration of the mechanistic evidence.' They further suggested that key characteristics be developed for other endpoints, such as endocrine disruption and reproductive toxicity. These have recently been published (PMID: 31719706; 31322437; 31199676) and KCs for hepato-, immuno-, neuro- and cardiovascular toxicants are in the final stages of development. We have also recently published the findings of two expert committees who described approaches to studying carcinogenicity of chemical mixtures using the KCs (PMID: 33784186) and identified biomarkers that can be used to measure the KCs of carcinogens in humans, animals and cell culture (PMID: 32152214). A uniform approach to applying these biomarkers in occupational studies of different epidemiologic design needs to be developed so that the most relevant biomarkers of each KC are measured in exposed human populations, thereby improving hazard identification and risk assessment.

S-496

RESPIRATORY DISEASE IN THE AGRICOH CONSORTIUM FROM SIX CONTINENTS

¹I Annesi-Maesano. ¹INSERM, France

10.1136/OEM-2021-EPI.450

Objectives Farming is filled with respiratory hazards: pesticide vapors, dusty fields, dangerous hydrogen sulfide accumulations in manure pits and pump sumps, nitrogen dioxide in conventional silos, and many others. Despite the recognition of respiratory hazards, this problem has not been fully investigated at the world level after harmonization of data. We used data from the AGRICOH consortium, a collective of prospective cohorts of agricultural workers, to assess respiratory disease prevalence among adults in 18 cohorts representing over 200,000 (118,520 men, 92,712 women) farmers, farmworkers, and their spouses from six continents.

Methods Cohorts collected data between 1992–2016 and ranged in size from 200 to >128,000 individuals; 44% of participants were female. Farming practices varied from subsistence farming to large scale industrial agriculture. All cohorts provided respiratory outcome information for their cohort based on their study definitions. The majority of outcomes were based on self-report using standard respiratory questionnaires; the greatest variability in assessment methods was associated with chronic obstructive pulmonary disease (COPD).

Results The median prevalence was 18.6% for cough, 13.3% for phlegm, and 15.0% for wheeze and was higher in men than in women, with the greatest difference for phlegm (17% vs. 10%). For asthma, the median prevalence was 7.2% and was higher in women (7.8% vs. 6.5%). The relative proportion of allergic asthma varied among cohorts. In two of eight cohorts for women and two of seven cohorts for men, allergic asthma was more common than non-allergic asthma. The median prevalence of COPD was 4.5%. Men suffered more than women from COPD (5.5% vs. 4.0%).

Conclusion These findings indicate that respiratory outcomes are common among farmers around the world despite the differences in agricultural production. Both allergic and non-allergic asthma exist among farmers.

S-497

COMPARISON OF REPORTED RELATIVE RISKS FOR HEALTH CARE, TRANSPORT, AND FOOD PROCESSING WORKERS

¹S Rhodes, M Gittins, K Stocking, M Van Tongeren, N Pearce. ¹The University of Manchester, United Kingdom

10.1136/OEM-2021-EPI.451

Background Risk of SARS-CV-2 infection has been strongly linked to occupation, with specific occupational sectors such as health care, food production, and transport, particularly affected. To better understand the potential risks by occupational sector we investigated the reported risks of COVID-19 infection and mortality for employees in the three sectors.

Methods We performed a rapid review of observational studies reporting COVID-19 risk for employees in health care, food manufacturing, and transport sectors. All studies published in the peer-review and pre-print literature between March 2020 and June 2021 were considered. The primary outcome measure was COVID-19 infection, with COVID-19 related mortality and hospitalisation considered as secondary measures. We