Respiratory Tract Model was used to calculate the mass of indium remaining in the alveolar compartment after accounting for initial deposition, particle characteristics, and mechanical and dissolution clearances. Relationships between exposure indices and health outcomes were evaluated using generalized linear mixed models with subject as a random factor and adjusted for smoking status and age. Models were compared using a ratio of the regression coefficient to its standard error, a measure of precision, and the Akaike Information Criterion (AIC), a relative measure of model fit.

Results The alveolar dose metric correlated well with cumulative exposure ($r_{sp} = 0.876$) and plasma indium ($r_{sp} = 0.726$). All three exposure indices were associated with respiratory symptoms, lung function, and serum biomarkers, but alveolar dose identified additional significant or borderline significant associations not present for cumulative or plasma indium. Alveolar dose often had the highest precision for the effect estimate and lowest AIC.

Conclusion The alveolar dose metric performed better than cumulative exposure and plasma indium despite the high correlation, demonstrating that dose-based metrics can improve exposure-response modeling.

0-317 CURRENT RESPIRABLE CONCENTRATIONS OF QUARTZ ACROSS OCCUPATIONS IN DENMARK

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Introduction High airborne concentrations of respirable quartz have been reported from workers in construction, foundries, and quarries. Current exposure levels in prevalent but presumably lower exposed jobs have been less examined.

Objectives To quantify the current exposure concentrations of respirable dust and quartz across prevalent occupations with expected moderate to high levels of exposure in Denmark. A second aim was to identify determinants of respirable quartz exposure across occupations.

Methods 189 full-shift personal samples of respirable dust within 11 occupations were sampled and analysed for quartz content with infrared spectrometry. Determinants for respirable quartz like use of tool and location of worksite were analysed in mixed linear effect models.

Results The overall geometric means (geometric standard deviation) for respirable dust and quartz were 220 $\mu\text{g}/\text{m}^3$ (4.19) and 16 $\mu\text{g}/\text{m}^3$ (4.07), respectively. The highest quartz concentrations were observed among stone cutters and carvers (93 $\mu\text{g}/\text{m}^3$ (3.47)), and metal melters and casters (61 $\mu\text{g}/\text{m}^3$ (1.71)). Use of power tools increased exposure concentrations by a factor of 3.5. Of the total variance, variability between jobs explained 27%, variability between companies within jobs explained 29%, and variability between workers within a job within a company explained 14%. 30% of the total variance was explained by day-to-day variability.

Conclusion A number of jobs in this study had average exposure levels to respirable quartz above 50 $\mu\text{g}/\text{m}^3$. Use of power tools were the main determinant. Preventive measures to lower excess risk of lung cancer among these workers are still needed.

0-462 ASSESSMENT OF OVEREXPOSURE TO MULTIPLE METALS IN ELECTRONIC RECYCLING FACILITIES: USING AIR SAMPLES AND BIOMARKERS TO HIGHLIGHT POTENTIAL TOXICITY

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Objective To estimate potential toxicity risks associated with exposure to several metals in electronic waste recycling (e-recycling) facilities in Quebec.

Methods In a cross-sectional study, personal air samples were collected on cellulose ester filters from six e-recycling facilities, during an 8-hour work day for 85 workers (66 men, 19 women). Twelve metals were analyzed by inductively coupled plasma mass spectrometry (ICP-MS). End-of-shift blood and urine spot samples were taken; blood cadmium and urinary arsenic were also analyzed by ICP-MS, and blood lead and urinary mercury by atomic absorption spectrometry. Additive hazard indices (HIs) were calculated for organ-specific toxic effects, by adding the ratios of measured concentrations of metals in air or biological fluids, on the threshold limit value (TLV[®]) or on the biological exposure indices (BEI[®]).

Results All facilities provided workers with some personal protective equipment, with inconsistent wearing of respiratory equipment. They all conducted manual dismantling, and three performed shredding of electronic/plastic residues. Cadmium, copper and lead were found in the highest concentrations in the air, albeit all below the TLVs. Air concentrations of lead showed a strong association with biological levels, indicating an occupational exposure origin. HIs calculated with the biological measures revealed an exceedance of the mixture's threshold limit for lung toxicity (arsenic, cadmium, cobalt, nickel and chrome) in 95% of the workers, as well as an exceedance for skin irritation (arsenic, mercury, cobalt, nickel) in 19% of them. HIs exceeded the unity as well in some workers for gastrointestinal, peripheral nervous system, and reproductive function toxicity.

Conclusions

Multi-exposures complicate risk assessment Although individual metals all respected the TLVs, the calculation of hazard indices from both air samples and biomarkers highlighted potentially increased risks of toxicity for several organs or systems in e-recycling workers.

Heat and Climate Change

0-127 HEAT-RELATED ACUTE KIDNEY INJURY IN INDOOR AND OUTDOOR WORKERS IN THE U.S.

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Introduction Heat-related acute kidney injury (HR-AKI) may increase workers' risk of chronic kidney disease. Occupational HR-AKI has been reported in agriculture and a few other sectors, but there has been no comprehensive study of HR-AKI across indoor and outdoor industries.

Objectives To enumerate and characterize HR-AKI cases among U.S. workers in a range of industries.

Methods Two data sources were analyzed: (1) archived case files of the Occupational Safety and Health Administration's (OSHA) Directorate of Technical Support and Emergency Management's Office of Occupational Medicine and Nursing from 2010 through 2020, and (2) the Severe Injury Reports database of work-related hospitalizations that employers reported to OSHA as required by regulation from 2015 to 2020. Confirmed cases of HR-AKI were ascertained by serum creatinine measurements. When creatinine measurements were unavailable, probable and possible cases of HR-AKI were ascertained from narrative incident descriptions. Industry-specific incidence rates of HR-AKI were computed. Capture-recapture methods assessed underreporting.

Results There were 607 cases of HR-AKI, including 22 confirmed cases and 585 probable or possible cases. HR-AKI occurred in a variety of indoor and outdoor industries including manufacturing, construction, mail and package delivery, and solid waste collection. Among the confirmed cases, 95.2% were male, 50.0% had hypertension, and 40.9% were newly hired workers. Incidence rates from 1.0 to 2.5 HR-AKI hospitalizations per 100,000 workers per year were observed in high-risk industries. The capture-recapture analysis suggested that employers accurately reported only 41.2% of eligible HR-AKI hospitalizations.

Conclusions Workers experienced HR-AKI in a diverse range of industries, including indoor facilities. Because of underreporting, data on work-related hospitalizations likely underestimate the true burden of occupational HR-AKI. Clinicians should be aware of kidney risk from recurrent heat stress. Employers should provide interventions to prevent kidney injury in heat-exposed workers.

O-163

PROTECTION, RESILIENCE, EFFICIENCY AND PREVENTION (PREP), PREPARING WORKERS AND EMPLOYERS FOR A CHANGING CLIMATE

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Introduction Chronic kidney disease of nontraditional cause (CKDnt), is a risk for millions of workers in Latin America and Asia. Treatment is expensive, resulting in early death for those affected. Strenuous work in extreme heat without sufficient rest and hydration is an important driver. Without prevention, this epidemic will likely accelerate due to climate change.

Objectives We established the Adelante Initiative, a workplace intervention focusing on heat stress mitigation, together with improved ergonomics, and organizational assessment designed to prevent CKDnt among workers at a sugarcane mill in Nicaragua. We aim to adapt the program to other geographies and industries.

Methods PREP builds on Adelante, investigating the following: 1)immediate and long-term impact of the intervention has on workforce health and productivity; 2)economic and social impacts on those affected by CKDnt and whether intervention promotes resilience 3)the economic burden on health systems treating CKDnt; 4) analysis of public and private policies to understand what policy factors (present or absent), have

contributed to the disease and what policies are required to address it.

Preliminary observations Despite the inconsistent implementation of intervention there is a 72% reduction of kidney injury. The economic burden in households with CKDnt is dire. CKDnt is depleting health systems. Current public and private policies are insufficient to address CKDnt though signs are encouraging within the development sector and some industries.

Conclusions Knowledge gained will create the groundwork to expand to other sugarcane mills and eventually other industries at-risk for heat stress and CKDnt. Climate change means more extreme temperatures in already impacted regions and the likelihood that regions further north and south of the equator will also be impacted by CKDnt. It is essential to develop a model to protect worker health and productivity. Occupational heat stress and resulting CKDnt require increased attention and resources.

O-370

HOT AMBIENT TEMPERATURE AND ITS IMPACTS ON ADVERSE PREGNANCY OUTCOME (APO) -A SYSTEMATIC REVIEW

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Introduction Exposures to hot ambient temperature have been associated with pregnancy complications and congenital abnormalities among working pregnant women. Workplace heat is likely to exacerbate the Adverse Pregnancy Outcomes (APO) especially with rising temperatures in tropical countries. Research evidence that associates occupational heat stress and APO are scarce and there is a need for new types of knowledge in this research area.

Objective Review the evidence from published literature on the association between exposure to hot ambient temperature and APOs.

Methods We conducted a systematic literature review of the published literature on the effects of hot ambient/occupational temperature and its impacts on pregnancy outcomes from databases such as Pub Med, Cochrane, Web of Science, and Science direct. We searched more than 500 related original & review articles, short communications, dissertations, newsletters, and book chapters. We systematically grouped the reviewed literature into the following categories: Heat stress/strain, adverse maternal, fetal outcome, and interventions. The categorized literature was then analyzed and examined the principal findings of the studies.

Results This review found a convincing association between heat stress and APOs among the exposed pregnant women, including miscarriages, preterm birth, stillbirth, low birth weight (LBW), and congenital anomalies. Furthermore, few articles found occupational heat may intensify the complications, an anticipated risk, which may trigger APOs during all the trimesters. Our review informs the magnitude and significance of the impacts of heat stress on pregnant women's health, providing useful information for exploring the biological mechanisms of APOs and also outlines various interventions to prevent heat-related APOs.

Conclusions The limited quantity of existing review gave us key insights and reemphasized the need for more extensive