risk in tropical and subtropical regions with middle- and low-income, when protective workplace policies and appropriate controls are insufficient. We examine epidemiological evidence from research studies undertaken in outdoor workplaces in India to evaluate the health consequences of occupational heat exposures, and also discuss critical future steps.

Materials & Methods Epidemiological evidence from the author’s seasonal studies with workers engaged in manual labour in outdoor workplaces collected over a 10-year period for occupational heat exposures (n=2000) was analysed to determine the magnitude of heat stress impacts on heat strain indicators, heat-related illnesses, and productivity losses.

Results & Conclusion A significant proportion of workers (65%) were exposed to wet bulb globe temperatures (Avg. WBGT 28.8°C±3.3°C) that exceeded the Threshold Limit Values (TLVs). Workers who were exposed to WBGTs above-TLV had a significantly higher risk of adverse health outcomes (OR=2.1; 95% CI=1.4–2.8) than workers who were exposed to below-TLVs. Significantly higher prevalence of heat strain indicators was evident among heat-exposed workers, including an increase in Core Body Temperature, above-normal sweat rates, urine specific gravities, and dehydration (OR=1.8; 95% CI=1.3–2.4). Heat-exposed workers, particularly those with significant physical labour, had 2.8-times higher risk of compromised renal health issues (95%CI=2.1–3.7). Climate estimates predict that future temperature increases and heat waves will exacerbate health and productivity risks for workers.

Occupational exposure standards must be reevaluated, optimised for tropical environments, and aligned with worker protection. Urgently necessary is in-depth research with a holistic approach to understand the ramifications of heat exposures. Even though interventions that reduce heat stress in the workplace have multiple benefits, adaptation and mitigation techniques, including policy changes, are required to address heat stress in the workplace in the climate change era.

Heat and cold

Introduction Traditional Cooling Drinks (TCDs) have been known to help workers in remaining hydrated and controlling their internal body temperatures, hence lowering the incidence of Heat-Related Illnesses (HRIs) in thermally demanding situations. It is crucial to obtain such epidemiological knowledge in order to develop natural, inexpensive, and cost-effective adaptation strategies for low-resource environments in the rising global temperature scenario.

Methods We conducted a cross-sectional study with around 1500 workers from 5-unorganised sectors. Wet Bulb Globe Temperature (WBGT) and physiological Heat Strain Indicators (HSI) such as Core Body Temperature and Sweat Rate (SwR) were measured using standard procedures. A HOTHAPS questionnaire was used to record self-reported HRI symptoms and the usage of traditional drinks for heat management. To conduct the statistical analysis, version 16.0 of the statistical software SPSS was utilised.

Results & Conclusion The average summer WBGT was 29.8°C±3.2°C. Approximately 87.7% of workers were exposed to WBGT levels that exceeded the Threshold Limit Value. During summer, 49% of workers drank TCDs such as buttermilk, fermented rice water, millet drinks, and tender coconut to cool off. 94% of these workers reported significantly reduced HRI symptoms after rehydrating with TCDs (p<0.05). Workers who consumed TCDs also had reduced incidence of HSI (OR=1.3; 95% CI: 1.1–1.5). Those who consumed TCDs had a lower frequency of above-normal SwR than those who did not (10% vs. 39%). Workers who took TCDs reported considerably reduced heat, thirst, and physical exhaustion (p<0.05). The association between lower HSIs and HRIs among workers adopting TCDs as a heat adaptation is evidenced by the preliminary findings. In order to scale up this adaptation technique as a preventative strategy for workers in unorganized-low resource sectors, there is a need for additional, in-depth intervention trials.

Occupational epidemiology in unorganised sectors: agriculture, construction, service sectors

O-24 ACUTE HEALTH SYMPTOMS FOLLOWING PESTICIDES EXPOSURE AMONG FARMERS IN KELANTAN STATE, MALAYSIA

Zulkhairul Naim bin Sidek Ahmad, Daniel Brison, Martie Van Tongeren, Andrew Povey.

Introduction The use of pesticides poses a potential serious health threat to occupationally exposed populations. However, there is limited information on acute health effects that may follow pesticide exposure among farmers in Malaysia. Therefore, this study was conducted to determine the prevalence of self-reported acute health symptoms occurring 48 hours after a spraying event and identify potential risk factors associated with these symptoms.

Methods A study was conducted in farmers from the Bachok and Kota Bharu districts, Kelantan state, Malaysia between September 2018 and February 2019. Both demographic and use of pesticide information was collected. A symptom diary was used to collect data on self-reported ill-health symptoms for seven days after use of a pesticide. The symptoms were categorised into pyrexial and respiratory factors.

Results 150 farmers growing either rice (n=83) or vegetables/fruits (n=67) participated. More than half of the farmers used two or more types of pesticide. This can be
observed especially among rice farmers. 32.7% of farmers reported on at least one occasion a health symptom within first 48 hours after spraying. Symptoms were more common among the rice farmers (p=0.04) and the most common symptoms were feeling unusually tired which was reported by 16% of farmers, followed by feeling sweaty (13.3%) and having a headache (13%). 18.7% of the farmers were identified as having a pyrexial factor. The farmers who wore face shields had an increased risk (OR 2.9; 95% CI: 1.01, 8.71) and the farmers who wore chemically resistant boots had a reduced risk of having the pyrexial factor (OR 0.23; 95% CI: 0.08, 0.70).

Conclusion Acute health symptoms were observed among the farmers following pesticide exposure. However, the symptoms were not specific to pesticides and might be due to other causes. The results will provide baseline data on pesticide exposure and health effects in Malaysia.

Specific occupations/Industries

**O-240 MORBIDITY PROFILE OF WORKERS IN A SPONGE IRON INDUSTRY IN GOA: A RETROSPECTIVE RECORD-BASED STUDY**

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**Introduction** The Sponge iron industries are categorized as red industries (i.e. highly polluted industries) with the major pollutants including particulate matters and gaseous pollutants, the toxic effects of which are often rapid. Prolonged exposure to such pollutants leads to obstructive lung disease such as asthma or chronic obstructive respiratory disease. The current study aims to assess the such morbidities prevalent among the workers in a Sponge iron industry in Goa and help them to minimize those with suitable measures.

**Objective** To study the morbidity profile of workers in a Sponge iron industry in Goa.

**Materials and Methods** A retrospective record-based study was conducted on 217 workers. Selected health parameters were studied: socio-demographic details, anthropometry, blood pressure, serum Creatinine, Total cholesterol, vision tests, ECG, Spirometry, urine microscopy and audiometry readings.

**Results** Among the 217 workers that were studied, 8% had Hypertension, 40% had refractive error, 31% had Dyslipidemia, 14.7% had mild restriction, 0.09% had moderate restriction and 1.1% had severe restriction in Spirometry testing. 10.1% had elevated Creatinine, 2.7% had mild to moderate hearing loss, 0.9% had changes in ECG and was referred to do 2D-Echocardiogram.

**Conclusion** The study revealed that the conditions of employment has caused numerous comorbidities among the sponge iron industry workers, several of which had spirometry restrictions suggesting pulmonary changes which may lead to eventual respiratory deterioration and advent of diseases such as COPD (Chronic obstructive pulmonary disease).

**Pesticides**

**O-245 IDENTIFICATION OF PESTICIDE MIXTURES TO WHICH FRENCH AGRICULTURAL WORKERS ARE EXPOSED: RESULTS FROM THE AGRICULTURE AND CANCER (AGRICAN) COHORT STUDY**

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**Introduction** Farmers, particularly in Europe, are exposed to multiple pesticides during their working life. Such exposures can cause adverse health outcomes. The most relevant pesticide mixtures to which French general population is exposed through diet were described last years. We aimed to identify main pesticides mixtures to which French agricultural workers are exposed to, and to classify farmers into clusters based on their mixture exposure profile.

**Material and Methods** AGRICAN cohort includes agricultural workers enrolled by questionnaire in 2005-2007, with information on exact year of beginning and end of pesticide use on 13 crops and 5 livestock. We estimated exposure duration to 391 pesticides identified using PESTIMAT crop-exposure matrix for 16,905 men, from 1950 to 2009. We used a Sparse Non-negative Matrix Under-approximation to identify main molecules mixtures based on exposure duration, then, a hierarchical agglomerative clustering to classify farmers sharing similar co-exposure profiles to identified mixtures.

**Results** Criterion of relevance and quality of interpretation suggested optimal number of mixtures: from 4 to 45 explaining from 27 to 93% of total variance. We selected 25 mixtures, the best compromise with an explained variance of 83%. Most of identified mixtures contained between 6 to 20 substances. Main mixtures were mostly used on wheat/barley, vine and fruit growing, the two majors mixtures were largely composed of phenoxy herbicides and organophosphorus. Hierarchical clustering method suggested 3 clusters composed of 3,261 to 8,363 men with maximum part of exposure to mixture for cluster 3 to the 1st mixture (11%).

**Conclusions** To our knowledge, this is the first study identifying pesticides mixtures in famers and classifying them into clusters based on their mixture exposure profiles. In a second step, we will aim to describe characteristics of the clusters and to study the associations between pesticides mixtures and health outcomes as prostate cancer within AGRICAN cohort.