

to obtain mortality and cancer registration data for the cohort. The intention is to produce SMRs and SIRs and, where sufficient number of events allow, subanalyses including by cumulative exposure will be undertaken.

Results & Conclusion The international study will be statistically the most powerful study to have examined the carcinogenicity of styrene to date. As well as cohorts from the UK, the updated study will include cohorts from Denmark, Finland, Italy, Norway, Sweden and the USA.

Shift work

0-205 NIGHT SHIFT WORK AND SLEEP DEPRIVATION IN RELATION TO VACCINE INDUCED SARS-COV-2 ANTIBODY RESPONSES IN A GENERAL POPULATION COHORT (COVICAT STUDY)

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Introduction Night shift work and sleep deprivation have been associated with lower antibody responses induced by vaccination against seasonal influenza, meningitis-C and hepatitis A. We examined the association of exposure to night shift work and sleep deprivation with antibody levels induced by COVID-19 vaccines.

Materials and Methods This study was nested in an ongoing population-based cohort in Catalonia, Spain. Blood samples were collected in 2021 from a random subsample of 1,090 participants. We measured 3 immunoglobulins (IgM, IgG, and IgA antibodies against 5 SARS-CoV-2 antigens, including RBD (receptor-binding domain), S (spike-protein), and S2 (subunit 2 from spike-protein). We collected data on night shift work (current night work, frequency, duration) and sleep metrics (sleep duration, sleep problems, changes in sleep duration since the beginning of the pandemic). We adjusted linear regression estimates (% change) for individual- and area-level covariates, time since vaccination, vaccine doses and type. Analyses were restricted to participants without previous COVID-19 infection (N=639). Infection status was defined using questionnaires, SARS-CoV-2 test registry and serology information (seropositivity to N-antigen).

Results Participants' mean age was 57.6 years, 57% were female, 73% received 2 vaccine doses (42% Pfizer, 44% Astra-Zeneca), 5.8% were current night workers and 36.5% of the sample reported sleep problems. No overall association pattern was observed between current night work and vaccine-induced antibody responses. IgG levels tended to be lower (differences in the range of 3.6–53.7%) among night workers, compared to day workers but differences were not statistically significant. Participants with short sleep (<=6 hours) had significantly lower IgM antibody levels compared to those that reported 7 hours of sleep. No clear pattern was observed with sleep quality.

Conclusions Further research in larger studies is needed to evaluate the influence of night shift work and impaired sleep on vaccine induced immune responses and risk of breakthrough infections.

Musculoskeletal disorders

0-21 ASSOCIATION BETWEEN WORK ABILITY INDEX AND LOW BACK PAIN AMONG PRINTING WORKERS

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Introduction and Objectives Low back pain is one of the most common musculoskeletal disorders and important causes of early retirement due to disability in employees in industrialized and developing countries. The present study aimed to determine the work ability index and its relationship with low back pain among employees of Tehran offset printing industry.

Methods A cross-sectional study was performed within six months in 2020. Data from 220 employers working in offset printing industry were collected through survey questionnaire including Nordic Musculoskeletal Questionnaires (NMQ) and Work Ability Index (WAI). Data analysis was performed using SPSS software version 24 with a significance level of P-Value <0.05.

Results In generally, more than half of the participants (62.5%) indicated high symptoms of Low Back Pain. Also, the results of Pearson correlation test showed that there is a positive and significant correlation between level of work ability and severity of low back pain (p<0.001).

Conclusion Job analysis and identification and correction of work procedures that put the body position during work in hard and unconventional conditions and impose a lot of workloads on the back area can be effective in preventing low back pain in work environments.

Exposure assessment

0-212 APPLYING SENSORS FOR ASSESSMENT OF OCCUPATIONAL EXPOSURES IN EPIDEMIOLOGICAL STUDIES: EVALUATION OF SENSORS AND PRELIMINARY FINDINGS

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Introduction Low cost sensors have potential for occupational exposure assessment by providing information on exposure profiles rather than time weighted averages (TWA). High resolution exposure data may advance our knowledge on how exposure patterns may affect (acute) health. We aimed to

develop and deploy a multi-sensor box for assessing working life exposures (exposure at and outside work) during a working week in a case study on respiratory health as part of the EU Exposome Project for Health and Occupational Research (EPHOR) project.

Material and Methods A multi-exposure sensor box (particulate matter (PM), noise, light, UV and temperature) has been developed and is currently being deployed with the aim to assess exposures during a working week in relation to acute respiratory health among 300 mild asthma patients. The sensors were evaluated against conventional equipment separately. Several PM sensors were co-located in different occupational settings with gravimetric samplers and the Aerodynamic Particle Sizer (APS). Sensors for noise, light, UV and temperature were tested against conventional instruments in various environmental settings.

Results and Conclusions Low-cost PM sensors and the APS correlated reasonably well in different occupational settings (high-resolution data) ($R^2=0.4-0.6$). Comparing the low-cost PM_{2.5} mass concentration from the sensors with the respirable gravimetric results (TWA) showed a moderate correlation ($R^2\sim 0.5$). A semi-quantitative comparison of TWA exposures with PM mass concentrations showed higher correlations ($R^2>0.75$). A method for calibrating the PM sensor results to reflect different workplace and nonworkplace aerosols is being developed. The noise, light, UV and temperature sensors demonstrated R^2 values of 0.9 and above with reference monitors in laboratory or field comparisons. Calibration equations have been developed based on these relationships. Along with the evaluation results of the different sensors, the preliminary results of the multi sensor box among ~ 25 case study subjects will be presented.

Climate change

0-217

AIR QUALITY AND HEALTH CO-BENEFITS OF CLIMATE CHANGE MITIGATION AND ADAPTATION ACTIONS BY 2030: AN INTERDISCIPLINARY MODELING STUDY IN AHMEDABAD, INDIA

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Introduction An unprecedented urbanization and population encroachment in Indian cities are making it's urban population more vulnerable to climate change and air pollution effects. Using an interdisciplinary modelling approach, our team has estimated the health co-benefits of mitigation and adaptation policies in Ahmedabad, India, through collaboration among the Indian Institute of Tropical Meteorology (IITM), Gujarat Energy Research & Management Institute (GERMI), Indian Institute of Public Health Gandhinagar (IIPH-G), and the Natural Resources Defense Council (NRDC) and an applied research project funded by the Wellcome Trust's Our Planet, Our Health Program.

Method We selected Ahmedabad city as it's experiencing extreme heat wave events in summer. The project aim was to

estimate the local health benefits of actions to reduce air pollution emissions and adapt to climate change in Ahmedabad, India, by the year 2030 using open-access BenMAP modelling software. We compared the relative health impacts of putting two climate strategies in place by 2030: more reliance on cleaner, renewable energy sources instead of coal; and expanding cool roof installation area across the city.

Results Our results yielded local, city-specific insights on climate change and energy demand, as well as air quality and health. On air quality and health, annual average fine particle air pollution (PM_{2.5}) would climb to 75.18 ug/m³ by 2030 under BAU. But with mitigation and adaptation strategies put in place, air quality would improve; lower PM_{2.5} concentrations (70.95 ug/m³) would mean 1,414 fewer all-cause deaths across the city by 2030. Furthermore, thousands more premature deaths could be avoided by meeting air quality standards: under the National Clean Air Program (NCAP), 6,510 annually; under the National Ambient Air Quality Standards (NAAQS), 9,047 annually; and under the World Health Organization (WHO) air quality guidelines, 17,369 annually. Moreover, one sees how climate adaptations can mean saving energy, and climate mitigation can mean saving lives.

Shift work

0-229

TIME SCHEDULE AND THE TOTAL AMOUNT OF NIGHT SHIFTS IN RELATION TO DEPRESSION AMONG HONG KONG NURSES

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Introduction Night shift work has recently been recognized as an important occupational hazard linked with depression. However, the extent to which shift workers' mental well-being is negatively affected by night shift exposure has rarely been assessed. This study examined the association between cumulative night shift work exposure and the risk of depression.

Material and Methods A cross-sectional study, using a computer-based questionnaire, was conducted among Hong Kong nurses between March and May 2022. Social demographic information and detailed shift work history (frequency of morning/evening/night shift and timetable, number of years and nights worked) were collected. Depression was assessed by Hospital Anxiety and Depression Scale. Logistic regression model adjusting for relevant covariates was used to assess the association between depression and night shift exposure. Ethics approval: CREC 2021.228

Results A total of 866 (82.6%) female nurses and 182 (17.4%) male nurses responded, with an average age of 33.5 \pm 7.2 years. The mean duration of night shift work of the nurses was 8.3 \pm 7.0 years and their cumulative night shifts