

States. Studies of underground miners, who often were exposed to high concentrations of radon, have been used to estimate public health impacts of domestic radon exposure. The healthy worker survivor bias - a condition resulting when individuals in relatively good health tend to work longer and thus become more exposed than individuals in relatively poor health - may be influencing estimates of occupational radon impacts on lung cancer, but this bias has not been thoroughly explored.

Method We implement G-estimation of a structural nested accelerated failure time model to adjust for time-varying confounding by employment history to partially control the healthy worker survivor bias in the Colorado Plateau uranium miners cohort.

Results 615 miners in our cohort died of lung cancer. Assuming no time-varying confounding, we estimate a time ratio (95% confidence intervals) per 1000 working level months of exposure of 1.55 (1.53, 1.58), and 1.95 (1.86, 2.04) when to control healthy worker survivor bias, a relative increase of 126%. Estimates of the radon-associated excess cases were 118 under standard methods and 179 when we controlled for the healthy worker survivor bias.

Conclusions There is evidence of a healthy worker survivor bias in standard analyses of the radon-lung cancer association in this cohort. The findings suggest need for further consideration of current estimates of the health impact of radon in occupational and environmental settings.

0217 THE NIEHS GULF STUDY: MENTAL HEALTH SYMPTOMS AMONG PARTICIPANTS INVOLVED IN THE DEEPWATER HORIZON OIL SPILL CLEAN-UP

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Objectives Workers and communities impacted by previous oil spills have shown increases in adverse mental health outcomes. The GuLF STUDY is investigating potential health effects among workers involved in the Deepwater Horizon oil spill clean-up response. Participants confronted physical and psychosocial stressors including exposures to oil and dispersants, income uncertainties, and challenges of family and community disruption.

Method Information on demographics, health, and clean-up experience was collected by telephone. Standardised surveys administered to 11 210 participants during home visits captured mental health outcomes including depression, anxiety, PTSD, resiliency, and perceived stress. A summary measure of adverse mental health was defined as having a poor outcome on at least one of the five standardised scales. Mental health outcomes were evaluated in relation to clean-up jobs in models that excluded individuals with pre-existing doctor-diagnosed mental health conditions and controlled for socioeconomic and other factors that contribute to mental well-being.

Results Preliminary analysis using the summary mental health measure indicate that persons who worked on oil-spill cleanup were more likely to report adverse mental health outcomes than those who did not, with ORs of 1.4 (95% CI: 1.1–1.9) for rig and barge workers who worked closer to the source of the oil spill and 1.3 (95% CI: 1.1–1.5) for those with land-based clean-up jobs compared to those who did not actively work on the clean-up effort.

Conclusions Adverse mental health outcomes were found among individuals in the GuLF STUDY population but further work is necessary to clarify the factors leading to these outcomes.

0218 PRESSURE PAIN SENSITIVITY AND STRESS

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Objectives During clinical observations of patients with heart diseases and stress related disorders, it has been observed increased pain sensitivity on specific locations on the skin of the sternum.

Method This sensitivity was measured as the pressure pain sensitivity (PPS) by Ull Metre instrument. Measured PPS values 60 or more indicate high PPS, values below 40 indicate low PPS.

Results There are presented results of PPS measurements in 371 men (av. age 43.6 + 10.4 years, 19–66 years); 345 of them were without diagnosis of disease. Average PPS values (whole group) were 36.6 + 9.5 (1. measurement) and 36.7 + 8.5 (2. measurement) ($r = 0.89$). Road drivers (177 men, PPS values 35.7 + 9.4, resp. 36.4 + 10.9) were not significantly different against other occupations (194 men, PPS values 36.5 + 9.5, resp. 37.8 + 11.4). Men with neuropsychological disorders were statistically significantly different against asymptomatic men (PPS values 50.8 + 14.8, resp. 67.3 + 11.4 vs. 38.8 + 13.3, resp. 35.5 + 5.9, $p = 0.002$, resp. less than 0.001) and also against men with different diagnosis (PPS values 50.8 + 14.8, resp. 67.3 + 11.4 vs. 38.8 + 13.3, resp. 43.4 + 19.7, $p = 0.015$, resp. 0.001). Men with other than neuropsychological symptoms doesn't differ significantly in PPS values against asymptomatic men.

Conclusions Method of measurement of PPS could be helpful in medical fitness assessment to work in safety related occupations and is useful for health promotion intervention program. Supported by research project of Charles University in Prague PRVOUK P25/LF1/2.

0220 IDENTIFICATION OF SHORT-TERM, LONG-TERM AND LIFELONG DNA METHYLATION MARKERS OF EXPOSURE TO TOBACCO SMOKE: EVIDENCE FROM EPIC AND NOWAC STUDIES

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Objectives The aim of our study is to validate and complement recently reported epigenetic biomarkers of exposure to tobacco smoke based on data from two cohorts and to characterise their prospective nature.

Method We used case-control data from studies nested in two prospective cohorts: the Italian component of the European Prospective Investigation into Cancer and Nutrition study ($N = 620$) and the Norwegian Women and Cancer study ($N = 382$) as a validation dataset. For each of the participant, genome wide methylation profiles were acquired from blood samples collected at enrolment using the Illumina HM450 DNA methylation array. We performed epigenome wide association studies within each dataset to assess the relation between methylation levels and smoking-related variables, controlling for technical variation (batch effects) and confounding factors (including white blood cell composition).