important occupational determinant of mental health. Prevention policies to eliminate bullying in organizations are urgent, what may help to decrease the prevalence of mental disorders among workers.

Shiftwork

04A.1 NIGHT SHIFTWORK, DNA METHYLATION, AND TELOMERE LENGTH IN FEMALE NURSES

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Introduction Studies on female nurses have reported a higher breast cancer risk among night shift (NS) workers, without a clear understanding of the underlying biological mechanisms.

Aim To assess the association between night shiftwork and molecular alterations potentially related to a higher carcinogenic risk, in details: DNA methylation of estrogen receptor (ER-Alpha, ER-Beta) and tumor suppressor (BRCA1, BRCA2, p53, p16) genes, global DNA methylation estimated on repeated elements (LINE-1, Alu), and telomere length (TL).

Methods 46 female nurses who had been working in NS for at least two years in a Hospital in Milan, Italy, were matched by age (30–45 years) and length of service (at least 5 years) with 51 female colleagues not working in NS. Each subject was administered a structured questionnaire and withdrawn a 12 ml blood sample. We applied linear regression models adjusted for age, BMI, smoking habit, parity, and oral contraceptive use.

Results Currently working in NS (yes/no) was associated with hypomethylation of ER-Alpha (β : -1.635, 95% CI: -2.715; -0.554). When examining both current and former NS workers, the number of years (NY) in NS was associated with hypermethylation of Alu (β : 0.078, 95% CI: 0.016; 0.138). After graphical inspection of the association between NYNS and TL, we classified the study population according to NS duration (<15 vs. $\geq$ 15 years). Among workers with at least 15 years of NS, NYNS was associated with TL reduction (β : -0.065, 95% CI: -0.122; -0.008) and hypomethylation of ER-Alpha (β : -2.009, 95% CI: -3.164; -0.853). Association between NYNS and hypermethylation of p53, p16, BRCA1, BRCA2, and LINE-1 was much stronger, albeit not significant, in workers with at least 15 years of NS.

Conclusions Our findings show NS-associated epigenetic alterations that might be involved in processes such as cellular aging, genomic instability, and cancer development.

04A.2 JOINT EFFECTS OF NIGHT WORK AND SHIFT ROTATION ON TREATED DEPRESSION IN A LONGITUDINAL COHORT OF MANUFACTURING WORKERS

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Past research consistently identifies shift work – a type of scheduled work that includes both night work and schedule rotations – as risk factor for depression. However, relatively few studies have examined whether people working more nights or rotations are more likely to seek treatment for depression.

A total of 5848 workers across 33 plants in the American Manufacturing Cohort (AMC) were followed 2003–2013. The first observed episode of treated depression was defined from insurance claims as two depression-related outpatient visits or two prescribed antidepressants within 365 days. Using detailed timeclock data, night work ($\geq$ 3 hours between 23:00 and 6:00) was defined as the percent of shifts that included a night shift and was categorized into non-night work 0%; low >0%–30%; medium >30%–70%; and high 70%–100%. Shift rotations ($\geq$ 6 hours between subsequent shift start times), were similarly defined and classified as none 0%, infrequent <10%, and frequent rotations $\geq$ 10%. We examined the joint effects of night work and shift rotation on the time to first episode of treated depression using Cox proportional hazards regression.

Shift workers were more likely to be treated for depression compared with non-rotating, non-night workers. Workers with medium exposure to night work had the highest association with treated depression compared with permanent non-night workers, and the joint effects were similar between those with frequent rotations (HR: 1.64, 95% CI: 1.00–2.67) and infrequent rotations (1.53, 0.99–2.37). Associations were slightly elevated among permanent night workers (1.27, 0.72–2.25) and workers with high exposure to night work regardless of rotations (1.36, 0.86–2.17).

Recent shift work exposure may be associated with higher rates of treated depression, and night work, rather than rotation, may be driving the association. However, there may be selection out of night work due to underlying depression and we were unable to differentiate new-onset from preexisting disease.

04A.3 DO SHIFT WORKERS HAVE A DIFFERENT EXPOSURE TO WORKPLACE CARCINOGENS THAN NON-SHIFT WORKERS?

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Background There is limited information on whether the prevalence of exposure to workplace carcinogens varies among shift workers and non-shift workers.

Methods This analysis used data from the Australian Work Exposures Study-Cancer, a telephone survey which examined exposure to carcinogens in the workplace. Workers were classified as shift workers if they indicated that their usual roster ever included work between the hours of midnight and 5 am. Modified Poisson regression was used to estimate the adjusted prevalence ratios (aPRs) and 95% confidence intervals (CIs).

Results Among the 5425 workers, 6.88% reported doing shift-work. Overall, shift workers were more likely to be exposed to any carcinogen (aPR=1.16; 95% 1.06–1.26) and to multiple carcinogens (aPR=1.17; 95% 1.06–1.30) than non-shift workers.

Conclusions Our study shows that there are differences in exposure to carcinogenic agents among shift and non-shift workers, and so there is a need for prevention programs in order to reduce these discrepancies.

04A.4 THE RELATIONSHIP BETWEEN SHIFT WORK AND SLEEP DISTURBANCE IN HOSPITAL WORKERS

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Introduction Many hospital workers suffer from sleep disturbance due to shift work. The best way to mitigate the problem would be reducing night shift. However, that is commonly impossible in reality. Thus, we aimed to examine the factors associated with sleep disturbance and suggest better-rotating schedules for hospital workers.

Methods We used sleep questionnaires asking sleep disturbance including sleep onset and maintenance problems for measuring health outcomes. Also, We obtained a duty schedule of the workers for assessing exposure. We examined the effect of the pattern of shift schedule and amount of night shifts on sleep disturbance.

Results A total of 590 workers participated in this study. Female (95%) 3-rotating shift (92%) workers dominated. For workshift pattern, two consecutive night shifts increased the risk of sleep maintenance problem significantly. For the amount of night shift, two or more night shifts per week increased the risk of sleep onset problem significantly.

Conclusion Our results suggest that avoiding consecutive night shifts and restricting night shift to one time per week would be helpful to prevent sleep disturbance in hospital workers.

04A.5 NIGHT SHIFT WORK IS ASSOCIATED WITH ABNORMAL LIVER FUNCTION

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Objective To examine the relationship between night shift work and elevated level of alanine transaminase (e-ALT) of workers, stratified by status of non-alcohol fatty liver.

Methods We established a prospective cohort of night shift workers in Shenzhen, China. All 4740 male workers who had liver function data from the baseline survey of this night shift workers' cohort were included in the current analysis. We collected information on demographics, lifestyles, and lifetime working schedule from standardized questionnaire. We examined workers' NAFL status using liver sonography and their serum ALT levels using the automatic biochemical analyzer. Unconditional logistic regression models were used to evaluate odds ratios (ORs) and 95% confidence interval (95% CI).

Results This cohort contained 39.5% night shift workers. Compared with the day workers, night shift workers had higher odds of e-ALT (OR: 1.18; 95% CI 1.00–1.40). Stratified analysis showed that a positive gradient between night shift years and elevated e-ALT was only restricted to the night shift workers without NAFL. No similar trend was observed among those with NAFL.

Conclusions Night shift work is positively associated with the abnormal liver function in workers without NAFL, which indicates that shift work involving circadian disruption is likely to affect abnormal liver function.

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04A.6 OCCUPATIONAL EXPOSURE TO EXTREMELY LOW FREQUENCY MAGNETIC FIELDS AND MELATONIN IN MALE ROTATING SHIFT WORKERS

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Background Occupational exposure to extremely low frequency magnetic fields (ELF-MF) is a suspected cancer risk factor, however, the epidemiological literature is limited and potential biological mechanisms unclear. Night shift work and associated circadian misalignment, leading to decreased melatonin production is also suspected in cancer. It has been suggested that ELF-MF exposure may decrease melatonin production leading to the promotion of cancer development, however previous findings are inconsistent. We assessed ELF-MF exposure and melatonin production in a recent study of male rotating shift workers.

Methods A total of 50 male shift workers rotating in a 3 week night, 3 week evening, and 3 week morning schedule were recruited at a local car manufacturing facility. Personal full-shift measurements of ELF-MF exposure were performed (EMDEX II, 40–800 Hz) and urine samples from all voids over 24 hour collected on two working days (end of 3 week night and end of 3 week morning shifts). Urinary concentrations of 6-sulfatoxymelatonin (aMT6s), the main melatonin metabolite, were measured in all samples (creatinine corrected), with the mesor (24 hour mean) derived based on cosinor models.

Results Arithmetic mean (AM (SD)) and geometric mean (GM (GSD)) ELF-MF levels were 0.05 (0.06) μ T and 0.03 (0.02) μ T, respectively. Peak production of aMT6s occurred 9 hours later in night compared with morning shifts, though with a similar mesor indicating adaptation. The adjusted mesor varied somewhat by age group and other personal characteristics, and was somewhat lower among those with higher AM and GM ELF-MF levels (i.e. ≥ 50 th or 75th percentile), with differences ranging from 0.94–1.38 ng/mg creatinine/hour in the morning to 0.96–4.33 in the night shift observed, with some differences significant.

Conclusions Overall, small differences in mean aMT6s levels were observed according to ELF-MF. Workers during the night shift adapted, showing a delay in the peak time of aMT6s production compared to the day shift.