investigated, and there needs to be a concerted effort to come to a consensus on what 'tolerance' to shift work means. Prospective studies would increase our understanding of which individual factors are associated with the development of tolerance over time, especially if they collect participants' complete occupational histories. Taking a paucity of evidence on these issues into account, the presentation will identify areas for future research with the goal of increasing evidence-based harm mitigation strategies for shift workers.

S-319 NIGHT SHIFT WORK AND CANCER RISK: WHERE DO WE STAND, WHERE SHOULD WE GO?

¹Kyriaki Papantoniou. ¹Medical University of Vienna, Austria

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Introduction Night shift work was re-classified in 2019 by IARC/WHO as a probable human carcinogen (Group 2A) for humans, with limited epidemiological evidence for breast, prostate and colorectal cancer.

Objectives The objective of this talk is to provide an overview of the evidence on night shift work and cancer in epidemiological studies with a focus on breast cancer, to discuss strengths and limitations of existing studies and summarize areas for future research studies and policy actions.

Methods Among others, results from a pooled analysis of 5 population-based case-control studies of breast cancer using a common definition of night work (at least 3 h between midnight and 5 a.m.) will be presented. Results from a systematic Cochrane review on the effect of years of night shift work on cancer incidence will be summarized.

Results Women who ever worked at night had higher odds for breast cancer compared to never night workers (OR 1.12 95% CI 1.00–1.25) in the pooled analysis. The risk was higher among pre-menopausal women (1.26; 1.06–1.51), high shift-work intensity and ER+ tumors. Our systematic review included 20 studies on breast cancer (12 case-control and 8 cohort studies). In preliminary meta-analysis, a non-linear dose-response relationship was found, with a 7% risk increase in breast cancer after 20 years of night work (95% CI: 1.01–1.15). This finding was stronger in studies that reported lifetime occupational history and case-control studies.

Conclusions Night shift work of high intensity and long duration tends to increase the risk of breast cancer. Findings are stronger in studies with lifetime occupational history, among pre-menopausal women and positive hormone receptor subtypes. Other shift work research domains that need to be considered in future studies include 1) patterns of night work schedules 2) susceptible groups e.g. chronotype 3) critical exposure windows 4) co-exposures with occupational carcinogens.

S-325 GENDERED OCCUPATIONAL INEQUALITIES AND HEALTH OVER LIFETIME: HOW CAN WE WORK THEM IN?

¹Emilie Counil, Hyunji Byun, Mélanie Bertin. ¹Institut national d'études démographiques (INED), France

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Introduction Major economic and social changes occurred over the last 50 years, such as the increased participation of women in the labour market and the development of non-standard forms of employment. These trends question the importance of work/employment conditions in the shaping of social inequalities in health over the life course. We thus hypothesize that (1) precarious occupational trajectories may contribute to ill health in adulthood, and that (2) they may affect genders differently.

Methods We used the French SIP (Santé Itinéraire Professionnel) national survey that collected information on occupational career and major health events of people aged 40–74 in 2006. We described poor employment conditions in terms of job instability, career discontinuity, qualification trends and versatility. We then applied multiple correspondence analysis and hierarchical ascending classification to identify patterns reflecting the accumulation of precarious employment conditions over job histories. Finally, we quantified the association between the type of occupational trajectory and self-reported health (Mini European Health Module) through multivariate logistic regression.

Results We included more than 9500 participants of working-age or < 5 -years retirees at the time of the survey. The classification showed that women were over-represented among most precarious trajectories. We also found that people with precarious trajectories more often reported less than good self-perceived health, currently experiencing longstanding illness or health problem, and activity limitation due to health problems. The trend of increasing ill health across work trajectories (stable/qualified/continuous trajectories serving as a reference) was similar among men and women, although adjusted ORs were slightly higher among women.

Conclusion We bring evidence that women experienced more precarious employment trajectories in France over the last decades than did men, with similar health outcomes among men and women. We now seek to expand our gendered perspective by taking into account hazardous working conditions as a potential mediating pathway.

S-337 EXPOSURE TO PESTICIDES AND CANCER OF THE LYMPHOHEMATOPOIETIC SYSTEM IN THE AGRICOH COHORT CONSORTIUM

¹Karl-Christian Nordby, on behalf of AGRICOH Working Group on Cancer. ¹National Institute of Occupational Health, STAMI, Norway

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Objective Pesticide exposure has been associated with certain cancer outcomes among farmers and applicators spraying pesticides. In the AGRICOH consortium of agricultural populations, we have evaluated cancer risk and pesticide exposure in three large cohort studies: The French Agriculture and Cancer Study - AGRICAN (FR), Agricultural Health Study (US), and Cancer in the Norwegian Agricultural Population (NO) studies.

Methods Estimates of lymphohaematologic cancers from the three cohorts (FR, US and NO) were analysed individually and then meta-analysed to yield more robust estimates of associations. Ever-never exposure to 33 chemical active ingredients from 14 chemical groups of agrochemicals was assessed using questionnaire information (US) and Crop Exposure

Matrices (FR and NO), in approximately 316 000 persons representing 3.6 million person-years of follow up. ‘

Results Results for Non-Hodgkin lymphomas (NHL) were recently published, based on 2430 cases. Most meta-HRs suggested no association. Moderately elevated meta-HRs were seen for NHL and ever use of terbufos (meta-HR=1.18, 95% CI: 1.00–1.39), based on 300 exposed cases; chronic lymphocytic leukaemia/small lymphocytic lymphoma and deltamethrin (1.48, 1.06–2.07), 148 cases; and diffuse large B-cell lymphoma and glyphosate (1.36, 1.00–1.85), 221 cases; although the latter was driven exclusively by results in the Norwegian cohort. Inverse associations of NHL with the broader groups of organochlorine insecticides (0.86, 0.74–0.99) and phenoxy herbicides (0.81, 0.67–0.98) were observed, but individual active ingredients within these groups were not associated after adjusting for exposure to other pesticides. Preliminary results based on data from the US and NO for myeloid cancers indicate moderate associations with dichlorvos and aldicarb.

Conclusion Individual studies are often underpowered regarding their ability to demonstrate associations of disease, particularly for more rare exposures or for rare cancers or subtypes. Analyses within the AGRICOH consortium provide an opportunity to overcome the low power to detect.

S-344

NEUROLOGICAL DISEASES IN FARMERS: OPPORTUNITIES WITHIN THE AGRICOH CONSORTIUM

¹Isabelle Baldi, Anne-Helen Harding, Christine G Parks, Sue Park, Joachim Schuz, Aesun Shin, Srishti Shrestha, Pierre Lebaillly. ¹University of Bordeaux, France

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Objectives In most countries, the burden of neurological disorders is shown to increase. One explanation is the increase in life expectancy, especially for neurodegenerative ones. Environmental factors, including chemicals such as pesticides may also explain this Public Health issue. Several epidemiological studies have shown pesticide exposure in farmers was associated with neurodegenerative diseases. The strongest evidence concerns Parkinson's disease, but there are also data for Alzheimer's disease and amyotrophic lateral sclerosis. In addition, several studies have suggested that farmers had higher depression and suicide rates than the general population, which could be explained by several factors like remote residence, long working days, time pressure, economic stressors. Pesticides are also suspected as some of them disturb neurotransmitters implicated in mood, like serotonin and dopamine.

Methods In AGRICOH, there are opportunities to further study the occurrence of neurological diseases in relation with agricultural exposures. A first step has been taken by describing mortality from neurodegenerative diseases and suicide in the 4 cohorts who collected this type of data: the Agricultural Health Study in US (N= 51,502, 1999–2015), the AGRICAN cohort in France (N=181,842, 2005–2015), the Prospective Investigation of Pesticide Applicators' Health Study in UK (N=4,944 participants, 2013–2016) and the Korean Multicenter Cancer Cohort study (N=8,428 participants; 1993–2013). Standardized mortality ratios were calculated according to gender and countries.

Results In these first analyses, no excess in neurodegenerative mortality in males and females was observed in the four

cohorts. However, suicide mortality was significantly increased in French, British and Korean females (SMR=1.46; 23; 1.66, respectively) and in French males (SMR=1.13, 1.03–1.25) compared to the general population.

Conclusion Possibilities to go further on neurological diseases in AGRICOH, exploring possibilities to get incidence data, to combine data from additional cohorts, to include metrics for pesticide exposures in the analysis will be discussed during this symposium.

S-388

EXPOSURE ASSESSMENT FOR POOLING PROJECTS WITHIN THE AGRICOH CONSORTIUM

¹Hans Kromhout. ¹Utrecht University, Netherlands

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Objectives Pooling epidemiological studies can be beneficial when studying rare outcomes and subtypes of diseases. However, pooling of exposure information is a challenge since standard approaches are not employed. The objective of this undertaking was to enable pooling of agricultural cohort studies at level of exposure to active ingredients.

Methods Initial efforts in AGRICOH focused on cancer outcomes in three large cohort studies, the Agricultural Health Study (AHS-USA), Agriculture and cancer (AGRICAN-France) and Cancer in the Norwegian Agricultural Population (CNAP-Norway) with data from >300000 individuals. Each study employed different methods, including Crop-Exposure Matrices (CEM), (AGRICAN and CNAP), and self-report (AHS), which were compared.

Results The CEM approach led to much higher prevalence of exposures. The CEM approach as expected generated false positive exposures. Lack of specificity is less of an issue for pesticides applied relatively frequently, but will lead to more exposure misclassification when prevalence of use is low. Given that assignment of exposure will be independent of disease status, misclassification is non-differential and will result in bias towards the null, especially when strength of association is modest, as for most agricultural exposures and health effects. Within AGRICOH our ability to detect associations are for now at best limited without further improvement of exposure assessment and assignment.

Conclusion Clear differences in farming systems, crops and animals, climate and agricultural inputs do exist and may result in large qualitative and quantitative differences in exposure when accurately assessed and assigned. Consequently, it may provide opportunities to evaluate exposure contrasts. To enable pooling in more informative ways, further thought is given within AGRICOH to collect agricultural occupational histories in more detail and to harmonize exposure assessment and assignment. Standardization of exposure assessment approaches within AGRICOH and future studies is a necessity and will make pooling easier and may result in more informative studies.

S-419

LONG TERM EFFECTS OF COVID-19 IN HEALTH WORKERS AND THE ASSESSMENT OF THE FATIGUE SYNDROME IN COMPENSATION CLAIMS

¹Albert Nienhaus. ¹University Clinics Hamburg Eppendorf (UKE), Germany

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