Conclusion Our findings suggest that welding may increase the risk of laryngeal cancer. The evidence is weaker for oral and hypopharyngeal cancer, and we found no evidence of an association with oropharyngeal cancer.

## Oral Presentation
### Exposure Assessment

**POULTRY WORKER TASKS ASSOCIATED WITH CAMPYLOBACTERIOSIS IN MINNESOTA, 2012–2016**

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0388

Background Campylobacteriosis is typically considered a foodborne disease. Poultry workers, however, may be at higher risk due to their close contact with the primary reservoir of Campylobacter. The objective of this study was to evaluate whether occupational poultry exposures are associated with campylobacteriosis in Minnesota.

Methods Campylobacter, Salmonella, Cryptosporidium, Shiga toxin-producing E. coli, and Yersinia infections are reportable to the Minnesota Department of Health. Cases reported during 2012–2016 were interviewed with a standard questionnaire to ascertain potential agriculture exposures. Using the population exposed to agricultural animals, we conducted a case-case comparison study comparing Campylobacter infections (cases) to Cryptosporidium, Shiga toxin-producing E. coli, and Yersinia infections (control-cases). These control pathogens were selected because poultry are not their primary reservoir, and thus infections likely came from non-poultry sources.

We determined whether campylobacteriosis was associated with working with poultry, and then if so, with what specific tasks. Odds ratios (OR) with 95% confidence intervals (CI) were calculated as measures of association.

**Results** Among all animal agriculture workers exposed (504 campylobacteriosis cases and 228 control-cases), campylobacteriosis was associated with working with poultry (OR=2.0; 95% CI: 1.5–2.8). Among poultry workers (276 cases and 86 control-cases), tasks associated with campylobacteriosis included slaughtering (OR=7.4; 95% CI: 1.0–53.4), removing dead birds (OR=7.5; 95% CI: 1.8–31.8), handling manure (OR=4.0; 95% CI: 1.2–13.4), and handling birds' water (OR=2.1; 95% CI: 1.2–3.5).

Conclusions These results support the hypothesis that occupational exposure to poultry increases the risk of campylobacteriosis, and certain poultry-related tasks pose a higher risk of infection than others.

### Oral Presentation
#### Shift Work

**0391 ARE WOMEN DOING SHIFT WORK IN PAPER MILLS AT INCREASED RISK FOR MYOCARDIAL INFARCTION?**

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0391

Introduction Nurses with long durations of rotating night shifts appear to be at increased risk for coronary heart disease. But industrial shift work among women has not been well-studied.

Methods Women employed more than one year from cohorts of soft paper mills (n=3354) and pulp and paper mills (n=2278) were evaluated in this study. Mill-specific job exposure matrices for shift work and noise exposure were developed at department and job levels. Every worked year was classified for shift work as probable, possible (including shift with no nights) or not likely. Similarly, noise was classified into seven 5 dBA bins<75 dBA to >100 dBA. Here we present the cohort mortality from myocardial infarction for 1969–2013 as standardised mortality ratios (SMRs) with 95% confidence intervals (CI) compared to the general population in Sweden.

Results Fatal myocardial infarctions (n=186) were increased in the cohort of women (SMR 123, 95% CI 106–142). Those classified as probable shift work (n=2399) had an SMR of 129 (98-166) and possible shift work (n=2060) had an SMR of 118 (93-146). Women with >10 years exposure to noise >90 dBA (n=602) had an SMR of 142 (103-192). SMRs declined with lower noise and shorter duration of noise, similar for both types of paper mills.

Conclusions Shift working women in paper mills have an increased mortality from myocardial infarction, but the effect of shift work is difficult to separate from noise exposure. Probable shift work and shorter durations of noise exposure >85 dBA were still associated with elevated SMRs.

### Invited
### Other

**INVITED KEYNOTE: FAST FORWARD EXPOSURE ASSESSMENT: UNDERSTANDING PRECARITY AS A WORK-RELATED RISK IN THE NEW ECONOMY**

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The organisation of work is undergoing rapid change making our traditional definitions and methods of exposure assessment less applicable or effective in understanding work-related risks. In a keynote address at EPICOH in 1995 I discussed concepts of measurement error and argued for use of statistical methods which explicitly linked exposure concepts with the outcomes. These concepts are now widely understood and we have moved beyond them using mixed models and a variety of more advanced statistical methods which were new at the time.

However, our framework for that work is less and less relevant in current and future occupational settings. Non-standard employment arrangements and increasing disparities in income, often associated with other demographic characteristics, compel an increasing focus on the health of working populations, rather than individual diseases or conditions. However, the ways in which the work context is defined and implemented in research is highly variable. While many of the terms used have overlapping attributes, and each have been associated with changes in work exposures and health risk, their lack of clear conceptual definitions hampers our ability to explain the apparent health risks with which they are associated.

This paper describes the various concepts and labels associated with precarious work and suggests that precarity requires integration of concepts of work organisation with worker vulnerability. By doing so, we can better understand the relationships between job content, working conditions and power dynamics within the workplace and its social context. Thus, we identify work as a social determinant of health, and can better assess the health implications of precarious work.

These concepts are implemented using a multidimensional approach to job quality which incorporates both work organisation and workplace power dynamics, based on latent class cluster analysis, to define an integrated typology for defining work organisation or social determinants on single dimensional characteristics, such as contract-type or demographic factors, and offers a new framework for understanding the implications of precarity.

While the ‘exposure,’ health outcomes, and methods differ substantially than those relevant in the 1990s, we again argue that a clear conceptual definition, measurement methods, and linkage with outcomes of importance in the 21st century, are required to continue understanding the impact of working conditions on health.

Poster Presentation

Pesticides

A SYSTEMATIC LITERATURE REVIEW: ORGANOPHOSPHATE (OP) PESTICIDE EXPOSURE AND SEMEN QUALITY

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Introduction Organophosphate (OP) pesticides exposure has been linked to various health effects but the association between exposure and semen quality is unclear. This systematic review aimed to investigate the association between OP exposure and semen quality.

Methods Electronic databases including Ovid-Medline, PubMed and Website of Science were searched for studies on OP and semen quality published between 2000 and 2016. Terms representing population, exposure and outcome were used in combination. Relevant articles were extracted and critically appraised using the Newcastle Ottawa Scale.

Results 12 epidemiological studies were identified of which 10 were cross-sectional and two case-control studies. Eight studies were of occupationally exposed workers with exposure assessed by self-report in four studies or inferred in three studies or by the use of urinary dialkylphosphates in five studies. Sperm concentration or motility or morphology was altered in eight studies. Concentration was reduced in one study of which assessed exposure by self-report, one by inference and three by biomarkers. Motility was reduced in four studies of which assessed exposure by self-report, one by inference and two by biomarkers. Morphology was reduced in three studies of which assessed exposure by self-report and one by inference. More fundamentally only one study examined the relationship between time of exposure and outcome assessment.

Conclusion There was a lack of consistency in the reported associations and hence there is limited evidence to support a causal association between OP exposure and semen quality. This could be due to heterogeneity in study populations and different in exposure assessment.
Abstracts

Oral Presentation

Muscloskeletal

ARE GENDER DIFFERENCES IN DISABILITY DURATION FOR WORK-RELATED MUSCULOSKELETAL INJURIES EXPLAINED BY HEALTH CARE UTILISATION?

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Underreporting of occupational injury and illness has been an important issue in Taiwan. We tried to implement an integrated surveillance system in the emergency services of National Cheng Kung University Hospital to screen work-related accidents. The system mobilised staffs of triage, registration and doctors to report occupational causes. A total of 4097 events were identified from Feb 2015 to Feb 2017, among which 2722 were work-related, and 1375 commuting injuries. Work-related events were predominant males (71.7%), but equally in commuting injuries. 1532 events were sent by ambulance, 498 cases hospitalised in the first month, and 4 patients died within 30 days after emergency services and all fatal cases were work-related injuries. The majority of diagnoses were contusions, abrasions and lacerations, totally accounting for 43.1%. However, significant proportion of head injuries (n=751, 18.3%), fractures (n=351, 8.6%), burns (n=264, 6.4%) including 62 cases (1.5%) of chemical burns, and 106 cases (4.4%) of amputations were found. The results were different from the government funded reporting system where most frequently reported were chronic musculoskeletal diseases. The total medical costs were about 2.9 million USD, based on a conservative estimation accounting 90 days from the first encounter. This study revealed the fact of underestimation of occupational injuries and illness resulting in significant health and societal impacts. The emergency room based surveillance system can augment the conventional reporting system. Furthermore, cluster analysis and work associated disability should be investigated to improve occupational safety and labour right.

Disease Surveillance

Detection of occupational injury and illness through surveillance at emergency room at a medical centre in Tainan, Taiwan

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Climate change will cause increasing environmental heat levels in large parts of the world. The heat levels for millions of people working outdoors or indoors without air conditioning, particularly in tropical areas, are already so high that physiological limits are exceeded and health risks and productivity loss occurs.

Using data on climate and working population size for 67,000 geographic grid cells (size = 0.5 × 0.5 degrees) based on internationally refereed sources we produced global heat stress maps for different calendar months and time periods. On internationally refereed sources we produced global heat stress maps for different calendar months and time periods.

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