PROJECT PROPOSAL

2023 Academic Entry Year – Cohort 2

Supervisory Team

Primary Supervisor

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Key Collaborators

Dr Suping Ling, London School of Hygiene and Tropical Medicine

Dr Francesco Zaccardi, Leicester Real World Evidence Unit, Diabetes Research Centre

Project Details

Title: Understanding the role of indoor air pollution on lung cancer risk in never-smokers of different ethnicities: a pilot study

Summary: There is increasing recognition of individuals who have never smoked developing lung cancer, especially in women and non-White ethnic groups. Risk factors for never-smoker lung cancer include environmental tobacco smoke (15% of cases), radon (10% of cases), outdoor air pollution and a family history of lung cancer[1, 2]. Indoor air pollution such as particulate matter (PM) and volatile organic compounds (VOCs) is becoming an increasing public health concern, particularly following the Covid-19 pandemic, as populations are spending more time indoors. In the UK, cooking is one of the main sources of indoor air pollution and its practices can vary across ethnic groups, resulting in different levels and toxicity of indoor air pollution. We hypothesise that cooking-related indoor air pollution plays a role in lung cancer development in never-smokers in UK populations, and exposure may differ between ethnicities, such that the risk is higher for women of South Asian origin that engage in traditional cooking practices. We also hypothesize that increased exposure to indoor air pollution may result in increased mutational load that can be detected in cells isolated from non-invasive biological samples, and this measure may have value for risk stratification.

Theme(s) the project most closely aligns to: DTP theme – Cancer. This project represents a new and first collaboration between the Cancer and Environment themes of the BRC, and also encompasses the Data Innovation and Ethnic Health theme. The supervisory team involves two recognised rising stars.

How the PhD project and training would be appropriate for NMAHPs or GPs: This project would be of interest to nurses, GPs and allied health professionals such as physiotherapists, occupational therapists and dieticians based in Oncology and Respiratory as it focuses on air quality as a result of cooking practices resulting in cancer risk. Training would be tailored to the applicant, who will work with a multidisciplinary team compromising of basic and translational scientists, clinicians, dieticians and nurses providing guidance in proof-of-concept clinical feasibility studies, ethical and legal requirements, measurement of indoor air pollution, mixed methods approaches involving questionnaires, as well as the use of real world/ big data. The student will be encouraged to advocate for dissemination of implementable findings in clinical practice and knowledge mobilisation.

How the project addresses health inequalities: This project investigates health inequalities in lung cancers arising in never-smokers, which are predominately seen in women and minor ethnic groups compared to White populations in the UK. Evidence suggests that overall lung cancer rates are increasing in British south Asians who have relatively low levels of smoking (16% in men and 3% in women compared to ~22% in the UK population as a whole), implying other factors are driving pathogenesis. This PhD project hypothesises that indoor air pollution, specifically exposures generated as a result of different cooking practices, could be a key driver of this health inequality in women. We will measure and compare cooking-related indoor air pollution levels in both South Asian and British White households, collect individual behavioural and perception data using well-designed questionnaires, and analyse mutation load in biological samples collected from participants. These data will then be analysed in each ethnic group and results will inform further mechanistic studies and screening or intervention guidelines that specifically target never-smoker women to prevent lung cancer.

Leicestershire Healthcare Inequalities Improvement DTP

Aim: The overarching aim is to assess levels of cooking-related indoor air pollution and the potential risk of lung cancer among never-smoker women in different ethnic groups. **Background:** Over the last decade, the 12% fall in lung cancer incidence rates among men across the UK was counteracted by the 13% increase among women, resulting in little progress on lung cancer prevention at the population level. While tobacco smoke remains the leading cause, there is a growing share of lung cancer cases in people who have never smoked[3], especially in relatively younger women (e.g. in their early 50s). Compared to White populations, incidence of never-smoker lung cancer is higher among non-White groups, as recently demonstrated in the UK Million Women Study[4]. Apart from genetic factors, it is equally crucial to identify environmental risk factors that are driving this upward trend in never-smoker lung cancer incidence. Evidence is sufficient to support outdoor Particulate Matter (PM) air pollution as a cause of lung cancer. However, little is known about the potential carcinogenic role of indoor air pollution, despite the fact individuals spend up to 80-90% of their time indoors. Ethnic disparities in outdoor air pollution exposure and the related health inequalities have been documented in both the US[5] and UK[6], although how this might translate to indoor air pollution has not been established. In the UK, cooking is a main source contributing to indoor air pollution, with women potentially experiencing a higher personal exposure. Different cooking practices across ethnic groups will also result in varying levels and potentially toxicity of indoor air pollution. **We hypothesize that never-smoker women of South Asian origin in Leicester are exposed to higher levels of indoor air pollution compared to White British women due to cooking practices, which predisposes them to a higher risk of lung cancer and correlates with mutational load in biological samples.**

References

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4.   Pirie K, Peto R, Green J, Reeves GK, Beral V, Collaborators MWS. Lung cancer in never smokers in the UK Million Women Study. Int J Cancer. 2016;139(2):347-54.
5.   Jbaily A, Zhou XD, Liu J, Lee TH, Kamareddine L, Verguet S, et al. Air pollution exposure disparities across US population and income groups. Nature. 2022;601(7892):228-+.
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