University of Leicester – PhD project

Funding Source: Self-funded

Proposed start date: negotiable

Closing date for applications: open until filled

Eligibility: UK/International

Tuition fees for overseas: 2025/26 academic year: £23,650 - £38,300 per year

Department/School: Population Health Sciences

Supervisors: Dr Tim Lucas tim.lucas@leicester.ac.uk

Project Title: *To understand how women's health during pregnancy is affected by heatwaves and how 24-hour behaviours and technological interventions can reduce these risks.*

Project Description:

Project Highlights:

1.	Work with experts in environmental and maternal epidemiology to develop novel statistical models to account for complexities in epidemiological and environmental data.
2.	Bring about real world impact via applied analyses on the effect of within-day exposure on maternal health outcomes.
3.	Use new statistical methods for studying how behaviour and built environment interact to govern a persons exposure to heat waves.

Aim: To understand how women's health during pregnancy is affected by heatwaves and how 24-hour behaviours and technological interventions can reduce these risks.
Background: Heat waves are known to affect a number of maternal health outcomes including preterm births and stillbirths [1,2]. Current studies have mostly used simplistic summaries of heatwaves such as daily average temperature and humidity. However, to fully understand the effects heatwaves, and how effective lifestyle mitigations might be, we need to examine the 'when' and the 'where'. When, during a 24-hour period, do exposures to heat and humidity matter most , and where are pregnant individuals at those times (home, work, recreational). These factors vary according to deprivation and ethnicity. Only by understanding lifestyles and behaviours at this more granular level can we make impactful recommendations on changes to 24-hour behaviours and technological interventions such as air conditioning. As climate change continues, heatwaves will become more common and increase in severity. Therefore, to protect pregnant women from the impact of heatwaves, estimating the importance of 24-hour behaviour and technological mitigations is vital.

Methods: The student will use cutting-edge statistical models that account for the complexities inherent in within-day modelling. They will use a new method for using distributed lag non-linear models [3] to estimate within-day effects from daily disease counts (recently developed at Leicester). Data on pregnancy outcomes (preterm birth and stillbirth) will be obtained from MBRRACE-UK and will be linked to hourly weather data from the Met Office. MBRRACE-UK have undertaken the national surveillance of stillbirth and neonatal death across the United Kingdom since 2012. Further analyses will include developing models that account for 24-hour activities, e.g. commuting, to understand how access to greenspace, and exposure to urban heat-islands, affect risk. Finally, the student will use machine learning methods to predict the prevalence of mitigations such as air conditioning and the usage of built environment mitigations such as greenspace.

Expected outcomes and impact: We expect the work to result in both new statistical methods and important applied analyses, looking specifically at within-day exposures and how behaviours and mitigations can reduce these exposures. We will be able to make policy recommendations such as improving access to indoor cooling or advice on outdoor behaviour (when to visit parks, or avoid urban heat islands) for pregnant people. These policies may help mitigate the effects of climate change on adverse maternal health outcomes such as preterm birth and stillbirth.

References:

[1] Lakhoo, D.P., Brink, N., Radebe, L. et al. A systematic review and meta-analysis of heat exposure impacts on maternal, fetal and neonatal health. Nat Med (2024). https://doi.org/10.1038/s41591-024-03395-8
[2] Cil, G. and Cameron, T.A. (2017), Potential Climate Change Health Risks from Increases in Heat Waves: Abnormal Birth Outcomes and Adverse Maternal Health Conditions. Risk Analysis, 37: 2066-2079. https://doi.org/10.1111/risa.12767
[3] Gasparrini A. Distributed Lag Linear and Non-Linear Models in R: The Package dlnm. J Stat Softw. 2011 Jul;43(8):1-20. PMID: 22003319; PMCID: PMC3191524.

Entry requirements:
Applicants are required to hold/or expect to obtain a UK Bachelor Degree 2:1 or better in a relevant subject.
The University of Leicester English language requirements apply where applicable.

Application advice:
To apply please refer to https://le.ac.uk/study/research-degrees/research-subjects/health-sciences
With your application, please include:

- CV
- Personal statement explaining your interest in the project, your experience, why we should consider you in addition to confirmation of how you will pay your fees.
- Degree Certificates and Transcripts of study already completed and if possible transcript to date of study currently being undertaken

- Evidence of English language proficiency if applicable
- In the reference section please enter the contact details of your two academic referees in the boxes provided or upload letters of reference if already available.

In the funding section please specify that you wish to be considered for Leicester Lifestyle and Health

In the proposal section please provide the name of the supervisors and project title (a proposal is not required)

Project / Funding Enquiries: Dr Tim Lucas tim.lucas@leicester.ac.uk
Application enquiries to **cls-pgr@le.ac.uk**