**R052: Maternal Exposure to Air Pollution during Pregnancy and Infant Health - QUB**

Maternal exposure to outdoor air pollution during pregnancy is associated with a range of adverse birth outcomes. However, it is not clear what causes this relationship, nor is it clear how far it represents the effects of unobserved confounding factors associated with both infant health and pollution exposure. Additionally, less is known about the effects of certain pollutants, and about the effects of pollution on certain infant health outcomes.

To address these literature gaps, this project will link province-wide outdoor air pollution data to Northern Ireland Maternity Service (NIMATs) data to investigate whether babies are harmed by the level of pollution their mother is exposed to during pregnancy. The NIMATs contains demographic and clinical information on infants and mothers, including numerous birth outcomes and the mother's past medical and obstetric history. Infant health will be measured in multiple ways, including outcomes at birth (e.g. birth weight) and outcomes after birth (e.g. experience of any respiratory-related postnatal health complications). Pollution exposure will be defined as the annual average level of outdoor air pollution at a mother's postcode address in the year of pregnancy. Variables describing a mother's health status and demographic characteristics, collected routinely during a mother's contact with maternity services, will be used to provide contextual information for each birth. Additionally, rainfall and temperature data will also be linked to account for the influence of weather conditions on pollution levels. The relationship between pollution exposure and infant health will be measured using regression analysis.

Primary Research Question/Objective

Investigate whether babies born to mothers living in relatively highly polluted areas during pregnancy have worse birth/health outcomes than babies born to mothers living in less polluted areas during pregnancy. The main aim is to build up a broad picture of the infant health effects of pollution and, if possible, to learn about some of the mechanisms which might give rise to these effects. Statistical methods will be used to answer the research questions.

Secondary Research Question/Objective

- Test whether any association between pollution exposure and infant health can be explained by observable differences in the characteristics of mothers. Potentially relevant factors include, but are not limited to, maternal employment status, age and marital status; maternal behaviours affecting infant health such as cigarette and alcohol intake; maternal history of respiratory-related illness; and the characteristics of her neighbourhood.

- Test whether any association between pollution exposure and infant health persists after comparing health outcomes for babies with the same mother (sibling comparisons). See Section B6 for an outline of how this test will be carried out.

- Test whether the effects of pollution vary by maternal characteristics. For example, is there a stronger association between pollution exposure and infant health if the mother has a history of respiratory-related illness?

- Test whether the effect of pollution exposure is the same across the distribution of birth weight (and across the distributions of other continuous outcome variables). For example, does an additional unit of pollution exposure reduce birth weight by the same amount at lower birth weights (e.g. birth weights in the bottom quartile) compared with higher birth weights (e.g. birth weights in the top quartile)? We will use quantile regression models to answer this question. To estimate these models, continuous versions of these outcome variables are required, e.g. birth weight in grams.