**Division (delete as appropriate):** | Health Sciences
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**Project Title:** | Evidence synthesis using causal models to facilitate the design and evaluation of service delivery interventions to improve the health of people living in slums
**Application Deadline:** | 15th June 2018
**Degree (delete as appropriate):** | PhD
**Mode of Study (delete as appropriate):** | Full time
**Project suitability (delete as appropriate):** | Home / EU
**Supervisor(s):** | Yen-Fu Chen, Samuel Watson, Richard Lilford
**Funding body (please tick as appropriate):** | Other (please specify) University of Warwick
**Has the funding been awarded?:** | Yes
**If the project requires consumables, please specify the amount and who is responsible for covering the cost:** | Reasonable consumables relating to project fieldwork will be funded by the NIHR Global Health Research Unit, subject to approval.

**Project Summary including key research questions, aims and anticipated outcomes (max 300 words)**

Service delivery interventions (SDIs) are complex interventions which include multiple components and involve many stakeholders. In addition their effectiveness can be influenced by various contextual factors. Synthesis of evidence to inform the design and evaluation of SDIs therefore requires the collation of diverse evidence from many different sources in order to fully characterise important factors in the service delivery causal chain. Traditional methods such as meta-analyses are inadequate for this purpose.

Causal models are techniques used to both graphically and mathematically represent the relationships between different variables or factors. They are potentially a very useful tool for synthesising evidence along a causal network and explore the influence of different components, potential mediators and modifiers of a SDI. Causal models such as Bayesian networks have been used widely in other disciplines such as environmental and information sciences, but their applications in health service delivery are limited. The proposed project aims to explore and demonstrate the feasibility of using a causal model to synthesise evidence to inform the design and evaluation of SDIs specifically in slum settings.

The research questions to be answered are:

1. What factors, at different levels (e.g. national, local, personal), are important for the delivery and utilisation of health services in slums?
(2) How do these factors relate to each other, conceptually and quantitatively?

(3) What are the advantages and potential issues in using a causal model (e.g. a Bayesian network) to answer the above questions?

These questions will be answered through the application of contemporary evidence synthesis methods (described below) alongside the development of a causal model. These will be supported by other activities and outputs from our Slum Health Research Unit.

The expected outcomes include the development of a comprehensive causal model and methodological insight of using this method, along with other evidence synthesis products.

Describe the methodology and techniques to be employed (max 200 words)

This PhD will be based in the NIHR Global Health Research Unit on Improving Health in Slums that is addressing health services in slums in 4 countries (Nigeria, Kenya, Pakistan, Bangladesh). The student will be embedded in an interdisciplinary, international team and have access to training programmes.

Development of a causal model (e.g. Bayesian network) requires both good knowledge of the subject area informed by best available evidence and a theoretical framework to explicate the conceptual and mathematical relationship of different factors in the causal network. A variety of methods will be employed to answer the research questions stated above:

(1) Scoping reviews and evidence mapping will initially be conducted to provide an overall picture of relevant literature; these will be used to inform selected areas/topics for which more detailed systematic review(s) may be undertaken.

(2) Based on findings from (1) and with additional inputs from other activities and colleagues of our Unit, a logic model/initial causal model will be constructed for a selected service delivery intervention (e.g. water and sanitation or maternal/child health).

(3) Further searches and literature reviews will be carried out to identify required evidence to populate the causal model or to confirm the evidence gaps (lack of data), for which elicitation of expert opinions can be carried out.

(4) A causal model will be constructed to summarise currently available evidence related to the service delivery intervention, and to explore possible options for the design and implementation of a future intervention.