



Title of PhD project	Impact of inter-community transmission on reductions in tuberculosis incidence achieved through interventions: mathematical modelling	
Supervisor	Dr Rein Houben	LSHTM
Co-Supervisor	Dr Nicky McCreesh	LSHTM
Brief description of project	<p>Tuberculosis was the leading infectious cause of death in 2019, killing an estimated 1.4 million people. Ambitious targets exist to reduce new TB cases by 90% between 2015 and 2035, but new technologies and methods are needed to reach the targets, and their potential impacts will need to be evaluated.</p> <p>Cluster-randomised trials are used to evaluate the full effects of tuberculosis control interventions that aim to reduce transmission. The impact of tuberculosis control interventions on the incidence of disease may be underestimated in cluster-randomised trials, however, due to transmission from outside the community. The extent of transmission from outside the cluster will vary by setting, depending on contact patterns within and outside the community. It will also vary with the size of the clusters. The effects of this on estimated intervention impact are not well understood, and are rarely considered in trial design or analysis.</p> <p>The successful student will analyse data from a social contact questionnaire conducted in two communities in KwaZulu-Natal, South Africa: one rural, and one urban. They will develop a mathematical model of contact patterns within and between the two communities, and determine the proportion of transmission that occurs outside the communities. Using this model, they will simulate interventions, to determine how the power to detect intervention impact varies between the two communities, and in hypothetical clusters with different population sizes, and a range of plausible contact patterns. This will help to inform the design of future cluster randomised trials, improving the power of studies to detect the impact of interventions on Mycobacterium tuberculosis transmission.</p> <p>There is room for the student to develop the project idea in line with their interests.</p>	

Skills we expect a student to develop/acquire whilst pursuing this project	Mathematical modelling Epidemiology Data analysis
Particular <u>prior</u> educational requirements for a student undertaking this project	The student should have a background in quantitative data analysis (e.g. an MSc in Epidemiology), or a mathematical background (e.g. degree in maths or physics). Some experience of mathematical modelling is desirable, but not essential
Project key words	Tuberculosis Social contact Mathematical modelling South Africa
Possible under 1+4 route? Master's options identified.	Yes LSHTM – MSc Epidemiology LSHTM – MSc Medical Statistics
MRC Core Skills developed through this project	Quantitative skills Interdisciplinary skills
MRC LID themes	Global Health Infectious Disease
Further reading	<u>Impact of the Covid-19 epidemic and related social distancing regulations on social contact and SARS-CoV-2 transmission potential in rural South Africa: analysis of repeated cross-sectional surveys</u> <u>Spatial analysis of cluster randomised trials: a systematic review of analysis methods</u>