Modelling the spread and control of Lassa Fever in Nigeria

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Research Project

Lassa Fever is a viral haemorrhagic fever caused by infection with the Lassa virus (*Lassa mammarenavirus)*. The disease is endemic in many West African countries, including Sierra Leone, the Republic of Guinea and Nigeria. Southern states of Nigeria, in particular Edo and Ondo, are currently experiencing a severe outbreak of Lassa Fever, with over 600 confirmed cases, resulting in over 100 deaths within the first two months of 2020 [1].
The lassa virus is maintained in small rodent reservoirs, most commonly the Africa rat, *Mastomys natalensis* [2-3]. This virus remains present in an infected rodent's droppings and urine for the duration of its life. Human contact with these infectious materials, through consumption of contaminated food or inhalation of virus particles, can result in infection. Over 80% of infected individuals are asymptomatic, however infection can result in a range of symptoms from mild (headache, fever) to severe (seizures, gastrointestinal bleeding), requiring hospital admission. Infectious individuals also have the propensity to pass on the virus through human-to-human transmission via respiratory droplets or sexual contact. Given the absence of a licensed vaccine against Lassa, control efforts have focused on improving sanitation to keep rodents away from homes and food supplies.
The aim of this project is to use mathematical modelling techniques to inform such policies to control the spread of Lassa Fever. This work will provide a detailed description of the role asymptomatic individuals and zoonotic reservoirs have on Lassa Fever epidemiology within a robust mathematical framework. This will involve close collaboration with Dr. Ehimario Igumbor, Dr. Chinwe Ochu and their team at the Nigeria Centre for Disease Control [4]. With them, we will also identify regions on which data collection efforts should be focused to improve modelling outcomes.

Outcomes

The aim of the project is to develop an understanding of the characteristics of disease spread and to explore the effect of targeted intervention policies upon the progress of the disease towards eradication. Progress will be possible on this within three months, providing the student with an excellent foundation in epidemiological modelling. Furthermore, the broad research question is a large one and lends itself to extension to a range of disease systems in lower and middle income countries and for which targeted intervention policies may accelerate eradication.
Only the level of coding taught during the MathSys MSc is a prerequisite for this project. In addition, the Systems Biology and Infectious Disease Epidemiology Research (SBIDER) Centre provides excellent modelling, statistical and computational support. The student will be encouraged to interact with PhD students and staff at the fortnightly SBIDER problem sessions. This project also complements work being carried out by an international collaborative team working on vaccine development to facilitate eradication efforts for a suite of infectious diseases in Africa and South East Asia.

References

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3. Lecompte, E. et al. (2006) Mastomys Natalensis and Lassa Fever, West Africa. *Emerg Infect Dis.* **12**(12), 1971-1974.
4. Nigerian Centre for Disease Control and Prevention, An update of Lassa fever outbreak in Nigeria, www.ncdc.gov.ng/diseases/sitreps/