

1) How has the Zika virus epidemic affected the population of North-Eastern Brazil and what are the global health implications of the outbreak?

North-Eastern Brazil has been particularly heavily affected by the Zika virus outbreak. In 2015 and 2016 there were 10,867 reported cases of microcephaly in Brazil, with 7,023 of these cases being in North-East Brazil (Brazilian Ministério de Saúde data). Annual numbers of microcephaly cases were only around 150 a year in the years 2010-2014; therefore, even allowing for the effect of some over-reporting, Zika virus has caused a huge rise in the number of children being born with microcephaly. This has affected the population by creating a cohort of children who will grow up with physical and mental disabilities (and hence be a burden to their families and the health services) and has even had a temporary affect on the birth-rate, as many women chose to postpone having children for a year or two.

The neurological complications of the virus in adults were my main focus for this elective placement. Brazil (along with several other Latin American countries) reported a significant increase in the number of Guillain-Barré syndrome (GBS) cases during the period of the 2015-2016 outbreak. During the Zika virus outbreak, the number of GBS cases in affected Latin American countries was between 2-10 times what would normally be expected (dos Santos et al., 2016, NEJM, 375:1598-1601). What is less well known (and something that I did not fully appreciate before the elective placement), is that there was also a significant increase in other neurological conditions, such as neuromyelitis optica and encephalitis, during this same period of the Zika outbreak.

Before undertaking this elective placement, I didn't appreciate the full impact of the recent Chikungunya virus outbreak. I was more focused on the Zika virus and considered this a more important global health issue (perhaps because Zika had received considerably more coverage in the media than Chikungunya). However, since my arrival in Brazil I have learned that Chikungunya appears to be accounting for a large proportion of the increase in neurological conditions here in Brazil and that it may even be more closely linked with neurological complications than the Zika virus is.

Although this region of Brazil was one of the parts of the world most heavily affected by the Zika virus, the outbreak was truly global in scale, with large parts of Latin America, the Caribbean, southern US states and Asia being affected. Many of the countries affected are low or middle income countries, with minimal resources to cope with the increase in the number of neurological cases and children born with congenital malformations. Although the increase in microcephaly and neurological cases themselves constituted a significant 'global health implication', it was really the degree of uncertainty surrounding the full effects of the virus which made Zika such a global health concern at the start of the outbreak. As the number of new cases has been diminishing and research has clarified the extent of the effects of the virus, there is now no longer a such an 'emergency' around the virus.

2) How does the healthcare system in Brazil compare with that of the UK?

Brazil's national health service (the SUS) was established in 1988 and provides healthcare free at the point of delivery to all who need it, much like the UK's NHS. However, the private sector is a lot larger in Brazil than it is in the UK; many people in Brazil are covered by private health insurance and will use private hospitals instead of the SUS. Private hospitals account for over half of all hospital beds and private spending accounts for 54% of health expenditure, which is significantly more than in the UK.

Only just over 50% of the country's population is reached by the Family Health Strategy (ESF), which is the government-funded primary-care programme, whereas almost the entire UK population has access to primary care in the NHS. I visited an ESF community health unit to get some first hand-experience of this unique system. The unit should be staffed by a doctor (although this unit has been lacking a doctor for the last 4 years), a nurse and several 'community health agents'. These community health agents are women who are recruited from the community in which they serve and look after the health needs of approximately 150 families each. I was fortunate to be able to accompany some of their agents on their daily home visits, in which they provide health education, actively seek cases of certain diseases such as TB and leprosy, help patients understand their medications and ensure medication coherence, monitor child growth and development and support community participation groups. This aspect of the system was really unique and it seems the agents work really well as a link between the community and the health service.

3) To gain an insight into how research is conducted in the context of public health emergencies.

My involvement in the ZikaPLAN research project provided a valuable insight into how these sorts of large international projects take shape. I also managed to speak to researchers from a separate but related international research project (IGOS-Zika), which allowed me to compare and contrast different ways of running such a large study. Meetings with the ZikaPLAN team in Glasgow and Recife as well as skype conversations and video calls gave me an insight into the more of the 'high-level' organisation and planning which takes place, while my work in the hospital gave me an insight into the day-to-day realities of how such projects take place 'on the ground'.

4) To develop my skills in adapting to work in a foreign healthcare setting and gain experience of working as a part of international collaborations

The language barrier was perhaps the hardest part of working in Brazil. Although I consider my Portuguese very good, and I don't have problems when talking one-on-one with other people, I frequently found myself not understanding what was being said when other health-professionals were talking to each other or when patients were talking with other members of the team. This spurred me to be more active in clarifying what is being said if I

have any doubts and feel confident in asking people to slow down if they are speaking at a pace that I can't keep up with.

Working as part of such a large team and with quite a loosely defined role at the start, I faced a challenge in 'finding my way' among the team and looking for ways in which I could contribute to the research. Fortunately I was able to find lots of ways to help out with the project work as well as lots of other learning opportunities, thanks to taking a bit of initiative. In this regard, the elective has been superb for my personal development and generic project management skills. This 'taster' has given me a real desire to pursue a career in the area of global health, and I'm sure my experiences in Brazil will be enormously valuable if my career does lead to further work outside the UK.