

SARAH HAY



Football fever could be a dose of dengue

Fans at next year's World Cup in Brazil may be exposed to a nasty and incurable tropical disease, warns Simon Hay.

The twentieth FIFA World Cup will take place in Brazil in June and July next year. This football tournament is expected to sell more than 3 million tickets and attract more than half a million international fans. But those who attend will have more to worry about than the fitness of their top goalscorers: dengue fever could be a significant problem in some of the tournament locations, and preventive measures are needed. Dengue is a persistent threat to Brazilians, as it is to billions of people throughout the tropics. It is much less familiar to others, such as Europeans. This means that FIFA, the Brazilian authorities and the World Cup sponsors must use their influence and experience to communicate the risk and what protective measures fans should take.

Next week sees the draw for the group-stage matches, which will help fans to plan their trips. One thing we know already is that the dengue risk will be close to its peak when matches are played in three of the host cities: Fortaleza, Natal and Salvador, all in the northeast of the country. Much could be done by the authorities there to reduce dengue risk in the run-up to the tournament.

Dengue is a viral infection that can produce a severe fever and symptoms that may require hospitalization. It is transmitted to (and between) humans by urban-adapted, day-biting *Aedes* mosquitoes and is therefore a particular problem in towns and cities. To explore this risk, my colleagues and I assessed the potential levels of exposure by examining distribution maps for dengue in Brazil and records of its seasonal variation at key sites (full details, credits and maps are on my website at go.nature.com/8g1io5).

Like the weather, it is impossible to forecast the precise situation with regard to dengue in Brazil in 2014. We can, however, make informed guesses on the basis of averaged records of dengue in previous years. For the areas around nine of the World Cup stadiums, these records show that the main dengue season will have passed before the World Cup is held in June and July. Unfortunately, the risk remains high during these months in the northeast.

The Brazilian authorities should implement aggressive vector control in April and May, particularly around the northern stadiums, to decrease the number of dengue-transmitting mosquitoes. They can target adult *Aedes* mosquitoes through fogging (the use of aerosol formulations of insecticides that disperse efficiently) and can interrupt breeding by clearing sites at which the mosquitoes lay their eggs — water collected in discarded rubbish, for example. Although control efforts have failed to stem the worldwide increasing incidence of dengue and the expansion of its endemic range,

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considerable local, albeit transient, reductions in mosquito populations have been achieved in some places, including Singapore.

There are no vaccines or drugs against dengue, but an individual will never contract dengue if they do not get bitten by an infected mosquito in the first place. So avoiding mosquito bites is the best precaution. Select accommodation with screened windows and doors and air conditioning; use insecticides indoors; wear clothing that covers the arms and legs, especially during early morning and late afternoon, when the chance of being bitten is greatest; and apply insect repellent to clothing and exposed skin.

The mass gatherings and predictable movement of fans should be a help to campaigns promoting personal protection, but they may also increase the potential for dengue transmission. Supporters may inadvertently introduce into Brazil new dengue

genotypes to which local immunity is low, and the assembly of large non-immune, and hence susceptible, populations could fuel transmission in the event of an outbreak.

Seasonal averages, by definition, are not always an accurate guide to risk. It will also be prudent to monitor dengue outbreaks in the time leading up to and during the World Cup. This can be done using online resources such as DengueMap (www.healthmap.org/dengue) and Dengue Trends (www.google.org/denguetrends). DengueMap is a collaboration between the US Centers for Disease Control in Atlanta, Georgia, and HealthMap, an automated, web-based monitoring and reporting system. Founded by a team at the Boston Children's Hospital

in Massachusetts, HealthMap collects, collates and maps formal and informal reports of dengue outbreaks to provide a free guide to them. Google's Dengue Trends reports on the volume of Google searches for dengue in a given location, a potential proxy for increased risk.

The World Cup is an opportunity to evaluate the uptake of these new public-health information systems and their utility both to individuals and the authorities. Crucially, if they can provide timely feedback on the effectiveness of preventive measures for the authorities on the ground, that could prompt yet further responses.

I don't want to dissuade anyone from going to the World Cup, nor to single out Brazil, which is just one of more than 100 countries worldwide battling dengue. My aim is to inform unwary spectators about the risk and how they can protect themselves, and how the risk could be mitigated by on-the-ground control measures.

PS Come on England! ■

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