Jean Joel R Bigna
bignarimjj@yahoo.fr

Goulfey Health District Unit, Goulfey, Cameroon

1 Bigna JJ, Noubiap JJ, Kouanfack C, Plottel CS, Koulla-Shiro S. Effect of mobile phone reminders on follow-up medical care of children exposed to or infected with HIV in Cameroon (MORE CARE): a multicentre, single-blind, factorial, randomised controlled trial. *Lancet Infect Dis* 2014; **14:** 600–08.
2 Mbuagbaw L. Mobile phone reminders for paediatric HIV follow-up care. *Lancet Infect Dis* 2014; **14:** 540–41.
3 Palmer S, Torgerson DJ. Economic notes: definitions of efficiency. *BMJ* 1999; **318:** 1136.
4 Disease Control Priorities Project. Cost-effectiveness analysis. In: Jamison DT, Breman JG, Measham AR, et al, eds. Priorities in health. Washington, DC: World Bank, 2006: 39–57.

Interpretation of probabilistic forecasts of epidemics

We are grateful to Eduardo Massad and colleagues[1] for discussing the results of our study[2] that addressed the potential for a dengue epidemic during the World Cup in Brazil. We believe our results are not comparable to point estimates obtained using deterministic models; however, we welcome the opportunity to discuss and clarify the interpretation of probabilistic forecasts of dengue risk. The approaches (including aim, methodological framework, data, and population) that we used[2] differ in several ways from those used by Massad and colleagues[3] to estimate the risk of acquiring dengue fever during the 2014 FIFA World Cup in Brazil. Massad and colleagues used a mathematical modelling approach, which was based on weekly notified cases in previous weeks, to estimate the number of cases of dengue in foreign visitors to Brazil. We used a spatiotemporal statistical model, driven by climate information and dengue incidence 4 months previously, to predict the probability of exceeding given thresholds for the whole Brazilian population.

In their Correspondence,[2] Massad and colleagues compared some results from our study with their results.[3] However, conversion of a ternary (ie, three-category) probabilistic forecast of dengue incidence rates in a population to a minimum expected number of cases for a subpopulation (ie, visitors) is not appropriate. To use the probability of reaching a specific threshold as a weight to calculate a point estimate is erroneous. In our study, the probability forecasts of low, medium, and high dengue risk, labelled p_{low}, p_{medium}, and p_{high}, show the chance of observing fewer than 100 dengue cases per 100 000 inhabitants, between 100 and 300 dengue cases per 100 000 inhabitants, and more than 300 dengue cases per 100 000 inhabitants, respectively. Statistical summaries of the posterior predictive distribution of dengue incidence obtained from our model could be extracted for each location (ie, mean and respective credible intervals) and applied to the number of visitors. However, our framework was not designed for this purpose.

The idea of a forecast that provides the probability of exceeding an epidemic threshold (eg, 300 dengue cases per 100 000 inhabitants[2]), is to allow decision makers to quantify the level of certainty of the model predictions. For example, if a specific area has a 99% chance of exceeding the epidemic threshold and the model is shown to have done well in that location in previous years, dengue control teams might well be inclined to mobilise resources to tackle the high probability of a dengue epidemic in that area. If the probability of a dengue epidemic is close to zero, efforts to control dengue can be diverted to those areas with a higher probability of epidemic dengue levels.

Our model was based on dengue data from the Notifiable Diseases Information System, organised by the Brazilian Ministry of Health. When the case data for June, 2014, becomes available, the probabilistic model predictions will be validated against observed dengue incidence rates to see if incidence rates fell into low, medium, or high risk categories for the 553 microregions of Brazil. If visitors to Brazil do become infected with dengue, they might not present symptoms until they have returned to their home countries.[4] Therefore, validation of the model results presented by Massad and colleagues[3] will rely on global cooperation to report dengue cases in visitors to Brazil during the World Cup.

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**Rachel Lowe, Marilia Sá Carvalho, Caio A S Coelho, Christovam Barcellos, Trevor C Bailey, David B Stephenson, Xavier Rodó*
rachel.lowe@ic3.cat

Climate Dynamics and Impacts Unit, Institut Català de Ciències del Clima, Barcelona, Catalonia, Spain (RL, XR); Fundação Oswaldo Cruz, Rio de Janeiro, RJ, Brazil (MSC, CB); Centro de Previsão de Tempo e Estudos Climáticos, Instituto Nacional de Pesquisas Espaciais, Cachoeira Paulista, SP, Brazil (CASC); Exeter Climate Systems, College of Engineering, Mathematics and Physical Sciences, University of Exeter, Exeter, Devon, UK (TCB, DBS); and Institució Catalana de Recerca i Estudis Avançats, Barcelona, Catalonia, Spain (XR)

1 Massad E, Burattini MN, Ximenes R, Amaku M, Wilder-Smith A. Dengue outlook for the World Cup in Brazil. *Lancet Infect Dis* 2014; **14:** 552–53.
2 Lowe R, Barcellos C, Coelho CAS, et al. Dengue outlook for the World Cup in Brazil: an early warning model framework driven by real-time seasonal climate forecasts. *Lancet Infect Dis* 2014; **14:** 619–26.
3 Massad E, Wilder-Smith A, Ximenes R, et al. Risk of symptomatic dengue for foreign visitors to the 2014 FIFA World Cup in Brazil. *Mem Inst Oswaldo Cruz* 2014; **109:** 394–97.
4 Harley D, Viennet E. Football fans and fevers: dengue and the World Cup in Brazil. *Lancet Infect Dis* 2014; **14:** 543–44.