International Journal of Infectious Diseases 17 (2013) e358–e359

Contents lists available at SciVerse ScienceDirect

International Journal of Infectious Diseases

journal homepage: www.elsevier.com/locate/ijid

Letter to the Editor

Effect of climate variables on dengue incidence in a tropical Caribbean municipality of Colombia, Cerete, 2003–2008

Climate change and climate variability is increasingly recognized as one of the factors influencing multiple infectious diseases worldwide.[1,2] During the last decade much evidence has been reported on the relationships between different environmental variables and vector-borne diseases,[2] such as dengue.[3,4] However, particularly in the Americas, there is still a lack of knowledge regarding the specific relationships between climate variables and the epidemiology of dengue,[3,4] especially in areas of low endemicity. This is the case in Colombia, where only two previous studies have been reported.[5,6] For these reasons more studies describing the magnitude of such influences are needed and should be reported.

This study describes the relationships between weekly climate variables and the weekly morbidity due to dengue in Cerete (Figure 1), a tropical Caribbean municipality located on the north-western coast of Colombia This study was carried out during 2003–2008 in order to establish the significance of the influences of climate on the disease epidemiology. The population of Cerete for the year 2008 was 86 133 inhabitants. Meteorological data (precipitation, relative humidity, and mean temperature) were obtained from the National Institute of Hydrology, Meteorology and Environmental Studies (IDEAM), and the epidemiological data from the Local Secretary of Health. Climate periods were classified according to the National Oceanographic Atmospheric Agency (NOAA) with regard to the El Niño Southern Oscillation months (El Niño or La Niña). Simple and multiple regression models were done using GraphPad Prism v.5.0 and SPSS v.17.0, at a 95% confidence level.

During the study period, a total of 291 cases were reported, ranging from 0 to 13 cases per week (0 to 15 cases/100 000 population). There were 14 months of El Niño (where a mean of 6 cases/month occurred) and 58 months of La Niña (with a mean of 3 cases/month) ($p = 0.745$) during this time. For the same years, precipitation ranged from 0 to 293.2 mm/week, relative humidity from 69.1% to 89.2%, and temperature from 26.6 °C (79.88 °F) to 29.7 °C (85.46 °F). Linear regression models showed a positive relationship between mean weekly morbidity due to dengue and the mean precipitation ($r^2 = 0.1415$; $p < 0.01$) (Figure 2A). Similarly there was a relationship with the mean relative humidity ($r^2 = 0.2156$; $p < 0.01$) (Figure 2B), but not for the mean temperature ($r^2 = 0.04156$; $p = 0.1472$) (Figure 2C). In the multiple linear regressions, these climatic variables were significantly associated with dengue morbidity (adjusted $r^2 = 0.205$; $F = 5.377$; $p = 0.003$), but the most important component was the relative humidity ($\beta_{standardized} = 0.695$; $p = 0.013$).

These results reflect significant influences of climate on dengue morbidity in a municipality of Colombia, which although it has a low incidence of disease is considerably affected by environmental variables, with similar effects to those previously reported in other areas of Colombia and Venezuela,[3–6] and more recently in Honduras,[7] where the disease epidemiology is significantly

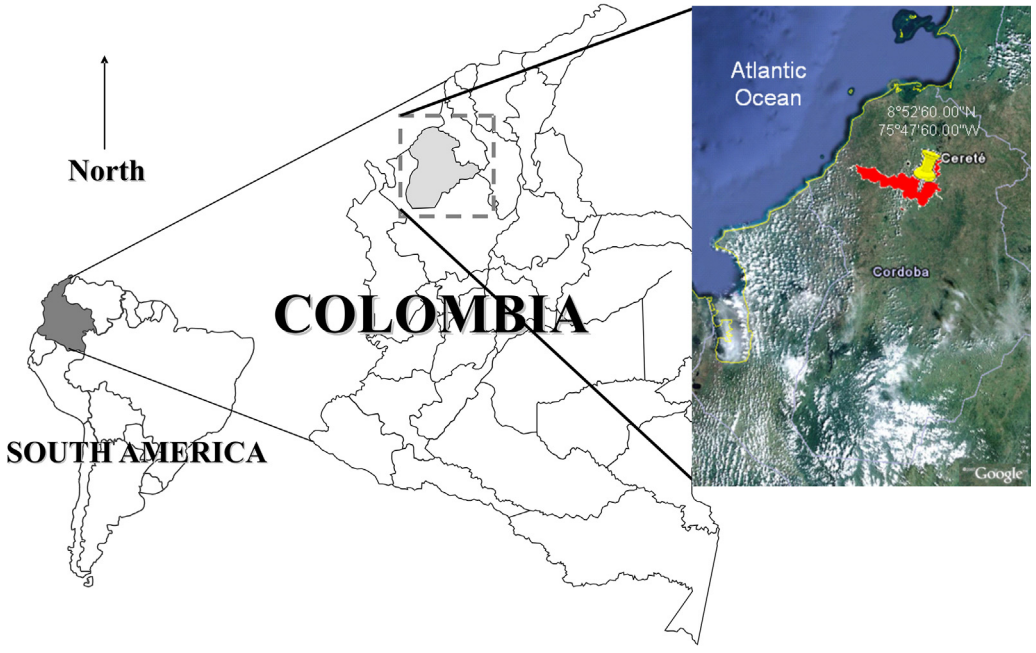

Figure 1. Location of the study, Cerete, Colombia, 2003–2008.

http://dx.doi.org/10.1016/j.ijid.2012.11.021

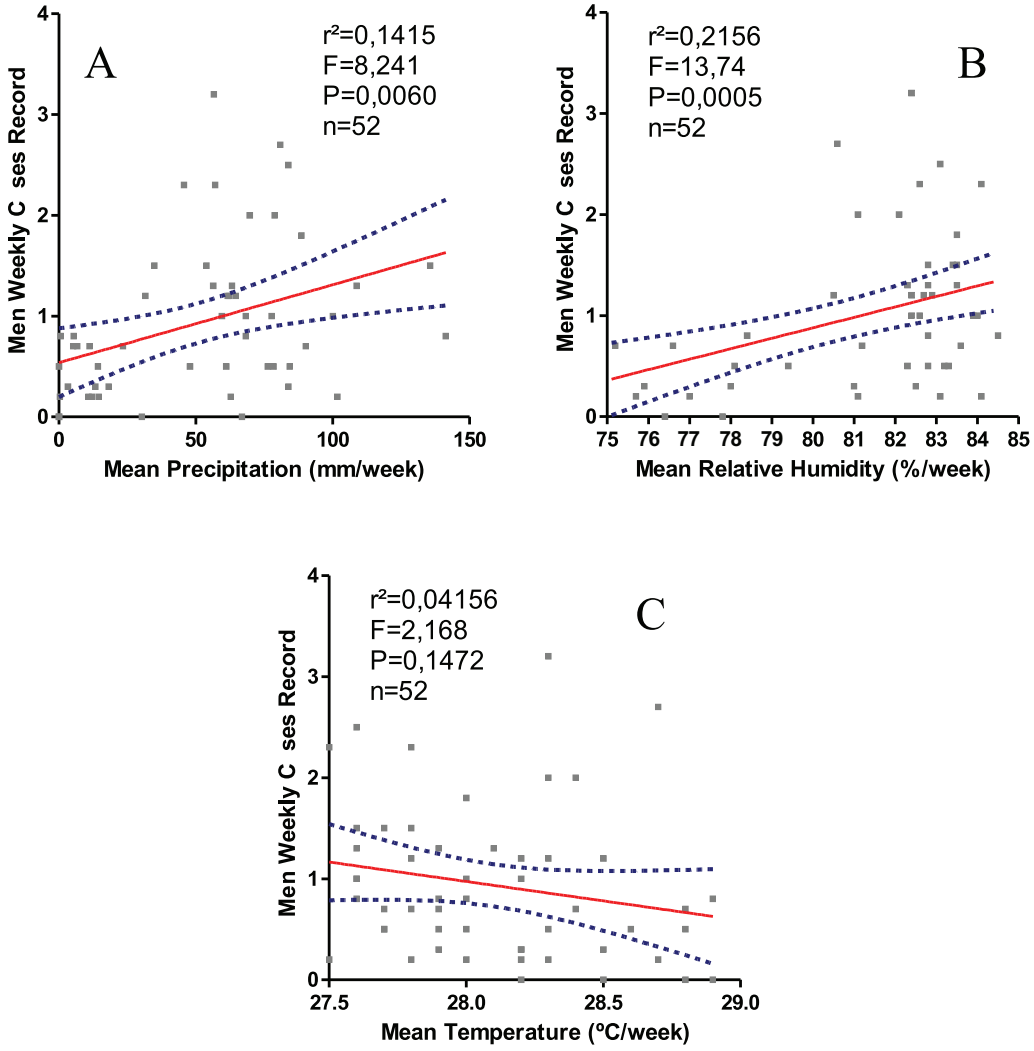

Figure 2. Relationships between climate variables and morbidity due to dengue in Cerete, Colombia, 2003–2008. (A) Linear regression between precipitation and mean dengue weekly cases. (B) Linear regression between relative humidity and mean dengue weekly cases. (C) Linear regression between temperature and mean dengue weekly cases.

influenced by climatic variables such as precipitation, relative humidity, and temperature. The low incidence in the studied area may be due to underreporting of cases to the local surveillance public health system. An increase in precipitation and humidity favored an increase in dengue. Although there are limitations to this preliminary study, and possibly the incurrence of ecological fallacies, this information reflects the importance of performing further studies, collecting more data in other areas of the country endemic for dengue, and developing forecasting models[8] in order to prevent and mitigate the effects of climate on the epidemiology of dengue.

Funding: This study was funded by the Universidad de Córdoba, Montería, Córdoba, Colombia.

Conflict of interest: The authors have no conflict of interest to disclose.

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26 July 2012