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Estimating and mapping the incidence of dengue and chikungunya in Honduras during 2015 using Geographic Information Systems (GIS)

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Summary: Geographical information systems (GIS) use for development of epidemiological maps in dengue has been extensively used, however not in other emerging arboviral diseases, nor in Central America. Surveillance cases data (2015) were used to estimate annual incidence rates of dengue and chikungunya (cases/100,000 pop) to develop the first maps in the departments and municipalities of Honduras. The GIS software used was Kosmo Desktop 3.0RC1[®]. Four thematic maps were developed according departments, municipalities, diseases incidence rates. A total of 19,289 cases of dengue and 85,386 of chikungunya were reported (median, 726 cases/week for dengue and 1460 for chikungunya). Highest peaks were observed at weeks 25th and 27th, respectively. There was association between progression by weeks ($p < 0.0001$). The cumulated crude national rate was estimated in 224.9 cases/100,000 pop for dengue and 995.6 for chikungunya. The incidence rates ratio between chikungunya and dengue is 4.42 (ranging in municipalities from 0.0 up to 893.0 [San Vicente Centenario]). Burden of both arboviral diseases is concentrated in capital Central District (>37%, both). Use of GIS-based epidemiological maps allow to guide decisions-taking for prevention and control of diseases that still represents significant issues in the region and the country, but also in emerging conditions.

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Introduction

Arboviral diseases, such as dengue and chikungunya [1,2], and now Zika [3], represent a public health problem especially in tropical countries, including those in Latin America, such as Honduras [4]. However, due to tourism and migration, also in non-endemic areas, as has been reported [5,6]. Whilst the epidemiology of dengue and chikungunya is well known in many countries, including its social and climatic factors associated, few data and reports are available from Central American countries, particularly from Honduras [1,4,7,8]. Previous studies in this country have addressed basic analyses of the epidemiological characteristics of epidemics since 1978 [9], up to the assessment of the impact of climate variability and change on dengue in 2010 [4]. Nevertheless, since ending 2014, but particularly 2015, dengue is not the only arboviral disease of epidemiological importance in Honduras and Central America, chikungunya arrived to the country and become endemic quickly as in other countries of Latin America [2,10]. In 2016, also Zika epidemics begun to be of concern [11].

In the case of chikungunya, there are not yet studies from Honduras, and there are very few from

Central America [10,12], indicating its importance as well analyzing in detail its epidemiological implications. A disease, different to dengue, that would progress to a chronic phase [13], producing particularly the chronic inflammatory rheumatism in around half of patients, according to recent estimates and measurements in Latin America [14–16]. This is leading to a significant burden of disease (in disability and costs) [17], has been estimated in the region and in detail in some countries such as Colombia, in addition to the well-known burden of dengue [17–20]. Even more, coinfections between dengue and chikungunya can occur and have been reported [21–24].

As part of enhanced efforts in control and risk assessment for dengue and chikungunya in Latin America (as well for other arboviral and tropical diseases), the Regional Information System of the Coffee-Triangle Region, together with the Universidad Tecnológica de Pereira (through the Public Health and Infection Research Group), the Ministry of Health of Honduras and the Universidad Nacional Autónoma de Honduras, among other international institutions, are working together in the academic analysis of epidemiological information of infectious diseases in regional and national scales [16],

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