Travel Medicine and Infectious Disease (2016) 14, 286–288

Available online at www.sciencedirect.com

ScienceDirect

journal homepage: www.elsevierhealth.com/journals/tmid

CORRESPONDENCE

Zika infection GIS-based mapping suggest high transmission activity in the border area of La Guajira, Colombia, a northeastern coast Caribbean department, 2015–2016: Implications for public health, migration and travel

KEYWORDS
Zika;
Epidemiology;
Travelers;
Colombia;
Latin America

Dear Editor

Zika (ZIKV) virus epidemic is advancing in Latin America. Brazil, Venezuela and Colombia, among the most affected in the region [1]. ZIKV has followed the path of chikungunya (CHIKV) [2], due to high extended presence of *Aedes aegypti*, but possibly of other vectors (*Ae. albopictus, Culex quinquefasctiatus*) [3]. Travelers visiting or returning from endemic areas in Latin America are under risk of exposure, even more in international border territories [4]. In order to help in the pre-travel as well post-travel assessment (including in migrant groups), updated epidemiological information is of utmost importance, considering the availability of risk maps in order to address recommendations when visiting specific places [4,5]. Then, we have developed epidemiological maps for ZIKV in Colombia using geographical information systems (GIS) at one of the departments (La Guajira) located in the northeast (border with northwestern Venezuela) of one of the main touristic regions of the country, at the Caribbean coast region, where we have previously provided GIS-based epidemiological maps for CHIKV [5].

Scientific publications using GIS for development of epidemiological maps in ZIKV lack in Latin America and Colombia, particularly at its north Caribbean coastal areas, e.g. Guajira department, which have been significantly affected by the 2015–2016 outbreak, even more considering a high migration flow between Zulia state, Venezuela and La Guajira.

Surveillance cases data (2015–2016) (officially reported by the National Institute of Health, Colombia) [6] were used to estimate the cumulative incidence rates using reference population data (2016), on ZIKV infections (cases/100,000 pop) and to develop the first map in the municipalities of Guajira. GIS used was Kosmo® 3.1.

Up to February 20, 2016, 478 cases of ZIKV were reported in La Guajira, for cumulative rates of 48.50 cases/100,000pop (1.1%). Rates ranged from 0 to 208.85 cases/100,000pop (San Juan del Cesar, 16.53% of the department cases), followed by Albania (166.04 cases/100,000pop; 9.4%), Barrancas (101.72 cases/100,000pop; 7.5%), Fonseca (100.64 cases/100,000pop; 7.1%), Distracción (86.74 cases/100,000pop; 2.92%) and Ríohacha (capital of the department) (62.88 cases/100,000pop; 35.36%) (Fig. 1). These six municipalities (out of 15), reported 78.87% of cases of the department (Table 1).

Colombia officially have reported a total of 42,706 cases (first 28 epidemic weeks, 21 in 2015 and 7 in 2016); 1.1% were from La Guajira department. There, burden of ZIKV infection has been concentrated in its southeast area, with one main ecological hotspot of four neighbor municipalities: San Juan del Cesar, Albania, Barrancas and Fonseca, all of them with $\geq$100 cases/100,000pop (Fig. 1). These have international borders with Venezuela which is also going a significant ZIKV outbreak. Also are surrounded by three municipalities with incidences between 50 and 99.99 cases/100,000pop, El Molino, Distracción and Ríohacha (the capital municipality of La Guajira) (Fig. 1).

Given the ecoepidemiological conditions, particularly of these municipalities, now they are becoming endemic for ZIKV. They have been also endemic of dengue and CHIKV [5]. Among cases in La Guajira, 106 (22.18%) were in pregnant women (5 confirmed by RT-PCR for ZIKV) [6]. Then, public health policies and strategies for integral control of ZIKV in people living, but also in travelers [7], in these areas, should be considered and urgently implemented. Very recently, imported cases of ZIKV from Colombia have been reported in Europe and Mexico, including those visiting the north coast Caribbean region (Santa Marta) [7]. Then, reaffirming the relevance of epidemiological maps for risk assessment. Even more, detailed evaluation of pregnant women morbidity and

http://dx.doi.org/10.1016/j.tmaid.2016.03.018

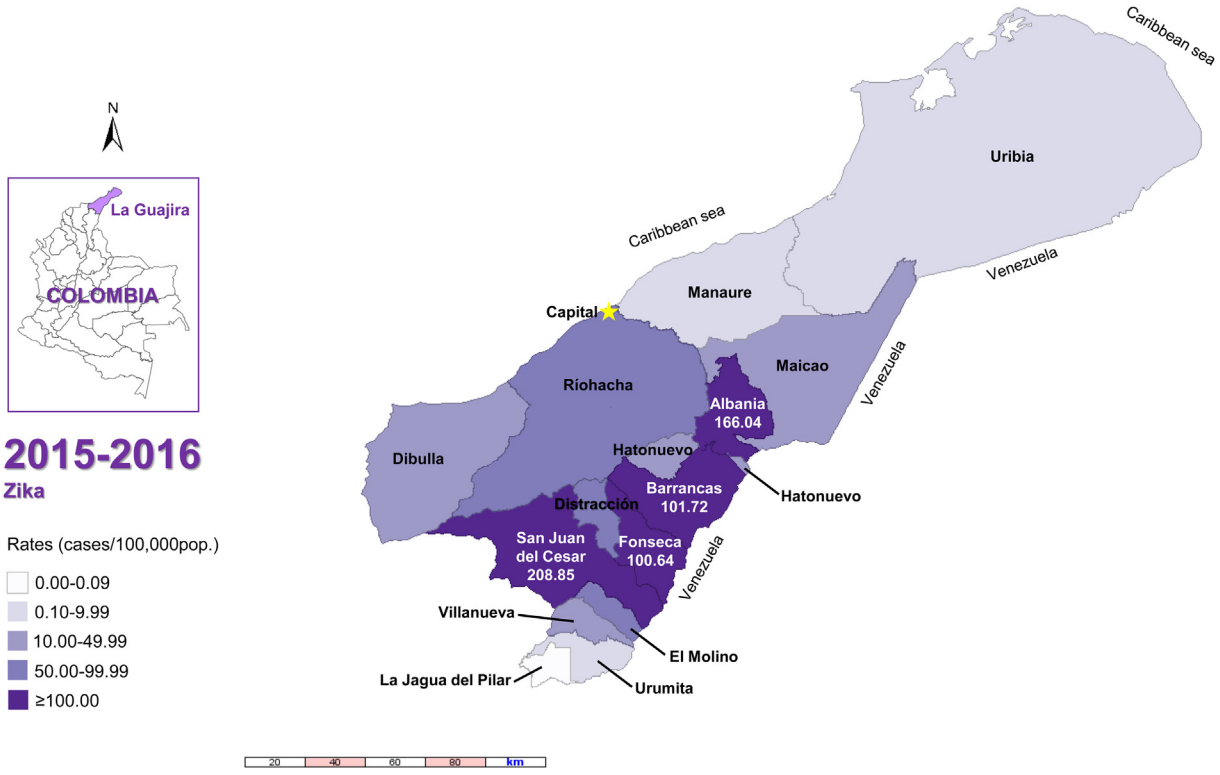

Fig. 1 Geographic distribution of ZIKV cumulative incidence rates (cases/100,000pop) in La Guajira department, Colombia, 2015—2016. (*Up to epidemiological week 7th, February 20, 2016).

Table 1 ZIKV cumulative incidence rates (cases/100,000pop) by municipalities in La Guajira department, Colombia, 2015—2016.[a]

Municipalities	Cases (2015—2016)	% Cumulated	Population (2016)	Rates (cases/100,000pop)
Whole department	478	100.00	985,498	48.50
San Juan del Cesar	79	16.53	37,827	208.85
Albania	45	25.94	27,102	166.04
Barrancas	36	33.47	35,393	101.72
Fonseca	34	40.59	33,785	100.64
Distracción	14	43.51	16,140	86.74
Riohacha	169	78.87	268,758	62.88
El Molino	5	79.92	8837	56.58
Dibulla	17	83.47	34,188	49.73
Villanueva	11	85.77	27,965	39.33
Hatonuevo	7	87.24	25,832	27.10
Maicao	20	91.42	159,675	12.53
Uribia	18	95.19	180,385	9.98
Manaure	8	96.86	108,006	7.41
Urumita	1	97.07	18,352	5.45
La Jagua del Pilar	0	97.07	3253	0.00
Unknown	14	100.00	—	—

[a] Up to epidemiological week 7th, February 20, 2016.

its mapping due to this arbovirus should be performed, around 20% of cases occurred in this group.

Although ZIKV was first isolated in 1947 [1], only after 2013—2014, significant research has been done regard it [8], now sharply increasing in Latin America and in Colombia, particularly focused on its association with microcephaly and other birth defects as well with the Guillain-Barré syndrome.

Use of GIS-based epidemiological maps allow to integrate preventive and control strategies, as well public health policies, for joint control of this vector-borne disease in this area of the country [4,5]. As dengue, CHIKV and

ZIKV are cocirculating, maps of these infections as well for coinfections will be also needed. Simultaneous or subsequent arboviral infections occur and should be also assessed. Finally, maps provide relevant information in order to assess the risk of travelers to specific destinations in highly transmission areas allowing detailed prevention advices. They would also play an important role in the virus spread [4,5,7], as occurs in Colombia and its La Guajira department in 2015—2016.

Funding

None.

Ethical approval

Not required.

Conflicts of interest

The authors have no conflict of interest to disclose.

References

[1] Rodríguez-Morales AJ. Zika: the new arbovirus threat for Latin America. J Infect Dev Ctries 2015;9:684—5.
[2] Alfaro-Toloza P, Clouet-Huerta DE, Rodriguez-Morales AJ. Chikungunya, the emerging migratory rheumatism. Lancet Infect Dis 2015;15:510—2.
[3] Rodríguez-Morales AJ, Paniz-Mondolfi AE. Venezuela: far from the path to dengue and chikungunya control. J Clin Virol 2015; 66:60—1.
[4] Rodriguez-Morales AJ, Bedoya-Arias JE, Ramírez-Jaramillo V, Montoya-Arias CP, Guerrero-Matituy EA, Cárdenas-Giraldo EV. Using Geographic information system (GIS) to mapping and assess changes in transmission patterns of chikungunya fever in municipalities of the Coffee-Triangle region of Colombia during 2014-2015 outbreak: implications for travel advice. Travel Med Infect Dis 2016;14:62—5.
[5] Rodriguez-Morales AJ, Cárdenas-Giraldo EV, Montoya-Arias CP, Guerrero-Matituy EA, Bedoya-Arias JE, Ramírez-Jaramillo V, et al. Mapping chikungunya fever in municipalities of one coastal department of Colombia (Sucre) using Geographic information system (GIS) during 2014 outbreak: implications for travel advice. Travel Med Infect Dis 2015;13:256—8.
[6] Instituto Nacional de Salud de Bogotá. Zika a semana epidemiológica 06 de 2016. Instituto Nacional de Salud de Bogotá; 2016. http://www.ins.gov.co/Noticias/ZIKA/CONTEO%20CASOS%20ZIKA%20MUNICIPIOS%20SE%2006%202016.pdf [access date: 24.02.16].
[7] Maria AT, Maquart M, Makinson A, Flusin O, Segondy M, Leparc-Goffart I, et al. Zika virus infections in three travellers returning from South America and the Caribbean respectively, to Montpellier, France, December 2015 to January 2016. Eurosurveillance 2016;21(6).
[8] Martinez-Pulgarin DF, Acevedo-Mendoza WF, Cardona-Ospina JA, Rodríguez-Morales AJ, Paniz-Mondolfi AE. A bibliometric analysis of global Zika research. Travel Med Infect Dis 2016;14:55—7.

Alfonso J. Rodriguez-Morales*
Public Health and Infection Research Group, Faculty of Health Sciences, Universidad Tecnologica de Pereira, Pereira, Risaralda, Colombia

Organización Latinoamericana para el Fomento de la Investigación en Salud (OLFIS), Riohacha, La Guajira, Colombia

Carlos Julian García-Loaiza
Maria Leonor Galindo-Marquez
Juan Alejandro Sabogal-Roman
Santiago Marin-Loaiza
Public Health and Infection Research Group, Faculty of Health Sciences, Universidad Tecnologica de Pereira, Pereira, Risaralda, Colombia

Carlos O. Lozada-Riascos
Regional Information System, Universidad Tecnológica de Pereira, Pereira, Risaralda, Colombia

Fredi A. Diaz-Quijano
Department of Epidemiology, Faculty of Public Health, Universidade de São Paulo, Av. Dr. Arnaldo, 715, Cerqueira Cesar, CEP 01246-904, São Paulo, SP, Brazil

*Corresponding author. Organización Latinoamericana para el Fomento de la Investigación en Salud (OLFIS), Riohacha, La Guajira, Colombia.
E-mail address: arodriguezm@utp.edu.co (A.J. Rodriguez-Morales)

17 March 2016