



## Letter to the Editor

**Ibagué Saludable: A novel tool of Information and Communication Technologies for surveillance, prevention and control of dengue, chikungunya, Zika and other vector-borne diseases in Colombia**


Dear Editor

Vector-borne diseases (VBD) are widespread in the world becoming a concern of public health [1–3]. Dengue, chikungunya and Zika incidence in Colombia during 2016 has been (up to December 1, 2016) of 350.7, 72.4 and 16.9 cases per 100,000 population respectively. In the municipality of Ibagué (Tolima, central Colombia) it has been (up to December 1, 2016) of 371.1, 140.3 and 657.5 cases per 100,000 population, respectively. Disease burden for chikungunya virus has been 42.8 Disability Adjusted Life Years (DALYs) per 100,000 population in the country and 36.25 for Tolima.

*Aedes aegypti* is the main vector of most of the mosquito-borne viral diseases in the Americas and Colombia. It is spreading in urban areas under 2200 m.a.s.l., with high population growth, unsettled water supply, non-appropriate storage practices, high-

density of water storage receptacles and high pluviosity, among other multiple variables. In that way, Ibagué municipality has these characteristics and has been considered an hyperendemic area for VBD, including dengue, chikungunya and now Zika [1–3].

Different vector control strategies have been developed. Those that involve physical, chemical, biological and other methods, being effective if there is an integral intervention on the social determinants of health at the same time. Then, seeking out for the optimization of VBD intervention, technological tools have been used to allow the proper decision making in public health policies and mitigation of the impact in the disease burden that these vectors produce, through geographical information systems, educational virtual games, medical decision applications and linked epidemiologic surveillance [4,5].

VBD control team of the health secretary of Ibagué, governed by guidelines of the Ministry of Health of Colombia (MoH), has constituted suitable groups in inspection, surveillance and control (ISC) of the vector *Aedes* spp. However, the process of geographical reference and analysis of information has not had still a significant impact on the local public health policy, since information is interpreted and analyzed retrospectively, reflected in the sustained prevalence and with peaks increase of the VBD, and not

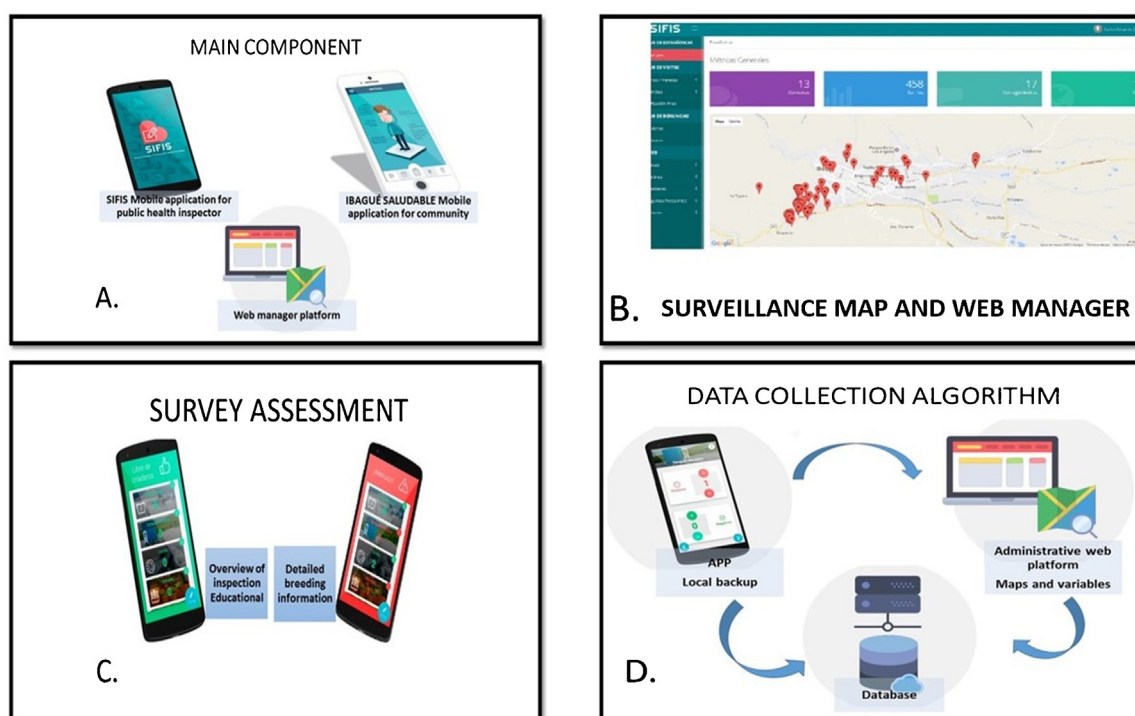


Fig. 1. Ibagué Saludable. Main component (A) surveillance map and web manager (B) survey assessment (C) and data collection algorithm (D).

<https://doi.org/10.1016/j.jiph.2017.03.001>

1876-0341/© 2017 The Authors. Published by Elsevier Limited on behalf of King Saud Bin Abdulaziz University for Health Sciences. This is an open access article under the CC BY-NC-ND license (<http://creativecommons.org/licenses/by-nc-nd/4.0/>).

in real time way. As an alternative solution, a team composed of experts in Information and Communication Technologies (ICT) and research was created, named “Ibague Saludable” (Ibague Healthy) ([www.ibaguesaludable.com](http://www.ibaguesaludable.com)), an initiative that uses ICTs as a complete tool for ISC on real time, based on the variables of surveillance and control of *Aedes aegypti* defined by the MoH, as well including national and international clinical guidelines, and scientific evidence of related experiences in other countries [5–7].

*Ibague Saludable* is constituted by an administrative web platform, two cell phone applications available in Android, one for the community (*Ibague Saludable*) and another one for public health inspectors (SIFIS) (Fig. 1). The first one provides vector and its diseases information and allows the users to report the possible breeding grounds in the city; the second one offers real time income of VBD georeferencing visits to the breeding grounds of *Aedes* spp. through Google Maps. This app is a prototype, and the partial results have facilitated the report in the map of positive breeding grounds zones with for *Aedes* spp., quality surveillance of home inspection by the public health inspector and finally offered an educational material for the community about prevention showing the risk to which the inhabitants are exposed (Fig. 1).

This tool will allow identification and description of principal epidemiological, entomological, environmental, socioeconomic and cultural variables involved in the VBD [7], allowing the development of a dynamic geographical information system according to population necessities, with a measurable impact on incidence and prevalence of VBD and *Aedes* spp. index in Ibague, Tolima, Colombia, with the possibilities to be used in a similar way in other endemic areas of the country and may be of Latin America.

## Funding

Secretary of Health of Ibague, Tolima, Colombia.

## Competing interests

None declared.

## Ethical approval

Not required.

## References

- [1] Instituto Nacional de Salud. Epidemiological week 45; 2016. Bogota, Colombia <http://www.ins.gov.co/boletin-epidemiologico/Paginas/default.aspx>.
- [2] Cardona-Ospina JA, Villamil-Gómez WE, Jimenez-Canizales CE, Castañeda-Hernández DM, Rodríguez-Morales AJ. Estimating the burden of disease and the economic cost attributable to chikungunya, Colombia, 2014. *Trans R Soc Trop Med Hyg* 2015;109(12):793–802.
- [3] Nagpal BN, Gupta SK, Shamim A, Vikram K, Srivastava A, Tuli NR, et al. Control of *Aedes aegypti* breeding: a novel intervention for prevention and control of dengue in an endemic zone of Delhi, India. *PLoS One* 2016;11(12):e0166768.
- [4] Siddiqui TR, Ghazal S, Bibi S, Ahmed W, Sajjad SF. Use of the health belief model for the assessment of public knowledge and household preventive practices in Karachi, Pakistan, a dengue-endemic city. *PLoS Negl Trop Dis* 2016;10(11):e0005129.
- [5] Zamora A, Galán-Rodas E, Ramírez E, Rodríguez-Morales AJ, Mayta-Tristán P. Videojuego pueblo pitanga en la lucha contra el dengue en Costa Rica. *Rev Peru Med Exp Salud Pública* 2015;32(2):397–8.
- [6] Brasil LM, Gomes MM, Miosso CJ, da Silva MM, Amvame-Nze GD. Web platform using digital image processing and geographic information system tools: a Brazilian case study on dengue. *Biomed Eng Online* 2015;14:69.
- [7] Rodríguez-Morales AJ, Galindo-Marquez ML, García-Loaiza CJ, Sabogal-Roman JA, Marin-Loaiza S, Ayala AF, et al. Mapping Zika virus infection using geographical information systems in Tolima, Colombia, 2015–2016. *F1000Research* 2016;5:568.

Guillermo Alfonso Jaramillo-Martinez<sup>a,b,c</sup>  
<sup>a</sup> Municipality of Ibague, Ibague, Tolima, Colombia  
<sup>b</sup> Secretary of Health of Ibague, Ibague, Tolima, Colombia  
<sup>c</sup> Ibague Saludable Research Group, Ibague, Tolima, Colombia

Heriberto Vasquez-Serna<sup>a,b,c</sup>  
<sup>a</sup> Secretary of Health of Ibague, Ibague, Tolima, Colombia  
<sup>b</sup> Ibague Saludable Research Group, Ibague, Tolima, Colombia  
<sup>c</sup> Colombian Collaborative Network on Zika and Other Arboviruses (RECOLZIKA), Pereira, Risaralda, Colombia

Ruthdy Chavarro-Ordoñez<sup>a,b</sup>  
<sup>a</sup> Secretary of Health of Ibague, Ibague, Tolima, Colombia  
<sup>b</sup> Ibague Saludable Research Group, Ibague, Tolima, Colombia

Oscar F. Rojas-Gomez<sup>a,b</sup>  
<sup>a</sup> Ibague Saludable Research Group, Ibague, Tolima, Colombia  
<sup>b</sup> ESE Hospital San Francisco, Ibague, Tolima, Colombia

Carlos E. Jimenez-Canizales<sup>a,b,c,d,e</sup>  
<sup>a</sup> Secretary of Health of Ibague, Ibague, Tolima, Colombia  
<sup>b</sup> Colombian Collaborative Network on Zika and Other Arboviruses (RECOLZIKA), Pereira, Risaralda, Colombia  
<sup>c</sup> Internal Medicine, Universidad Surcolombiana, Neiva, Huila, Colombia  
<sup>d</sup> Public Health and Infection Research Group, Faculty of Health Sciences, Universidad Tecnológica de Pereira, Pereira, Colombia  
<sup>e</sup> Infection and Immunity Research Group, Faculty of Health Sciences, Universidad Tecnológica de Pereira, Pereira, Colombia

Alfonso J. Rodríguez-Morales<sup>a,b,c,\*</sup>  
<sup>a</sup> Colombian Collaborative Network on Zika and Other Arboviruses (RECOLZIKA), Pereira, Risaralda, Colombia  
<sup>b</sup> Public Health and Infection Research Group, Faculty of Health Sciences, Universidad Tecnológica de Pereira, Pereira, Colombia  
<sup>c</sup> Infection and Immunity Research Group, Faculty of Health Sciences, Universidad Tecnológica de Pereira, Pereira, Colombia

\*Corresponding author at: Universidad Tecnológica de Pereira, Faculty of Health Sciences, Building 14, Carrera 27 #10-02 Barrio Álamos, Pereira, Risaralda, 660003, Colombia.  
 E-mail address: [ajrodriguezmm@gmail.com](mailto:ajrodriguezmm@gmail.com) (A.J. Rodríguez-Morales)

6 February 2017