

## Malaria in Venezuela: Gabaldón's legacy scattered to the winds



Between 1936 and 1970, Venezuela enacted one of the most important sanitary campaigns against malaria. It was led by Arnoldo Gabaldón, and its cornerstone was a national indoor residual spraying campaign with dichlorodiphenyltrichloroethane that lasted for almost four decades. By 1961, malaria had been wiped out from 68% of the Venezuelan territory, and the mortality rate had been reduced from 164 deaths per 100 000 people in 1936 to zero in 1962.<sup>1,2</sup> The partial elimination of the disease earned Venezuela an increase of over 400 000 km<sup>2</sup> in its commercially exploitable territory,<sup>1</sup> an area twice as large as the UK. This additional land proved fundamental for Venezuela's economic development during the second half of the 20th century.

The current situation could not be more different: the 2020 World Malaria Report estimates that 467 421 cases of malaria occurred in Venezuela in 2019—a 1200% increase compared with the year 2000.<sup>3</sup> Venezuela's incidence of 32.8 per 1000 people at risk is 8 times higher than that of neighbouring Brazil, and comparable to that of Ethiopia (34 cases per 1000 people at risk). Mortality figures are similarly striking. With 403 deaths in 2019, Venezuela accounted for 73% of the total deaths from malaria estimated on the continent.<sup>3</sup>

The epicentre of the epidemic is the mining regions south of the Orinoco river,<sup>4</sup> where conventional health care is often no longer available. This unavailability makes local Amerindian groups particularly susceptible, given their poor access to preventive measures and antimalarial treatment.

The World Malaria Report shows that the situation in Venezuela is anomalous in the global context, with substantial progress achieved elsewhere. Furthermore, the scale of the epidemic, combined with migration from Venezuela into neighbouring countries, makes this malaria crisis a regional problem, and is driving Latin America severely off track in meeting WHO's milestones for the 2016–30 period.<sup>3,5</sup> If the current trend is sustained, the region might reach 12 cases of malaria per 1000 people at risk by 2030, in striking contrast with the projected reduction in areas with a higher malaria burden. Yet, international attention and support are scant, because of a long-outdated understanding of Venezuela as an affluent country.

Because of the economic gains attained through its oil riches and the exploitation of malaria-free territories in the 1950s, the World Bank has long labelled Venezuela as an upper-middle-income country. That classification has not been changed, even though the estimated percentage of people living below the extreme poverty line (defined at \$1.9 per day) reached 54.6% in 2019.<sup>6</sup>

The current income classification is probably out of date. Between 2013 and 2020, the Venezuelan economy has shrunk by an estimated 74%,<sup>7</sup> but the World Bank classification has yet to account for the last 2 years. The newest edition, published in July 2020, is based on economic data from mid-2019.<sup>8</sup> If there were full accounting for the past 7 years of economic contraction, Venezuela's per-person income would be well under the threshold to be classified as a lower middle-income country.

The upper-middle-income classification constrains or, in some cases, outright prohibits assistance from key funders of malaria research and control. The Global Fund to fight AIDS, Tuberculosis and Malaria for instance, did not consider Venezuela to be eligible for malaria funding until 2019, when it was exceptionally included for the 2020–22 allocation period based on its high malaria burden. At least US\$19.8 million is expected to be disbursed to the country in 2021.<sup>9</sup> Despite this, Venezuela still is not prioritised by other key funders.

Furthermore, although the Global Fund's decision is a key step, there is concern over how the funds will be managed, given obstacles ensuring public health neutrality in the context of humanitarian crisis and the political control of social aid programmes by the Venezuelan Government.<sup>10</sup>

To ensure a democratic use of these resources, allocation strategies should involve the Venezuelan medical and scientific community and civil society organisations in the design, monitoring, and evaluation of any interventions. Government participation should be conditional on the release of epidemiological data (which has been absent since 2016), the cessation of the persecution of non-governmental organisations providing humanitarian support, and the acceptance of international accountability for disease control efforts.

Paradoxically, we expect malaria cases to decrease in 2020, as mobility restrictions, caused by the COVID-19

pandemic and national fuel shortages, have probably reduced local transmission in mining sites. Additionally, a few non-governmental organisations together with the Pan-American Health Organisation have made substantial efforts to distribute insecticide-treated nets in some of the higher burden areas, in addition to the tireless surveillance and control endeavours led by indigenous community health agents.

The epidemic, however, will not be brought under control without a functional national malaria programme in place. Ironically, it was the success of such a previous programme that led to the economic boom now preventing Venezuelan researchers from accessing urgently needed resources. It is time for this painful irony to end.

CC received salary support from Unitaid through the BOHEMIA grant to ISGlobal. ISGlobal acknowledges support from the Spanish Ministry of Science and Innovation through the "Centro de Excelencia Severo Ochoa 2019-2023" Programme (CEX2018-000806-S), and support from the Generalitat de Catalunya through the Centres de Recerca de Catalunya Programme.

We thank Pedro Rosas for his support in the calculation and interpretation of economic indicators.

Copyright © 2021 The Author(s). Published by Elsevier Ltd. This is an Open Access article under the CC BY 4.0 license.

*\*Juan C Gabaldón-Figueira, Leopoldo Villegas, Maria Eugenia Grillet, Javier Lezaun, Leonor Pocaterra, Mariapía Bevilacqua, Alberto Paniz-Mondolfi, Oscar Noya González, Carlos Chaccour*  
**[jgabaldonfi@unav.es](mailto:jgabaldonfi@unav.es)**

Área de Enfermedades Infecciosas, Clínica Universidad de Navarra, Pamplona 31008, Spain (JCG-F, CC); Asociación Civil Impacto Social, Tumeremo, Venezuela (LV); Global Development One, Silver Springs, MD, USA (LV); Laboratorio de Biología de Vectores y Parásitos, Instituto de Zoología y Ecología Tropical, Facultad de Ciencias (MEG), Cátedra de Parasitología, Escuela de Medicina "José María Vargas" (LP), and Sección de Biohelmintiasis, Instituto de

Medicina Tropical, Facultad de Medicina (ONG), Universidad Central de Venezuela, Caracas, Venezuela; Institute for Science Innovation and Society, University of Oxford, Oxford, UK (JL); Asociación Venezolana para la Conservación de las Áreas Naturales, Caracas, Venezuela (MB); Academia Nacional de Medicina, Caracas, Venezuela (AP-M); Department of Pathology, Molecular and Cell Based Medicine, Icahn School of Medicine at Mount Sinai, New York City, NY, USA (AP-M); Centro para Estudios Sobre Malaria, Instituto de Altos Estudios "Dr. Arnoldo Gabaldón", Ministerio del Poder Popular para la Salud, Aragua, Venezuela (ONG); ISGlobal, Hospital Clínic - Universitat de Barcelona, Barcelona, Spain (CC); Ifakara Health Institute, Ifakara, Tanzania (CC)

- 1 Griffing SM, Villegas L, Udhayakumar V. Malaria control and elimination, Venezuela, 1800s-1970s. *Emerg Infect Dis* 2014; **20**: 1691-96.
- 2 Avilán Rovira JM. Palabras del doctor Blas Bruni Celli, en el acto homenaje a los equipos pioneros del rociamiento del DDT en Venezuela y en especial a su director el doctor Arnoldo Gabaldón, el día jueves 2 de febrero de 2006. *Gaceta Médica de Caracas* 2006; **114**: 157-67.
- 3 WHO. World malaria report 2020: 20 years of global progress and challenges. 2020. [https://cdn.who.int/media/docs/default-source/malaria/world-malaria-reports/9789240015791-eng.pdf?sfvrsn=d7a8ec53\\_3&do\\_wload=true](https://cdn.who.int/media/docs/default-source/malaria/world-malaria-reports/9789240015791-eng.pdf?sfvrsn=d7a8ec53_3&do_wload=true) (accessed Dec 18, 2020).
- 4 Grillet ME, Moreno JE, Hernández JV, et al. Malaria in southern Venezuela: the hottest hotspot in Latin America. *PLoS Negl Trop Dis* 2021; **15**: e0008211.
- 5 Grillet ME, Hernández-Villena JV, Llewellyn MS, et al. Venezuela's humanitarian crisis, resurgence of vector-borne diseases, and implications for spillover in the region. *Lancet Infect Dis* 2019; **19**: e149-61.
- 6 Encovi, Instituto de Investigaciones Económicas y Sociales. Encuesta Nacional de Condiciones de Vida 2019-2020. 2020. [https://assets.website-files.com/5d14c6a5c4ad42a4e794d0f7/5f03875cac6fc11b6d67a8a5\\_Presentaci%C3%B3n%20%20ENCOVI%202019-Pobreza\\_compressed.pdf](https://assets.website-files.com/5d14c6a5c4ad42a4e794d0f7/5f03875cac6fc11b6d67a8a5_Presentaci%C3%B3n%20%20ENCOVI%202019-Pobreza_compressed.pdf) (accessed Dec 18, 2020).
- 7 Estudio Económico de América Latina y el Caribe Principales condicionantes de las políticas fiscal y monetaria en la era pospandemia de COVID-19. Santiago, Chile: Comisión Económica Para América Latina y el Caribe, 2020.
- 8 Serajuddin U, Hamadeh N. New World Bank country classifications by income level: 2020-2021. July 1, 2020. <https://blogs.worldbank.org/opendata/new-world-bank-country-classifications-income-level-2020-2021> (accessed July 12, 2020).
- 9 The Global Fund. Recommendation on eligibility of Venezuela malaria for the 2020-2022 allocation period 2019. May 12-16, 2019. [https://www.theglobalfund.org/media/8642/bm41\\_edp06\\_annex\\_en.pdf](https://www.theglobalfund.org/media/8642/bm41_edp06_annex_en.pdf) (accessed Dec 18, 2020).
- 10 Turkewitz J. Venezuela votes in an election the opposition calls a charade. Dec 5, 2020. *The New York Times*. <https://www.nytimes.com/2020/12/05/world/americas/venezuela-election.html> (accessed May 12, 2020).