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## Yellow fever and infectious diseases in Venezuela

In October, 2021, WHO reported an outbreak of yellow fever in Venezuela, involving seven confirmed human cases. Six of the seven patients had not received the yellow fever vaccine. The probable location of the outbreak, according to WHO, was Monagas state in the northeast region of Venezuela where seven epizootics in non-human primates had also been recorded between Aug 11 and Oct 1, 2021. On Dec 28, 2021, in an Epidemiological Update on yellow fever, Pan American Health Organization (PAHO) stated that, between early-October and mid-December, 2021, a further 11 confirmed human cases of yellow fever were reported from Monagas state. Among these 11 confirmed cases, nine patients had no history of yellow fever vaccination. Reacting to these yellow fever cases in Venezuela, David A Forero-Peña, (Biomedical Research and Therapeutic Vaccines Institute, Ciudad Bolívar, Venezuela) told *The Lancet Microbe*, "I am not surprised by the recent report of yellow fever cases in Venezuela, and I believe that there are many more cases than those reported up to now". Forero-Peña, added that Venezuela has "the necessary climatic conditions" for transmission and "no efficient programmes" for the control of yellow fever.

Venezuela is categorised by WHO as a high-risk country for yellow fever and is identified by the 2017–26 WHO Global Strategy to Eliminate Yellow fever Epidemics as a priority country. A vaccination campaign started in ten priority states in Venezuela in November, 2020, achieving 100% coverage in five of those states. Yet, WHO describes the coverage of the yellow fever vaccine in the country as "suboptimal" due to low vaccination rates in high transmission areas. María Eugenia Grillet (Universidad Central de Venezuela, Caracas, Venezuela) told *The Lancet Microbe* that "at the end

of 2020, the region where the outbreak was detected had just reached 67.7% of vaccine coverage". This coverage is substantially lower than the rest of the country (Zulia state is the only state with a lower vaccination coverage at 44.7%). Grillet explained that the low vaccination coverage coupled with a weakened health system and "lack of entomological and animal surveillance" in the country contributed to the outbreak of yellow fever.

Since 2016, Venezuela has experienced political unrest, which has led to an economic crisis and migration of people from the country. "Venezuela has been undergoing a sustained public health emergency due to a widespread collapse of the health-care system, routine immunisation, and health care services" says Chris Beyrer, (Johns Hopkins Bloomberg School of Public Health, Baltimore, MD, USA).

The collapse of the health-care system has caused outbreaks of other infectious diseases in Venezuela. According to Beyrer, the yellow fever outbreak in Venezuela occurred after "a very large malaria outbreak," and outbreaks of other childhood vaccine preventable diseases, such as measles during July 2017–19.

Over the past 7 years, Venezuela has been a major hotspot for the transmission of malaria in the region, according to Grillet. In 2017–18 in Latin America, there were nearly 1 million cases of malaria per year and approximately half of those cases were reported from Venezuela. Venezuela also saw substantial outbreaks of measles and diphtheria owing to low immunisation coverage. According to PAHO, an outbreak of measles in Venezuela led to 7054 cases and 84 deaths between July, 2017, and July, 2019. The country also faced a diphtheria outbreak between July, 2016, and July, 2019, with 3033 suspected cases and a case fatality rate of 9%. Beyrer

also highlighted that there are "some 70 000 people" facing HIV treatment interruptions. "All these events have affected (and could be affecting) neighbouring countries of the region due to forced migration of the Venezuelans, which still is occurring," added Grillet. The COVID-19 pandemic further added to the health crisis with Venezuela reporting 447 865 cases and 5361 deaths between Jan 3, 2020, and Jan 12, 2022.

According to Grillet, major public health interventions such as improving immunisation coverage and re-establishing surveillance in people and non-human primates are required, particularly in known hotspots such as Monagas state. She recommended that "national, regional, and global actions" are needed, particularly in controlling the malaria epidemic. Beyrer urged for an urgent political resolution stating that "the people of Venezuela need urgent humanitarian assistance and this can most likely be managed regionally, through PAHO, and OAS [Organization of American States]". In the Epidemiological Update on yellow fever, PAHO urged high-risk countries—ie, Bolivia, Brazil, Peru, and Venezuela—to identify and vaccinate people living in high transmission areas and advised travellers to get vaccinated before going to affected countries. However, the COVID-19 pandemic and weakened Venezuelan health-care system are likely to make yellow fever vaccination and implementation of infectious disease control programmes difficult, as Beyrer explains "the health crisis is the outcome of political unrest, economic collapse, and widespread poverty and food insecurity among the majority of the Venezuelan people".

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For more on **yellow fever in Venezuela** see <https://www.who.int/emergencies/disease-outbreak-news/item/yellow-fever---bolivarian-republic-of-venezuela>

For **PAHO Epidemiological Update on yellow fever** see <https://www.paho.org/en/documents/epidemiological-update-yellow-fever-28-december-2021>

For the **Global Strategy to Eliminate Yellow Fever Epidemics** see <https://apps.who.int/iris/bitstream/handle/10665/272408/9789241513661-eng.pdf?ua=1>

For more on **malaria in Venezuela** see *PLoS Negl Trop Dis* 2021 published Jan 25. <https://journals.plos.org/plosntds/article?id=10.1371/journal.pntd.0008211#sec007>

For more on **COVID-19 in Venezuela** see <https://covid19.who.int/region/amro/country/ve>

For more on **Venezuelan migration** see *World Report Lancet* 2020; **395**: 1023