



## COUNTRY SITUATIONAL ANALYSIS

Ecuador is situated on the west coast of South America. Foci of sylvatic transmission persist across most of the national territory, except in cities located in the highlands. Since the introduction of the yellow fever (YF) vaccine in the childhood vaccination schedule and the implementation of mass vaccination campaigns, the case incidence has decreased significantly. However, isolated cases persist in unvaccinated populations living or working in forest areas. With the reintroduction of *Aedes aegypti*, dengue has become a primary public health problem, with progressive increases in both its incidence and geographical distribution. In addition, two other arboviruses were introduced during the last decade: chikungunya and Zika. Their dramatic spread and morbidity highlight the extraordinary capacity of these viruses to invade a mainly susceptible population.

## ECOLOGICAL FACTORS AND CLIMATE<sup>1</sup>

Ecuador has wide array of climate zones, primarily due to its altitude. These include high-altitude glaciers, tropical rainforests in the Amazon upper tributaries, and dry tropical forests on the Pacific coast. The following ecoregions converge in the country:

- 1) The **Amazon rainforest** region in the east covers 47% of the territory.
- 2) The **Andean mountains** cross the country from north to south along the central part of the country. This is where Quito, the capital city, is located.
- 3) The **Coastal region** lies to the west, between the Andes and the Pacific Ocean, and consists mainly of dry tropical forests. While to the north, on the border with Colombia, there are rainforests.

Forest areas make up 51% of land cover, of which 22% is used for agricultural activities.

### Vector distribution and incidence

High entomological indices were found for *Aedes aegypti*.<sup>3</sup>

## YELLOW FEVER HIGHLIGHTS

<b>EYE strategy risk categorization</b>	High
<b>Routine immunization introduction (year)</b>	2009
<b>Latest official coverage estimates (2021)</b>	70%
<b>Gavi eligibility</b>	No
<b>International Coordinating Group on vaccine provision requests</b>	No
<b>Last disruptive yellow fever outbreak</b>	1997
<b>Yellow fever vaccination proof for entry/exit</b>	No
<b>Diagnostic capacity</b>	Yes
<b>Fragility, conflict, and violence status</b>	No

## DEMOGRAPHICS<sup>2</sup>

<b>Total population</b>	17 373 660
<b>Annual population growth rate</b>	1.7%
<b>Life expectancy</b>	80 years (women) and 74 years (men)
<b>Percentage population living in urban dwellings</b>	63%
<b>Percentage urban population living in slums</b>	20%

1 World Bank Group. Climate Change Knowledge Portal for Development Practitioners and Policy Makers: Ecuador. Washington, DC: World Bank; 2021. Available from: <https://climateknowledgeportal.worldbank.org/country/ecuador>

3 Stewart Ibarra AM, Ryan SJ, Beltrán E, Mejía R, Silva M and Muñoz A. Dengue vector dynamics (*Aedes aegypti*) influenced by climate and social factors in Ecuador: implications for targeted control. PloS one. 2013 8(11): E78263. Available from: <https://doi.org/10.1371/journal.pone.0078263>

2 World Bank Group. Understanding poverty: Open data. Washington, DC: World Bank; 2020. Available from: <https://www.worldbank.org/en/understanding-poverty>

## EPIDEMIOLOGY

Urban epidemics of yellow fever were observed in the port city of Guayaquil until the first half of the 20th century. After the introduction of the YF vaccine and regional *Aedes aegypti* controls, only enzootic foci have persisted. These mainly occurred in the Amazon region, but also in some coastal departments in which the climatic conditions and the presence of non-human primates and vectors increase the risk of the introduction of the disease. Historically, cases occurred annually with small outbreaks or isolated events. After 2000, there were no further outbreaks with only isolated cases being reported, the last was in 2017 in the province of Sucumbíos (Amazon rainforest). The incidence has further decreased over the past few years. The case fatality rate oscillates between 50% and 100%, with an average of 67%. A few cases were reported in international travelers. In all cases for which data are available, the person had not been vaccinated.

### Endemic areas

Departments to the east and south (Amazon region) are endemic. Some departments to the northwest are considered at moderate risk while the rest of the coastal areas is low-risk. There is no risk in high-mountain cities.

## PAST OUTBREAKS<sup>4</sup>

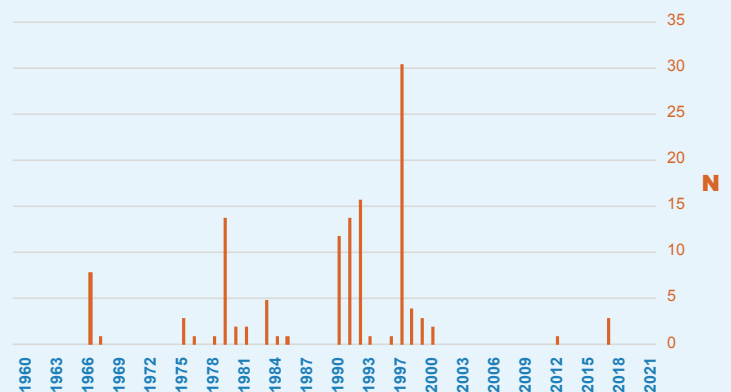
Year	Number	Region	Comments
1960-1980	30	Not available	
1981-2000	93	Not available	
2012	1	Not available	
2017	3	Province of Sucumbíos	All three fatal cases were in adult men with no vaccination history.

### Trends of previous outbreaks<sup>5</sup>

Ecuador reported 127 confirmed cases and 49 deaths in the period from 1960 to 2021, and only 4 confirmed cases in the last 20 years.

The country reported 30, 93, and 4 cases in the periods 1960-1980, 1981-2000, and 2001-2021, respectively. The reduction in the burden of disease in recent years is most likely due to the introduction and improvement of immunization programs. There have been no autochthonous cases in the country since 2017 when the last 3 cases were recorded.

Yellow fever cases in Ecuador, 1960-2021



## ARBOVIRAL ACTIVITY

**Dengue** Dengue emerged in Ecuador in 1988 when a major outbreak was recorded. Since then, the disease has persisted over the years, with co-circulation of all four serotypes (currently serotypes 1 and 2 are present). Ecuador reported 733 669 cases to PAHO between 1988 and 2021.<sup>6</sup>

**Chikungunya** Chikungunya virus disease emerged in Ecuador at the end of 2014, with a peak incidence in 2015 that then declined in the following years. During the period from 2014 to 2017, the country reported over 30 401 cases to PAHO.<sup>7</sup>

4 Pan American Health Organization. Epidemiological alerts and updates: Yellow fever. Washington, DC: PAHO; n.d. Available from: <https://www.paho.org/en/epidemiological-alerts-and-updates>

5 Ibid.

6 Pan American Health Organization. Health Information Platform for the Americas (PLISA). Dengue and severe dengue: Cases and deaths for the countries and territories of the Americas. Washington, DC: PAHO; n.d. Available from: <https://www3.paho.org/data/index.php/en/mnu-topics/indicadores-dengue-en/dengue-nacional-en/257-dengue-casos-muertes-pais-ano-en.html>

7 Pan American Health Organization. Chikungunya. Data and statistics. Cumulative number of confirmed cases of Chikungunya in South America from 2013 to 2017. Washington, DC: PAHO; n.d. Available from: <https://www.paho.org/en/topics/chikungunya>

**Zika** The first cases of Zika were recorded in Ecuador in early 2016, with a second epidemic wave in 2017. The country reported a total of 93 803 suspected cases and 9927 confirmed cases between 2015 and 2017, and 248 confirmed congenital syndromes associated with the Zika virus.<sup>8</sup>

## YELLOW FEVER VACCINATION<sup>9</sup>

Routine childhood immunization		Vaccine coverage <sup>10</sup>																										
Yellow fever vaccine introduced	Yes	<p style="text-align: center;"><b>Yellow fever vaccination coverage in children in Ecuador, 2010-2021 (%)</b></p> <table border="1"> <caption>Yellow fever vaccination coverage in children in Ecuador, 2010-2021 (%)</caption> <thead> <tr> <th>Year</th> <th>Coverage (%)</th> </tr> </thead> <tbody> <tr><td>2010</td><td>90</td></tr> <tr><td>2011</td><td>88</td></tr> <tr><td>2012</td><td>88</td></tr> <tr><td>2013</td><td>75</td></tr> <tr><td>2014</td><td>85</td></tr> <tr><td>2015</td><td>80</td></tr> <tr><td>2016</td><td>90</td></tr> <tr><td>2017</td><td>85</td></tr> <tr><td>2018</td><td>85</td></tr> <tr><td>2019</td><td>85</td></tr> <tr><td>2020</td><td>80</td></tr> <tr><td>2021</td><td>70</td></tr> </tbody> </table> <p>Childhood YF vaccine coverage rate ranged from 80% to 90% over the past decade. The gap between MMR-1 and YF vaccines has been less than 5% in recent years.</p>	Year	Coverage (%)	2010	90	2011	88	2012	88	2013	75	2014	85	2015	80	2016	90	2017	85	2018	85	2019	85	2020	80	2021	70
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2020	80																											
2021	70																											
Level	National																											
Year of introduction	2009																											
Age vaccine is administered (months)	12																											
Vaccine schedule	Single dose																											
Integration with first does of measles, mumps, rubella vaccine (MMR-1)	Yes																											
Gap MMR-1/ yellow fever vaccine to monitor program	Yes																											
<b>Vaccination campaigns</b>																												
Catch-up campaigns implemented during the last 20 years		Yes																										
Preventive mass campaigns implemented during the last 20 years		Yes																										
Reactive vaccination campaigns implemented during the last 20 years		Yes																										
<b>Vaccination in international travelers<sup>11</sup></b>		Yes																										
Ecuador offers YF vaccination to people traveling to at-risk countries																												
<b>Vaccination in internal travelers (when traveling to high-risk areas in the country)</b>		No																										
<b>Registration system to record vaccination data<sup>12</sup></b>	Nominal paper immunization registry system																											
<b>Vaccine program funding<sup>13</sup></b>																												
Sources of funding		Government																										
Gaps in financing during the past 5 years?		No																										
Does the country require financial support?		Yes																										

<sup>8</sup> Pan American Health Organization. Zika cases and congenital syndrome associated with Zika virus reported by countries and territories in the Americas, 2015-2018. Cumulative cases. Washington, DC: PAHO; 2018. Available from: <https://www.paho.org/en/node/60231>

<sup>9</sup> Pan American Health Organization. Comprehensive Family Immunization Unit: Survey for mapping of national policies on yellow fever vaccination and their implementation. Washington, DC: PAHO, 2021. Unpublished data.

<sup>10</sup> World Health Organization. Data compiled from WHO vaccine-preventable diseases: monitoring system reported through the Joint Reporting Form. Washington, DC: PAHO; n.d. Available from: <https://immunizationdata.who.int/pages/coverage/yfv.html>

<sup>11</sup> See Note 9.

<sup>12</sup> Ibid.

<sup>13</sup> Ibid.

## INTERNATIONAL HEALTH REGULATIONS<sup>14</sup>

Does the country request proof of YF vaccination at points of entry?	No
An international YF vaccination certificate is not required to enter the country. Vaccination is recommended for all travelers to the provinces of the Ecuadorian Amazon (Morona Santiago, Napo, Orellana, Pastaza, Sucumbíos, and Zamora Chinchipe) and international travelers arriving from or leaving for countries with active YF outbreaks. <sup>15,16</sup>	

LABORATORY DIAGNOSTIC CAPACITY <sup>17</sup>		SURVEILLANCE <sup>18</sup>	
Member of the Arbovirus Diagnosis Laboratory Network of the Americas	Yes	National guidelines for surveillance	Yes
National Reference Laboratory	National Institute for Public Health Research	Type of surveillance for human cases	Syndromic and case-based
Reports to PAHO	Yes	Type of YF surveillance for non-human primates	Yes
TESTING CAPACITY FOR YELLOW FEVER		Entomological surveillance	Yes
IgM antibody capture enzyme-linked immunosorbent assay (MAC-ELISA)	Yes	Entomovirological surveillance	No
Plaque reduction neutralization test (PRNT)	No	Case investigation (reactive)	Yes
Reverse transcription polymerase chain reaction (RT-PCR) blood specimens	Yes	YELLOW FEVER CONTROL STRATEGIES	
RT-PCR tissue specimens	Yes	Multi-annual immunization plan	Yes
RT-PCR wild type virus versus vaccine	Yes	Risk assessment methodology <sup>19</sup>	Yes
Immunohistochemistry	No	Vector control activities	Yes
Virus isolation	No	Diagnosis	Yes
External quality assessment compliance	Yes	Surveillance	Yes
Shortages of diagnostic supplies in the last 5 years	Yes	Request for proof of YF vaccine at points of entry	No

## POPULATION MOVEMENTS

There has been a large influx of migrants crossing the border from Venezuela (Bolivian Republic of) over the past few years, driven by the crisis in the neighboring country. Since 2015, around 1.15 million Venezuelan citizens have entered Ecuador and some 500 000 have settled there.

<sup>14</sup> Ibid.  
<sup>15</sup> Ministry of Health of Ecuador. Yellow fever. Quito: Government of Ecuador; n.d. Available from: <https://www.salud.gob.ec/febre-amarilla/>  
<sup>16</sup> Ministry of Health of Ecuador. Requirements to enter Ecuador. Quito: Government of Ecuador. Available from: <https://www.ministeriodegobierno.gob.ec/requisitos-para-ingresar-a-ecuador/>  
<sup>17</sup> See note 9.  
<sup>18</sup> Ibid.  
<sup>19</sup> Ibid.