

Report on the Situation of Malaria in the Americas – 2017¹



**Pan American
Health
Organization**



**World Health
Organization**

REGIONAL OFFICE FOR THE **Americas**

¹ Document prepared by the Regional Malaria Program, Pan American Health Organization with data from Annual Country Reports- 2017

General situation in endemic countries

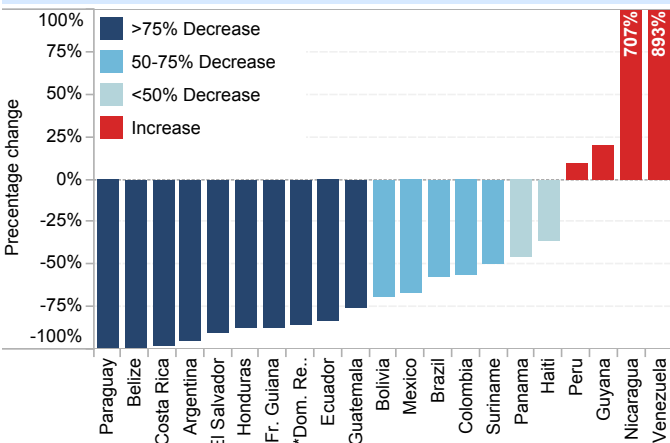
The last decade shows an overall downward trend of malaria morbidity and mortality rates in the Region of the Americas (Fig. 1). There were approximately 7,500 fewer confirmed cases of malaria between 2007 and 2017. Excluding Venezuela, in the same period, malaria-related deaths also decreased by almost half from 170 in 2007 to 88 in 2017 (Fig. 1). Almost half of the endemic countries showed at least 75% reduction in morbidity, while 35% showed a minimum of 35% reduction (Fig. 2). In 2017, there were approximately 108 million people at risk of malaria. Despite the overall trending decline in the number of cases and deaths, the last three years showed a steady increase in the number of malaria cases (Fig. 1). The rise is attributed to the increase in the number of cases in Venezuela, Nicaragua, Brazil, and Guyana (Table 1).

Five-year snapshot: 2013 - 2017: Over 93% of all malaria in the Americas was concentrated in six countries: Brazil, Colombia, Guyana, Haiti, Peru and Venezuela. In the same period, 17 of the 21 endemic countries showed a minimum of a one-third reduction in indigenous cases, including high burden countries such as Haiti and Colombia. Meanwhile, 10 of the countries (Belize, Costa Rica, El Salvador, Honduras, French Guiana, Dominican Republic, Ecuador, and Guatemala) reported decreases above 75% in the incidence of indigenous cases in that period. This shows that these countries are progressing and are on track to achieving the goals of the Global Technical Strategy for Malaria by 2020. However, there is a threat of not achieving the goals in Peru, Guyana, Nicaragua, and Venezuela due to increases in malaria (Fig. 2).

Paraguay and Argentina have reported zero indigenous cases of malaria since 2011 and 2012, respectively. Paraguay has also reported no imported cases in 2017. The latest malaria outbreaks in Paraguay occurred in the departments of Canindeyu (2007) and Alto Paraná (2009). The 17 malaria cases detected in Argentina in 2017 were imported cases from countries in the Americas and Africa. In 2016, Argentina and Paraguay officially requested the WHO to begin the malaria elimination certification process in their territories and they are on track for the certification. For Argentina to remain on track to receive the elimination certification, it must maintain its epidemiological surveillance efforts for timely event identification for new cases from the Bolivian territory. The endemic municipality of Yacuiba in bordering Bolivia is of particular interest as it has shown an increase from 15 in 2014 to 104 in 2017.

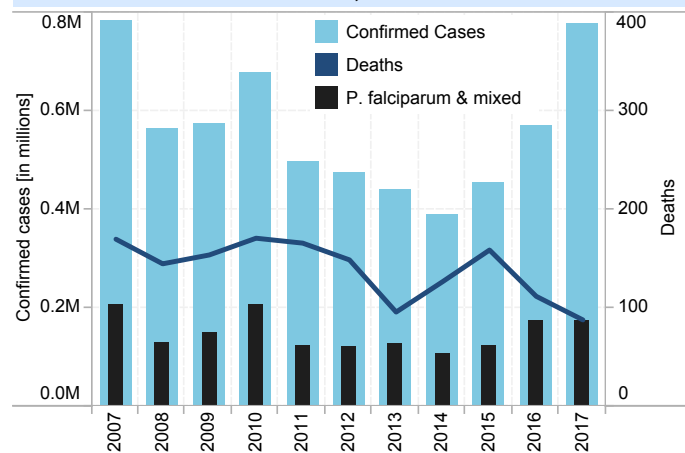
In the past five years, Venezuela and Nicaragua increased by almost 530% and 917% respectively, with the significant increase taking place in the last three years (2015-2017; Table 2.). Costa Rica reported indigenous cases for the second year in a row since 2015— 4 in 2016 and 12 in 2017. The 2017 cases were recorded in the cantons of San Carlos (6 cases), Matina (3 cases), and Sarapiquí (3 cases). The detection of cases in these districts highlights the risk of re-establishment of transmission in areas where ecological conditions persist.

Figure 2. Decrease in malaria morbidity by countries of the Americas, 2007 - 2017



* French Guiana ** Dominican Republic

Figure 1. Malaria morbidity and mortality in the Americas, 2007 - 2017



Between 2016 and 2017: Between 2016 and 2017, the Region of the Americas observed a 26% rise in malaria (from 569,203 to 776,444). Seven countries reported an increase in indigenous malaria cases from 2016 to 2017: Brazil, French Guiana, Guyana, Mexico, Nicaragua, and Venezuela. The increase in cases in Venezuela and Nicaragua continue to be significant (Fig. 2). However, the overall increase in cases in the Americas is largely due to increases in malaria transmission in Brazil, Nicaragua and Venezuela (Table 1.). Despite the rising malaria cases, there was a downward trend in the morbidity rates of countries that generally tend to have high burden of the disease (Bolivia, Colombia, Guatemala, Haiti, Honduras, and Peru).

In 2017, Venezuela saw a 171% percent increase in confirmed cases from the previous year and accounted for over half of the cases in the Americas. Almost all of these cases were indigenous and were reported in 16 out of the 23 states, with Bolivar state accounting for three-fourths of total cases in the country. Of those identified, *P. vivax* accounted for two-thirds of the cases while the rest of the infections were due to *P. falciparum* (15%) and mixed infections (5%).

In particular, the cases in Bolivar state were limited to Sifontes municipality, where one-third of all cases in the country were concentrated. Despite the total population of Sifontes being approximately 50,000, they reported around 120,000 cases, which shows the magnitude of the transmission with people getting multiple infections in a year. Also, large migrations of unaccounted people to the area for mining increased the proportion of miners with malaria by 30% (36,376) from the previous year. The movement of the population from other states and countries to Sifontes due to the illegal mining boom has encouraged these people to settle in places with conditions conducive for malaria transmission. In turn, both the United Nations (UN) and the World Bank agree that Venezuela is going through a complex situation due to social, political, and economic problems.

Suriname is well on its way to eliminating local transmission of malaria by 2020 through the implementation of its National Malaria Elimination Strategy. Forty indigenous malaria cases were reported in 2017 compared to 1756 in 2010. In 2017, almost 70% of all cases were found among males between the ages of 15 and 59, demonstrating the strong association of malaria risk to economic activity. As such, Suriname's success is the result of proactive and innovative interventions that primarily focused on areas and communities at risk, such as people engaged in informal and small-scale mining operations as well as those that serve the miners. Suriname can help strengthen regional efforts by strengthening surveillance and control measures and sharing its lessons learnt with neighboring Brazil, Guyana, and French Guiana.

Between 2014 and 2017, Peru reduced the number of malaria cases by more than 15% (from 65,252 to 55,367 cases). The Ministry of Health of Peru approved the "Malaria Zero Plan" in 2017 with the objective of eliminating malaria in the Amazon region of Peru, particularly in Loreto department which had 96% of all cases in 2017.

Most of the cases were located in districts with a large proportion of ethnicities.

Table 1. Malaria in countries in the Region of the Americas, 2015 - 2017

Country	Year	Total Popn at Risk	Blood Slides Examined	Confirmed Cases	P. falciparum & mixed infections	SPR	API
Bolivia	2015	4,549,215	159,167	6,907	96	4.34	1.52
	2016	4,549,215	155,407	5,553	9	3.57	1.22
	2017	4,549,215	151,697	4,587	4	3.02	1.01
Brazil	2015	25,933,921	1,573,538	143,161	16,743	9.00	5.52
	2016	33,469,323	1,341,644	129,246	15,297	9.47	3.86
	2017	37,954,004	1,656,428	194,370	20,933	11.46	5.12
Colombia	2015	10,176,936	316,451	55,866	32,363	17.01	5.49
	2016	10,792,295	242,973	83,227	50,098	28.11	7.71
	2017	10,792,295	244,732	54,102	30,925	21.28	5.01
Dominican Republic	2015	6,319,676	316,947	661	651	0.18	0.10
	2016	5,549,499	280,124	755	722	0.20	0.14
	2017	5,625,227	226,988	398	370	0.15	0.07
French Guiana	2015	136,831	11,558	434	91	3.75	3.17
	2016	136,388	9,430	258	80	2.74	1.89
	2017	107,020	...	597	84		5.58
Guatemala	2015	12,600,000	295,246	5,540	51	1.88	0.44
	2016	10,361,230	333,535	4,854	4	1.46	0.47
	2017	...	372,158	3,744	5	1.01	
Guyana	2015	767,000	132,941	9,984	3,950	7.51	13.02
	2016	747,884	110,891	11,108	4,547	9.55	14.85
	2017	751,223	100,096	13,936	6,117	13.92	18.55
Haiti	2015	10,243,693	69,659	17,583	17,583	5.81	1.72
	2016	9,600,395	61,210	21,430	21,430	7.09	2.23
	2017	11,741,236	62,539	19,135	2,119	6.48	1.63
Honduras	2015	5,717,174	150,854	3,575	933	2.32	0.63
	2016	7,897,968	167,836	4,097	1,351	2.24	0.52
	2017	8,055,603	148,160	1,287	129	0.78	0.16
Nicaragua	2015	3,523,063	604,418	2,307	345	0.38	0.65
	2016	2,762,132	553,615	6,284	1,311	1.13	2.28
	2017	2,461,541	660,452	10,949	1,869	1.65	4.45
Panama	2015	717,489	64,511	562	6	0.87	0.78
	2016	725,253	50,772	811	38	1.60	1.12
	2017	673,330	38,270	689	6	1.80	1.02
Peru	2015	4,453,082	865,980	66,609	13,682	7.69	14.96
	2016	3,273,897	566,230	56,623	15,319	10.00	17.30
	2017	3,843,337	388,699	55,367	13,321	13.75	14.41
Venezuela	2015	6,165,291	625,174	137,996	35,967	22.07	22.38
	2016	10,712,823	852,556	242,561	61,615	26.01	22.64
	2017	16,537,063	1,144,635	414,527	96,101	36.21	25.07

Table 2. Malaria in countries of E2020 in the Region of the Americas, 2015 - 2017

Country	Year	Total Cases	Cases Investigated	Imported	Indigenous-fal..	Imported-falci..	Imported-vivax	Active Foci
Argentina	2015	11	8	1	0	3	4	0
	2016	7	7	1	0	3	2	0
	2017	17	17	17	0	8	6	0
Belize	2015	13	13	4	0	0	4	11
	2016	5	5	1	0	0	1	2
	2017	9	9	2	0	1	1	3
Costa Rica	2015	8	8	8	4	4	4	0
	2016	13	13	9	3	3	6	1
	2017	25	25	13	7	7	5	3
Ecuador	2015	686	686	59	184	18	41	20
	2016	1,424	1,424	233	403	91	142	23
	2017	1,380	1,380	105	309	55	48	6
El Salvador	2015	9	9	7	0	0	7	4
	2016	14	14	1	0	0	1	6
	2017	4	4	3	0	0	3	0
Mexico	2015	551	551	34	0	6	27	50
	2016	596	596	45	0	14	31	43
	2017	765	765	29	0	11	15	46
Paraguay	2015	8	0	8	0	2	2	0
	2016	10	0	10	0	3	3	0
	2017	5	5	5	0	2	3	0
Suriname	2015	376	376	295	17	91	170	
	2016	327	327	251	6	94	147	
	2017	551	433	511	1	113	279	19

Blank cells and "..." imply no data available

Distribution of bed nets in Peru has not taken place since 2016, and although the number of households sprayed increased from 7,581 in 2016 to 15,865 in 2017, the open nature of people's homes in Loreto - especially those in Andoas - makes it difficult to spray houses. The plan aims to address the lack of access to diagnosis and treatment as well as the coverage of preventive measures that puts them on the path to malaria elimination.

Honduras reported less cases in 2017, as compared to 2015 and 2016 (Table 1). The decline in cases is potentially associated with the reported consolidation of jellyfish fishing from the coastal areas of Gracias a Dios in Honduras to Puerto Cabezas along the Nicaraguan Caribbean coastal strip. Although there was little difference between the *P. vivax* cases, Honduras showed a 90% decrease in *P. falciparum* cases between 2016 and 2017. Also, Gracias a Dios showed a 75% decrease in *P. vivax* cases. Furthermore, improved access to bed nets, and prompt diagnosis and treatment and investment in surveillance is contributing to the reduction of malaria cases. There is an increase in the number of cases being investigated, as well as an improvement in quality of the investigations.

Plasmodium species

Although there are five parasite species, four species of plasmodia affect people (*P. vivax*, *P. falciparum*, *P. malariae* and *P. ovale*). *Plasmodium vivax* and *P. falciparum* have the highest prevalence in the world and pose the greatest threat. Unlike *P. falciparum*, *P. vivax* manages to persist in latent state for months or even years in the liver of infected people and cause a relapse. In this sense, the training of health systems personnel, responsible for the identification of the plasmodium species, is a fundamental component for the understanding of the epidemiology of the disease.

In 2017, *P. vivax* (75%) and *P. falciparum* (20%) caused the cases in the Americas. *P. falciparum* made up almost all of the infections in the Dominican Republic and Haiti. Despite the increase in cases in Nicaragua and Venezuela, there is a decrease in proportion of cases due to *P. falciparum* and mixed infections.

In the Americas, *P. vivax* has the highest incidence and is responsible for almost two-thirds of the infections registered between 2013 and 2017. During this period of time, all indigenous cases reported by Belize, Costa Rica, El Salvador and Mexico were caused by *P. vivax*. Furthermore, only four cases of *P. falciparum* cases were reported in Bolivia compared to 959 in 2013.

Malaria cases by sex and age

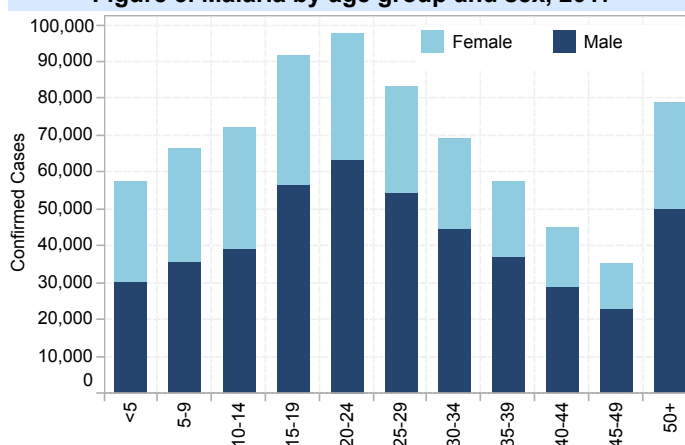
Between 2013 and 2017, six out of every 10 cases reported in the Americas occurred in men. During the same period, the majority of cases in the Americas were reported among those aged 15-19 and 20-24 years (Fig. 3). In 2017, the proportion of cases in men was the same as 2016 and slightly lower than in 2013 (Fig. 3).

In Suriname and Venezuela, those aged 15-49 accounted for over half of all cases demonstrating a strong association of malaria risk and illegal and informal mining in 2017 (Fig. 4). The following nine countries accounted for a significant portion of the total number of cases reported for those aged 14 and below: Bolivia, Brazil, Colombia, Guatemala, Guyana, Haiti, Nicaragua, Peru, and Venezuela (Fig. 4). This suggests that a significant fraction of the malaria transmission of in these countries occurs within the household.

Amazonas

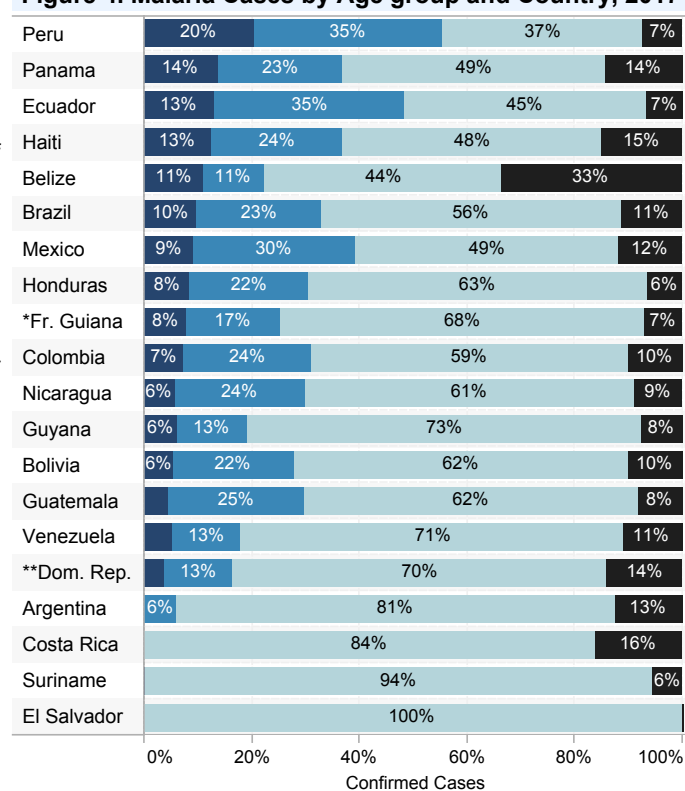
In 2017, the 25 municipalities with the highest malaria burden in the Amazonas reported over half of the total cases in the Americas (Fig. 5). Compared to the previous year, malaria increases were observed in 24 out of the 25 municipalities in 2017. The 25 municipalities are represented by six states in three countries, with Venezuela (17) having the highest number of municipalities, followed by Brazil (7) and Peru (1). The malaria cases in these 17 municipalities in Venezuela combined accounted for half of the cases in the Americas, while 20% of all the cases occurred in Sifontes of Bolivar State. As a result of an outbreak, the combined cases in Bermudez, Cajigal, Benitez, Ribero, and Marino municipalities in Sucre state represented 10% of the total cases among these high burden municipalities. Malaria continues to increase in Sifontes and extend to neighboring municipalities such as El Callao due to the persistence of illegal mining and associated social conflicts. These and other persistent factors have compromised the efficiency of distribution of supplies as well as the coverage of vector control activities that aim to reduce malaria. ..

Figure 3. Malaria by age group and sex, 2017



*Data provided by Haiti is excluded due to methods of reporting

Figure 4. Malaria Cases by Age group and Country, 2017



*French Guiana **Dominican Republic

Age Group

■ Less than 5 years ■ 15 to 49 years
 ■ 5 to 14 years ■ 50 and above

Sixteen of the 25 municipalities with the highest cases in 2016 were also among the top 25 municipalities in 2017. The other nine that are no longer in the top 25 municipalities include Quibdo, San Juan Bautista, Casacoima, Tigre, Rodrigues Alves, Napo, Atabapo, Bolivar, and Alto Baudo. The following nine municipalities were among the 25 municipalities in 2017, but not 2016: Bermudez, Cajigal, Barcelos, Santa Isabel, Bagre, Autana, Manapiare, Ribero, and Marino.

Although Gran Sabana is among the top 25 municipalities for both years, it showed a 40% reduction, while Quibdo was no longer among the top 25 municipalities after reducing two-thirds of its cases. Andoas was no longer considered among the top 10 (of the 25) municipalities between 2016 and 2017 due to an increase in cases in other municipalities. Sifontes is the municipality with the most cases in both years, while malaria in Atures has also increased exponentially owing to low coverage of preventive interventions.

Mesoamerica

In 2017, the 25 municipalities with the highest burden of disease in Mesoamerica reported a 20% increase from the previous year (Fig. 6). Fifteen of the 25 municipalities showed an increase in malaria. Municipalities in Gracias a Dios state of Honduras have shown significant decrease. The municipalities (Puerto Lempira and Sonaguera) that accounted for over 50% of all cases in Honduras in 2016 reduced their cases by at least three-fourths in 2017. The following four municipalities in Guatemala: La Gomera, Tiquisate, and Masagua reported at least a one-fourth reduction since 2016.

La Gomera, which exhibited a significant increase of cases in 2015 was able to decrease malaria cases through the reinforcement of epidemiological surveillance efforts. Along with Guatemala, the malaria reduction in Honduras and Panama exhibits the impact of the readjustment of activities, such as better access to diagnosis and treatment through volunteer collaborators using RDT and mass distribution of bed nets.

Fifteen of the 25 municipalities with the highest cases in 2016 were also among the top 25 municipalities in 2017. The following 10 municipalities were among the top 25 in 2016, but not in 2017: Tocoa, Brus Laguna, La democracia, Villeda Morales, Olanchito, Santa Catalina, Puerto Barrios, Chiquimulilla, Desembocadura, and Fray Bartolome de las Casa.

Although malaria seems to have halved in El Progreso, transmission continues to occur in farms and communities of municipalities in the bordering state of Cortes. The slight increase in Guna Yala is related to passive surveillance with introduction of RDT for use by community health workers. Siuna municipality, which was not among the top 25 in 2016, was among the top five (of the 25) municipalities with the most cases in 2017 due to an outbreak, which may be linked to the expanding risk of malaria from the neighboring municipality of Rosita. Although, Roatan showed decline of malaria mainly due to prevention activities and supervision of the diagnosis and treatment network, it experienced an outbreak in 2017.

Hispaniola

The municipalities with the highest burden of malaria are represented by Haiti. Seven municipalities (Les Irois, Les Anglais, Port-a-Piment, Jeremie, Anse d'Hainault, Dame Marie, and Roseaux) made up almost half of the total cases in Haiti (Fig. 8). Eleven of the 25 municipalities show a declining trend in 2017.

Eighteen of the 25 municipalities with the highest cases in 2016 were also among the top 25 municipalities in 2017 for the island of Hispaniola. The municipalities of Arnaud Nippes, Carrefour, Leogane, Ganthier, Arcahaie, and Gressie were among the 25 municipalities with the highest burden in 2016, but not in 2017. The following five municipalities were among the 25 municipalities in 2017, but not 2016: Baraderes Nippes, Cavallion, Anse a Veau, Torbeck, and Petite Riviere de Nippes.

In 2017, there were outbreaks in the municipalities of Les Irois and Port-a-Piment that increased malaria cases by 50% and 98% respectively (Fig. 8). Croix-Des-Bouquets, Delmas, and Port-au-Prince reduced their cases by more than half in 2017, removing them from the top 10 municipalities.

As for the Dominican Republic, malaria is currently almost exclusively limited to shanty towns settled on the border of rivers in Santo Domingo

Vector Control Interventions

In 2017, just over 726,207 homes and 1.6 million people were protected through indoor residual spraying (IRS). Meanwhile, another 4.7 million were protected with insecticide-treated bed nets (ITNs). In recent years, coverage by IRS has decreased. Between 2016 and 2017 the number of people protected by IRS was reduced by 22%, while that by ITNs increased by 12%.

Figure 5. Municipalities (ADM-2) with high malaria burden in countries of the Amazonas sub-region, 2015 - 2017

Municipality	State	Country	2015	2016	2017
Sifontes	Bolivar	Venezuela	71,934	102,543	142,267
Atures	Amazonas	Venezuela	9,812	12,856	46,725
El Callao	Bolivar	Venezuela	4,462	11,135	38,230
Cruzeiro do Sul	Acre	Brazil	14,979	20,591	21,322
Caroni	Bolivar	Venezuela	922	9,004	17,789
Cedeno	Bolivar	Venezuela	6,898	11,727	14,600
Sucre	Bolivar	Venezuela	3,820	8,944	13,628
Manaus	Amazonas	Brazil	9,748	9,699	13,596
*Sao Gabriel	Amazonas	Brazil	5,071	10,415	12,274
Raul Leoni	Bolivar	Venezuela	7,777	11,250	11,338
Andoas	Loreto	Peru	7,898	10,112	10,744
**Andres Eloy	Sucre	Venezuela	774	5,047	10,142
Piar	Bolivar	Venezuela	2,115	5,447	9,509
Mancio Lima	Acre	Brazil	5,552	7,885	9,290
Bermudez	Sucre	Venezuela	57	2,496	9,242
Gran Sabana	Bolivar	Venezuela	8,354	15,662	8,996
Cajigal	Sucre	Venezuela	46	889	8,884
Barcelos	Amazonas	Brazil	4,207	3,865	8,129
***Santa Isabel	Amazonas	Brazil	1,608	3,348	7,581
Benitez	Sucre	Venezuela	935	6,104	7,517
Bagre	Para	Brazil		129	6,793
Autana	Amazonas	Venezuela	3,528	3,802	6,139
Manapiare	Amazonas	Venezuela	3,091	3,234	6,126
Ribero	Sucre	Venezuela	413	1,997	5,988
Marino	Sucre	Venezuela	13	571	5,871



* São Gabriel da Cachoeira **Andres Eloy Blanco, ***Santa Isabel do Rio Negro District-level data (ADM-3) used for Peru, which were partially available during 2015-2017.

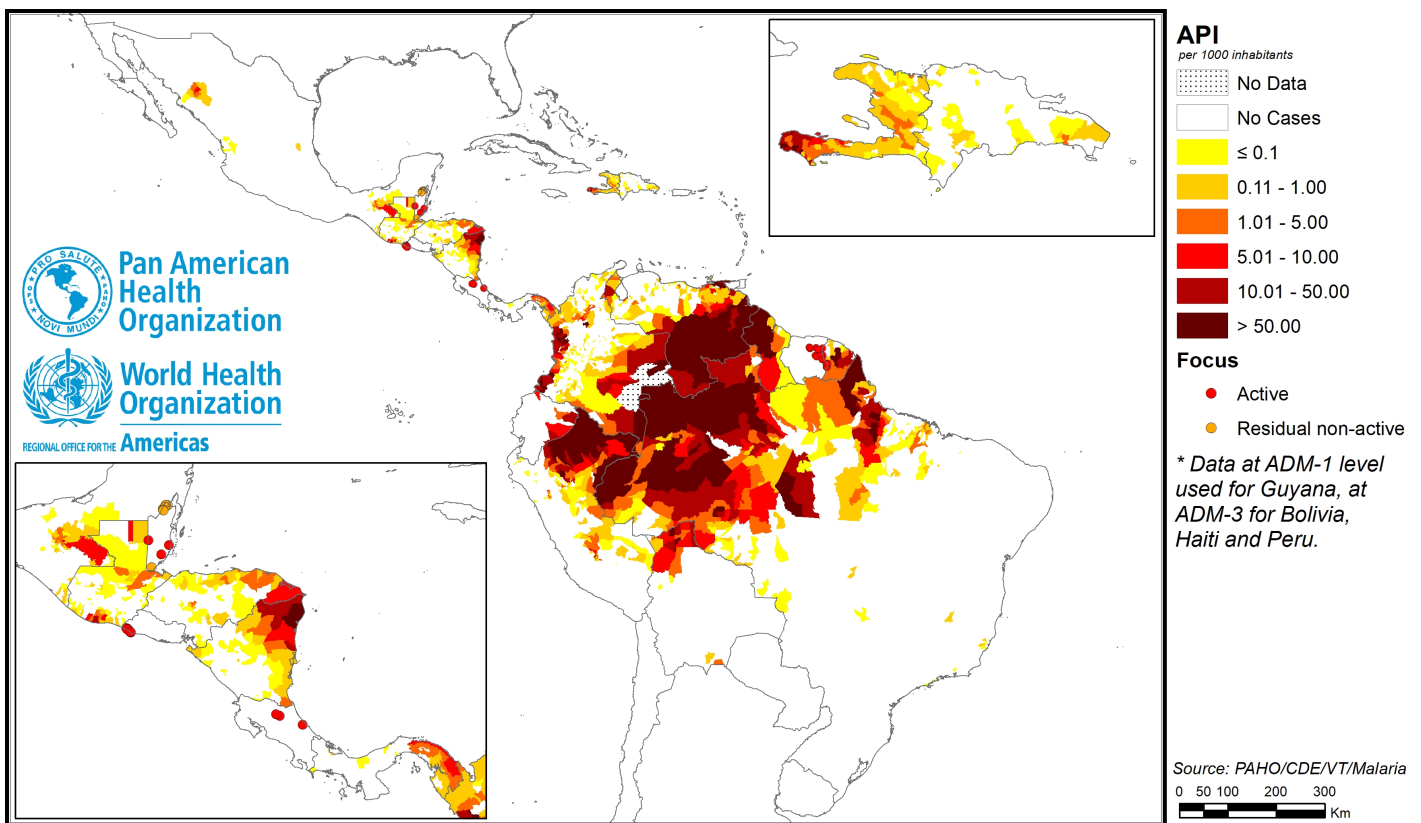
Figure 6. Municipalities (ADM-2) with high malaria burden in countries of the Mesoamerican sub-region, 2015 - 2017

Municipality	State	Country	2015	2016	2017
Puerto Cabezas	*RACCN	Nicaragua	673	1,309	7,954
La Gomera	Escuintla	Guatemala	1,935	1,655	1,253
Rosita	*RACCN	Nicaragua	340	818	1,151
Waspan	*RACCN	Nicaragua	414	441	710
Siuna	*RACCN	Nicaragua	45	14	362
Masagua	Escuintla	Guatemala	807	565	359
Tiquisate	Escuintla	Guatemala	424	615	317
Prinzapolka	*RACCN	Nicaragua	393	74	315
Puerto Lempira	Gracias A Dios	Honduras	954	1,854	314
El Estor	Izabal	Guatemala	301	235	301
**Santa Lucia	Escuintla	Guatemala	246	211	300
Guna Yala	Guna Yala	Panama	200	270	300
Panzos	Alta Verapaz	Guatemala	453	172	234
Roatan	***Islas De La	Honduras	88	150	217
Chepo	Panama	Panama	136	216	142
El Progreso	Yoro	Honduras	191	273	136
Bonanza	*RACCN	Nicaragua	42	55	126
Batopilas	Chihuahua	Mexico	16	26	114
Chisec	Alta Verapaz	Guatemala	128	38	105
****Nueva Conce	Escuintla	Guatemala	86	84	100
*****Santa Cata	Alta Verapaz	Guatemala	59	29	90
Sitala	Chiapas	Mexico	12	52	85
Sonaguera	Colon	Honduras	167	274	82
Chilon	Chiapas	Mexico	17	30	80
Santa Catalina	Ngobe-Bugle	Panama	34	107	77



*RACCN- North Caribbean Coast Autonomous Region, ** Santa Lucia Cotzumalguapa, ***Islas de la Bahia, ****Nueva Concepcion, *****Santa Catalina la Tinta

Figure 7. Malaria by Annual Parasite Index (API) at the second administrative level (ADM-2) in the Americas - 2017



Between 2016 and 2017, Venezuela, Brazil, Colombia, Panama, and the Dominican Republic were the countries that reported the greatest declines in coverage by IRS.

Among these countries, Venezuela showed the most drastic reductions (99%), compared to 2015 and 87% compared to 2016. Bolivia's 2017 policy adoption included free distribution of ITNs/LLINs to all age groups and through mass campaigns. Furthermore, IRS is recommended by the malaria control program. Bolivia, along with Costa Rica, Nicaragua, and Peru exhibited the most important increases in IRS coverage. In particular, there was an 80% increase in IRS in Nicaragua largely due to an organized response to the outbreak in Puerto Cabezas.

Resistance to insecticides

In 2017, the structure of the Americas Network for Surveillance and Insecticide Resistance Management led to more countries developing their surveillance and management plans for insecticide resistance for Anopheles than previous years. The following 13 endemic countries are in the development phase of their respective plans (Brazil, Bolivia, Colombia, Costa Rica, Dominican Republic, Ecuador, Guatemala, Guyana, Haiti, Honduras, Mexico, Nicaragua, and Paraguay).

Meanwhile, Argentina, Panama, Peru, and Suriname are in the initial consultation stages of their entomological surveillance and insecticide resistance management plans. Although Panama and Suriname have not begun their development of the plans, they expressed their desire to comply with the policies and strategic frameworks surrounding malaria. In 2017, Costa Rica, Guatemala, Colombia, Honduras, and French Guiana carried out sensitivity tests on Anopheles.

Diagnosis and treatment

The diagnosis and timely treatment are paramount for malaria control. In 2017, the uptake of rapid diagnostic tests for malaria (RDT) performed in endemic countries continued to expand by more than 100,000, compared to 2012 (from 220,529 to 364,878). This demonstrates the adoption of the strategy at the national and regional level as well as a possible improvement in access to diagnosis.

The proportion of cases treated within the first 72 hours after the onset of symptoms exceeded 70%, as reported by Bolivia, Brazil, Ecuador, Peru, and Suriname (Fig. 9).

Figure 8. Municipalities (ADM-2) with high malaria burden in countries of the Island of Hispaniola, 2015 - 2017

Municipality	State	Country	2015	2016	2017
Les Irois	Grand-Anse	Haiti	365	781	1,500
Les Anglais	Sud	Haiti	371	1,238	1,493
Port-a-Piment	Sud	Haiti	71	107	1,392
Jeremie	Grand-Anse	Haiti	1,801	2,029	1,358
Anse d'Hainault	Grand-Anse	Haiti	777	1,462	1,320
Dame-Marie	Grand-Anse	Haiti	1,332	1,746	1,112
Roseaux	Grand-Anse	Haiti	1,183	1,981	798
Bonbon	Grand-Anse	Haiti	53	222	635
Abricots	Grand-Anse	Haiti	282	606	588
Corail	Grand-Anse	Haiti	433	417	526
Croix-Des-Bouquets	Ouest	Haiti	1,077	1,468	412
Verrettes	Artibonite	Haiti	113	299	398
Baraderes	Nippes	Haiti	105	104	395
Tiburon	Sud	Haiti	131	335	366
Chardonnières	Sud	Haiti	124	280	360
Port-Salut	Sud	Haiti	42	234	353
Delmas	Ouest	Haiti	1,628	831	334
Les Cayes	Sud	Haiti	90	316	301
St. Louis du Sud	Sud	Haiti	10	537	283
Port-au-Prince	Ouest	Haiti	659	562	259
Pestel	Grand-Anse	Haiti	336	499	254
Cavillon	Sud	Haiti	171	63	238
Anse a Veau	Nippes	Haiti	33	32	210
Torbeck	Sud	Haiti	13	65	200
*Petite Riviere de	Nippes	Haiti	11	37	142

Change from previous year

Decrease (orange bar), Increase (black bar)

2015 2016 2017

*Petite Riviere de Nippes
Data at commune level used for Haiti

Nonetheless, it is likely due to confusion on the part of the countries that report the time elapsed between sampling (not since the onset of symptoms) and start of treatment. Strengthening the capacities of national programs to maximize the supply of inputs to combat malaria is a prerequisite for adequate access to diagnosis and antimalarial treatments.

Vulnerable populations

Between 2013 and 2017, people who are living in conditions of vulnerability saw a significant increase in cases. During this period, a one-fourth increase was observed among pregnant women and indigenous populations. Nicaragua and Venezuela presented the highest number of cases among pregnant women. During the same period, eight of the endemic countries showed a decrease. With 33,103 cases, Venezuela presented the highest number of cases in indigenous people among the endemic countries in 2017, a 50% increase since 2013. Guatemala, Haiti, Honduras, and Panama have improved the quality of data on pregnant women while Peru needs to continue improvement. In many malaria endemic countries, poor and disadvantaged people with limited access to health facilities and treatments are disproportionately affected by the disease. Atures in Amazonas State, where the indigenous people live, was hit hard by cases of malaria, with fourfold increase in cases.

One-third of the cases in miners were found in countries within the Guiana Shield (Fig. 10). Since miners search for gold in watery pits, which serve as breeding grounds for mosquitos, tens of thousands of illegal miners contract the disease. The economic activity that promoted migration and to Bolivar state from other states has resulted in the rapid spread of the disease among the indigenous people who come in contact with the miners and those living in other states as the miners return to their homes.

The proportion of cases among miners in Suriname decreased by 80% between 2013 (629 cases) and 2017 (134). In 2017, one-fourth of the total cases were among miners. Suriname is showing progress through the Ministry of Health Malaria Programme, which targets vulnerable populations such as mobile migrant gold miners. The programme provides malaria services in a migrant clinic in Paramaribo, operates a small number of border malaria-screening posts along the border with French Guiana, maintains a malaria service deliverer (MSD) network in gold-mining areas, performs active case detection surveys in remote mining areas, and implements Malakit- an innovative pilot project used for self-diagnosis and self-treatment.

Cases imported from malaria in endemic countries

In 2017, 8,411 imported cases were reported by 14 of the endemic countries in the Americas. One-third of these cases occurred in Venezuela (2,941) while Brazil accounted for almost two-thirds of the infections. During the same period, almost all of the imported cases (7,686) in the Americas originated in four countries (Venezuela, Guyana, Colombia, and Peru). Brazil reported the largest number of cases detected in its territory imported from other countries (4,148 cases).

Financing

Most of the budget for malaria control the Americas between 2013 and 2017 came from national government resources. During this period, the government invested just over 900 million dollars, representing approximately two-thirds of total financing in the Americas (Fig. 12). Between 2013 and 2017, eight countries (Bolivia, Brazil, Colombia, Costa Rica, Dominican Republic, El Salvador, Panama, and Suriname) showed a decline in malaria funding from the national government. Ecuador showed a 71% decline between 2016 (US \$20,000,000) and 2017 (US \$5,835,716). This is due to the earthquake response in Ecuador in 2016 and the ensuing increase in vector control budget; budget for only malaria control is difficult to estimate in integrated vector control programmes.

Between 2012 and 2017 the investment from the United States Aid for International Development and the Global Fund to Fight AIDS, Tuberculosis and Malaria for the Americas amounted to approximately US \$ 140 million (Fig. 12). In 2017, government funding reached US \$ 145 million, which was 70% of the total budget for that year, slightly lower than in 2016. Seven endemic countries (Brazil, Colombia, Guatemala, Guyana, Nicaragua, Paraguay, and Peru) increased their government budget in 2017 compared to 2016.

Table 3. First line of treatment for malaria by species type in the Región of the Américas

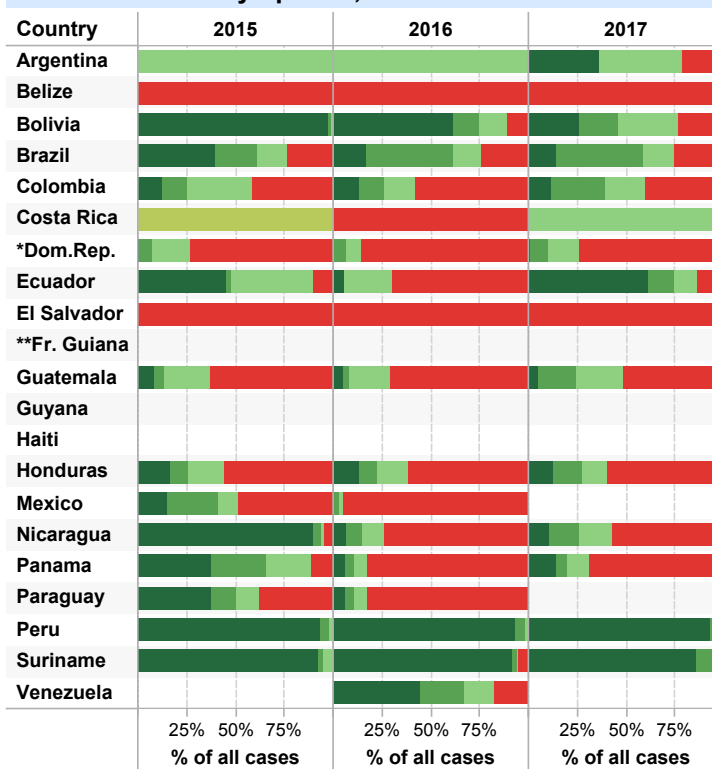
Country	P. vivax	P. falciparum
Argentina	CQ+PQ	AL+MQ,CL,DO
Belize	CQ+PQ(14d)	CQ+PQ(1d)
Bolivia	PQ+CQ(7d)	AL+PQ
Brazil	CQ+PQ(7d);CQ+PQ(14d)	AL+PQ;AS+MQ+PQ
Colombia	CQ+PQ(14d)	AL+PQ(1d)
Costa Rica	CQ+PQ(7d);CQ+PQ(14d)	CQ+PQ(1d)
Dominican Republic	CQ+PQ(14d)	CQ+PQ(1d)
Ecuador	CQ+PQ(7d)	AL+PQ
El Salvador	CQ+PQ(14d)	AL
French Guiana	CQ+PQ	AL;AQ+PG
Guatemala	CQ+PQ(14d)	CQ+PQ(3d)
Guyana	CQ+PQ(14d)	AL+PQ(1d)
Haiti	CQ+PQ(14d)	CQ+PQ(1d)
Honduras	CQ+PQ(14d)	CQ+PQ(1d)
Mexico	CQ+PQ	CQ+PQ
Nicaragua	CQ+PQ(7d)	CQ+PQ(1d)
Panama	CQ+PQ(7d);CQ+PQ(14d)	AL+PQ(1d)
Paraguay	CQ+PQ(14d)	AL+PQ
Peru	CQ+PQ(7d)	AS+MQ+PQ(1d)
Suriname	CQ+PQ(14d)	AL+PQ(1d)
Venezuela	CQ+PQ(14d)	AS+PQ(1d)

CQ- Chloroquine PQ- Primaquine MQ- Mefloquine AS- Artesunate AL- Artemether & Lumefantrine AQ- Atovaquone CL- Clindamycin DO- Doxycycline

For P. falciparum- (3d): 15 mg of Primaquine per day for 3 days (adults)
 (1d): 45 mg of Primaquine in one dose on 1st day (adults)
 For P. vivax- (14): 15 mg of Primaquine per day for 14 days (adults)
 (7): 30 mg of Primaquine per day for 3 days (adults)

* Artemisinin-based combination therapy (ACT) is used for imported cases of P. falciparum in countries using CQ as first-line treatment for this species.

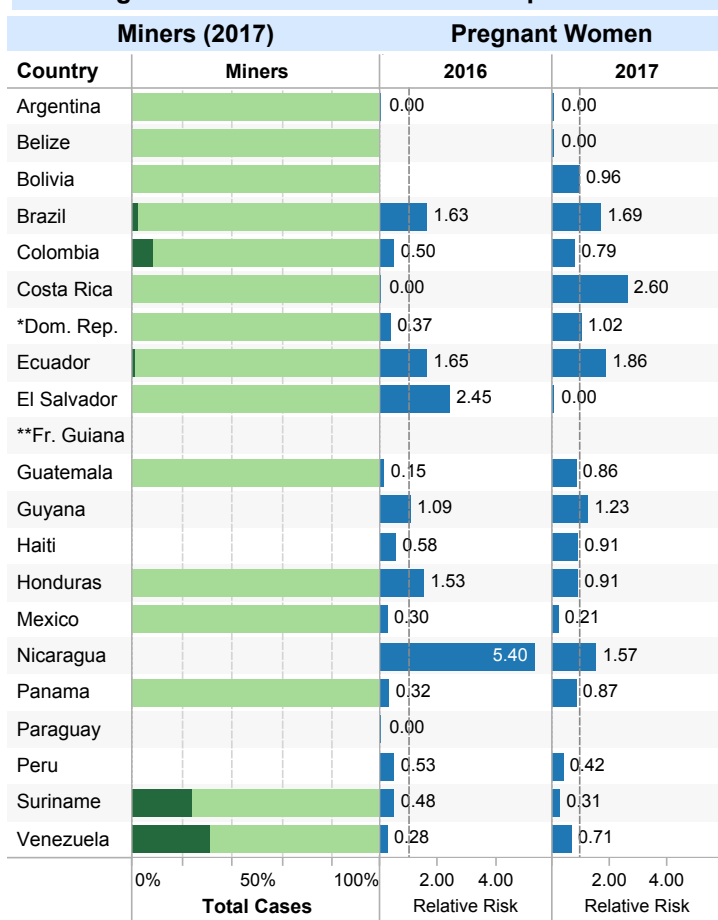
Figure 9. Time taken for treatment since the onset of symptoms, 2015 - 2017



*Dominican Republic **French Guiana

Time taken
 Same day (dark green) 2-3 days (light green) >3 days (red)
 1 day (medium green) Less than 3 days (yellow-green)

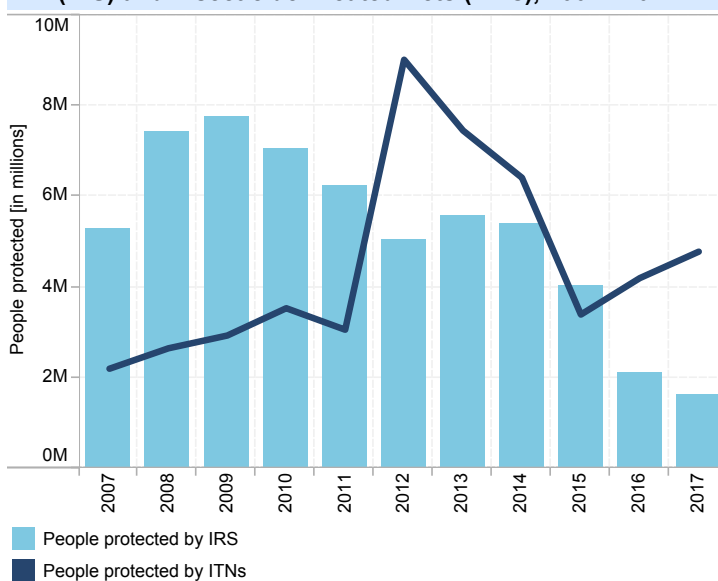
Figure 10. Malaria in Vulnerable Populations



* Dominican Republic **French Guiana

Miners Others

Figure 11. People protected by Indoor Residual Spraying (IRS) and Insecticide-Treated Nets (ITNs), 2007 - 2017

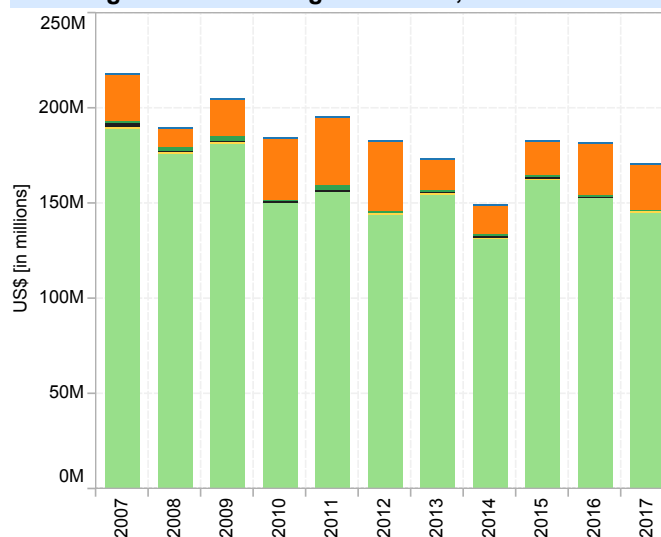


People protected by IRS
People protected by ITNs

However, there were increases in malaria in three of these seven countries: Brazil, Guyana, and Nicaragua.

In contrast, during 2017, government funding declined in Bolivia, Costa Rica, Dominican Republic, Mexico, Panama, and Suriname from the previous year. Despite the steady decrease in funding in the last five years (US \$ 787,966 in 2013 and US \$451,993 in 2017), Bolivia exhibited a 20% decline in confirmed cases. In order to continue its commitment to providing free malaria prevention tools to miners and other hard-to-reach and mobile populations, Suriname must increase its government contribution for its elimination strategy as funding has been steadily declining since 2013.

Figure 12. Financing for malaria, 2007 - 2017



*Data unavailable for Costa Rica and Ecuador (2014), French Guiana (2007-13 & 2017), Guatemala (2009 & 2010), Haiti (2007-11), Honduras (2015), Nicaragua (2009), Peru (2009 & 2014), Suriname (2007, 2009-17) and Venezuela (2007-08 & 2017).

Funding Source
Bilaterals USAID World Bank
GFATM UN Agencies Gov. budget

Malaria in non-endemic countries

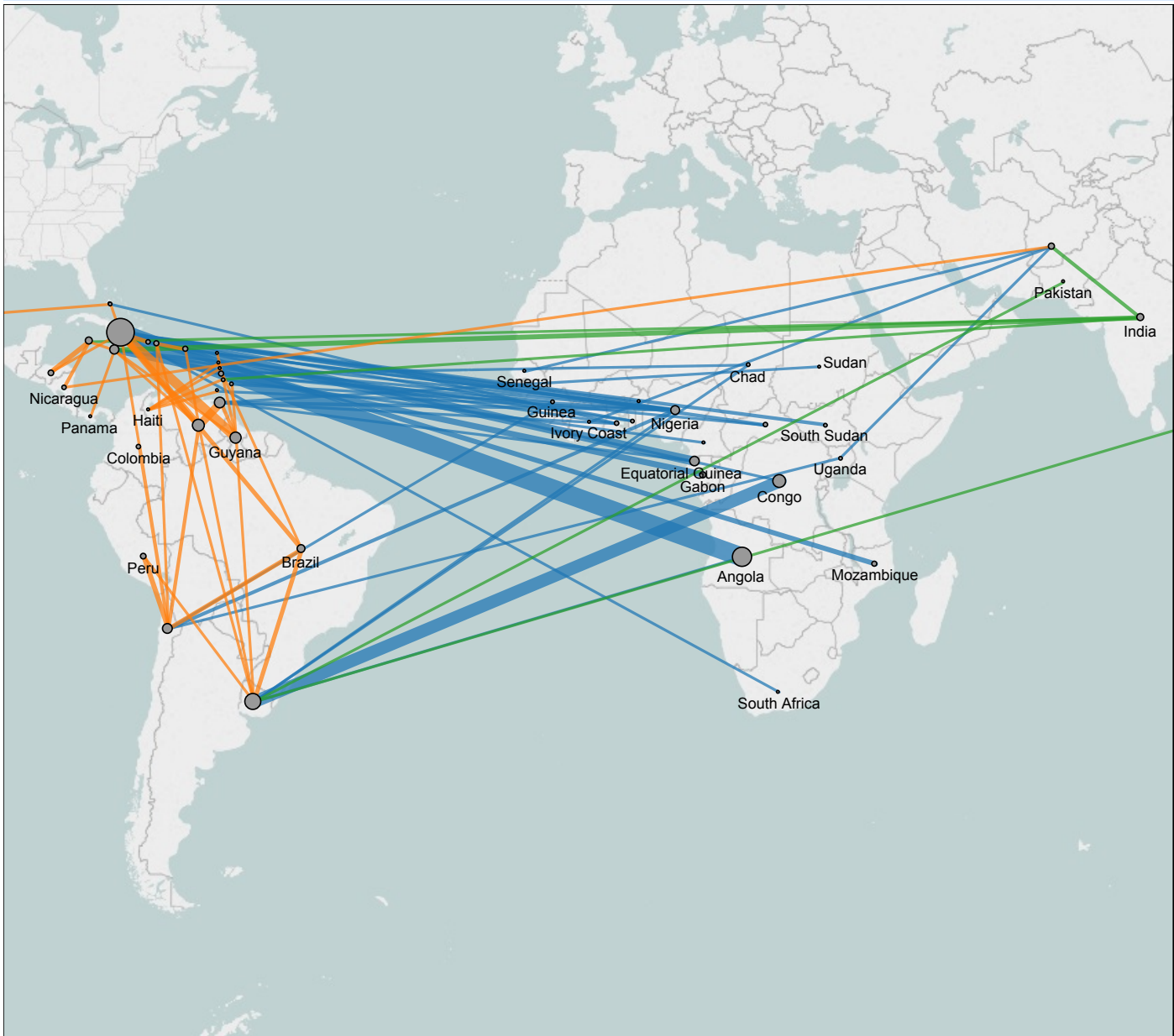
General situation of non-endemic countries

In 2017, 19 of the 32 of the non-endemic countries in the Americas reported a total of 106 cases of malaria and no associated deaths were reported, excluding the United States and Canada (Table 4). Cuba (36) and Uruguay (23) reported the highest number of malaria cases among the non-endemic nations of the Americas.

Large number of imported cases from Guyana and Venezuela were reported in Cuba. Seven of the cases reported in Uruguay were imported from the Americas, mainly Brazil. Increased imported cases from Honduras to the Cayman Islands may be due to the availability of direct flight services that connects both countries.

Almost all of the imported cases in Trinidad and Tobago (11 out of 12 cases), were from Venezuela. Due to the geographical proximity, Trinidad and Tobago is a convenient destination where Venezuelan migrants go to for various reasons. The risk of having re-established malaria transmission in this country remains high and calls for robust surveillance. Of the total cases in non-endemic countries reported between 2015 and 2017, almost half were caused by *P. falciparum* and mixed infections, and the species is unknown in almost 10% of the cases.

Figure 13. Malaria by country from which cases were imported by non-endemic countries in the Region of the Americas, 2015 - 2017



* Does not include cases reported imported by Canada & United States of America.

Import Region

- Americas
- Asia
- Africa

Number of cases

- 0
- 50
- 100
- 134

Table 4. Number of malaria cases in non-endemic countries of the the Region of the Americas, 2007 - 2017

Country	Year										
	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017
Anguilla		0	0		0	0	0				
Antigua & Barbuda		1	0	1	1	0	0	0	0	0	0
Aruba									0	0	0
Bahamas	6	14		1	6	2	2	3	0	0	2
Barbados			2	2	10	9	5	2	2		
Bermuda								2	2	2	2
Bonaire											0
British Virgin Islands		0		0			0	0	0		
Canada	397	381	364	514	517	480	490	449	552	612	114
Cayman Islands				1	1	3		0	5	1	1
Chile	5		4	3	5	10	6	4	8	8	21
Cuba	35	19			28	32	48	37	29	71	36
Curaçao									0	0	0
Dominica	0		0	1	1	0	1		0	1	0
Grenada	0	0	1	0	0	1	2	0	1	0	0
Guadeloupe		12	0	8	1	2	2	1	1	2	
Jamaica	199	22	22	12	9	5	6		4	3	8
Martinique		14	11	7	13	2	9	5	4	2	
Montserrat		0	0	0	0	0	0				
Puerto Rico	3	2	3	5	2	1	1	1	5	4	0
Saba								0	0	0	0
Saint Barthelemy			0			1					
Saint Kitts & Nevis		0	1	1	1	0	0				
Saint Lucia	0		1		1	2	1	1	1	1	1
Saint Martin			2	1	7	1	0	0	0	0	
*Saint Vincent & the G	0	1		2	0	0					
Sint Maarten								0	0	0	0
Trinidad & Tobago	16	22	24	23	10	19	13	12	8		12
United States of America	1,505	1,298	1,484	1,691	1,925	1,687	1,741	1,725	1,517	2,053	1,744
Uruguay		12	5		2	7	13	2	7	14	23
US Virgin Islands	0	0	0	0	0	0	0	0	0	0	0
Grand Total	2,166	1,798	1,924	2,273	2,540	2,264	2,340	2,244	2,146	2,774	1,964

*Saint Vincent & the Grenadines **Blank spaces imply no data available ***Preliminary data from Canada for 2016 & 2017 and from USA for 2017

Table 5. Imported cases in non-endemic countries of the Americas by country / Region of origin, 2015 - 2017

Country/Region from which malaria was imported	Country / Territory														U.S.A.	Uruguay		
	Antigua & Barbuda	Bahamas	Barbados	Bermuda	Canada	Cayman Islands	Chile	Cuba	Dominica	Grenada	Guadeloupe	Jamaica	Martinique	Puerto Rico			Saint Lucia	Trinidad & Tobago
Bahamas							1											
Brazil							3	3					1				11	3
Colombia							2	1									5	
Dominican Republic					3		1						2				42	1
El Salvador																	1	
Guatemala																	25	
Guyana	0	1					16				1				2	19	1	
Haiti					2		3	0	0	0					0		33	
Honduras					4	4	1										15	
Jamaica						1												
Mexico		1															3	
Nicaragua				1		2											1	
Panama							1										1	
Peru					6		4										22	1
Venezuela							2	8			1	1			11	3	1	
Trinidad															1			
*Central America, unsp																	10	
Africa	1	1	1	3	255		4	99	1	1	1	8	3	1	1	5	2,867	35
Asia				2	25	1		1				4			1		294	2
Oceania																	7	
Unknown				11							1				1		138	

Countries of Americas
1 42

Other Regions
1 2,867

* U.S.A. - United States of America

*Central America, Unspecified