

# 15 | Nicaragua

## Overview of the situation

### Figures 1-5

There has been a significant decrease in the number of cases of malaria in Nicaragua in recent years. A total of 762 cases were reported in 2008; of those, 231 were transmitted by *Plasmodium vivax*. The country's North Atlantic Autonomous Region (RAAN) reported the highest number of cases by this species; it was also the place of origin of 52 of the 61 *Plasmodium falciparum* cases reported in the country.

Waspan, a municipality close to the Honduran border, reported 172 cases in 2008, or 22% of the national total. Malaria transmission in this region particularly affects the Miskito population near the Honduran Province of Gracias a Dios, the country's most concentrated area of transmission. Malaria foci were also present in the Department of Chinandega, on the Pacific coast, but transmission there was exclusively by *P. vivax*. The Department of Managua registered 15% of the total number of cases reported nationally, though a significant proportion of them originated in other regions of the country.

The vector species responsible for malaria transmission in Nicaragua are *Anopheles albimanus* and *A. pseudopunctipennis*; the latter is responsible for summer transmission in some regions.

According to epidemiological risk stratification, 68 of the country's 154 municipalities are low-risk, and 86, minimum-risk. In minimum-

risk cases, local malaria transmission is interrupted over periods of one to three consecutive years.

## Morbidity and mortality trends

### Figures 4 – 9

Between 2000 and 2008, the number of cases of malaria in Nicaragua fell by 97% in the case of *P. vivax* malaria, and by 96% in cases by *P. falciparum*. Only 61 cases of the latter form of malaria were reported in 2008 and, by year-end, only two municipalities had reported more than 10 cases each. The control program is, therefore, in a very favorable position for moving ahead with the elimination of *P. falciparum* malaria.

In 2005, six malaria deaths were reported in Nicaragua. In 2006, the number of cases of *P. falciparum* malaria fell and, consequently, only one death was reported. In 2008, an individual from Nigeria died from *P. falciparum* malaria that was apparently resistant to first-line antimalarial drugs used in Nicaragua. The country's geographical location and the heavy migration of Nicaraguans to Africa create a unique risk. Special situations, like those of the last two years, require that antimalarial drugs for drug-resistant *P. falciparum* malaria be available.

## Geographical distribution

### Figures 1, 12-19

A total of 37% of the country's malaria transmission, of which 83% are by *P. falciparum*, is con-

centrated in the RAAN SILAIS. The Municipality of Waspan in the RAAN alone reported 22% of the country's total number of cases, and 58% of those by *P. falciparum*. This constitutes a considerable concentration of malaria, although not as pronounced as in other countries of the subregion. Chinandega (to the west), ranked second among SILAIS in number of cases, and reported 161 cases of malaria, or 21% of the country's total.

Of the total number of cases in Nicaragua, 87% were reported in four SILAIS (RAAN, Chinandega, Managua and Matagalpa), and 75% of the burden of disease is concentrated in 11 municipalities. The Municipality of Siuna, in the RAAN, had the third highest number of cases, together with El Viejo Municipality (Chinandega). It also reported a significant percentage of cases, nearly 25%, by *P. falciparum*. San Rafael del Sur, in a tourist area on the Pacific coast, was the municipality of the Managua SILAIS with the highest number of cases (70), all of them of by *P. vivax*.

The national API was low (0.13 cases per 1000 population), even in those municipalities with higher morbidity, such as Waspan (3.2 cases per 1000 population).

Some determinants of the disease, like internal and external migration and agricultural activity in the Pacific area and in northern Nicaragua, keep *P. vivax* transmission active. Sugarcane and coffee cultivation alone mobilize close to 500,000 people. These are the same determinants of recurrence and reinfection in the Departments of Chinandega and Matagalpa. Efforts are under way to address the needs of these populations, including improvements in surveillance systems and strategies for achieving better treatment adherence.

## Malaria in specific populations

### Figures 25–28

In 2008, 11% of malaria cases reported in Nicaragua occurred among children under the age of five years. This proportion is higher than that of other countries in the Region, and could be indicative of the prevalence of household transmission.

The proportion of cases resulting from urban transmission was also very high (66.1%). The Municipality of Rosita in the RAAN had the highest percentage of cases of urban transmission.

The Autonomous Atlantic Region, with its predominantly Miskito population, plays a prominent role in terms of the country's burden of disease from malaria. In 2008, 26.4% of the country's cases of malaria occurred among its indigenous population. This percentage is higher than that reported by most countries in the Region. No malaria cases were reported among pregnant women in 2008.

## Diagnosis and treatment

### Figures 20-24, 29–30

In 2008, the National Malaria Program conducted 532,342 blood slide examinations among febrile patients. The slide positivity rate was 0.1%, the country's lowest rate since 2000, and the lowest SPR of the hemisphere's malaria endemic countries.

In the Department of Managua, of 130,911 tests conducted, only 116 were positive. Considerably more tests were performed in this department than in the RAAN, where the number of cases was much higher (283). The slide examination rate in the country was 9.4%. An analysis of these parameters is important for determining the cost-effectiveness of interventions and the operating criteria responsible for the high testing rate, considering that malaria is clearly focalized.

In 2008, 10,000 rapid diagnostic tests were conducted. This strategy has been used in difficult to reach communities and by special health brigades that provide comprehensive medical care, support the search for active cases, and improve access to treatment.

The information system does not record the time between the onset of symptoms and diagnosis. Improvements to the information system are expected to result from the program's strategic reorientation during its current pre-elimination phase.

In 2006, the radical treatment regimen for *P. vivax* malaria was modified by reducing the duration of the full primaquine dose from 14 to 7 days. The first-line treatment for uncomplicated *P. falciparum* malaria is chloroquine + primaquine, which a recent study showed to be highly effective in dealing with the strains now circulating in the country.

The malaria treatment policy includes treatment for household partners and case collaterals. In 2008, 7,686 household partners and 7,281 collaterals were treated. In addition, 74,202 selective treatments were administered. The number of treatments distributed was very high in comparison to the number of cases parasitologically confirmed. A seven-day treatment regimen for positive cases has been in use for the past three years as part of the country's strategy to eliminate reservoirs. The plan is to reduce the number of these treatments year-by-year.

Given the country's low slide positivity rates the reporting network, made up of the health services network and voluntary community collaborators, has changed its approach by eliminating suppressive treatment, withdrawing drugs from the network, and reorienting slide examination in order to improve epidemiological surveillance of malaria.

## Prevention and vector control

### Figures 31-33

Vector control activities are conducted according to epidemiological stratification, and include: focal control of positive cases; residual spraying; insecticidal nets; and breeding site control. The use of IRS, however, has been diminishing in keeping with transmission patterns.

Fewer LLINs were distributed in 2008 than in the previous year, but still enough to ensure the coverage already attained. Distant and difficult-to-reach indigenous communities with high transmission levels were prioritized for LLIN distribution.

Because the characteristics of the terrain lead to the existence of a large number of breeding sites, biological control is widely used, particularly in the sugarcane production areas of Chinandega, tourist areas on the Pacific, Managua and rural municipalities. Physical control of breeding sites with community support has also been intensified based on the experience of the DDT/GEF Project.

## Financing of malaria control

### Figure 34

Between 2004 and 2008, the Global Fund covered a significant proportion of the cost of Nicaraguan control activities. These financial resources will be extended as of 2009, due to the approval of a new project during the Seventh Round. The new funding will not only make it possible to consolidate and strengthen the work that has already been accomplished, but also to extend coverage to 154 additional municipalities. Finally, during the Ninth Round of proposals to the Global Fund, an extension for the first project, mentioned above (2004-2008) was approved for *P. falciparum* elimination in 37 municipalities at risk; the project will contribute approximately US\$ 7 million.

Figure 1. Number of cases by ADM 2 level (municipality, district), 2008

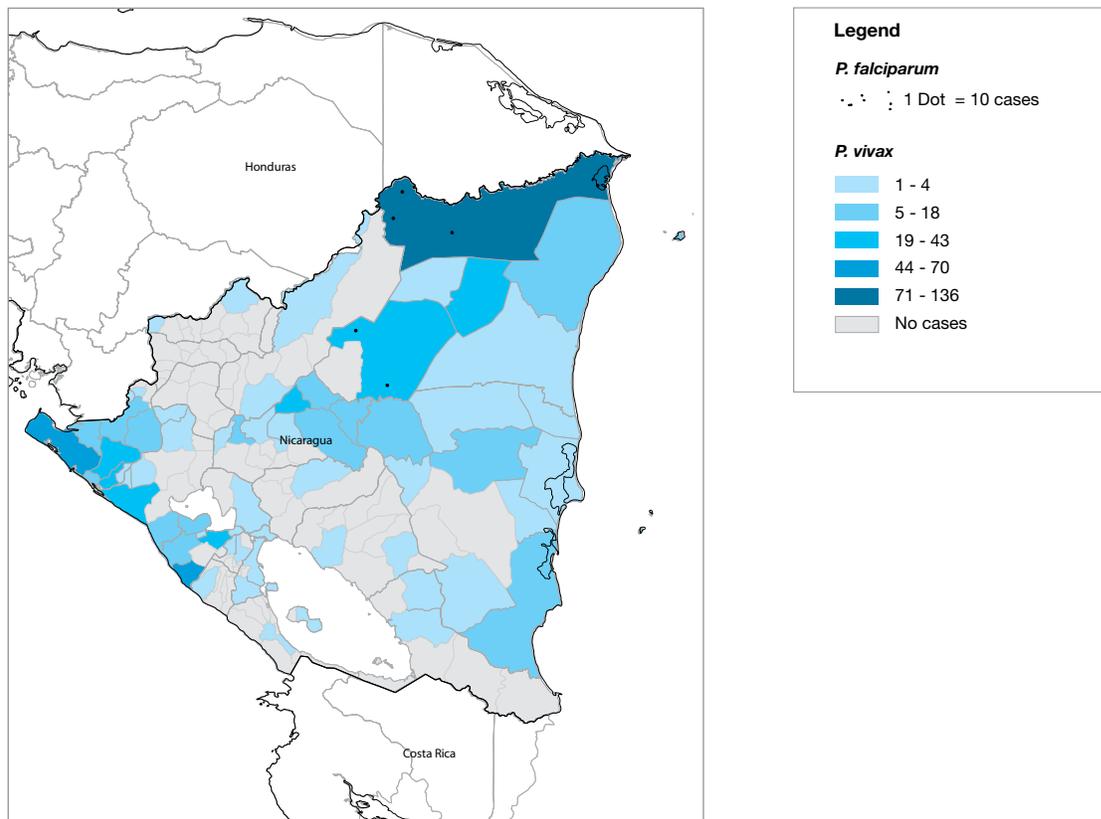
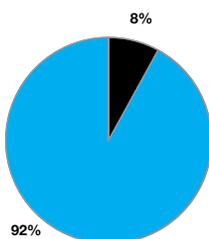


Figure 2. Proportion of cases by species, 2008



**Plasmodium species**  
■ *P. vivax*  
■ *P. falciparum* and mixed

Figure 3. Number of malaria cases by species by ADM1 level in 2008

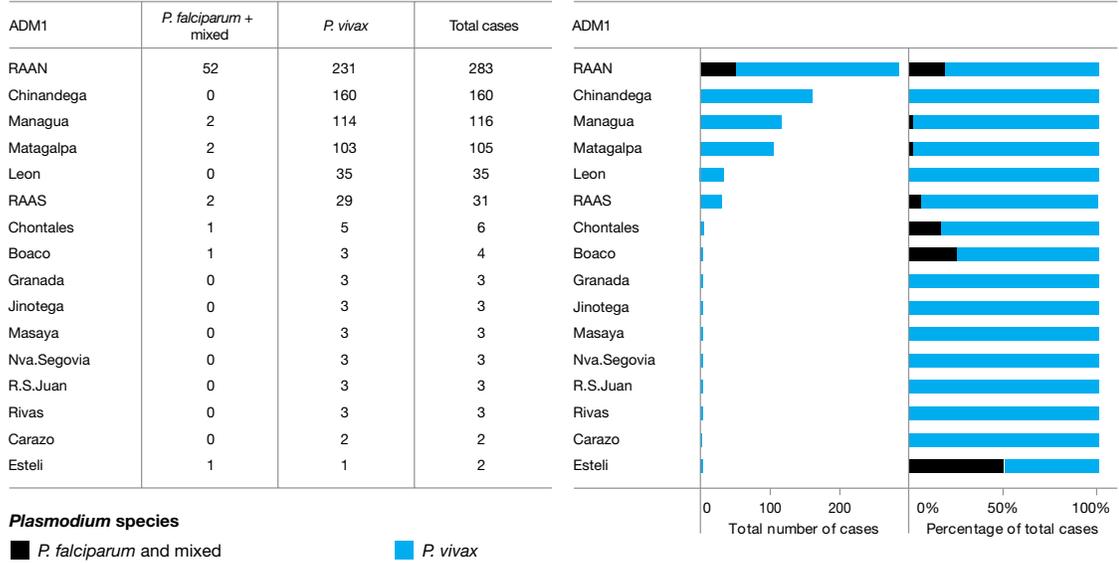


Figure 4. Number of cases by species, 2000-2008

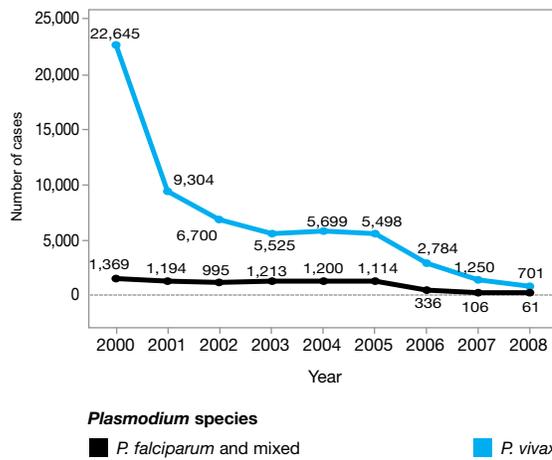


Figure 5. Number of malaria cases, 2000-2008

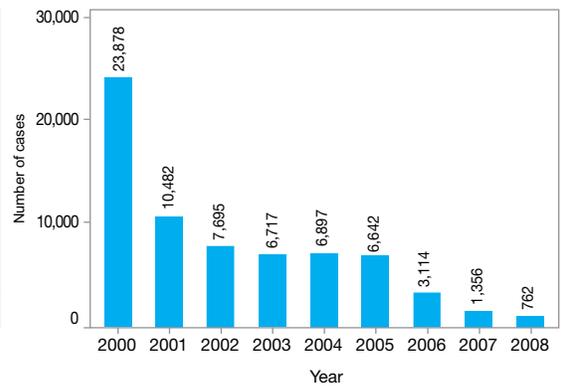


Figure 6. Number of malaria deaths, 2000-2008

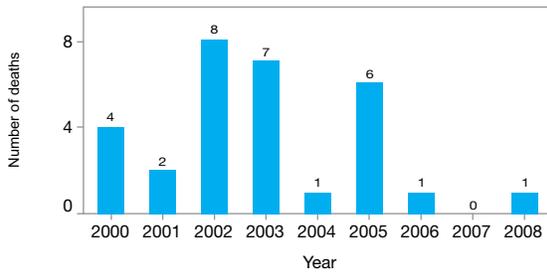


Figure 7. Number of hospitalized malaria cases, 2000 - 2008

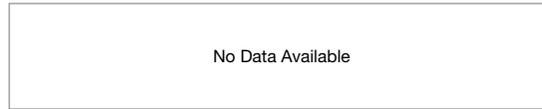


Figure 8. Annual variations in number of cases

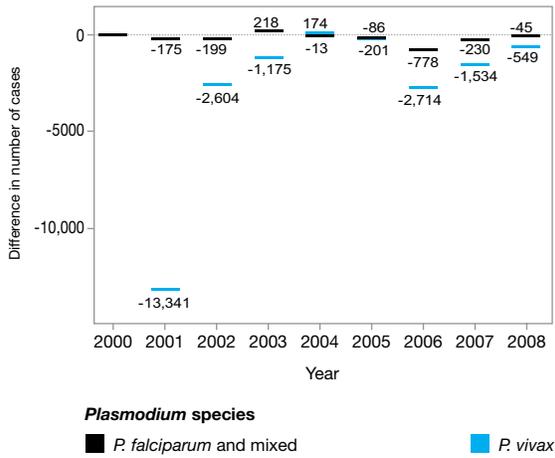


Figure 9. Percentage difference in number of cases compared to 2000

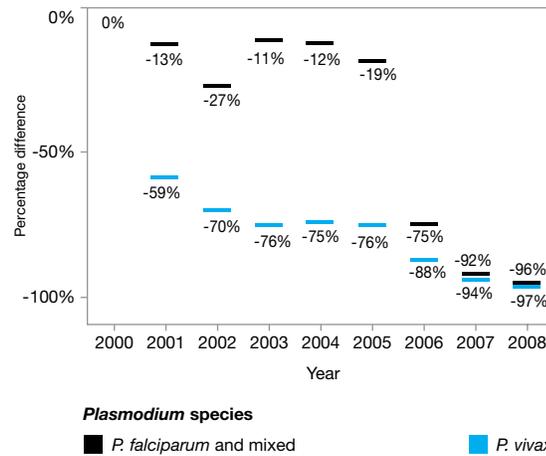


Figure 10. Number of cases and RBM / MDG targets for 2010 and 2015

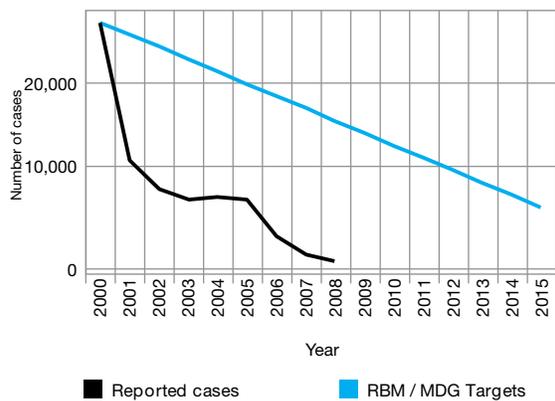
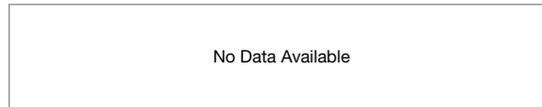
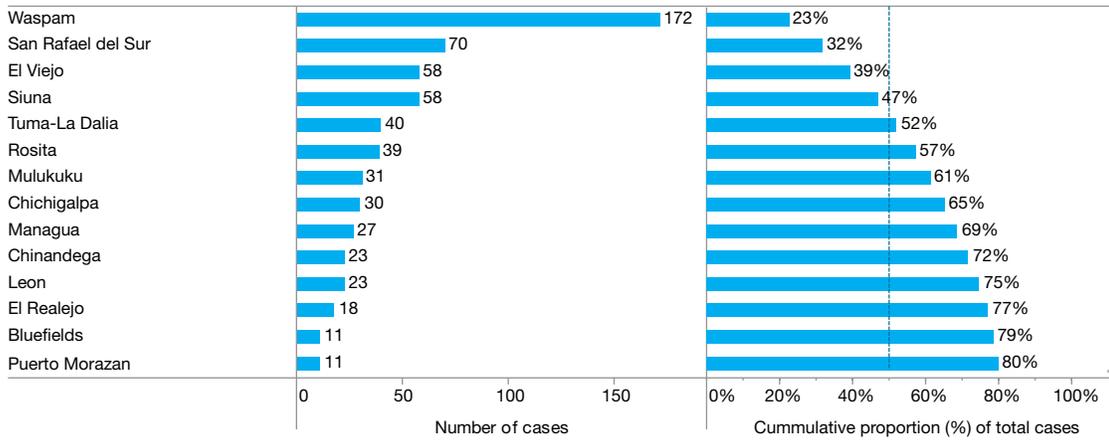


Figure 11. Percentage of hospitalized cases, 2008

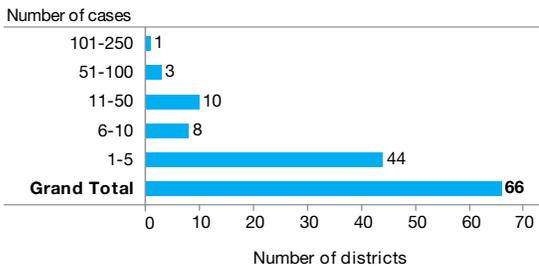


**Figure 12. Districts with highest malaria burden and cumulative proportion of total cases in the country, 2008**

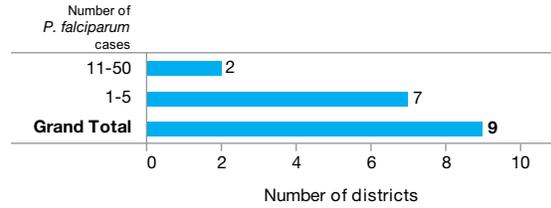


\* See Annex A for a complete list.

**Figure 13. Districts by number of malaria cases, 2008**



**Figure 14. Districts (ADM2) by number of P. falciparum cases, 2008**



**Figure 15. Districts by number of cases, API and percentage of P. falciparum cases, 2008**

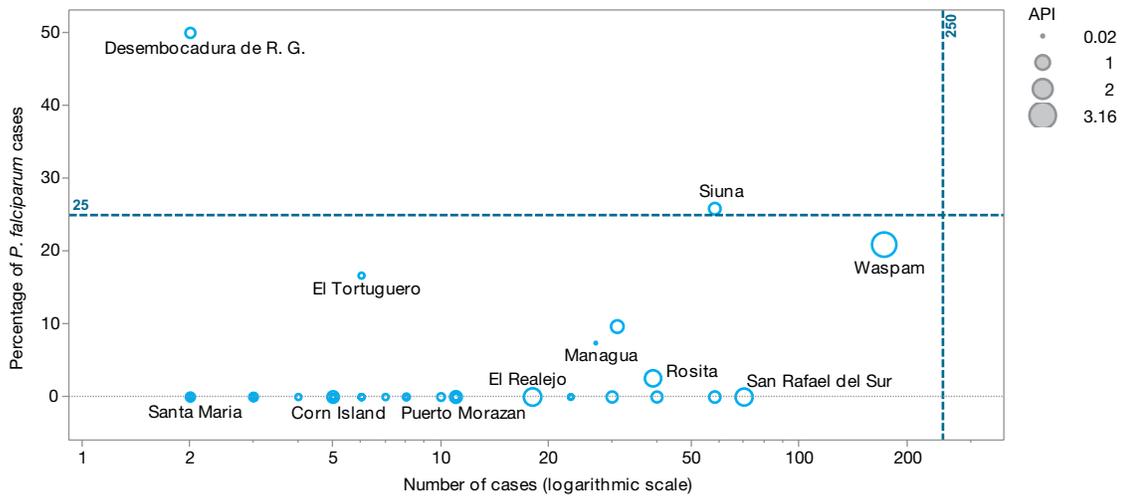


Figure 16. Annual Parasite Index (API) by districts (ADM2), 2008

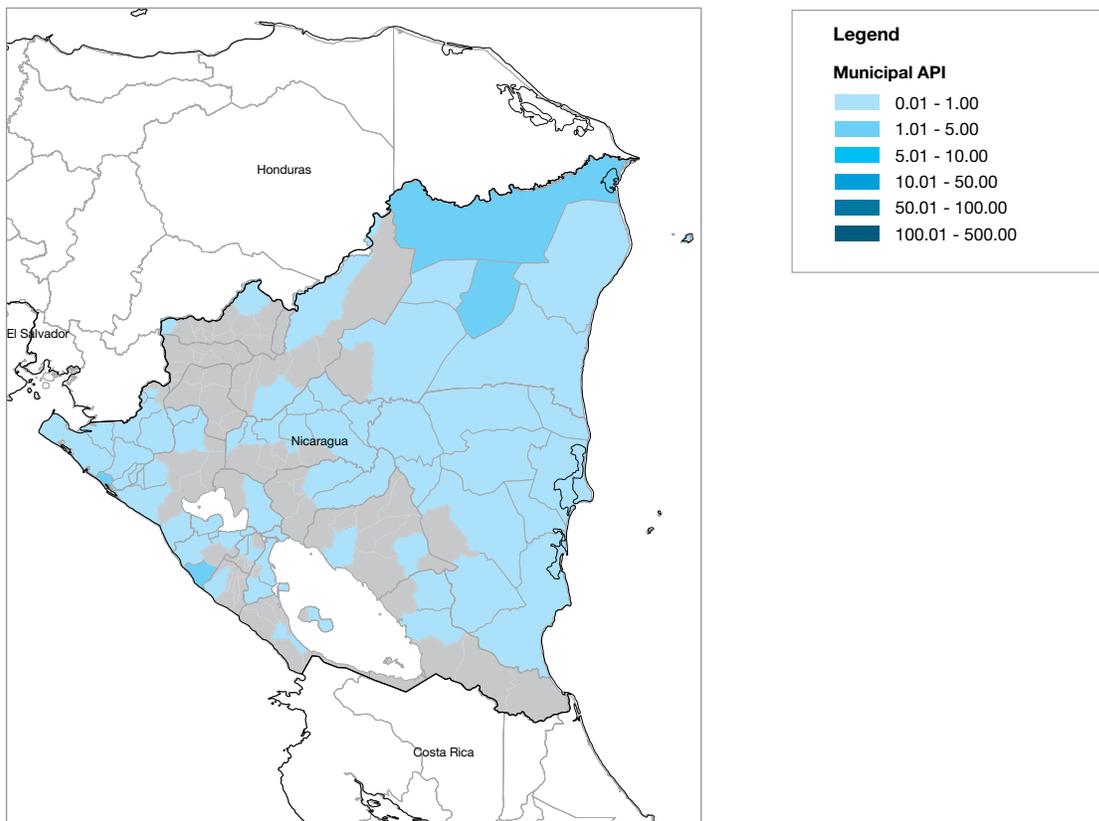
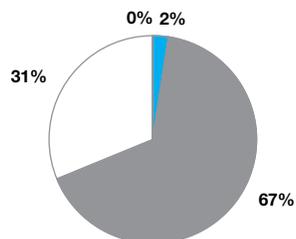


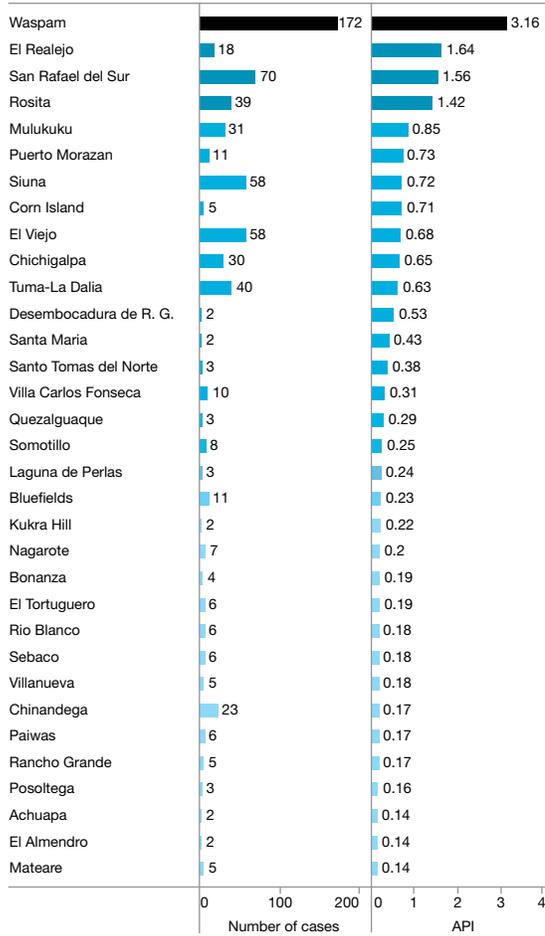
Figure 17. Population by malaria transmission risk, 2008



**Population**

- High risk (API > 10/1000)
- Medium risk (1/1000 < API < 10/1000)
- Low risk (API < 1/1000)
- Malaria free areas (No indigenous transmission)

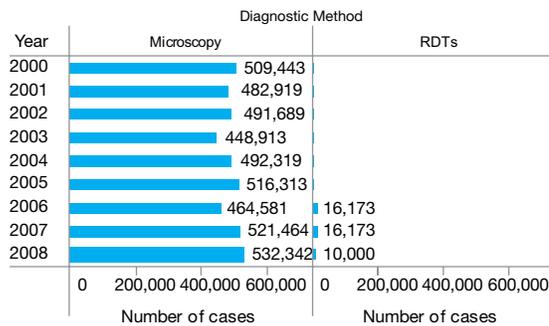
**Figure 18. Annual Parasite Index (API) and number of cases by district, 2008**



API (cases/ 1000 people at risk)  
 0 3.16

\* See Annex A for a complete list.

**Figure 21. Cases diagnosed by microscopy and RDTs, 2000-08**



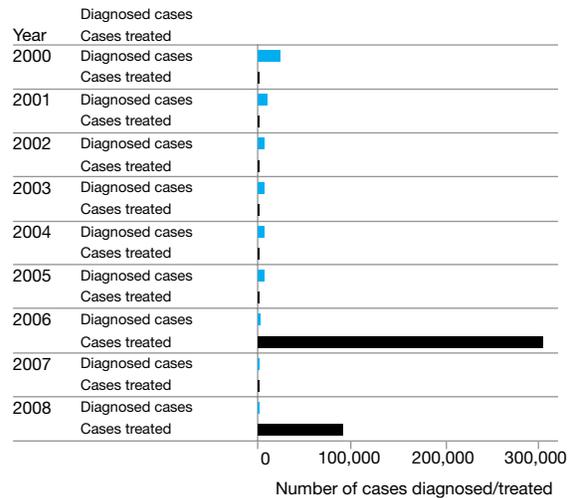
**Figure 19. Population by malaria transmission risk, 2000-08**

Year	High risk (API > 10/1000)	Medium risk (1/1000 < API < 10/1000)	Low risk (API < 1/1000)	Malaria free areas (No indigenous transmission)
2000	832,000	1,478,000	2,670,000	91,000
2001	1,165,000	759,000	3,418,000	0
2002	0	303,000	5,038,000	1,000
2003	311,000	0	5,171,000	1,000
2004	109,000	226,000	5,297,000	0
2005	340,000	246,000	4,897,000	0
2006	36,000	187,000	5,381,000	794,179
2007	0	437,775	3,520,186	1,645,278
2008	0	137,814	3,759,754	1,767,312

**Figure 20. Slides examined and Slide Positivity Rate (SPR), 2000-2008**

Year	Number of slides examined	Number of slides positive	Slide Positivity Rate (%)
2000	509,443	23,878	4.69
2001	482,919	10,482	2.17
2002	491,689	7,695	1.57
2003	448,913	6,717	1.5
2004	492,319	6,897	1.4
2005	516,313	6,642	1.29
2006	464,581	3,114	0.67
2007	521,464	1,356	0.26
2008	532,342	762	0.14

**Figure 22. Number of cases diagnosed and cases treated, 2000-2008**



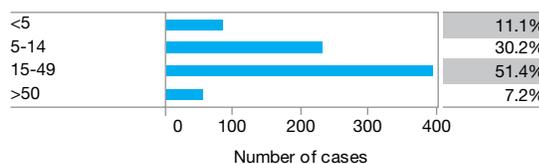
**Figure 23. Slide Positivity Rate (SPR) by ADM1, 2008**

ADM1	Examined	Total cases	SPR (%)
RAAN	33,574	283	0.84
Chinandega	80,876	160	0.2
Managua	130,911	116	0.09
Matagalpa	45,501	105	0.23
Leon	31,948	35	0.11
RAAS	15,853	31	0.2
Chontales	18,831	6	0.03
Boaco	20,977	4	0.02
Granada	20,936	3	0.01
Jinotega	36,322	3	0.01
Masaya	9,534	3	0.03
Nva.Segovia	31,270	3	0.01
R.S.Juan	10,047	3	0.03
Rivas	12,840	3	0.02
Carazo	9,991	2	0.02
Esteli	20,669	2	0.01
Madriz	2,262	0	0

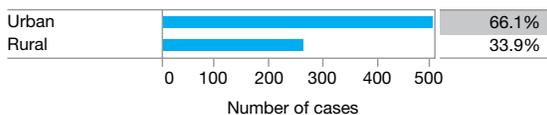
**Figure 24. Time span between onset of symptoms and diagnosis, 2008**

No Data Available

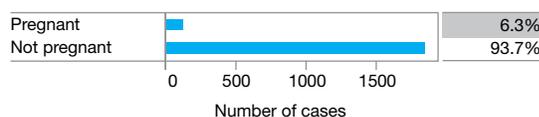
**Figure 25. Number and percentage of cases by age group, 2008**



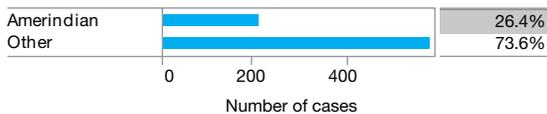
**Figure 26. Number and percentage of cases by locality type, 2008**



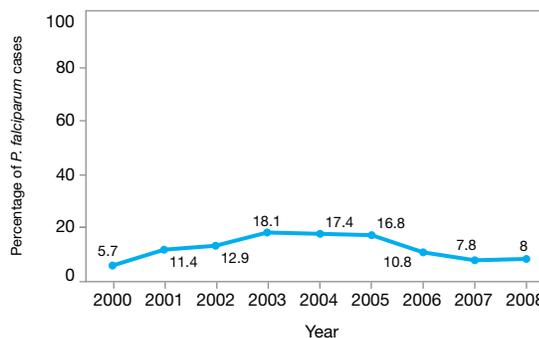
**Figure 27. Number and percentage of cases in pregnant women among women of child bearing age, 2008**



**Figure 28. Number and percentage of cases in indigenous population, 2008**



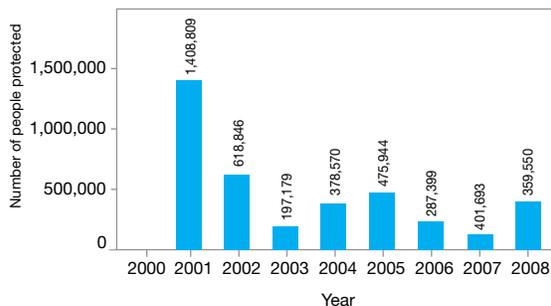
**Figure 29. Proportion of *P. falciparum* cases, 2000-2008**



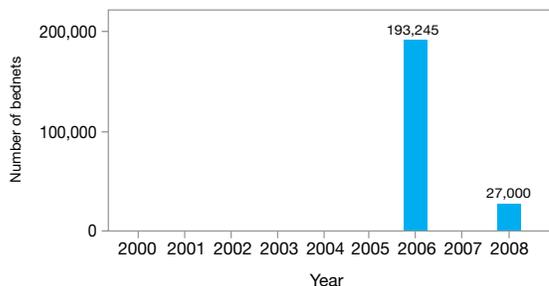
**Figure 30. Number of ACT treatments distributed by year, 2000-08**



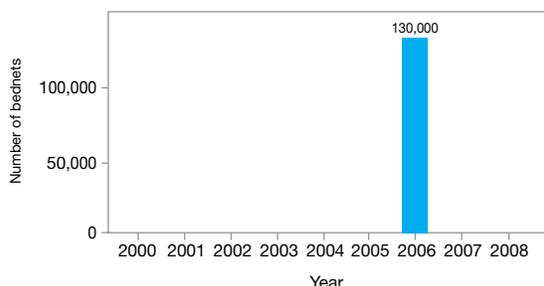
**Figure 31. Indoor residual spraying coverage by year, 2000-08**



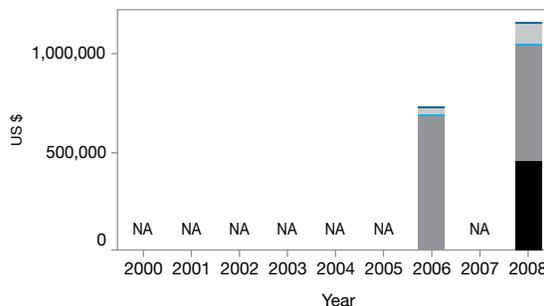
**Figure 32. Number of LLINs distributed by year, 2000-2008**



**Figure 33. Number of ITNs distributed by year, 2000-08**



**Figure 34. Sources for malaria control funds by year, 2000-08**



**Financing sources**

- USAID
- Other bilateral funds
- UN agencies
- Global Fund
- Government

NA - Data not available