



# **Pan American Health Organization**

*Regional Office of the  
World Health Organization*

**(AMI / RAVREDA) Amazon Malaria Initiative/ Amazon Network for  
Surveillance of Anti-malarial Drug Resistance: Ten Years of Malaria  
Prevention and Control in the Region**

**Keith H. Carter**

**PAHO/WHO Regional Advisor for Malaria  
AMI / RAVREDA Annual Evaluation Meeting  
Panama City, Panama • 22 - 24 March 2011**

# Background

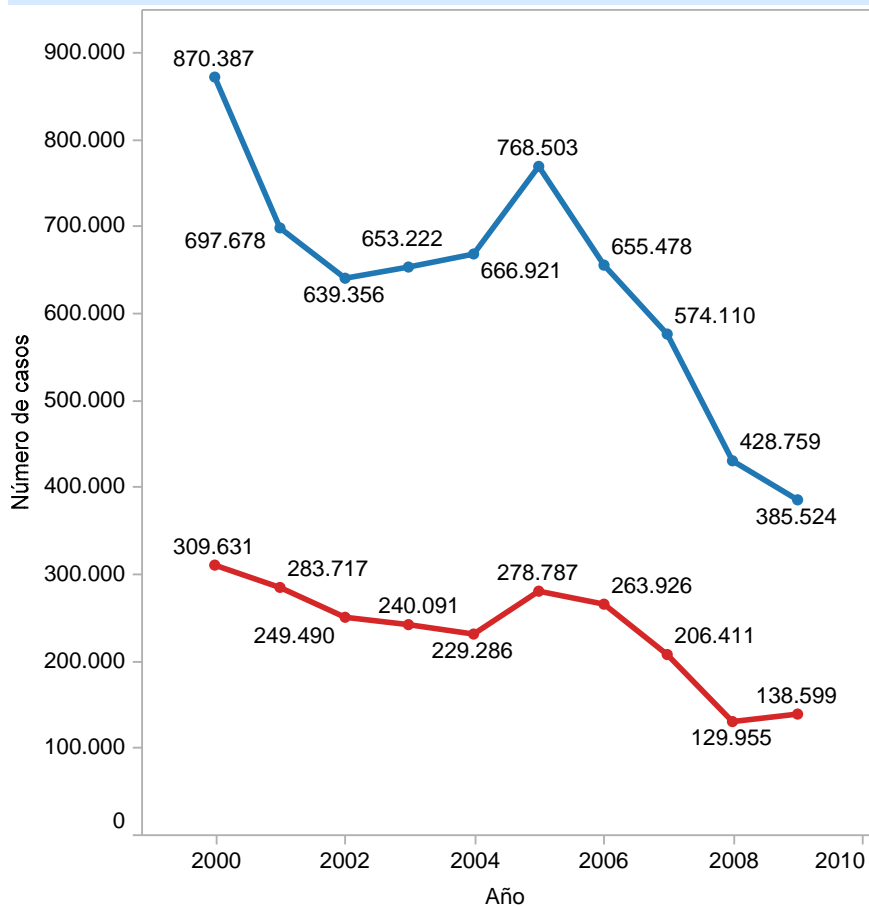
- **Malaria endemicity in the Americas**
- **Efforts in North America and Caribbean**
- **Global Malaria Eradication (1955); Control (1992)**
- ***P. falciparum* resistance to Antimalarials (Americas)**
- **Roll Back Malaria Initiative 1998 – launched in Americas 2000**

# Malaria Prevention and Control Efforts in the Region 2000-2011

- Roll Back Malaria Initiative – 2000
- Amazon Malaria Initiative - 2001
- DDT/GEF Project - Mexico and Central America
- Global Fund Projects – 13/15 eligible countries

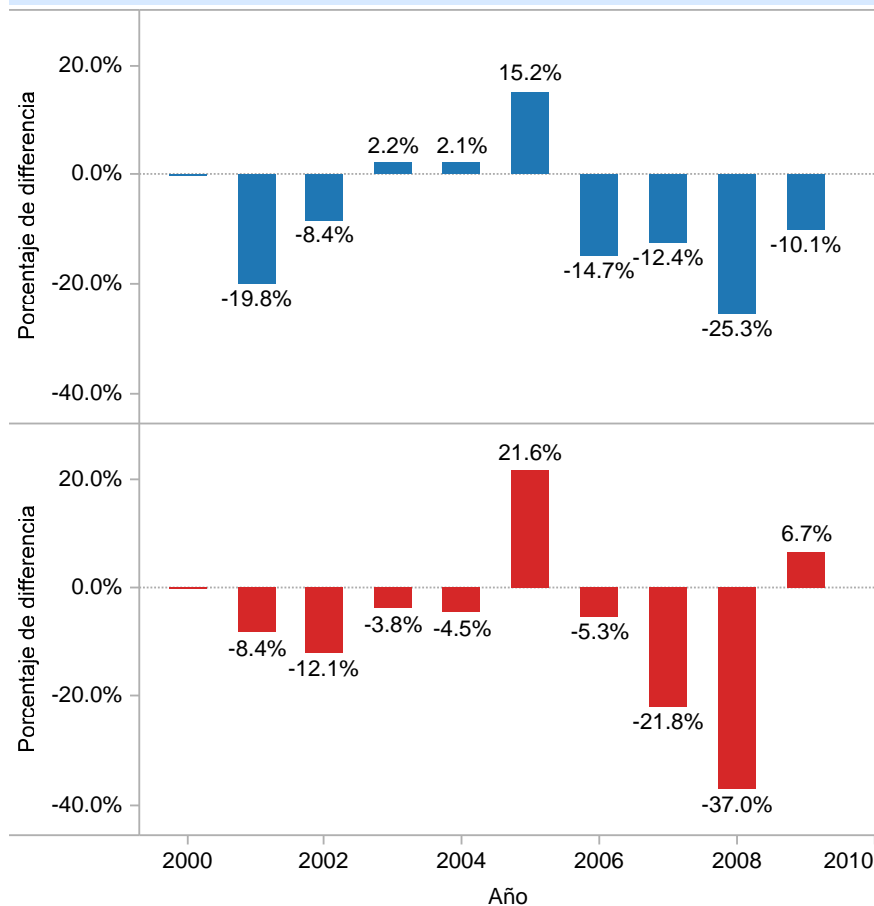
# Morbilidad de la malaria en las Américas, 2000 a 2009

Número de casos por especie, 2000 a 2009



**Especie**  
■ P. falciparum y mixtos ■ P. vivax

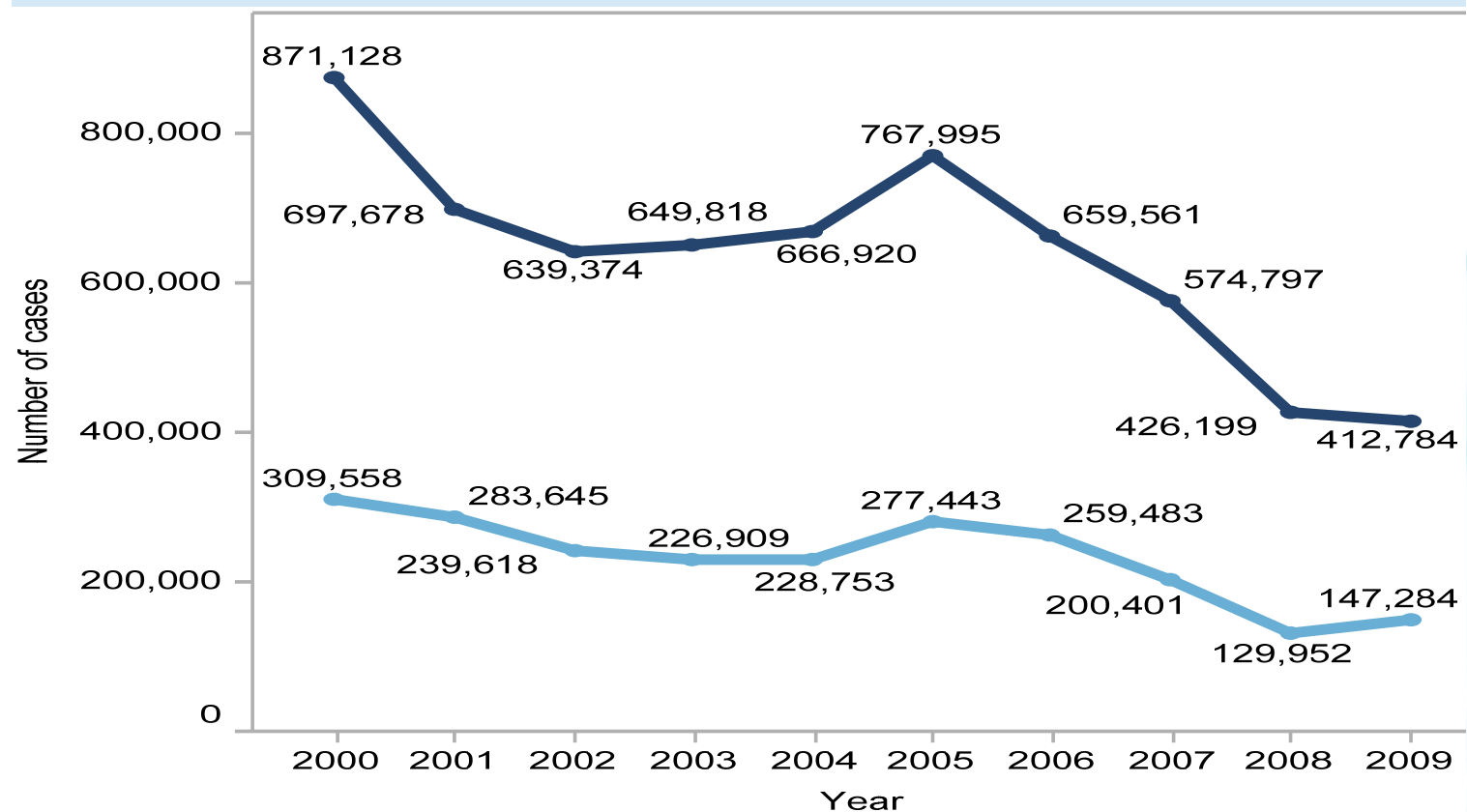
Variaciones interanuales en el número de casos, 2000 a 2009



Fuente: Informes anuales de los países OPS/OMS

\* Datos de 2008 para Belice y Venezuela utilizan para el 2009

## Malaria Cases in the Americas by *Plasmodium* species, 2000 – 2009



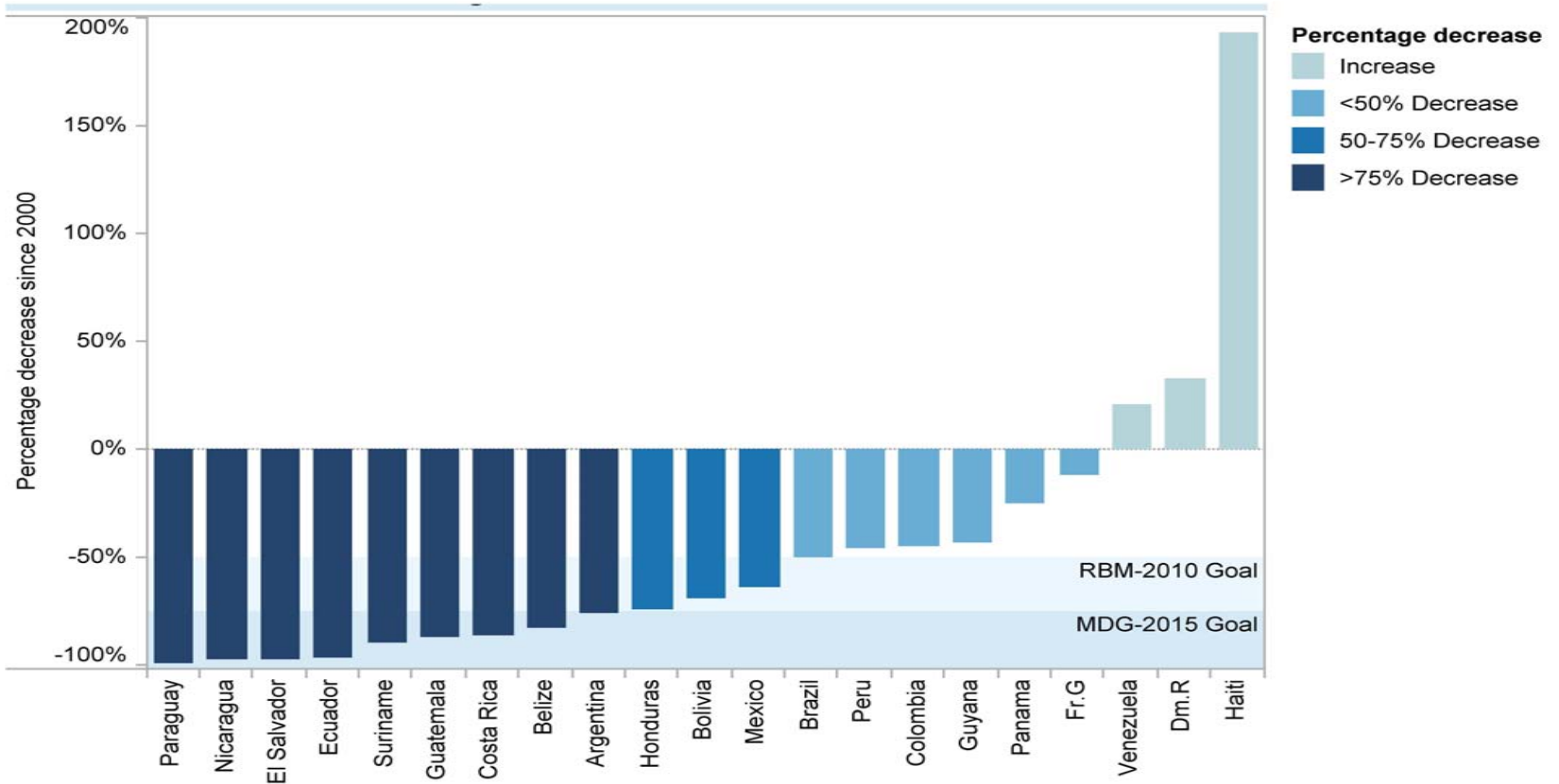
\*Data for 2008 was used for Argentina and French Guiana in 2009

### ***Plasmodium* species**

■ *P. vivax*

■ *P. falciparum* & Mixed

# Decrease in Reported Number of Malaria Cases Since 2000



\* Data for 2008 used for Argentina and French Guiana  
Dm.R- Dominican Republic  
Fr.G- French Guiana

## Percentage Change in Number Malaria Cases in Endemic Countries (baseline 2000)

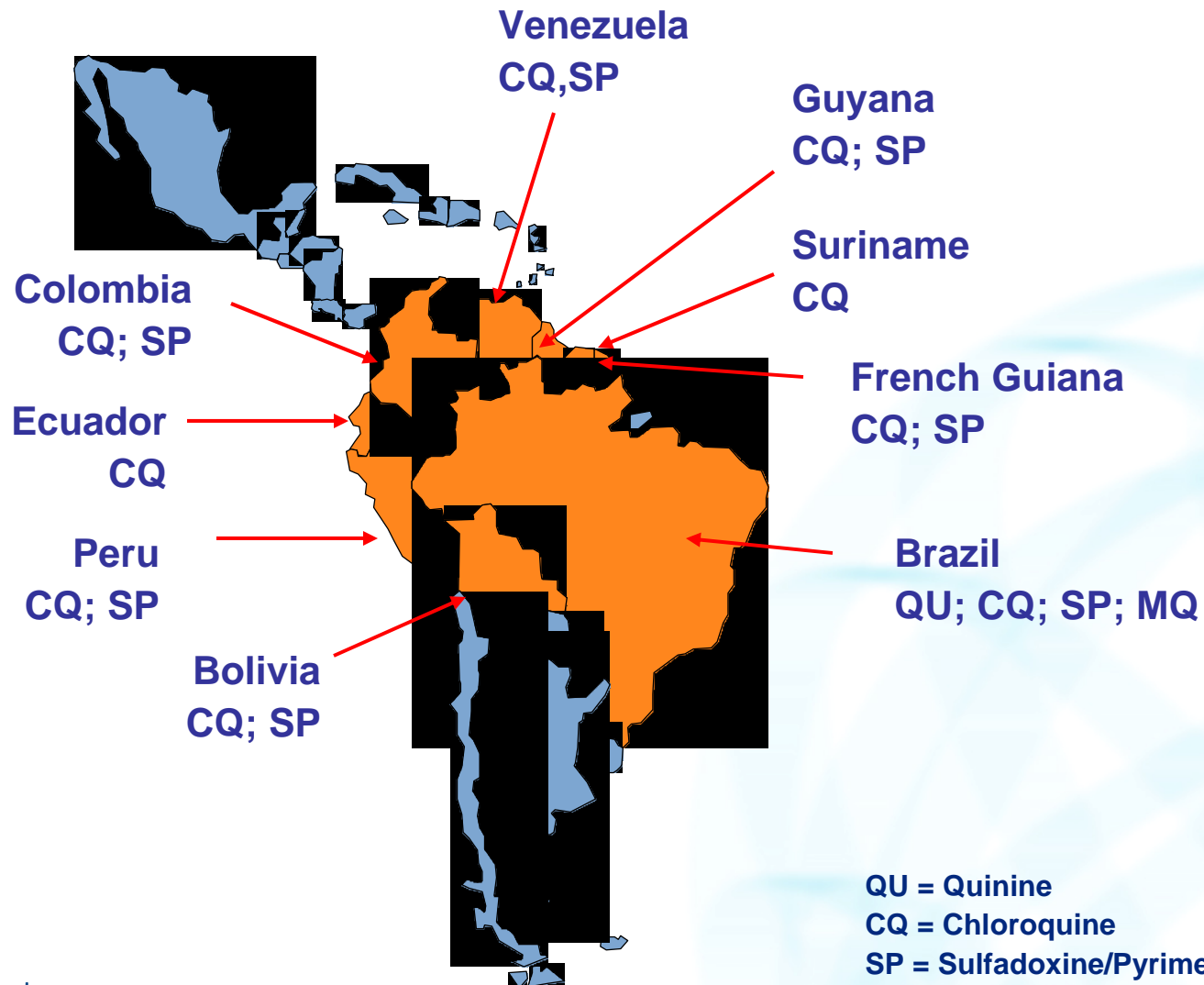
- Argentina (2008) 130 (-70%)
- Belize (2009) 256 (-83%)
- Bolivia (2009) 9,743 (-69%)
- Brazil (2009) 308,498 (-50%)
- Colombia (2009) 79,252 (-45%)
- Costa Rica (2009) 262 (-86%)
- **Dominican Republic**  
(2009) 1,643 (+33%)
- Ecuador (2009) 4,120 (-96%)
- El Salvador (2009) 20 (-97%)
- French Guiana  
(2008) 3,264 (-12%)
- Guatemala (2009) 7,080 (-87%)
- **Guyana (2009) 13,673 (-43%)**
- **Haiti (2009) 49,535 (+193%)**
- Honduras (2009) 9,216 (-74%)
- Mexico (2009) 2,703 (-63%)
- Nicaragua (2009) 610 (-97%)
- Panama (2009) 778 (-25%)
- Paraguay (2009) 91 (-99%)
- Peru (2009) 36,886 (-46%)
- Suriname (2009) 1,658 (-85%)
- **Venezuela (2009) 35,725 (+20%)**

# AMI/RAVREDA

- Suspected / Confirmed Drug Resistance and Treatment Failure in South America
- Efficacy trials in Peru and Bolivia – changes in drug treatment policy (introduction combination therapies)
- Interest in evaluating efficacy definition treatment policies other countries



# Suspected / Confirmed Anti-malarial Resistance



# Background

- Bahia, Brazil, March 2001: creation of Amazon Network for Monitoring Antimalarial Drug Resistance (RAVREDA)
- October 2001 – Amazon Malaria Initiative launched by USAID – LAC
- AMI support for activities in Amazon countries
- First technical Meeting in Bolivia, March 2002 (8 Countries, CDC, PAHO/WHO, USAID)
- Other partners MSH-RPM Plus, USP involvement begins towards end 2002; Links Media and RTI collaboration since 2008

# AMI – RAVREDA Innovative Partnership

- Seven Amazon Countries (BRA, BOL, COL, ECU, GUY, SUR, PER)
- National Malaria Control Programs
- National Institutes of Health
- Quality Control Laboratories
- Local Research Institutes
- Universities
- Public Health Laboratories
- PAHO/WHO
- USAID
- Centers Disease Control
- Management Sciences for Health
- US Pharmacopeia
- Links Media
- Research Triangle Institute

# Areas of Work 2001-2011

- **Establishment National Committees; Steering Committee**
- **Resistance surveillance studies (*in vivo*, *in vitro*, molecular)**
- **Treatment Policy Implementation**
- **Quality of Malaria Diagnosis**
- **Access and Use of Antimalarials**
- **Quality of Antimalarials**
- **Vector Control**
- **Stratification and Analysis of Information**
- **Communications, Publications, Advocacy**

# AMI Thematic Areas

**1**

Surveillance of antimalarial resistance

*a. In vivo*

*b. In vitro*

c. Molecular markers

**2**

Drug policy implementation

**3**

Access and quality of diagnosis and treatment

a. Improve access to diagnosis (Microscopy & Rapid tests)

b. Quality of diagnosis

c. Drug quality

d. Drug availability and use

**4**

Vector control based in evidence

**5**

Epidemiological stratification

**6**

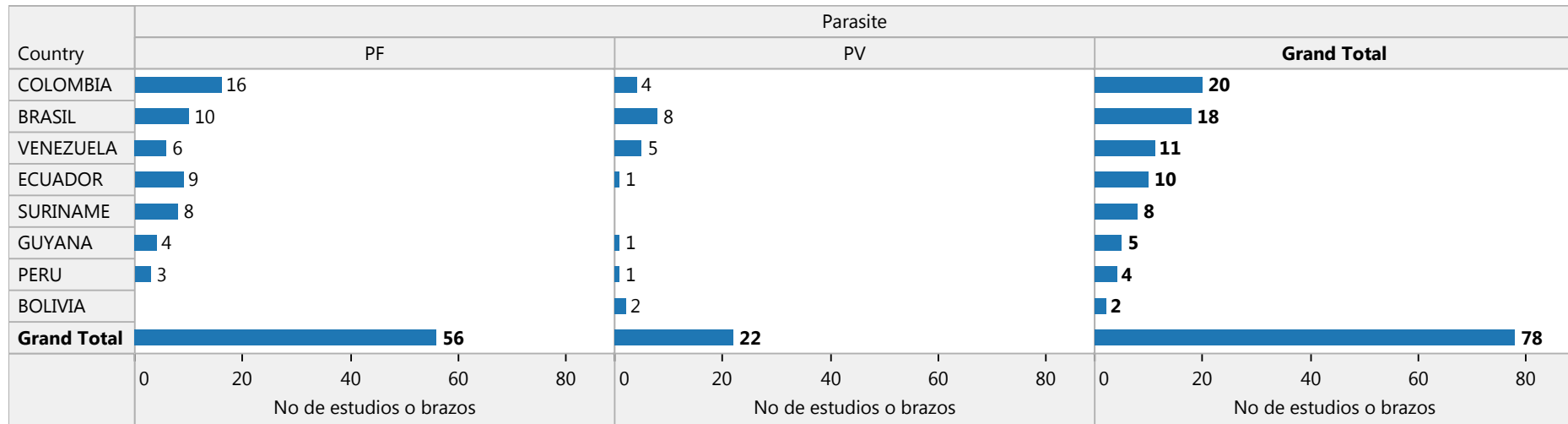
Communications and Information Dissemination



# 1 Monitoring antimalarial drug resistance

- ***In vivo* drug efficacy trial results used in first line treatment policy decision making: use of Artemisinin-based Combination Therapy (ACT) for *P. falciparum* infection**
- **Selective use of *in vitro* monitoring of susceptibility to antimalarial drugs and molecular markers as an early warning system**
- **Molecular studies**

# Número de estudios (brazos de estudios) realizados en el marco de AMI/RAVREDA entre 2002 - 2008



*Estudios apoyados  
en Honduras y  
Nicaragua (CQ)*



2

## Policy Change for *P. falciparum* in the Amazon countries 1998-2006

ART-LUM Coartem®		●			●		●	
MQ+AS	●		●			●	●	●
SP+AS				●				
AQ+AS					○			
MQ		○				○	○	
Q+D/ Q+T								
Q								
AQ+SP			○					
CQ+SP	○			○		○		○
CQ o SP								
Country	Bolivia	Brazil	Colombia	Ecuador	Guyana	Peru	Suriname	Venezuela

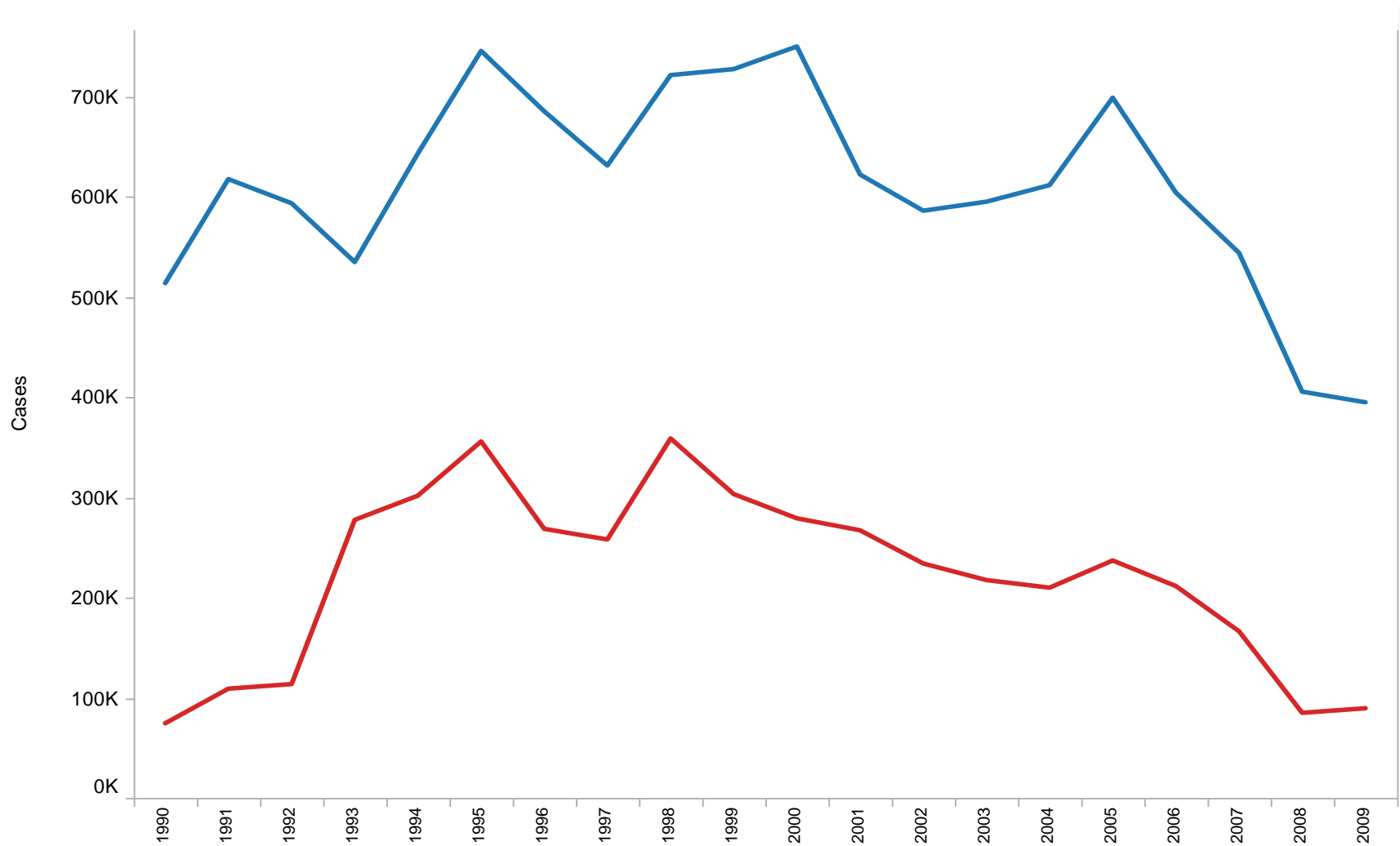
● Current

○ Late Nineties

ART-LUM: Artemether-Lumefantrine, AS: Artesunate AQ: Amodiaquine, CQ: Chloroquine,  
D: Doxycycline, MQ: Mefloquine S/P: Sulfadoxine/Pyrimethamine, Q: Quinine, T: Tetracycline,



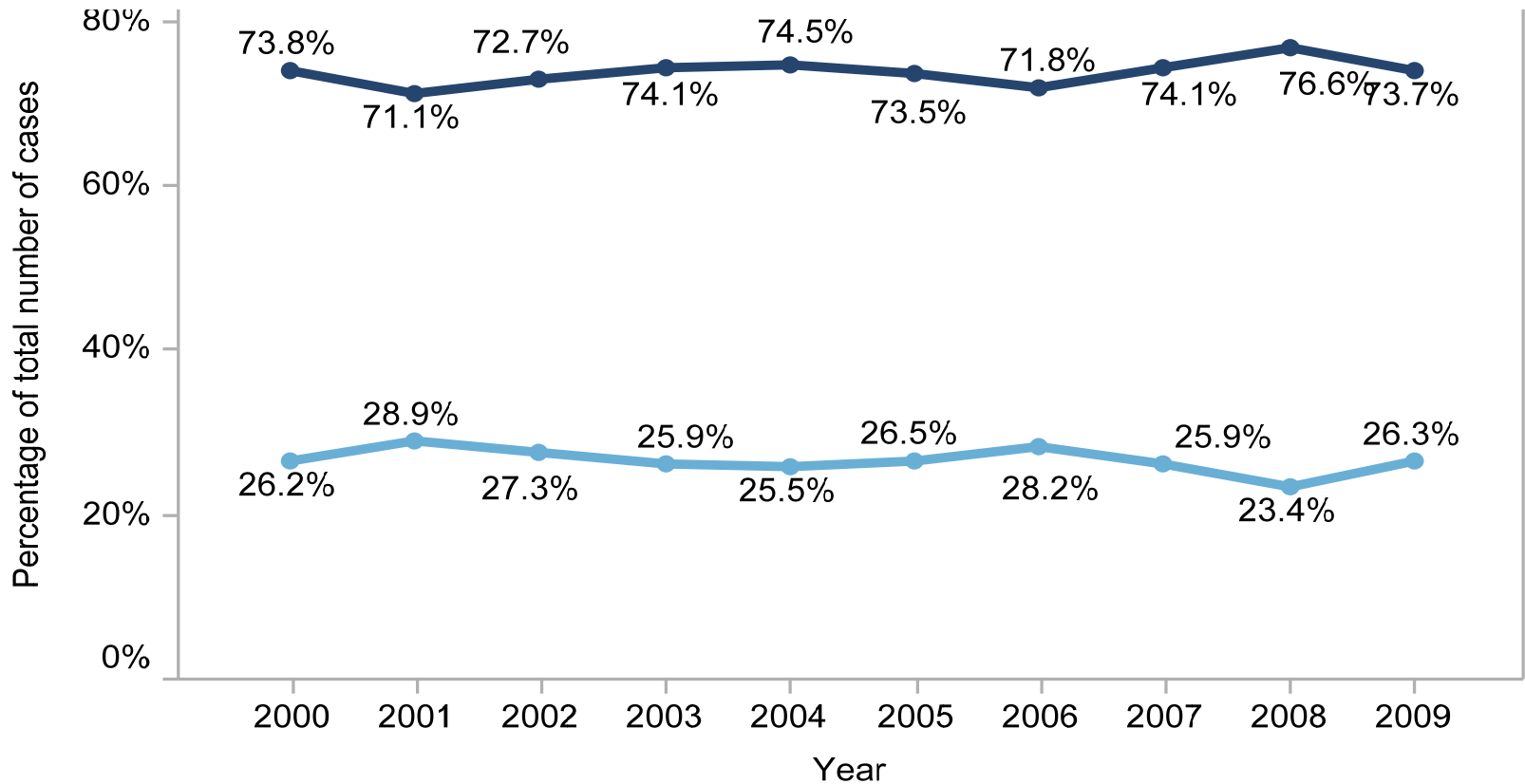
# Malaria cases by species, South America, 1990-2009

**Species**

■ P Falciparum

■ P# Vivax Cases

# Proportion of Malaria Cases by Species in the Americas, 2007<sup>2007</sup> 2000 – 2009



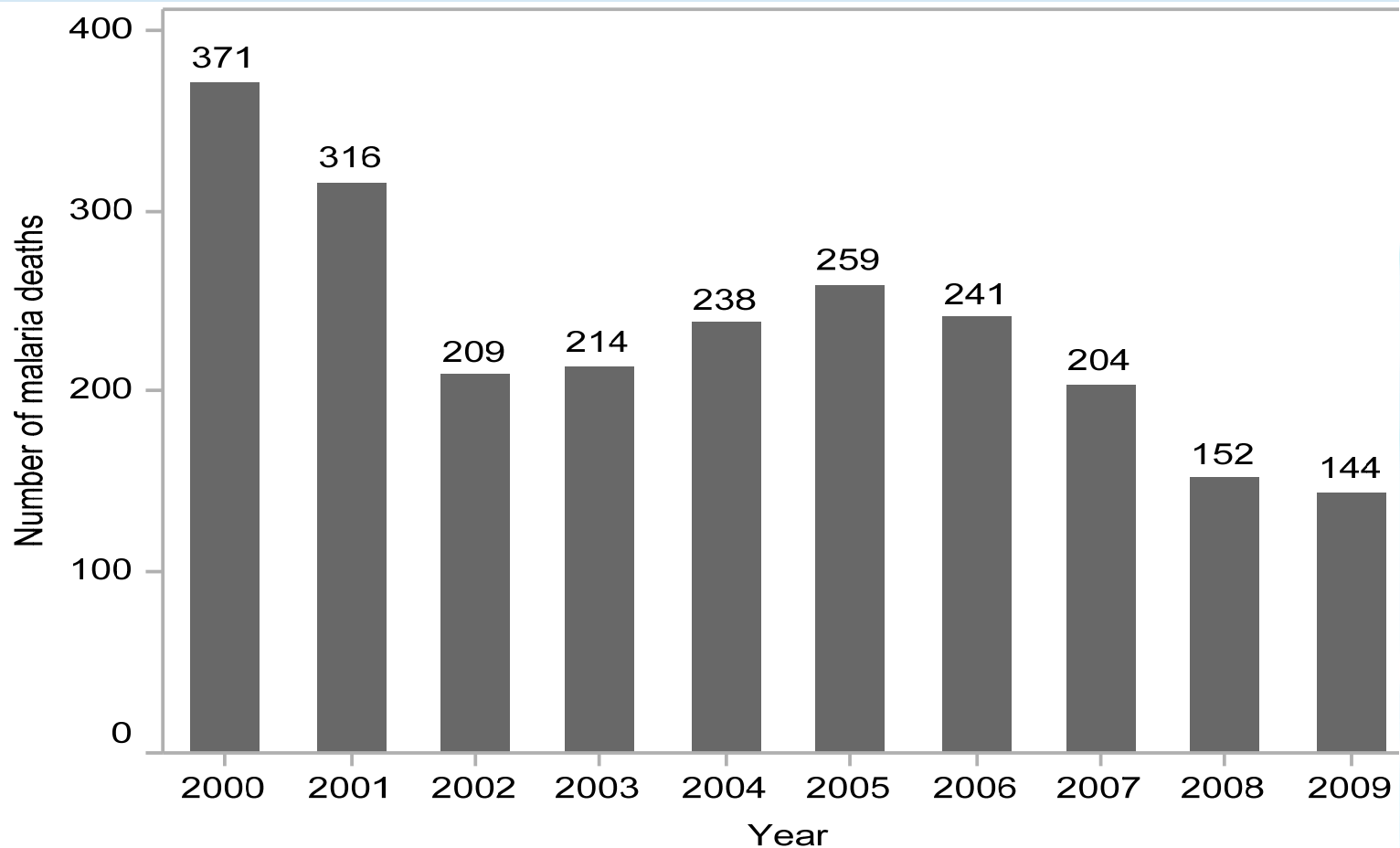
## *Plasmodium* species

■ *P. falciparum* & Mixed

■ *P. vivax*

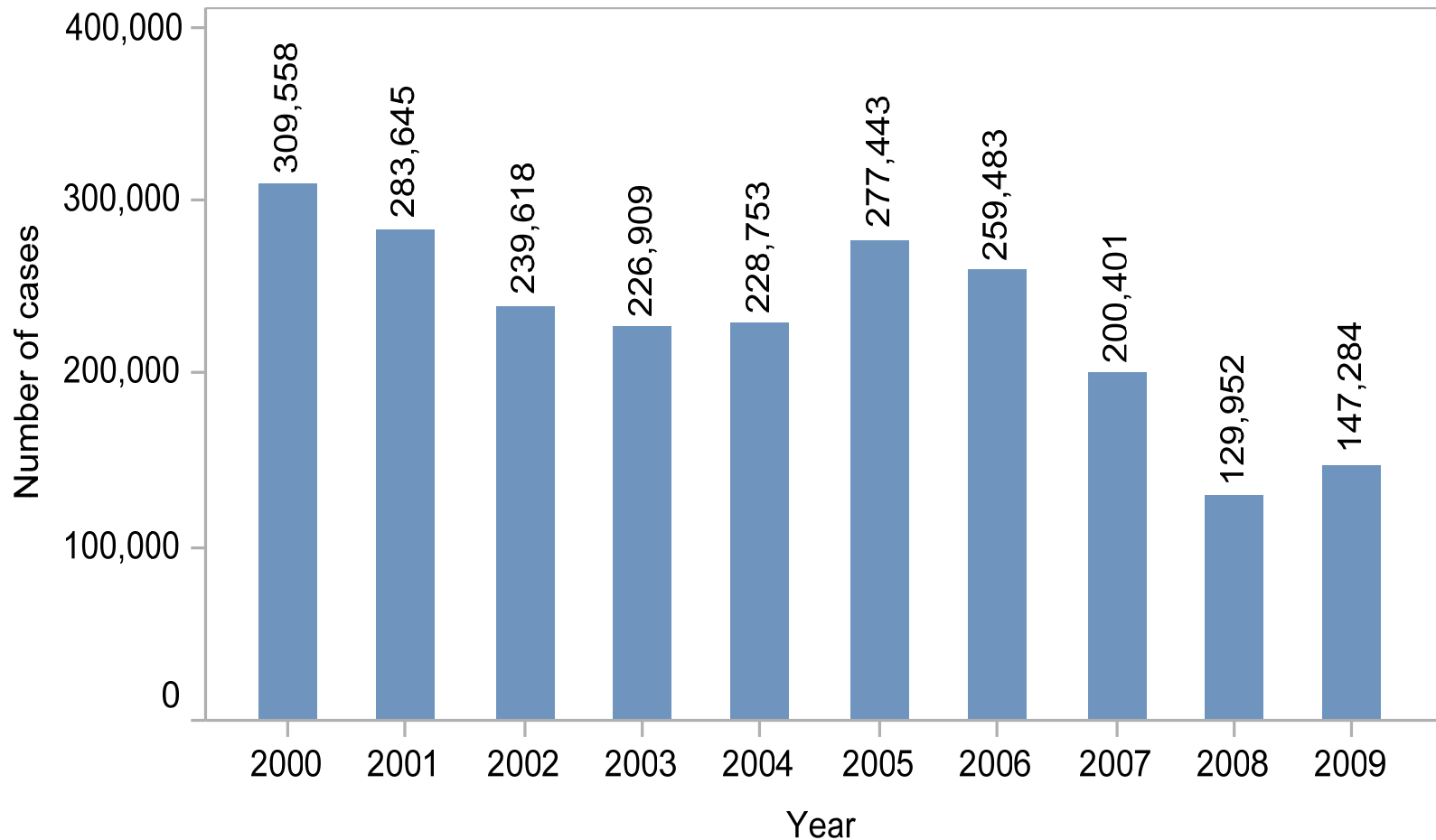
# Malaria related Deaths in the Americas

## 2000 - 2009



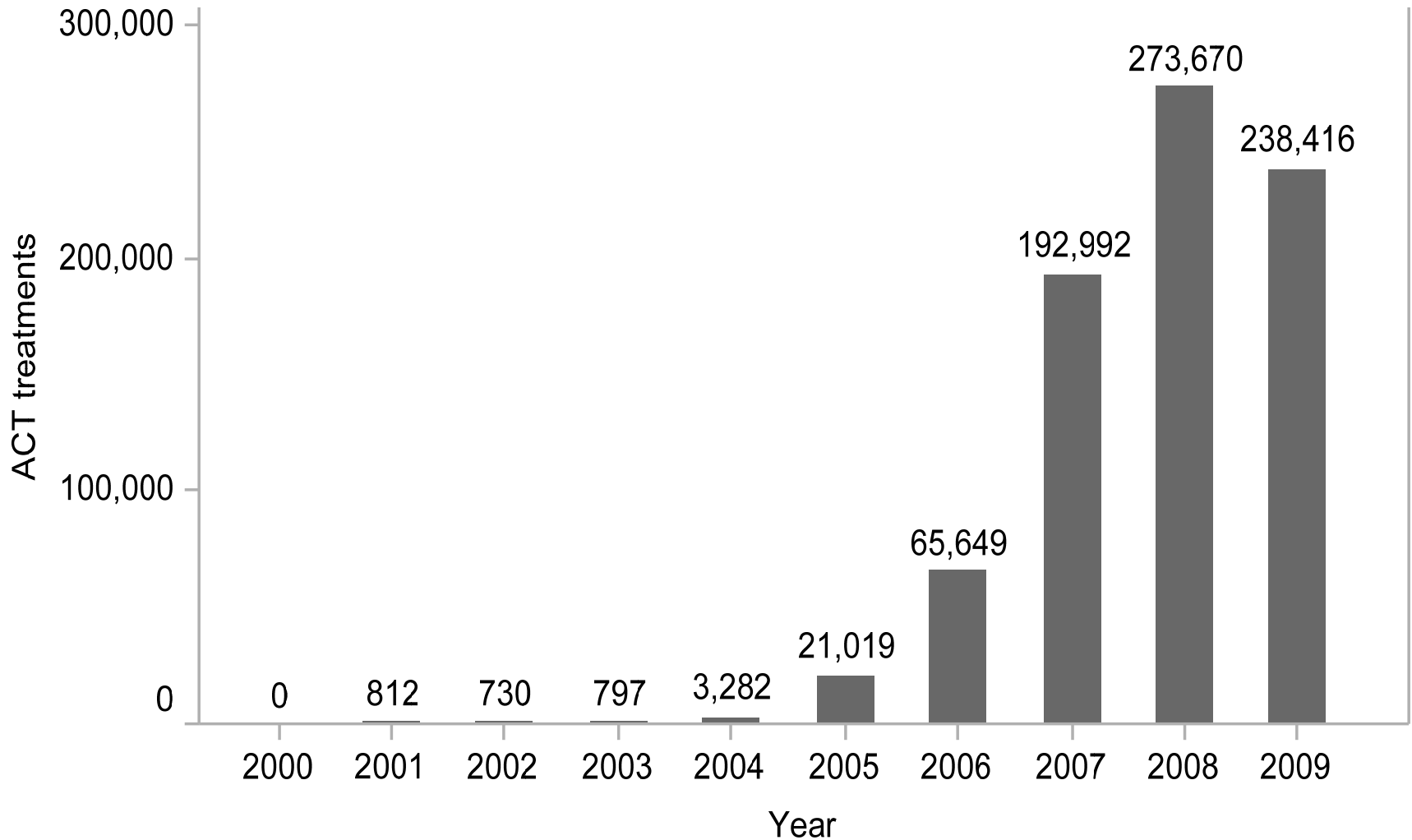
\*Data for 2008 was used for Argentina and French Guiana in 2009

## Number of *P. falciparum* in the Region of the Americas, 2000 – 2009



# Number of Malaria Cases Treated with ACT by Year

## Americas, 2000 – 2009



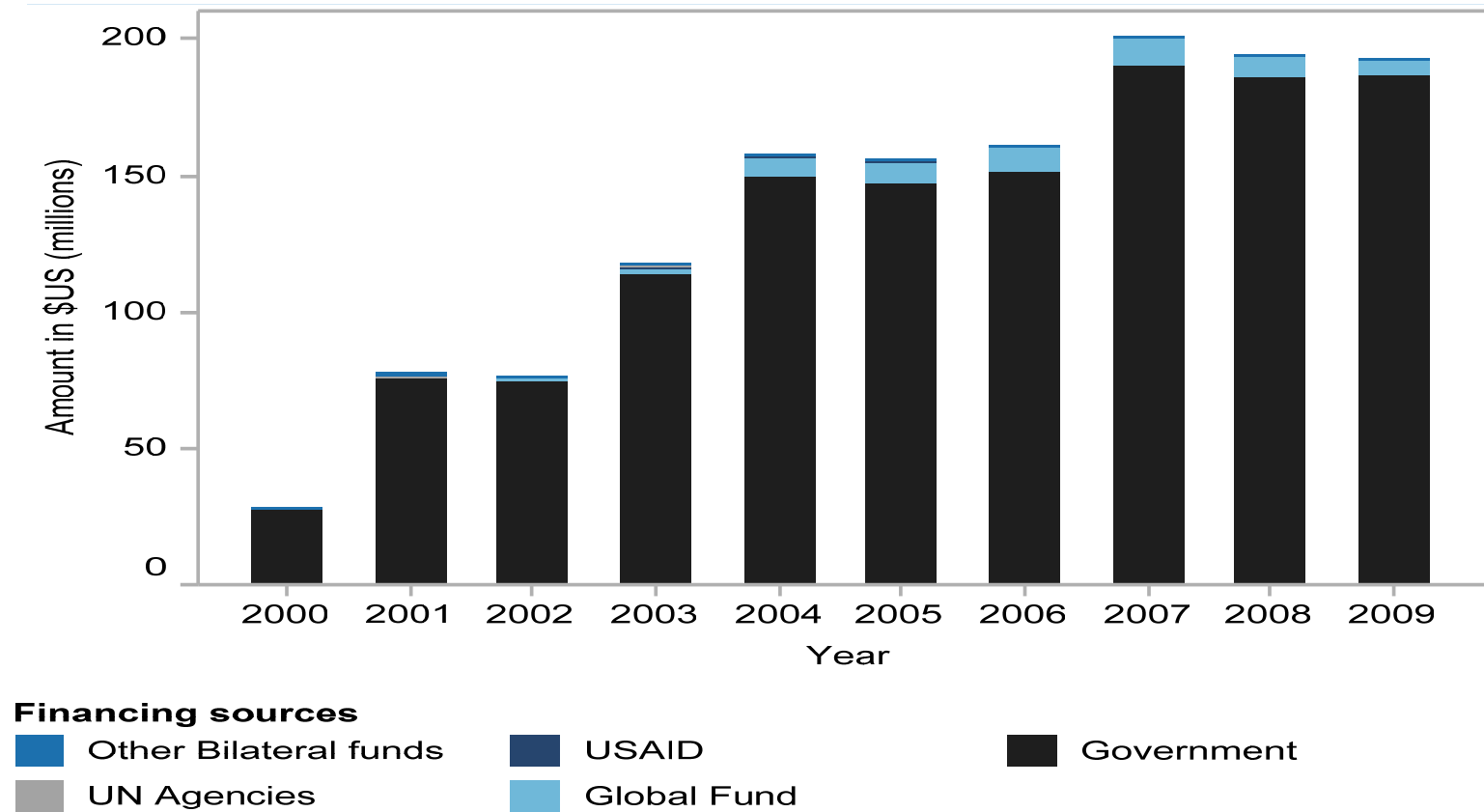
# Contributions of AMI/RAVREDA

- Important catalyst for the impact of malaria prevention and control efforts in the Region
- Fills important gaps of global efforts in recent years
- Sustained the achievements and provides continuity of efforts toward RBM goals and the MDGs
- Provides support to regional and sub-regional efforts that facilitate coordination among countries with shared borders / areas of common epidemiologic interest
- Profound contribution in laying out the foundation for successful malaria country proposals to the Global Fund
- AMI/RAVREDA Efforts are currently being extended to countries in Central America

# AMI/RAVREDA Added Value

- Technical cooperation – between and within institutions
- Financing – Global Fund
- Catalyst external collaboration – DNDi; WWARN; Mesoamerica Initiative - ISGlobal; IDB; CLAIM etc.
- Call revitalization coordinated efforts in Guyana Shield (Brazil, French Guiana, Guyana, Suriname, Venezuela)

## Malaria Control Funds in the Americas by Source and Year, 2000 - 2009





# AMI Contribuciones

Desarrollo y necesidades orientaciones estrategicos –

- Protocolos estudios eficacia
- Enfoque malaria en distintos contextos epidemiologicos;
- Compra, suministros, manejo de medicamentos
- Enfoque de tres niveles para control calidad medicamentos;
- Control vectores; intevenciones;
- Diagnostico: microscopia– programa externa evaluacion desempeno; RDTs - epidemiologia molecular
- Diseminacion informacion

Cooperacion tecnica – recursos humanos, institucionales

# AMI/RAVREDA

- Contributions 2001 – 2011
- Contribution 2011 - 2015 ?

*Thank you.*  
[malaria@paho.org](mailto:malaria@paho.org)