MALARIA ELIMINATION IN EL SALVADOR

A Historical and Epidemiological Perspective

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PATH

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CONTENTS

ACRONYMS

ACD	active case detection
AL	artemether-lumefantrine
API	annual parasite index
CDC	United States Centers for Disease Control and Prevention
CDC-CAR	United States Centers for Disease Control and Prevention – Central America Regional Office
CHAI	Clinton Health Access Initiative
CQ	chloroquine
CQ+PQ	chloro-primaquine
DDT	dichlorodiphenyltrichloroethane
ECOS	Equipos Comunitarios de Salud Familiar (Community Family Health Teams)
EMMIE	Eliminación de la Malaria en Mesoamérica y la Isla La Española
GFATM	Global Fund to Fight AIDS, Tuberculosis and Malaria
GMEP	Global Malaria Eradication Program
IHME	Institute for Health Metrics and Evaluation
INS	Instituto Nacional de Salud (El Salvador National Institute of Health)
IRB	institutional review board
IRS	indoor residual spraying
LAMP	loop-mediated isothermal amplification
LLIN	long-lasting insecticide-treated bed net
MDA	mass drug administration
MINSAL	Ministerio de Salud de El Salvador (Ministry of Health of El Salvador)
MOH	Ministry of Health
NMS	National Malaria Service
NMSP	National Malaria Strategic Plan
NTD	neglected tropical diseases
OMS-33	ortho-isopropoxyphenyl methylcarbamate
PAHO	Pan American Health Organization
PCD	passive case detection
PQ	primaquine
RDT	rapid diagnostic test
SIBASI	Sistema Básico de Salud Integral (Basic Integrated Health System)
SPR	slide positivity rate
SUIS	Sistema Único de Información en Salud (Health Information System)
ULV	ultra low volume
USAID	United States Agency for International Development
VIGEPES	Sistema Nacional de Vigilancia Epidemiológica de El Salvador (El Salvador's national epidemiological surveillance system)
VC	voluntary collaborator
WHO	World Health Organization

EXECUTIVE SUMMARY

Since the early 1980s, El Salvador has maintained a substantial decline in malaria incidence. The country is now in the malaria elimination phase, with fewer than 20 cases reported annually since 2011.

The rapidity and durability of El Salvador's malaria decline is especially notable in comparison with its immediate neighbors Guatemala and Honduras, with whom it shares a similar climate, malaria vector characteristics, and topography (in areas of ongoing transmission). Until the early 1980s all three countries experienced similar cyclical patterns of malaria transmission, but in 1981 El Salvador's malaria trajectory began to diverge. A period of rapid decline in the 1980s and 1990s has been followed by two decades in which malaria incidence has been kept at very low levels. Guatemala and Honduras also recorded periodic declines in malaria transmission in the 1980s and 1990s, but the drops were neither as pronounced nor as durable as in El Salvador. In 1980, El Salvador contributed 37 percent of all cases in the Mesoamerica region. By 2010, El Salvador was contributing less than 1 percent of malaria cases in the region while Guatemala and Honduras together contributed nearly 80 percent.

In collaboration with the government of El Salvador, PATH has reviewed the recent history and epidemiology of malaria in El Salvador to identify the factors most closely associated with the continued decline in malaria cases; to understand how the country has maintained such a low level of transmission without elimination or resurgence; and to assess future requirements in terms of approach, financing, and regional collaboration for El Salvador to eliminate malaria by their stated target of 2020. Project investigations and analyses indicate that El Salvador's early and maintained decline in reported malaria cases is correlated to interventions and strategies implemented by the Salvadorian National Malaria Program that were employed earlier and more systematically than in Guatemala and Honduras. Notable interventions and strategies include:

- A malaria surveillance system that leveraged the regular health system and the voluntary collaborator network to achieve broad national coverage.
- Early geographic stratification by malaria risk and use of stratification to inform program strategy and resource allocation.
- A voluntary collaborator network of community health workers notable for its coverage, its coverage, targeted geographic distribution, and community commitment.
- Early decentralization of the diagnostic laboratory system and stratification-informed resource allocation that improved diagnostic capacity and accelerated treatment turnaround time.
- Committed malaria leadership and consistent domestic funding to support national malaria control efforts.

Specific impact from these interventions and strategies was seen during five distinct historical time periods. In all time periods, deliberate adjustments in National Malaria Program interventions and strategies interacted with changing socioeconomic and political conditions to generate substantial variations in malaria case incidence and transmission dynamics. These time periods are categorized as:

- **Global Eradication Campaign (1955–1969)**
- **Resurgence (1970–1980)**
- **Rapid Decline (1981–1995)**
- **Continued Decline (1996–2011)**
- **Endgame (2011–today)**

Understanding how El Salvador has maintained very low levels of local malaria transmission for two decades can inform national, regional, and donor decision-making. El Salvador's experience in functionally eliminating local transmission raises an important question: should a country that has achieved very low levels of malaria transmission push for malaria elimination in the short term, or wait until new malaria tools or more promising regional conditions (such as falling malaria burdens in neighboring countries) reduce the technical, operational, and financial requirements for elimination? As El Salvador, and the Mesoamerica region, move toward elimination, identifying factors that contribute to sustaining very low or interrupted transmission ("stickiness") may be relevant to other countries that are developing plans for malaria elimination. The report thus concludes with a discussion of future prospects for malaria elimination in El Salvador and lays out a learning agenda to help clarify opportunities and next steps for El Salvador and its neighbors.

SECTION 1

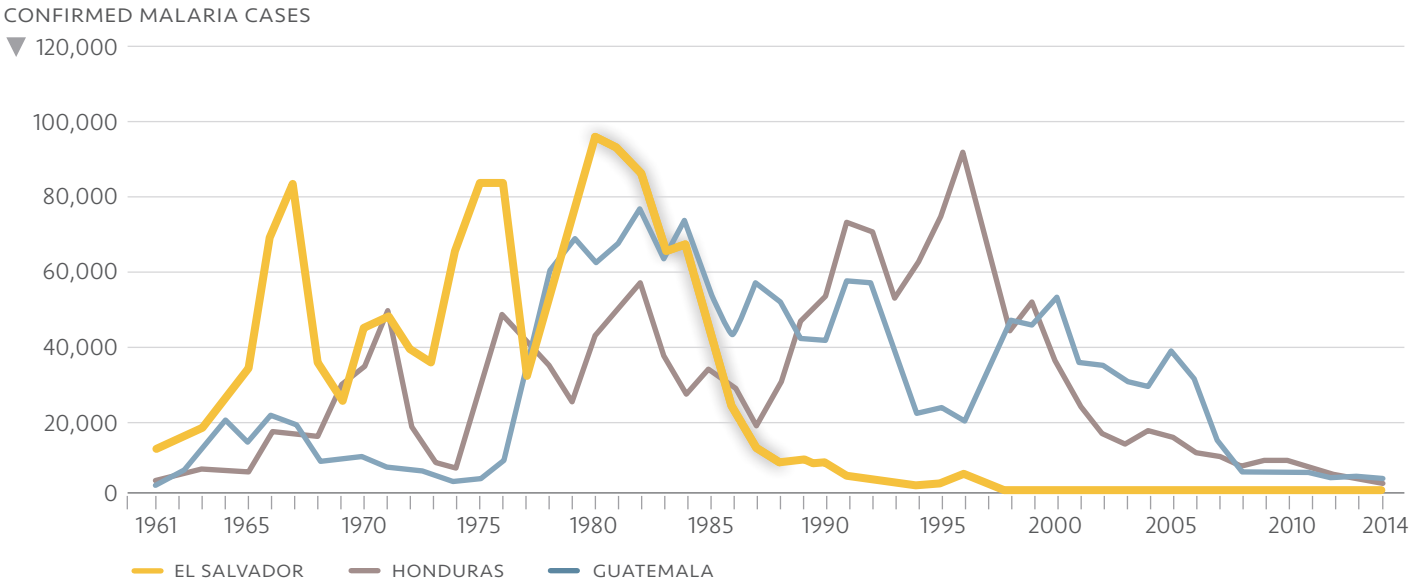
INTRODUCTION

Over the last decade, El Salvador has reported the lowest national number of malaria cases in Mesoamerica, building on dramatic progress in reducing and controlling the malaria burden during the 1980s and 1990s. El Salvador's malaria control successes since the early 1980s stand in stark contrast to its experience in previous decades, when it had the highest malaria burden per capita in Mesoamerica. In 1980, the year before confirmed malaria incidence began its long-term downward trajectory, the country made up 20 percent of the region's population but accounted for nearly 37 percent of the malaria cases.[1,2]

Today, El Salvador is in the malaria elimination phase, with fewer than 20 reported cases per year since 2011, while its immediate neighbors Guatemala and Honduras have among the highest number of malaria cases per capita in Mesoamerica. El Salvador's divergence from the malaria trajectory of its neighbors began in the early 1980s, when a rapid decline in confirmed malaria incidence considerably reduced its malaria burden. Even though Guatemala and Honduras recorded periodic declines in malaria transmission during the 1980s and 1990s, the drops were not as great as in El Salvador and they were not sustained for as long. Yet El Salvador and its neighbors share a similar climate, malaria vector characteristics, socioeconomic development trends, topography, and, until the early 1980s, experienced similar cyclical patterns of malaria transmission (Figure 1).

This report explores factors that could account for El Salvador's early, strong, and sustained progress against malaria and compares its experiences with those of Guatemala and Honduras, the two countries with which it shares land borders. El Salvador's distinctive malaria strategies and program actions appear to have contributed to its early and sustained achievements against malaria. The Salvadorian National Malaria Program was one of the first in the region to build a national surveillance system and use data to stratify areas by malaria risk and inform program strategy and resource allocation decisions. The National Malaria Program decided where to concentrate community health workers, known as voluntary collaborators (VCs), and where to strengthen microscopy lab capacity based on the

Figure 1. Confirmed malaria cases in El Salvador, Guatemala, and Honduras, 1961–2014.[2]



results of risk stratification. El Salvador's neighbors are now working to enact strategies to drive down transmission and achieve similar successes. But surveillance systems in neighboring countries have been slower to improve.[3]

El Salvador has not yet completely eliminated local malaria transmission, but very low numbers (less than 50 cases annually) of reported *Plasmodium vivax* (*P. vivax*) malaria cases have been sustained for more than a decade. El Salvador's maintenance of very low levels of local malaria transmission over such a long time period, without eliminating or resurging, is notable.

Examining the past record of malaria-eliminating countries, researchers have suggested that malaria elimination, once achieved, appears to be more "sticky"—i.e., intrinsically durable—than previously hypothesized in moderate-to-low transmission areas with well-functioning health systems.[4] Because of this durability, malaria-eliminating countries with strong health and integrated surveillance systems can devote fewer resources to malaria control if health systems can identify and treat imported malaria cases before they result in expanded local transmission. El Salvador's experience is consistent with, and may even extend further, this line of reasoning. A review of the situation in El Salvador in comparison to the Mesoamerica region supports the hypothesis that in El Salvador the stability of elimination is correlated to targeted control efforts and not solely dependent on structural requirements such as economic development, climatic factors, or ecological factors.

El Salvador provides a relevant country case study, as learnings can guide application of similar strategies in neighboring countries in the Mesoamerica region and other countries approaching malaria elimination as they work to increase collaboration across countries and accelerate progress toward elimination.

El Salvador provides a relevant country case study, as learnings can guide application of similar elimination strategies in the Mesoamerican region and beyond.

SECTION 2

PROJECT OBJECTIVES AND METHODOLOGY

2.1 Scope and objectives

In collaboration with the government of El Salvador, the project team sought to document the recent history and epidemiology of malaria in El Salvador; identify the factors most closely associated with the continued decline in malaria cases; understand how the country has maintained such a low level of transmission without elimination or resurgence; and assess what will be required in terms of future approach, financing, and regional collaboration for El Salvador to eliminate malaria by their stated target of 2020.

This report addresses a gap in analysis and documentation of the social, political, and epidemiological conditions that contributed to El Salvador's decline in malaria cases and ability to maintain low levels of transmission over the past decade. A more in-depth analysis of the El Salvador experience may advance the understanding of factors that contribute to malaria elimination or pre-elimination "stickiness"[4] through comparison with Guatemala and Honduras, neighboring countries with similar socioeconomics, vectors, climate, and transmission intensity that have not been able to achieve similarly low levels of malaria transmission. As the country, and region, move toward elimination, understanding the factors that have led to sustained low levels of transmission without resurgence—and what will be required for El Salvador to reach elimination by 2020—may be relevant to other countries developing malaria elimination plans and can inform national, regional, and donor decision-making.

2.2 Methodology

A standard, systematic approach to public health data acquisition and analysis was adopted.[5,6,7] Data from peer-reviewed and grey literature, records and documentation from district-level and national malaria efforts, and information from 31 personal interviews (Annex 1) with local and regional malaria experts were obtained and compiled. Public health data were continuously updated and triangulated to establish the veracity of any given fact or source and guide additional investigations.

This activity received a non-research determination from the PATH Research Determination Committee, and institutional review board (IRB) approval was not required in El Salvador per determination of El Salvador's National Institute of Health (INS; Instituto Nacional de Salud).

Initial research activities consisted of a literature review of publicly available national malaria data, focusing on the period 1960–2015, for El Salvador, Guatemala, and Honduras. Literature, including policies and implementation strategies, was reviewed and analyzed to establish the historical and current context of the malaria situation in each country and the region, along with the historical and current interventions and strategies employed. Reviewers consulted the peer-reviewed literature, existing socioeconomic and health indicators, and epidemiologic and global malaria program data.

Substantial gaps in publicly available literature and databases were identified. Information detailing specific program strategies, intensity of activities, treatment guidelines, surveillance systems, stratification methodologies, and programmatic timelines was lacking. To address this lack of information, initial connections were made with contacts from the Pan American Health Organization (PAHO), the US Centers for Disease Control and Prevention (CDC-Atlanta), the Clinton Health Access Initiative (CHAI), the Global Fund to Fight AIDS, Tuberculosis and Malaria (GFATM), and the Institute for Health Metrics and Evaluation (IHME) to verify initial literature and data findings and to establish in-country contacts with access to additional required data and insight into current and historical factors of malaria elimination in El Salvador and the Mesoamerica region.

Project introductions and descriptions of desired data were made via teleconference with personnel in El Salvador, Guatemala, and Honduras, followed by informational interviews conducted in person. Interviews in El Salvador were held with personnel from the Ministry of Health Vector Control Program, US Centers for Disease Control and Prevention – Central America Regional Office (CDC-CAR), and previous Ministry of Health malaria program staff. Informational interviews were also conducted in Guatemala with representatives from the Ministry of Health, CDC-CAR, and the Universidad del Valle de Guatemala.

A review of information shared in interviews combined with additional focused research and public health data triangulation resulted in a detailed timeline and

comparative analysis of possible contributing factors to the decline of malaria incidence in El Salvador and the generation of hypotheses as to which factors were key contributors to the decline and the unique factors that may contribute to sustainability.

Per the introduction and facilitation of CDC El Salvador personnel, contact with El Salvador's INS, a national research body within El Salvador's Ministry of Health (MOH), was established. The INS agreed to facilitate the acquisition of the remaining documentation needed and formalize the collaboration between PATH and the Ministry of Health of El Salvador (MINSAL, Ministerio de Salud de El Salvador) for project completion. To obtain additional documentation, establish in-person contact with El Salvador's INS, and formalize the relationship between PATH and MINSAL's Vector Control Program, a second trip was conducted to San Salvador. Meetings were convened with the INS and National Vector Control Program to discuss additional details around El Salvador's malaria program activities. Data were shared from both the INS and MINSAL, allowing the team access to critical details previously missing from the research. Upon return from this final trip, the PATH team worked to analyze all information received and began to compile a detailed overview of activities that occurred in El Salvador to date. A final trip was made upon completion of the draft report to validate all information, finalize the report, and discuss publication and launch plans.

2.3 Report structure

The report is structured as follows:

- **Section 3** reviews the malaria situation and epidemiological, geographical, climatic, and socioeconomic context in Mesoamerica.
- **Section 4** reviews the malaria situation and associated factors in El Salvador.
- **Section 5** presents a periodization of El Salvador's malaria history and analyzes the actions and approaches used to control and eliminate malaria in El Salvador.
- **Section 6** presents major findings related to El Salvador's malaria experience.
- **Section 7** explores opportunities and next steps for El Salvador.

> El Salvador's distinctive malaria strategies and program actions appear to have contributed to its early and continued progress against malaria.

SECTION 3

MALARIA IN MESOAMERICA

Mesoamerica comprises eight countries: Belize, Costa Rica, El Salvador, Guatemala, Honduras, Mexico (southern states), Nicaragua, and Panama. Reported cases of malaria in Mesoamerica have been in decline over the past decade, with a 78.5 percent overall reduction in morbidity in the region between 2000 and 2014 (Figure 2).[2,8] The region recorded 11,014 malaria cases and 3 malaria deaths in 2014, just 7.5 percent of the 390,000 malaria cases recorded in North and South America for that year.[9]

Technical and financial assistance provided by a number of initiatives and agencies contributed substantially to the decline seen across the region over the past 15 years, including the Roll Back Malaria (RBM) initiative adopted by the Americas in 2000, the subsequent PAHO-developed Regional Strategy for Malaria in the Americas (2006–2010), and the more recent Strategy and Plan for Action for Malaria (2011–2015); in addition to technical and financial support through USAID, PAHO, GFATM, CDC, and the US Pharmacopeia.[8]

Mesoamerican countries are now working together to move toward regional elimination as part of the GFATM regional initiative to eliminate malaria in the Americas, Eliminación de la Malaria en Mesoamérica y la Isla La Española (EMMIE), established in 2014.

Areas of special concern for malaria elimination in Mesoamerica include *La Moskitia*, an isolated area of tropical rainforest on the Atlantic coasts of Honduras and Nicaragua; *Esquintla*, a highly malaria-endemic area on Guatemala's Pacific coast; and the Darien Gap, which connects Panama to the South American continent (Figure 3).[10] *El Petén*, an undeveloped jungle area in northern Guatemala, historically accounted for a large portion of the country's malaria burden, but successful control efforts similar to those of El Salvador during the past decade have reduced the number of malaria cases originating in this area.[11]

P. vivax is the most widespread parasite species in Mesoamerica, accounting for 92.7 percent of cases in 2014 (Table 1). *P. falciparum* is present in Costa Rica, Honduras, Nicaragua, and Panama only sparsely.[2] Chloroquine is still efficacious against most *P. falciparum* strains in most of Mesoamerica and continues to be used in combination with primaquine as the first-line treatment for *P. falciparum* and *P. vivax* infections in all countries except Panama, which uses a combination of artemether-lumefantrine (AL) and primaquine.[9] Microscopy continues to be the gold standard method for routine diagnosis across the region, with rapid diagnostic tests (RDTs) in use in remote areas with infrastructural and public service limitations.[9]

El Salvador has experienced a dramatic reduction in malaria cases over the past 35 years. In 1980, El Salvador had the highest number of malaria cases in the region (95,835 cases) and was contributing disproportionately—given its relatively small size and population of 4.7 million[1]—to Mesoamerican malaria cases, with nearly 40 percent of overall reported cases (Figure 4). By 2015 the recorded number of cases had fallen to seven, representing only 0.1 percent of all malaria cases in the region (Figure 4).[2]

Figure 2. Percent reduction of malaria morbidity in Mesoamerica, 2000–2014.[2]

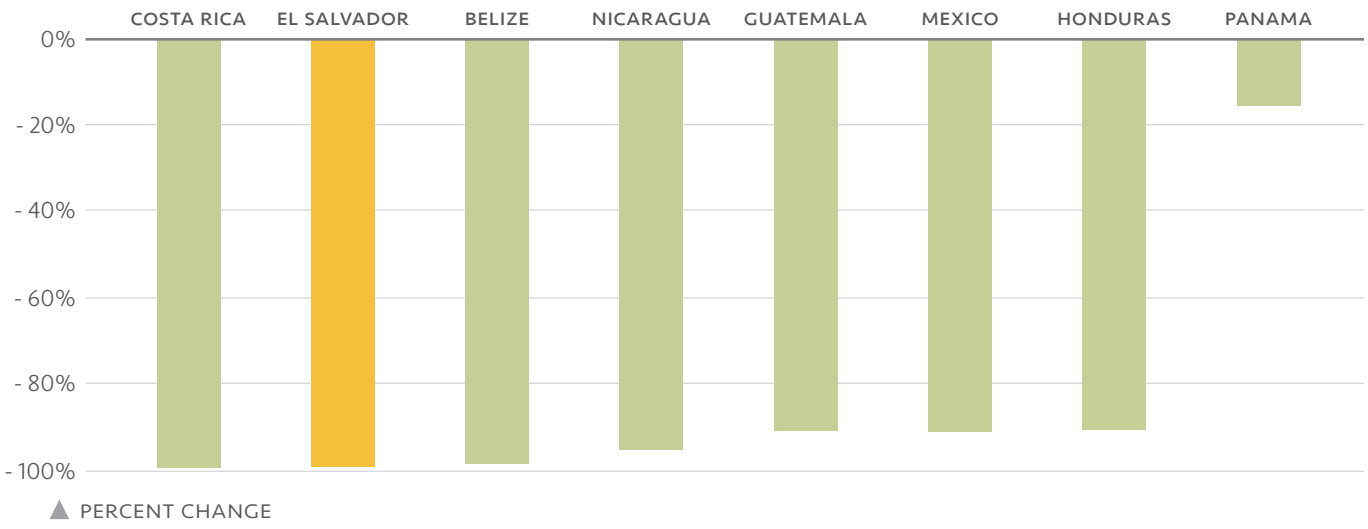


Figure 3. Malaria in Mesoamerica by Annual Parasite Index (API), 2013 and areas of risk.[10,12]

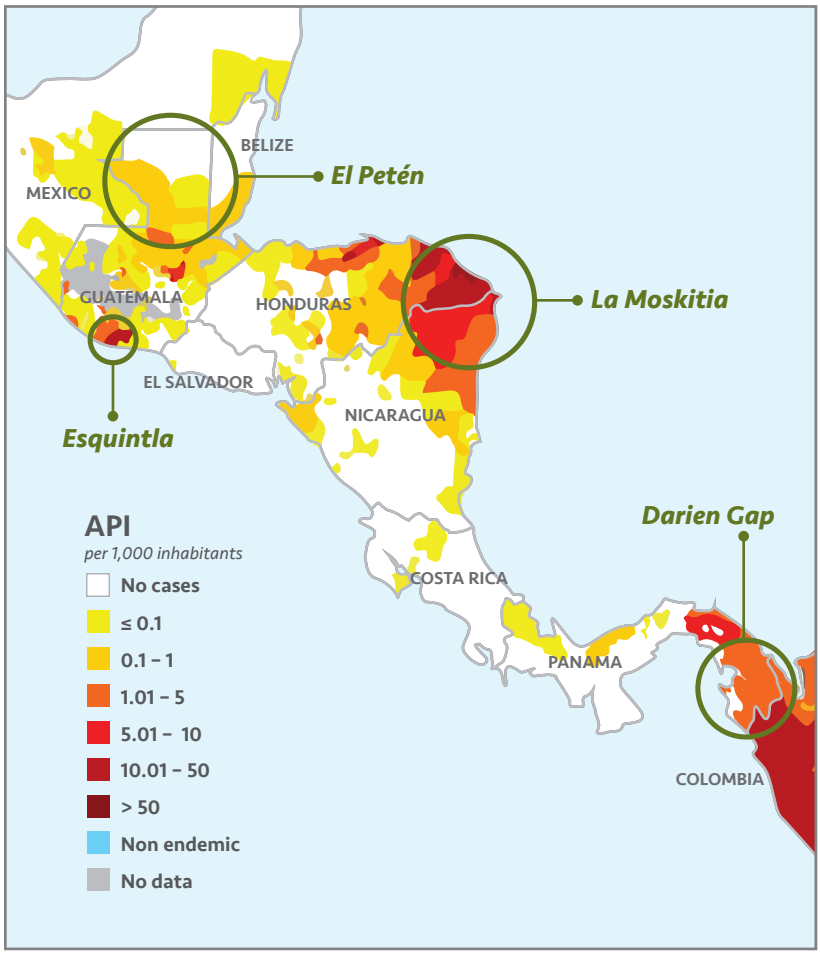


Figure 4. Proportion of El Salvador's contribution to malaria cases in Mesoamerica.[2]

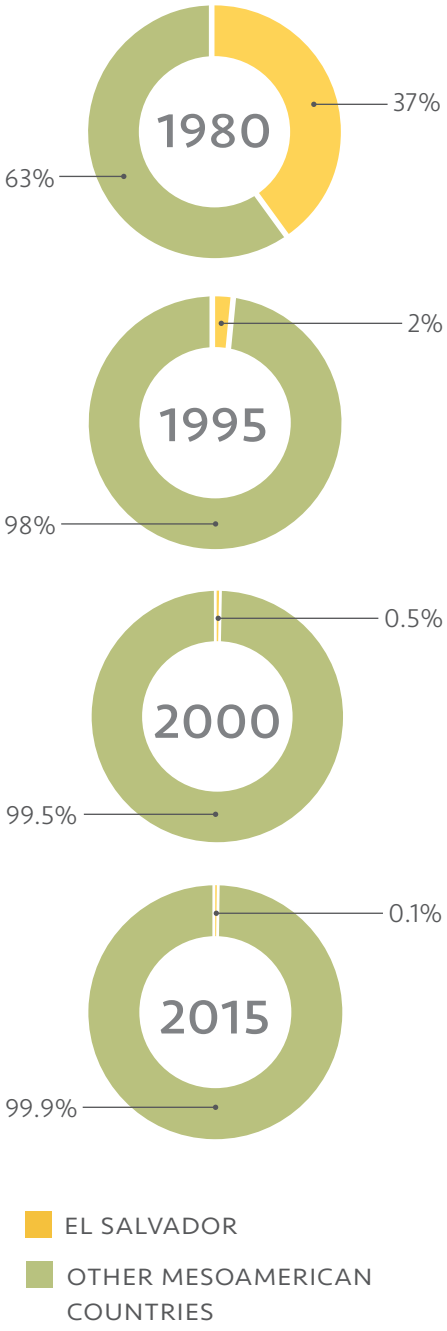


Table 1. Malaria in Mesoamerica, 2014.[2]

COUNTRY	REPORTED DEATHS	*P.VIVAX* CASES	*P. FALCIPARUM* CASES	MIXED CASES	TOTAL CASES
GUATEMALA	1	4,839	0	67	**4,906**
HONDURAS	2	2,813	530	37	**3,380**
NICARAGUA	0	1,000	161	2	**1,163**
PANAMA	0	866	8	0	**874**
MEXICO	0	658	0	0	**658**
BELIZE	0	19	0	0	**19**
EL SALVADOR	0	8	0	0	**8**
COSTA RICA	0	2	3	1	**6**
TOTALS	**3**	**10,205**	**702**	**107**	**11,014**

Infographic 1 provides a brief overview of the history of malaria incidence and a comparison of relevant geographical and socioeconomic similarities and differences between El Salvador and its contiguous neighbors, Guatemala and Honduras. The early decrease in malaria incidence in El Salvador is clearly distinguishable. What perhaps is less clear—and the focus of this research—is given the observed similarities and differences among the countries represented, what impact did the unique and timely implementation of specific malaria control and elimination policies in El Salvador have on the reduction of the overall malaria burden in that country? This question, and the evaluation of the various strategies implemented by El Salvador during this time period and their applicability to other malaria-eliminating countries, are explored in subsequent sections.

Infographic 1.

SIMILARITIES ACROSS THE REGION

Topographical and ecological similarities:

Low-land coastal borders along the Pacific Ocean or Caribbean Sea with tropical climate

Highlands in the interior with temperate climate

Vectors that primarily transmit malaria include *Anopheles albimanus, Anopheles darlingi,* and *Anopheles pseudopunctipennis*[11,13]

Malaria transmission is highest during the rainy season from May to October

Socioeconomic similarities:

Low GDP relative to the rest of North America (figures for 2015):[1]

EL SALVADOR	GUATEMALA	HONDURAS
$7,600	$5,300	$4,700
ranked 19 of 22	ranked 20 of 22	ranked 21 of 22

All countries were large exporters of cotton through the 1970s; collapse of the global cotton price in the 1980s limited migrant labor movement. From 1977 to 1990 bales of cotton exported was reduced by:[14,15,16]

EL SALVADOR	GUATEMALA	HONDURAS
94.25%	83.77%	100%

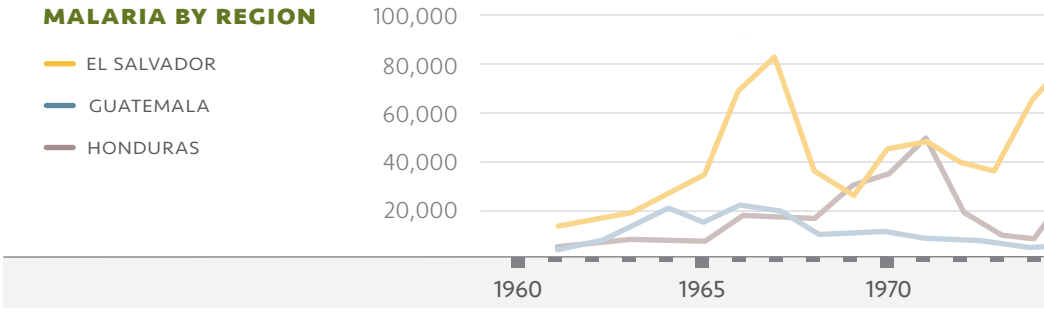
Increase in population density from 1961-2013:[1]

EL SALVADOR	GUATEMALA	HONDURAS
↑ 323%	↑ 291%	↑ 361%

Geopolitical similarities:

Ravaged by civil war:

EL SALVADOR	GUATEMALA
1980 to 1992	1960 to 1996



DIFFERENCES ACROSS THE REGION

Topographical and ecological differences:

Total land area:[1]

EL SALVADOR	GUATEMALA	HONDURAS
20,721 km²	107,159 km²	111,890 km²

Socioeconomic differences:

Total population density 2013 (people/km²):[1]

EL SALVADOR	GUATEMALA	HONDURAS
306	72	144

Indigenous populations:[17, 18, 19]

EL SALVADOR	GUATEMALA	HONDURAS
9.70%	39.80%	15.68%

Health indicators:

Under 5 mortality per 1,000 live births in 2013:[20]

EL SALVADOR	GUATEMALA	HONDURAS
16	31	22

Maternal mortality ratio per 100,000 live births in 2013:[20]

EL SALVADOR	GUATEMALA	HONDURAS
6	140	120

Percent of 1-year-old children immunized against measles in 2013:[20]

EL SALVADOR	GUATEMALA	HONDURAS
94%	85%	89%

PEAK OF RECORDED MALARIA CASES:

EL SALVADOR
1980
95,835

GUATEMALA
1982
77,375

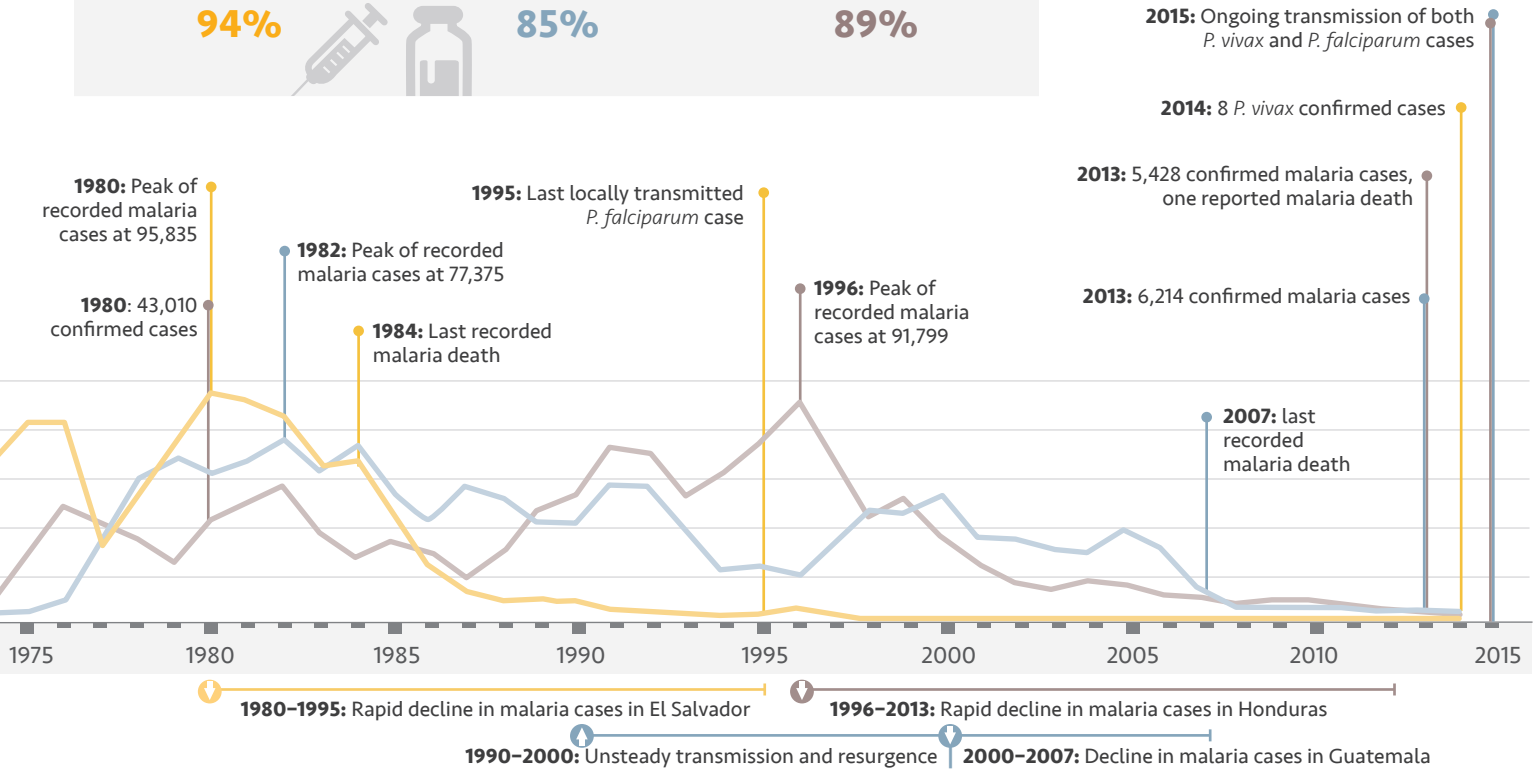
HONDURAS
1996
91,799

LAST RECORDED MALARIA DEATH:

EL SALVADOR
1984

GUATEMALA
2007

HONDURAS
tbd



SECTION 4

MALARIA IN EL SALVADOR

El Salvador considers its program to be in the elimination stage, with only nine cases of *P. vivax* reported in 2015 (6 imported, 3 autochthonous) among its population of 6.1 million (Figure 5).[21] The last recorded malaria death in El Salvador occurred in 1984, and the last locally transmitted case of *P. falciparum* was recorded in 1995.[22] Reported local transmission in El Salvador today is exclusively from *P. vivax* infections, transmitted by two vectors common in Mesoamerica—*An. albimanus* and *An. pseudopunctipennis*.[23]

El Salvador has experienced a dramatic decline in malaria: in 1980, the country contributed 37 percent of all reported cases in the region while today it contributes only less than 0.1 percent.[2] For most of its history, patterns of transmission in the country were analogous to those in neighboring countries: periods of decline in malaria incidence were followed by periods of resurgence.[2] Beginning in the 1980s, the number of cases detected each year was in decline, with El Salvador achieving a 90 percent reduction in cases from 1980 (95,835 reported cases) to 1990 (9,269 reported cases).[2] El Salvador continued to reduce locally acquired cases each year as remaining transmission foci were cleared, with less than 50 cases annually since 2006, as shown in Tables 2 and 3. This sustained maintenance of low levels of cases distinguishes the country from its neighbors, Guatemala and Honduras, which had persistent malaria transmission during this period (see Figure 1).[23]

Notably, although the number of malaria cases remained on a downward trajectory in El Salvador after 1980 (Figure 6), overall reported malaria cases in the region remained concentrated in El Salvador, Guatemala, and Honduras—which consistently accounted for more than half of reported cases in Mesoamerica from 1960–2010 (Table 3). Persistent high levels of reported cases among El Salvador's closest neighbors relative to the region as a whole support the assertion that programmatic actions in El Salvador had a profound effect on malaria incidence and that the decrease cannot be solely attributed to economic development, climatic factors, or ecological factors.[24]

El Salvador: geography, economy, and demographics[25,26]

Borders: Guatemala and Honduras are land neighbors; 307 km of Pacific Ocean coastline

Administrative units: divided into 14 departments: Ahuachapan, Cabanas, Chalatenango, Cuscatlan, La Libertad, La Paz, La Union, Morazan, San Miguel, San Salvador, San Vicente, Santa Ana, Sonsonate, and Usulutan

Climate: tropical, with a rainy season from May to October and a dry season from November to April

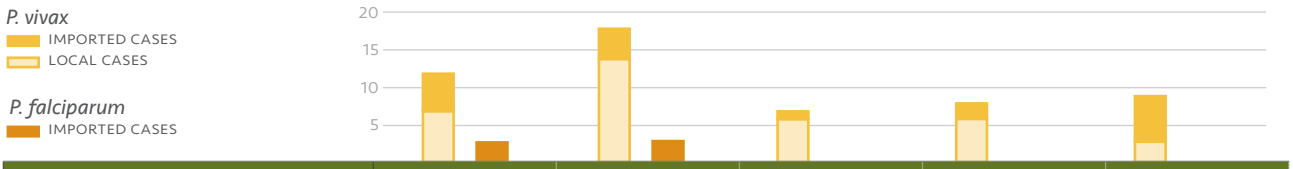
Terrain: mostly mountainous, with a narrow coastal plain and central plateau

Population: 6,125,512 (July 2014 est.); 1.097 million live in the capital San Salvador

Wetlands: about 510 km^2 of wetlands located mainly in coastal areas, much of the surface distributed among Usulutan, La Union, La Paz, Sonsonate, and Ahachapán

Recent natural disasters: Hurricane Mitch (1998) and earthquake (2001)

Table 2. Classification of malaria cases in El Salvador, 2011-2015.
Data provided by National Vector Control Program, El Salvador



	2011	2012	2013	2014	2015
P. VIVAX	12	18	7	8	9
P. FALCIPARUM	3	3	0	0	0
TOTAL RECORDED CASES	**15**	**21**	**7**	**8**	**9**

Figure 5. All reported (imported and local) malaria cases in El Salvador, 2009–2015.
Data provided by National Vector Control Program, El Salvador

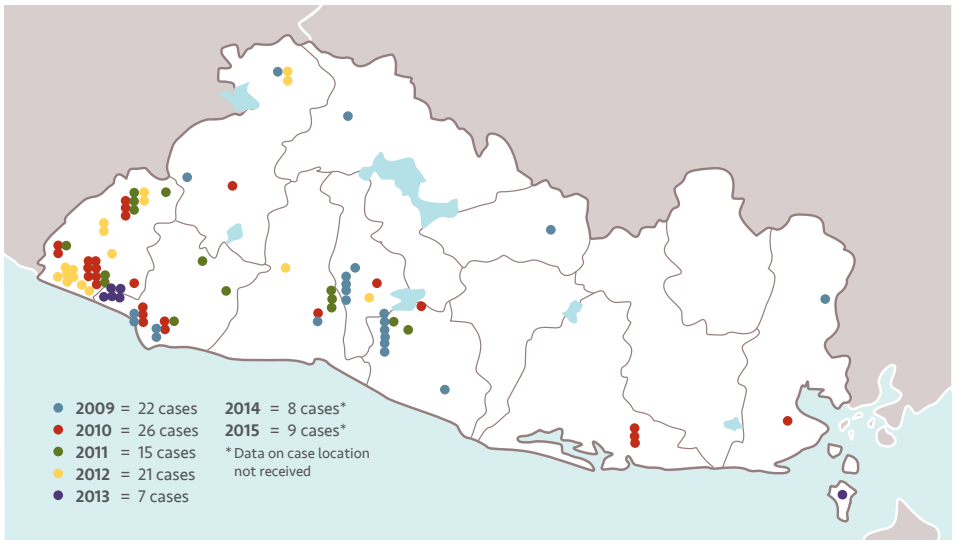


Table 3. Number of annual reported malaria cases per country in Mesoamerica.[2]
The yearly percent contribution from El Salvador, Guatemala, and Honduras is also indicated.
Bold number indicates the country with the highest number of recorded cases each year.

	1960	1965	1970	1975	1980	1985	1990	1995	2000	2005	2010	2014
EL SALVADOR	**10,066**	**34,070**	45,436	**83,100**	**95,835**	**44,473**	9,269	3,364	753	67	4	8
GUATEMALA	3,387	14,472	11,044	4,979	62,657	54,958	41,711	24,178	**53,311**	**39,571**	7,198	**4,906**
HONDURAS	5,517	6,952	34,537	30,289	43,010	33,828	53,099	**74,346**	**35,125**	16,007	**9,745**	3,380
MEXICO	3,496	10,103	**61,109**	27,910	25,731	133,697	**44,513**	7,316	7,390	2,967	1,233	658
NICARAGUA	7,528	10,275	27,260	24,692	25,465	15,130	35,785	69,444	23,878	6,642	692	1,163
COSTA RICA	2,000	2,563	350	290	376	734	1,151	4,515	1,879	3,541	114	6
PANAMA	4,464	1,929	4,584	666	304	126	381	730	1,036	3,667	418	874
BELIZE	196	206	33	90	1,529	2,800	3,033	9,413	1,486	1,549	150	19
TOTAL CASES	36,654	80,570	184,353	172,016	254,907	285,746	188,942	193,306	124,858	74,011	19,574	11,014
Percent contribution from El Salvador	27%	42%	25%	48%	38%	16%	5%	2%	1%	.01%	0.1%	0.1%
Percent contribution from El Salvador, Guatemala, Honduras	52%	69%	49%	69%	79%	47%	55%	53%	71%	75%	87%	75%

SECTION 5

ACTIONS AND APPROACHES TAKEN TO CONTROL AND ELIMINATE MALARIA IN EL SALVADOR

Several factors emerged as key contributors to the overall decline of malaria incidence in El Salvador.

Specific impact was seen during five distinct historical time periods listed below, each of which exhibits pronounced variation in malaria case incidence and transmission dynamics.

- **Global Eradication Campaign (1955–1969)**
- **Resurgence (1970–1980)**
- **Rapid Decline (1981–1995)**
- **Continued Decline (1996–2011)**
- **Endgame (2011–today)**

Section 5 reviews these trends and considers the the factors—in particular the deliberate adjustments in National Malaria Program strategies, approaches, and interventions—that account for them.

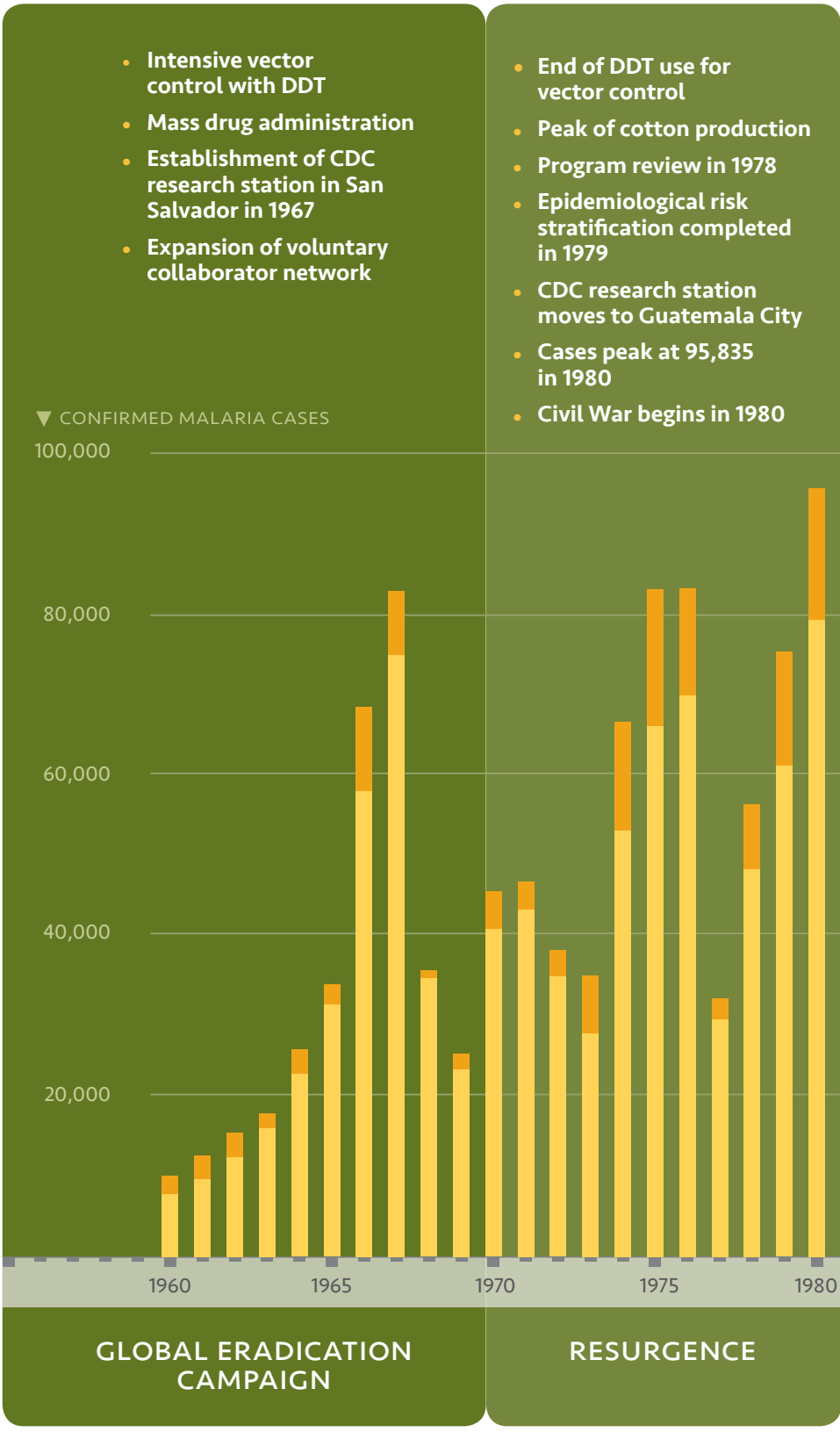
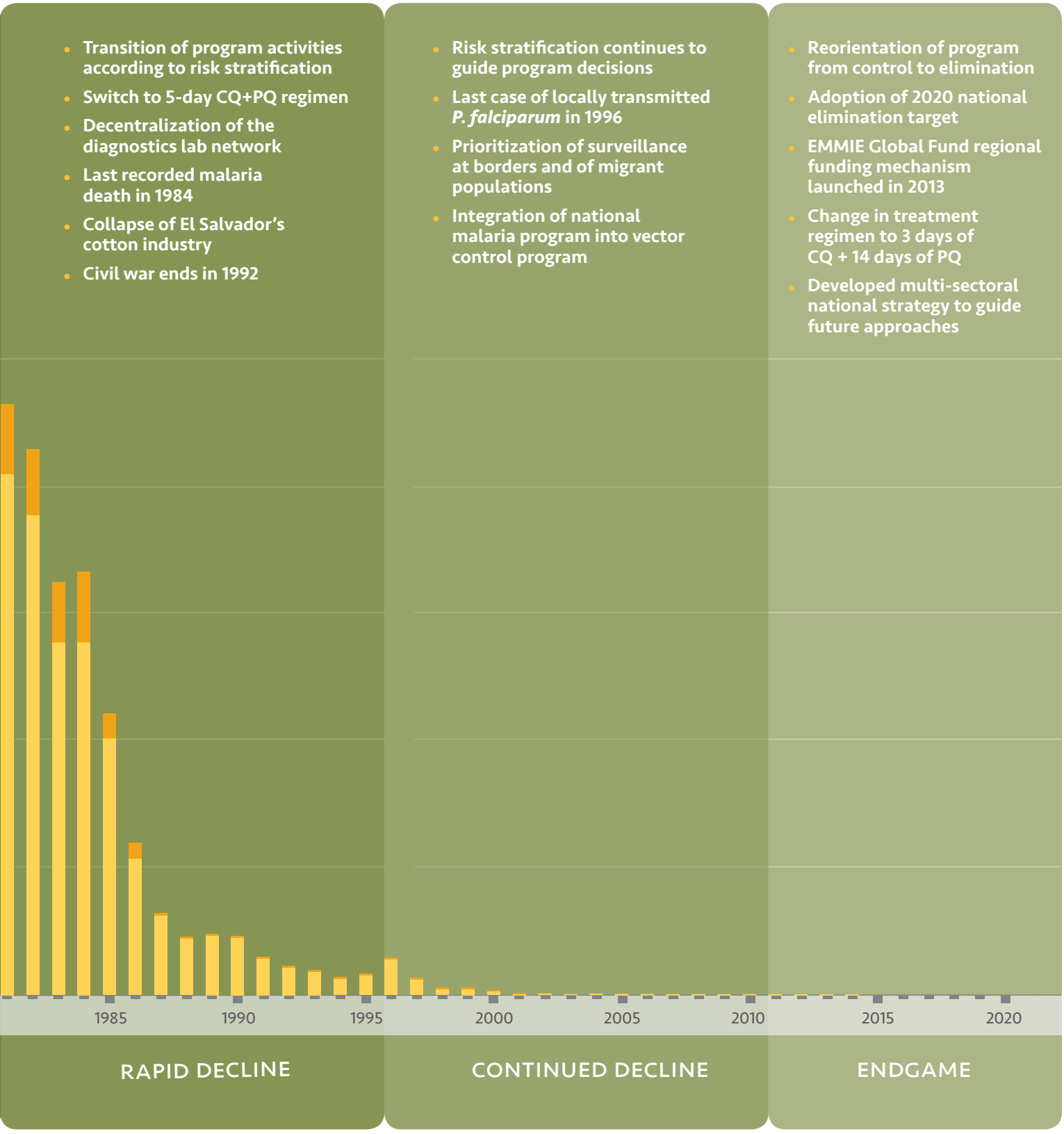
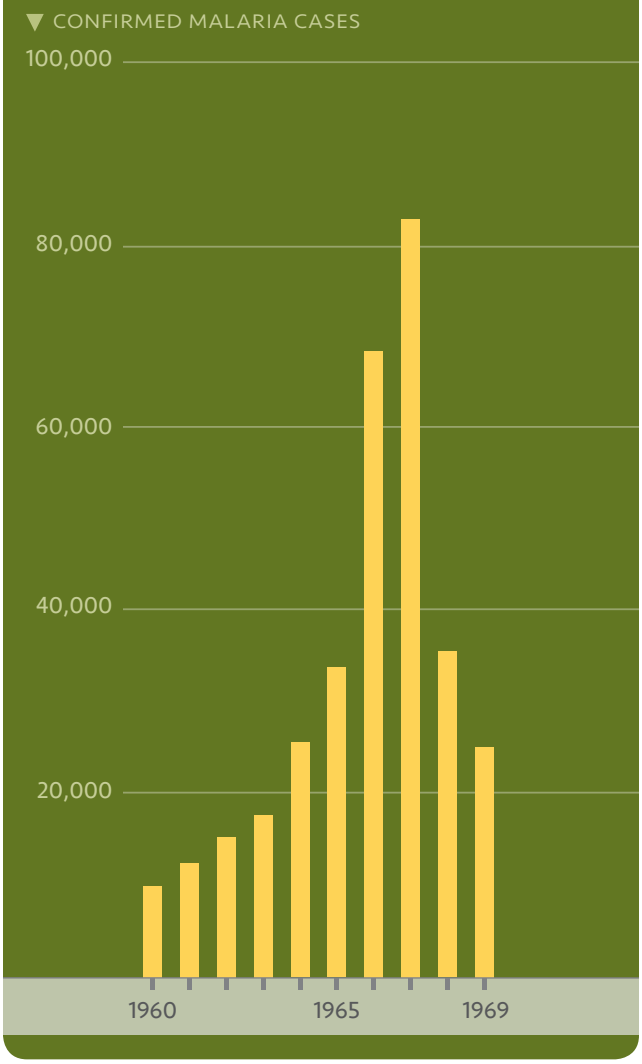


Figure 6. El Salvador malaria reported cases and correlating time periods.

P. falciparum & mixed *P. vivax*


Transition of program activities according to risk stratification
Switch to 5-day CQ+PQ regimen
Decentralization of the diagnostics lab network
Last recorded malaria death in 1984
Collapse of El Salvador's cotton industry
Civil war ends in 1992
Risk stratification continues to guide program decisions
Last case of locally transmitted P. falciparum in 1996
Prioritization of surveillance at borders and of migrant populations
Integration of national malaria program into vector control program
Reorientation of program from control to elimination
Adoption of 2020 national elimination target
EMMIE Global Fund regional funding mechanism launched in 2013
Change in treatment regimen to 3 days of CQ + 14 days of PQ
Developed multi-sectoral national strategy to guide future approaches
1985
1990
1995
2000
2005
2010
2015
2020
RAPID DECLINE
CONTINUED DECLINE
ENDGAME

- **Intensive vector control with DDT**
- **Mass drug administration**
- **Establishment of CDC research station in San Salvador in 1967**
- **Expansion of voluntary collaborator network**



5.1 Global Eradication Campaign (1955–1969)

In the mid-1950s, at a time when the newly developed World Health Organization (WHO) Global Malaria Eradication Program (GMEP) was creating enthusiasm for malaria elimination in endemic countries around the world, El Salvador expanded its own efforts against the disease and adopted plans aimed at national elimination.[27] In line with the GMEP approach, the National Malaria Program relied heavily on indoor residual spraying with DDT during this period, although spraying was supplemented by mass drug administration, mass prophylaxis, active case detection, and environmental management techniques such as larvaciding.[27,28]

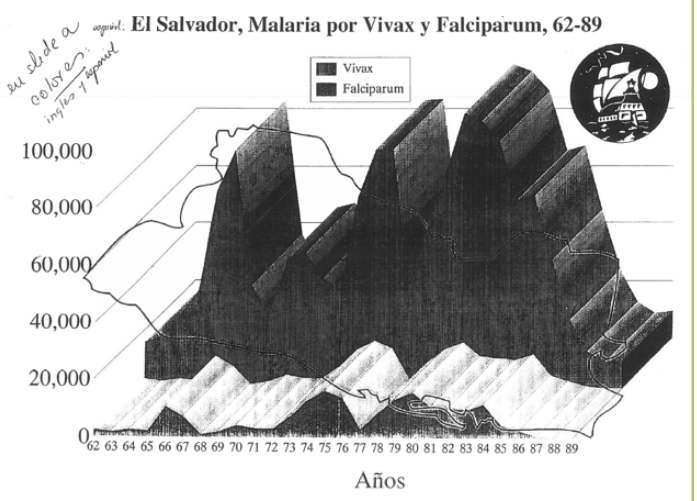
The period also saw the establishment of the VC network (a community health and disease surveillance platform), the creation of subnational risk maps to inform decision-making, and the establishment of a CDC research station in San Salvador in 1967.[29] Confirmed malaria case incidence remained low through the first half of the period but began to rise considerably in the mid-late 1960s as DDT resistance, rising insecticide costs, and waning momentum for the global eradication campaign began to have an effect.

Voluntary collaborator network

The VC network, a community health and disease surveillance platform, was established and subsequently strengthened in El Salvador in the 1950s. VCs in El Salvador were traditionally selected from the communities in which they served. These individuals tended to already be respected members of their communities, and they earned further respect from their communities by assuming the roles and responsibilities of a VC. In many instances, retiring VCs would pass on their duties to another capable and esteemed family member, taking pride in the opportunity for their family to continue improving their community.[30,31] Despite the lack of monetary compensation, VCs earned respect from their peers and were proud of their service in the community. This sense of pride motivated VCs to perform high quality and accurate work.[32] For community members, VCs were also a reliable resource for information about malaria.

Figure 7. Early graph of El Salvador's confirmed *P. falciparum* and *P. vivax* cases.

Provided by Mauricio Sauerbrey, El Salvador



During this early period, the VCs provided diagnosis and treatment for malaria in the communities they served, though exact responsibilities and drug regimens used remain unclear. All case data was reported to the National Malaria Program.[27]

Following the hierarchical operational approach exemplified by the Global Eradication Campaign, El Salvador's network of VCs was established with strict expectations: accuracy, timeliness, and a high level of respect for superiors.[33] Waiving health center fees for VCs and their families initially incentivized participation. This was no longer an incentive in the subsequent decades as national health care became free and easier to access, but VCs maintained the same sense of loyalty and commitment to the program.[21]

The National Malaria Program expanded the VC network later in this period as vector control activities intensified. The number of VC posts increased from 79 posts in 1955 to 590 posts in 1959.[27] The malaria case data generated by the volunteers served as the first initial form of El Salvador's malaria surveillance system. The VC network established in this period continued to expand and strengthen, becoming an integral part of El Salvador's success in malaria case management and surveillance.

Mass drug administration

Mass drug administration (MDA) strategies were initiated in select areas in 1961 and further expanded from 1963 to 1966. MDA campaigns used amodiaquine-primaquine every two weeks in areas with high malaria incidence.[34] MDA activities were conducted again beginning in 1967. It is not clear if these campaigns were conducted year round or only during the dry season. It is also not known if these campaigns were integrated with other disease efforts.

Technical support through CDC San Salvador Research Station

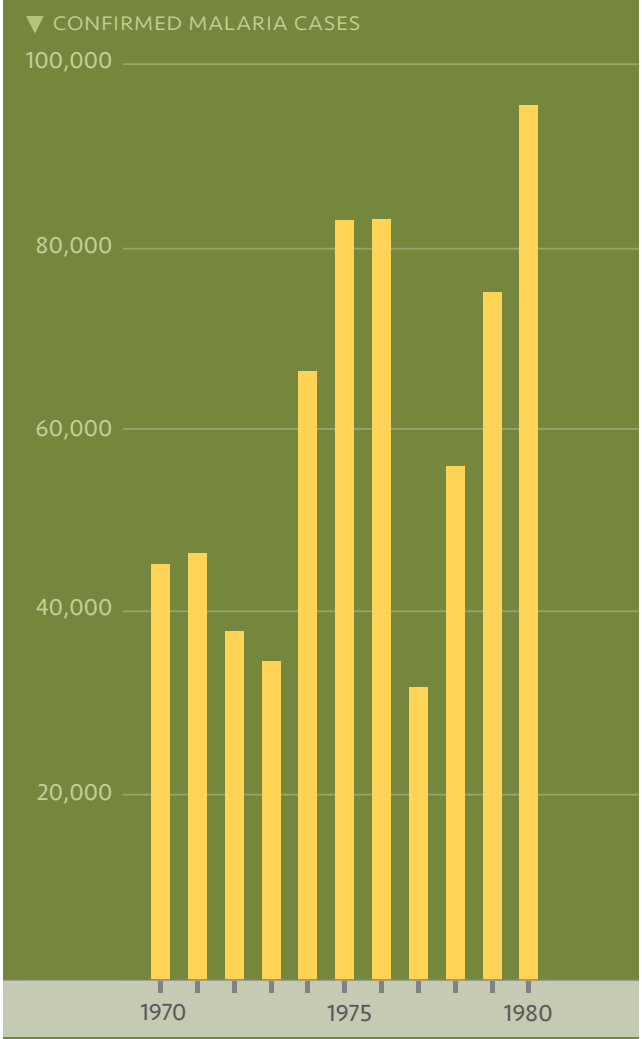
The United States Centers for Disease Control and Prevention (CDC) provided technical assistance and support to National Malaria Program efforts throughout the period.[32] In the early 1960s, the CDC Division of Parasitic Diseases established a research station in San Salvador focused on medical entomology and parasitology. The El Salvador research station contributed strongly to El Salvador's understanding of the malaria parasite and uptake of evidence-based approaches.[35]

Decline in GMEP momentum

Globally, GMEP strategies and interventions produced early declines in malaria, but progress began to slow by the mid-to-late 1960s as *Anopheles* mosquitoes developed DDT resistance.[8] Eradication programs grew more expensive because of the need for greater quantities of insecticide, and global funding reductions coupled with policy disagreements brought about the end of the GMEP era in 1969.[8] After 14 years of investment, the GMEP had achieved mixed results overall, and many countries saw their tenuous gains lost to resurgence after the program's end.[36]

El Salvador left the GMEP era facing a major increase in malaria cases, peaking at 82,960 cases in 1967 compared to 10,066 in 1960 (Figure 7).[2] Unstable financing compounded the challenge of insecticide resistance and contributed to malaria resurgence,[27] with reported cases rising by 365 percent from 1963 to 1967.[2] In 1968 the country initiated a three-year plan calling for DDT spraying, active case detection (ACD), and the extension of MDA to all malarious areas of the country. But El Salvador was unable to regain control over malaria as mosquitoes developed resistance to DDT, its main vector control tool, in part due to its overuse as a pesticide in the cotton industry.[28,37] Another insecticide, propoxur,[34] became less effective against vector populations in this period as well. Malaria case levels remained above 1963 levels through the 1960s and 1970s.[2]

- **End of DDT use for vector control**
- **Peak of cotton production**
- **Program review in 1978**
- **Epidemiological risk stratification completed in 1979**
- **CDC research station moves to Guatemala City**
- **Cases peak at 95,835 in 1980**
- **Civil War begins in 1980**



5.2 Resurgence (1970–1980)

In the late 1960s and throughout the 1970s , El Salvador experienced a resurgence of malaria cases, eventually peaking at 95,835 recorded cases in 1980—an 852 percent increase from 1960 case levels.[2] The intensity of the surge overwhelmed the health system and made timely diagnosis impossible: the central diagnostic laboratory reported delays of up to four months following the rainy season and many blood samples had to be thrown out without being analyzed.[27]

Several factors likely contributed to the resurgence. The growth of the cotton industry increased the number of migrant workers working in lowland areas and living in temporary living spaces during the peak malaria transmission season. The National Malaria Program lost its key GMEP-era vector control tool when growing resistance among *Anopheles* mosquitoes forced it to end DDT spraying in 1972 (it was replaced by ortho-isopropoxyphenyl methylcarbamate [OMS-33]).[27] The CDC conducted a five-day primaquine (PQ) efficacy study in El Salvador in 1978. A source of locally based technical assistance was lost when the United States moved the CDC research station in El Salvador to Guatemala. In the face of resurgence, the National Malaria Program experimented with additional mass treatment strategies and convened CDC and PAHO for a program review in 1978. Throughout this period, El Salvador's malaria activities were primarily, and consistently, funded by domestic resources, with additional support received from USAID.

Expansion of cotton production

The cotton industry in Central America flourished during the 1970s, with production peaking during the 1977–1978 growing season.[14] Growing global demand raised cotton prices, while inexpensive pesticides and a large migrant labor force reduced production costs for cotton growers in the region.[37]

Expanding cotton production may have created new challenges for the National Malaria Program by intensifying malaria transmission in El Salvador. Cotton estates were located primarily along the coastal plain, an ideal habitat for the malaria vector. Highland residents who often had little or no immunity to malaria moved into malarious lowland areas to work on cotton estates. Seasonal workers rarely stayed in permanent shelters and often lived near water, where mosquito breeding sites were located, increasing the likelihood of malaria transmission.

The seasonal nature of the work weakened cohesion among migrant workers and made it difficult to establish and sustain an effective VC network.

Program review and transition

In addition to the challenges created by the cotton industry, the primary malaria control approaches in use during this period—MDA campaigns and vector control through insecticide spraying—were proving increasingly ineffective. In 1970, the National Malaria Program had changed its MDA strategy, issuing a combination of pyrimethamine and primaquine every two weeks in areas with high malaria incidence.[34]

A resurgence in malaria cases served as the impetus for the transition of the Ministry of Health's strategies for malaria control. The National Malaria Program initiated a review in 1978 in collaboration with the CDC and PAHO to reshape El Salvador's malaria control strategy.[27] Following this review, the National Malaria Program worked to determine the distribution and frequency of malaria cases by geographic location, allowing the program to stratify the country by malaria morbidity (Table 4).[38] With the support of USAID, epidemiologic stratification was completed by 1979 and used to transition program activities.[28] By 1980 stratification was an integral part of the malaria strategy. The national program also recognized the need to decentralize the diagnostic lab system and to increase the number of labs to improve slide turnaround time, though efforts in this direction would not be completed until the early 1980s.

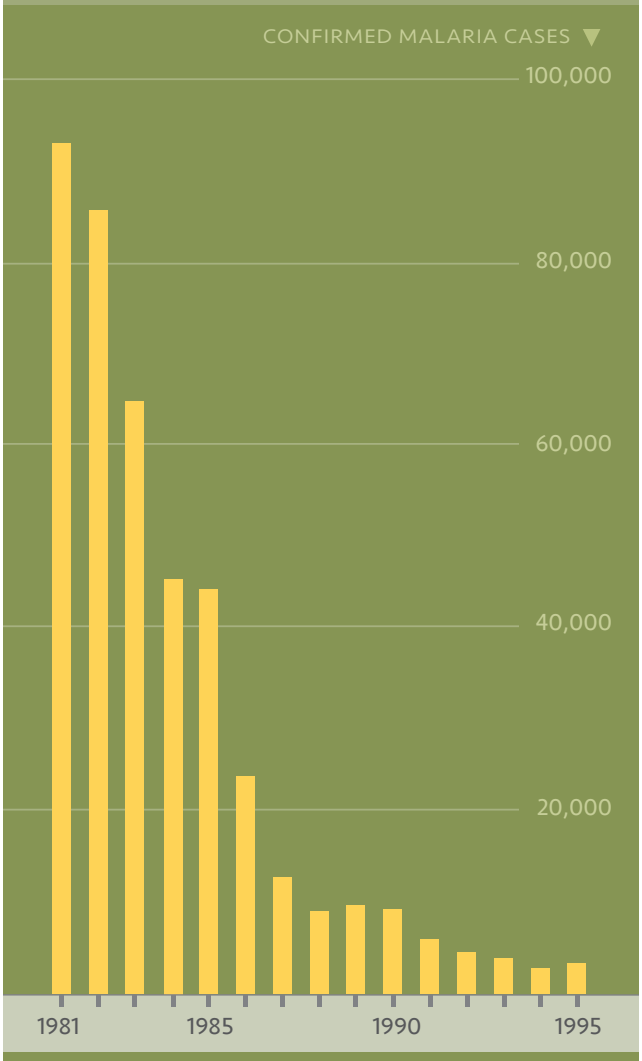
The CDC Central American Research Station in El Salvador continued to conduct operational research and to provide technical assistance to the national program in these years. In 1978 the CDC conducted a field evaluation in El Salvador to gauge the effectiveness of a shorter course of primaquine in controlling *P. vivax* malaria. The study found that a five-day primaquine regimen "produced a substantial reduction in the numbers of patients experiencing renewed parasite activity and in the number of parasitemias" and concluded that primaquine regimens "which are more practicable for field use than the full 14-days curative regimen, are of value to both the patient and the community through the reduction of parasite episodes and the reduction of the source of mosquito infection for continuation of transmission."[39] Following this review, the National Malaria Program adopted the five-day approach, against PAHO advice.[32]

National efforts to address malaria resurgence took place against a backdrop of intensifying civil unrest and conflict. Increasing political instability prompted the CDC Central American Regional Station to move from San Salvador to Guatemala City.[35] Despite this loss, the CDC's legacy of technical assistance and the National Malaria Program's adoption of evidence-based approaches such as risk stratification helped to lay the programmatic foundation for El Salvador's progress against malaria in the early 1980s and beyond.

Table 4. Original CDC-CAR Malaria stratification in El Salvador, 1979.[40]

STRATA	AREA SQ KM (%)	% OF TOTAL CASES	# OF VC POSTS (%)	POPULATION (%)
NON-MALARIOUS API < 10 (>901 meters)	1,888 (9%)	1	382 (13%)	538,979 (10%)
HYPOENDEMIC API = 10–49 (601–900 meters)	11,118 (53%)	3	499 (17%)	3,395,567 (63%)
MESOENDEMIC API = 50–99 (301–600 meters)	3,216 (15%)	6	656 (23%)	485,081 (9%)
HYPERENDEMIC API > 100 (0–300 meters)	4,819 (23%)	90	1,377 (47%)	970,162 (18%)

- **Transition of program activities according to risk stratification**
- **Switch to 5-day CQ+PQ regimen**
- **Decentralization of the diagnostics lab network**
- **Last recorded malaria death in 1984**
- **Collapse of El Salvador's cotton industry**
- **Civil war ends in 1992**



5.3 Rapid Decline (1981–1995)

Beginning in the early 1980s and continuing through the mid-1990s, malaria transmission in El Salvador entered a period of Rapid Decline. The last recorded malaria death occurred in 1984 and by 1988 El Salvador had achieved a 90 percent reduction in malaria cases from 1980 levels.[2] Locally transmitted *P. falciparum* cases were eliminated in 1995.[22]

The dramatic decline in malaria cases coincided with the Salvadorian civil war (1980–1992) and the collapse of the national cotton industry. Falling cotton production and deteriorating security conditions may have reduced malaria transmission by consolidating the population into urban centers, curbing general population movement, and reducing the size of the seasonal cotton workforce at elevated risk of malaria infection.[41] The National Malaria Program also undertook a major transition of program activities in these years, distributing VCs according to risk stratification, decentralizing the diagnostics lab network, switching to a five-day chloro-primaquine (CQ+PQ) regimen, and instructing VCs to provide directly observed presumptive treatment, and then following up to stop remaining doses of treatment if test results came back negative for malaria.[24,30,42] In many cases, results were not available before the full course had already been completed. USAID and domestic funding continued to support activities throughout the period. In the early 1990s, USAID ceased funding and the national government increased its financial support to maintain activities.[32] Taken together, the totality of changes suggest that the rapid decline resulted both from the deliberate actions of the National Malaria Program and from changes in malaria transmission dynamics created by changing socioeconomic conditions. As stated by Randall M. Packard, "the success of malaria control in El Salvador during the 1980s needs to be viewed as the result of an efficiently designed malaria control program operating within a favorable social and economic environment."[24]

The civil war's impact

Between 1980 and 1992, El Salvador was ravaged by a civil war that left 70,000 people dead and caused approximately $2 billion in damage. Salvadorans fleeing the war sought safety and better economic prospects in Mexico, Guatemala, Honduras, Nicaragua, and Costa Rica, as well as the United States and Canada. Malaria cases continued to decline during the war despite

challenges to the implementation of a malaria control program created by the conflict. Although malaria control activities were affected, control methods—especially at the community level—were maintained. The VC network continued to function during the war. Those who participated in the program explained its success by describing the flexibility and commitment of the personnel involved in running the program, especially the VCs.[41] After the war, political authorities carried out land reform to address the issue of 'landlessness' which was viewed as a destabilizing factor. Large estates along the coastal plain were broken up into smaller land holdings and small-scale agricultural cooperatives were created.[41]

The collapse of the cotton industry

El Salvador saw its cotton industry collapse in these years. The global economic recession had reduced cotton demand at the same time as production costs were skyrocketing due to the decreasing efficacy of pesticides like DDT which forced farmers to spray more frequently and to use more costly second- and third-line pesticides.[41] As cotton production contracted so fell the number of migrant laborers living in temporary housing and working in the cotton fields during the peak malaria transmission season.

Declining cotton production helped to eliminate a factor that contributed to malaria transmission during El Salvador's intense malaria resurgence of the 1970s. However, the later success of El Salvador's malaria control efforts cannot be solely attributed to these events. Guatemala was another major cotton exporter that saw its cotton industry collapse during this period, and also went through a civil war, yet it did not see a marked and sustained change in its malaria profile.[37]

The end of the civil war allowed for an increased focus in health activities. Due to the notable reduction in cases, a strategic program change was sought in 1992, with a new focus on surveillance and vector control and an increased government role in managing malaria.[40]

National program transition

The period of rapid decline began with a change in program transition following a program evaluation in partnership with PAHO and CDC in 1978 to try to course correct after a dramatic increase in cases in the late 1970s.[38,40] The evaluation examined data from the previous seven years of malaria control activities and developed a strategy of 'integrated control' with a focus on epidemiological monitoring and surveillance, entomological surveillance, vector control, and the use of the VC network for diagnosis and treatment.[41]

These activities were primarily completed by VCs; epidemiology assistants (auxiliares de epidemiología), who were provided motorcycles and were responsible for collecting slides and VC registers, distributing supplies, and supervising the VC network; and Entomology Assistants (auxiliares de entomología), who were responsible for larval control activities.[32]

Upon completion of the stratification, the National Malaria Program outlined the following overarching goals:[38]

1. Maximize the utility of the general health system structure by expanding upon community-level resources (principally the voluntary collaborators) to achieve effective program coverage.
2. Realize malaria vector control in both the larval and adult stage, and encourage the integration of this goal into the goals of other institutions and health sectors that benefit from vector control expansion/improvement.
3. Strengthen antimalarial activities at the border.
4. Realize integral control activities, at the level of an emergency in high incidence areas, according to the stratification completed.
5. Protect migrant laborers or those working on construction projects with antimalarials.
6. Include malaria control activities as an integral part of the Primary Health Attention Strategy (Estrategia de Atencion Primaria de la Salud).
7. Promote intersectoral coordination and technical cooperation between developing countries and at the international level.
8. Encourage inter-country meetings for programs to enact means of mutual protection, analyze epidemiological information, and evaluate available technology.
9. Improve the information system between surrounding countries in Central America.
10. Promote and realize epidemiological and operational investigations.

Intervention targeting by risk stratification

Aiming to determine the geographic transmission of malaria, the program completed epidemiological mapping to understand the highest risk areas of transmission. Using primarily altitude and monthly annual parasite index (API) averages—the number of blood smear-confirmed cases, per 1,000 residents per year—from years 1970–1977, the national program

stratified El Salvador geographically into the following four categories:[27,43]

- **Hyperendemic:** API > 100
- **Mesoendemic:** API = 50–99
- **Hypoendemic:** API = 10–49
- **Non-malarious:** API < 10

The National Malaria Program continued to use this stratification throughout this period (Figure 8), and it remains in place in 2015.[43]

The number of VCs in each epidemiological strata was determined according to malaria risk, with the highest number of VCs deployed to the hyperendemic region with a goal of one VC for every 600 individuals in the two highest burden strata. Analysis of API and SPR data indicated that 70 percent of the VCs were located in areas with little or no malaria burden (Figure 9) and VCs were reallocated according to the API.[44]

VCs worked collaboratively with employed epidemiology assistants and zonal epidemiological surveillance leads (Jefes de Zona en Vigilancia Epidemiológica). Zonal surveillance leads were responsible for epidemiological surveillance, administrative tasks, planning control interventions, and supervision.[40] These leads were primarily responsible for operational planning based on changes in API (per 1,000 people) in health catchments every year. This review and planning process took place at the end of every year. Health catchments with more than 15 cases per 1,000 people were given the highest priority at the operational level.[40]

In the 1980s, the priority and intensity of activities for health posts continued to be determined using slide

Figure 8. El Salvador national stratification: Classification of areas according to potential malaria risk, population size within area, percentage of cases, and malariometric indicators, 1994.

Received from Mauricio Sauerbrey, El Salvador.

Breakdown by strata of land area (KMS²), percent of land area of total country (% del pais), percent of total population (% del total del pais), number of cases (numero de casos por area), percent of country's malaria cases (% de caso por area), blood slides collected (muestras colectados por area), annual blood examination rate (IAES), slide positivity rate (ILP), and annual parasite index (IPA) in 1994.

MINISTERIO DE SALUD PUBLICA Y ASISTENCIA SOCIAL
DEPARTAMENTO DE MALARIA

CLASIFICACION DE AREAS SEGUN EL POTENCIAL MALARICO COMPRENDIENDO SUPERFICIE, POBLACION MUESTREO Y PORCENTAJE DE CASOS E INDICADORES MALARIOMETRICOS--1994

AREA	KMS²	% DEL PAIS	POBLACION	% DEL TOTAL DEL PAIS	NUMERO DE CASOS POR AREA	% DE CASO POR AREA	MUESTRAS COLECTADAS POR AREA	IAES	ILP	IPA
NO MALARICA	1188	9	545743	10	139	4.9	7546	1.4	1.8	0.3
HIPOENDEMICA (BAJO RIESGO), SE INCLUYEN ALGUNAS AREAS URBANAS*	11118	53	3438181	63	126	4.5	11946	0.3	1.1	0.04
ENDEMICA (MODERADO RIESGO)	3216	15	491169	9	285	10.1	24511	5.0	1.2	0.6
HIPERENDEMICA (ALTO RIESGO), MAS DE 60 CASOS POR AÑO	4819	23	982338	18	2253	80.3	95574	9.7	2.4	2.3
TOTAL PAIS	20341	100	5457431	100	2803	100	139577	2.6	2.0	0.51

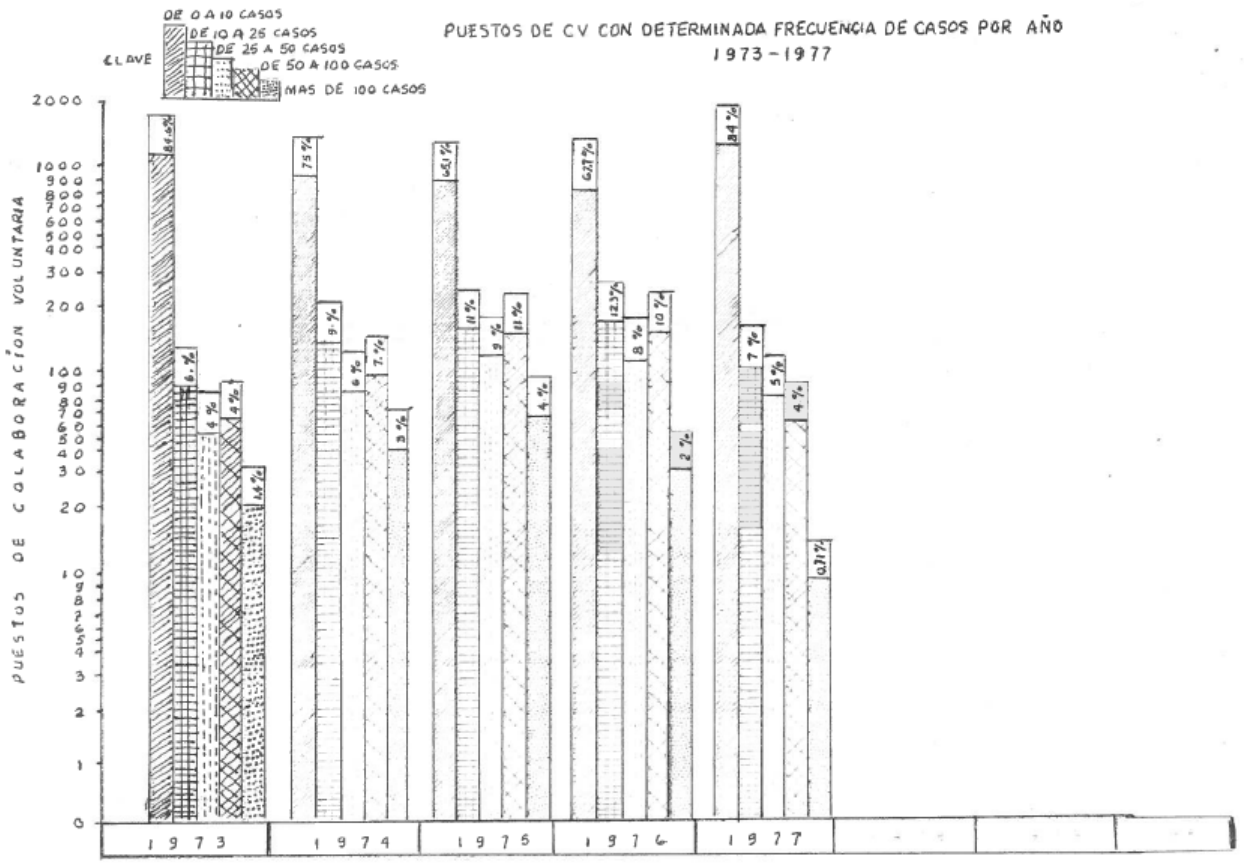
* Las áreas urbanas consideradas son: San Salvador, Santa Ana, Ahuachapán, Sonsonate, Santa Tecla, Zacatecoluca, Usulután, San Miguel y La Unión.

Fuente de información: Departamento de Malaria–Ministerio de Salud Pública y Asistencia Social

Figure 9. Number of VC posts by incidence category, 1973-1977.[44]

Inserted from PAHO report "Caracteristicas generales del programa anti-malarico en El Salvador."

Bar graph depicting the number of VC posts according to malaria case incidence between the years 1973 and 1977. The associated key stratifies case frequency into five categories: 0-10 cases, 10-25 cases, 25-50 cases, 50-100 cases, and more than 100 cases. The percentage written atop each bar indicates the percentage of VC posts corresponding to the associated case frequency.



positivity rate (SPR), annual parasite index (API), and frequency of infections. Epidemiology assistants would visit each of the health posts run by the VCs in what became known as epidemiological circuits. The objective of the epidemiological circuits was to provide increased oversight to VCs in those areas of highest endemicity. Frequency of epidemiologic assistant visits to VCs to collect data varied by region and was determined by API: weekly visits API > 100; every 15 days API 16–35; monthly API 6–15; visited every three months API 0-5.[43]

El Salvador was reporting weekly on a number of malaria indicators. Figures 11 and 12 show examples of their surveillance system data collection and detailed weekly reporting information (full versions available in Annex 2 and 3). Epidemiological data were manually entered into the surveillance system to provide these reports. The reports were then accessed and evaluated weekly by regional managers and central managers to guide local and village-level (caserío) control efforts.[45] With these weekly data in hand, local leaders were empowered to independently respond in a timely manner to observed changes.

It is important to note that the process of stratification and decentralization in El Salvador, supported by the VCs and the surveillance system, truly resulted in local, timely, evidence-based decision-making. The success of this effort led to the description of the approach as "dynamic epidemiology".[44,45]

In 1993, 2,914 VCs were distributed according to the following four areas, and within that by each department (Figure 10).[46]

Figure 10. Malaria voluntary collaborator (VC) network in El Salvador, 1993.

Received from Mauricio Sauerbrey, El Salvador.

MALARIA VOLUNTARY COLLABORATORS NETWORK
EL SALVADOR 1993

HEALTH REGION	ENDEMICITY AREAS				TOTAL
	HYPERENDEMIC	MESOENDEMIC	HYPOENDEMIC	NON-MALARIOUS	
WESTERN	230	109	157	70	566
CENTRAL	200	174	89	52	515
METROPOLITAN	57	65	68	36	226
PARACENTRAL	222	168	134	152	676
EASTERN	668	140	51	72	931
TOTAL COUNTRY	1377	656	499	382	2914

Figure 11. Sample of weekly report by town: Department of Ahuachapan, Week 31, 1995 (full version in Annex 2).

Received from Mauricio Sauerbrey, El Salvador.

Print-out of weekly reported cases by town in the Department of Ahuachapan. Report includes number of P. falciparum cases, P. vivax cases, blood slides taken, and positive slides by town for week 31, as well as the prior four weeks and annual accumulation to date. The snapshot below shows the first page of the report; the remaining 5 pages can be seen in Annex 2. This information was collected weekly for all departments.

EMISION: 14-08-95 MINISTERIO DE SALUD PUBLICA Y ASISTENCIA SOCIAL PAG. 1

DEPARTAMENTO DE MALARIA

REPORTE DE SEMANA 31. / 1995 PARA EL DEPARTAMENTO AHUACHAPAN

LOCALIDAD	ESTA SEMANA				ULTIMAS 4 SEMANAS				ACUMULADO ANUAL			
	FAL	VIV	POS	LAM	FAL	VIV	POS	LAM	FAL	VIV	POS	LAM
EL CALVARIO	0	0	0	0	0	0	0	1	0	0	0	1
SAN SEBASTIAN	0	0	0	0	0	0	0	0	0	0	0	1
SAN JOSE	0	0	0	0	0	0	0	0	0	0	0	1
LAS FLORES	0	0	0	0	0	0	0	1	0	0	0	1
SANTA TERESA	0	0	0	0	0	0	0	0	0	0	0	1
LA GLORIA	0	0	0	0	0	0	0	1	0	0	0	1
EL NOPAL	0	0	0	0	0	0	0	0	0	0	0	1
FAVIO MORAN	0	0	0	0	0	0	0	0	0	0	0	1
SANTA MARIA	0	0	0	0	0	0	0	0	0	0	0	2
MARIA AUXILIA	0	0	0	0	0	0	0	0	0	0	0	3
SAN RAFAEL	0	0	0	0	0	0	0	0	0	0	0	1
I.V.U.	0	0	0	0	0	0	0	1	0	0	0	2
ASHAPUCO	0	0	0	0	0	0	0	1	0	0	0	3
CUYANANSUL	0	0	0	0	0	0	0	2	0	0	0	6
CHANCUYO	0	0	0	3	0	0	0	6	0	2	2	65
LA LAGUNA	0	0	0	0	0	0	0	0	0	2	2	42

Figure 12. Report of endemicity and source, by department, weeks 1–39, 1993 (full version in Annex 3).

Received from Mauricio Sauerbrey, El Salvador.

Print-out of weekly reported cases by region for the first 39 weeks in 1993, indicating who detected the case. Report includes number of P. falciparum cases, P. vivax cases, blood slides taken, and positive slides by departments within each region. Cases were detected either by voluntary collaborators (C. Voluntario), active case detection (B. Activa), medical personnel (S. Medico) or specialists (E. Especiales). The snapshot below shows the report for the Occidental region; the remaining data for El Salvador's four other regions can be seen in Annex 3.

MISION: 25-10-93 MINISTERIO DE SALUD PUBLICA Y ASISTENCIA SOCIAL PAG. 1

DEPARTAMENTO DE MALARIA

REPORTE DE ENDEMICIDAD Y FUENTE POR DEPARTAMENTO. SEMANAS 1.- 39. / 1993

DEPARTAMENTO	HIPERENDEMICA				MESOENDEMICA				HIPOENDEMICA				NO MALARICA			
	FAL	VIV	POS	LAM	FAL	VIV	POS	LAM	FAL	VIV	POS	LAM	FAL	VIV	POS	LAM
REGION: OCCIDENTAL																
SANTA ANA																
C. Voluntario	0	35	35	531	0	53	53	666	0	40	40	1594	1	5	6	813
B. Activa	0	1	1	500	0	9	9	792	0	2	2	266	0	0	0	21
S. Medico	0	2	2	17	0	0	0	2	0	2	2	42	0	0	0	11
E. Especiales	0	0	0	119	0	5	5	224	2	0	0	72	0	0	0	10
TOTAL	0	38	38	1167	0	67	67	1684	0	44	44	1974	1	5	6	855
AHUACHAPAN																
C. Voluntario	0	332	332	3458	0	41	41	975	0	23	23	1188	0	1	1	214
B. Activa	0	45	45	2356	0	0	0	174	0	0	0	112	0	0	0	0
S. Medico	0	29	29	378	0	0	0	123	0	0	0	78	0	0	0	1
E. Especiales	0	2	2	222	0	0	0	0	0	0	0	0	0	0	0	0
TOTAL	0	408	408	6406	0	41	41	1272	0	23	23	1378	0	1	1	215
SONSONATE																
C. Voluntario	0	472	472	5838	0	10	10	284	0	1	1	89	0	67	67	558
B. Activa	0	23	23	939	0	0	0	104	0	0	0	146	0	2	2	167
S. Medico	0	1	1	53	0	1	1	11	0	0	0	52	0	0	0	0
E. Especiales	0	0	0	47	0	0	0	8	0	0	0	0	0	0	0	1
TOTAL	0	496	496	6877	0	11	11	407	0	1	1	287	0	69	69	726
TOTAL REGION	0	942	942	14450	0	119	119	3363	0	68	68	3639	1	75	76	1796

Environmental management

The improvement and maintenance of water management projects to eliminate breeding sites was cited as a critical component of El Salvador's vector control strategy, which aimed to reduce dependence on vector control through indoor residual spraying (IRS).[32,40] In the early 1980s, two large environmental management projects began in the Department of La Libertad to limit standing water of two estuaries—areas where the mouths of rivers entering the Pacific Ocean would close during the dry season, producing large mosquito breeding sites often close to large towns.[27] The drainage projects included three main components: 1) construction of a central ditch to connect the estuary and the ocean and drain potential breeding sites in the estuary into the ocean during the dry season; 2) construction of a dam in the river to remain closed during the dry season, thus causing a diversion of water directly from the river to the ocean, bypassing the estuary and also containing a gate that, when opened, allowed sea water, whose increased salinity served to inhibit larval development, to flow back into the estuary; and 3) development of several canals that drained low-lying areas back into the river during the rainy season.[27,30,32] The drainage project was completed on the Ticuiziapa estuary in 1987 and on the San Diego estuary in 1992.[40] In total, there were ten primary source reduction sites, which were the product of collaboration between the National Program, USAID, and PAHO.[40,47]

Lab decentralization

Between 1978 and 1983, the National Malaria Program carried out the decentralization of the diagnostics lab network to decrease time required to turn around diagnostic results of slides received, aiming to reduce time to read slides to 72 hours from time of receipt.[43] A network of regional labs was expanded largely along the coast. While some areas continued to struggle with timely turnaround—sometimes 30 days in hypoendemic areas—there was in general a five-day turnaround for diagnostics in the hyperendemic strata throughout the 1980s.[40] Slides were collected by epidemiology assistants who routinely visited a defined circuit of VCs and transported slides to the labs via motorcycle.[21,47] These personnel also distributed new diagnostic supplies as needed to these VCs.[21,47]

Increased diagnostic capacity with improved turnaround time enhanced accurate and timely case management, as well as providing a basis for a strengthened and agile information system to make decisions.

Adoption of 5-day drug regimen

In the early 1980s, the National Malaria Program transitioned from a 14-day PQ treatment regimen to a 5-day treatment regimen of combined CQ+PQ (Table 5), following a PQ efficacy study conducted in El Salvador by the CDC.[40] This treatment regimen remained in place until the early 2010s. The chloro-primaquine used throughout this period was manufactured locally in El Salvador.[21,47] The shortened treatment regimen was intended to address compliance issues of patients not completing the longer treatment course. The program aimed to have all five doses supervised, though it is unclear to what degree this was completed.

Additional research is needed to understand if this shift in treatment regimen had an impact on compliance, and if this was an important factor in El Salvador's malaria case decline. MDA continued to be employed through the early 1980s, but the high frequency of continual biweekly cycles resulted in dissatisfaction among participants. MDA strategies were renounced by the general population, rendering implementation of this strategy ineffective.[43]

Table 5. Modified treatment regimen with chloro-primaquine, adopted in the early 1980s and used until 2013.

Provided by National Vector Control Program, El Salvador

	CHLORO-PRIMAQUINE									
	DAY 1		DAY 2		DAY 3		DAY 4		DAY 5	
AGE GROUP	AD	INF	AD	INF	AD	INF	AD	INF	AD	INF
6 MONTHS TO < 1 YEAR		1		1/2		1/2		1/2		1/2
1 YEAR TO < 3 YEARS		1		1		1		1/2		1/2
3 YEARS TO < 7 YEARS*	1			1		1		1		1
7 YEARS TO < 12 YEARS	1		1		1		1		1	
12 YEARS TO < 15 YEARS	2		2		1		1		1	
OLDER THAN 15 YEARS	3		2		2		2		2	

	CHLOROQUINE		
AGE GROUP	DAY 1	DAY 2	DAY 3
INFANTS TO < 6 MONTHS	1/4	1/4	1/4

AD: ADULT DOSAGE COMBINED TABLET: CHLOROQUINE+PRIMAQUINE (DIPHOSPHATE) 150MG/15MG
INF: INFANT DOSAGE COMBINED TABLET: CHLOROQUINE+PRIMAQUINE (DIPHOSPHATE) 75MG/7.5MG
*COMBINED TABLET AT AN ADULT DOSAGE FOR ONLY ONE DAY

Case detection

During this period, El Salvador's passive case detection (PCD) system consisted of VCs, health centers, and hospitals. Nurses, physicians, and VCs took blood smears and administered curative treatment to anyone with recent fever. VCs were the primary source of PCD,[40] who were trained to take blood smears from all febrile patients, which was then sent to a parasitology lab where positivity was confirmed. Curative antimalarial therapy was administered to all symptomatic people who come to their homes.[48] If blood smear results came back negative before the fifth day then the remaining days of treatment were stopped.[48]

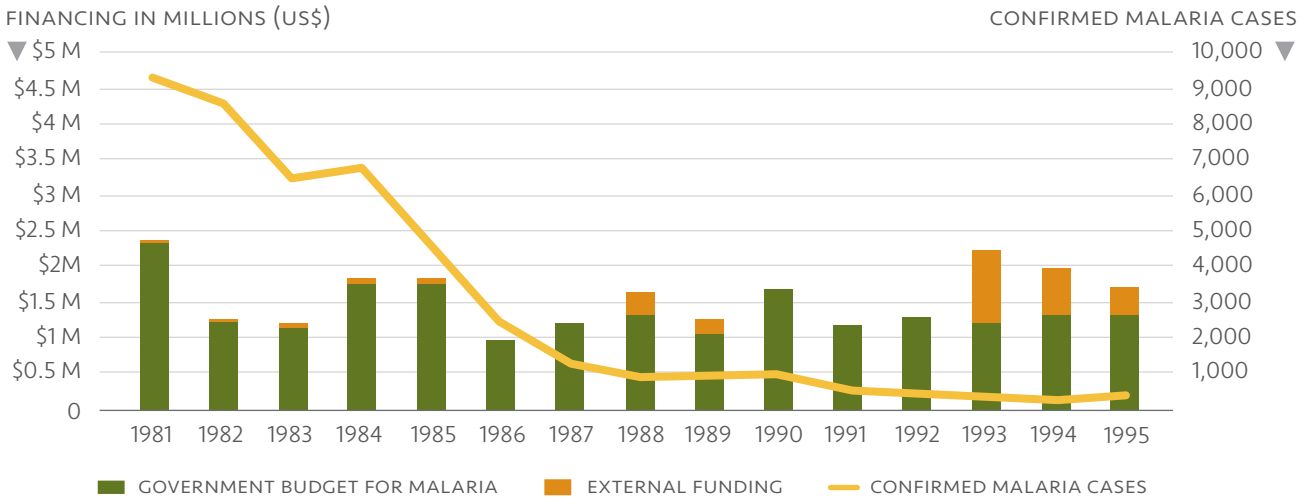
Active case detection occurred during parasitology surveys, where National Malaria Service (NMS) workers visited residents in homes, collected blood smears from each individual in the home, and provided curative treatment to anyone with recent fever.[48] By the late 1980s, these malaria surveys were being conducted twice a year in selected villages in high-, moderate-, and low-transmission areas in an effort to measure changes in malaria prevalence that were not normally detectable through the passive surveillance system.[40] In 1989, VCs were responsible for 70.4 percent of all blood samples taken and 94.4 percent of all cases diagnosed; 29.5 percent of all blood samples taken that year were a result of active case detection.[40]

Epidemiology assistants were responsible for training new VCs when a volunteer had to step down from their duties. Official training varied based on the region, and was usually spread over three days.[21] Training sessions were often condensed into a one-day session for VCs in harder to reach areas. Each VC received a box with the register book and all necessary supplies.[21] In addition to formal training, nearly all VCs benefitted from hands-on training from the previous volunteer. In most cases, the VC knew their successor—and often was even a family member—so there was opportunity to transfer knowledge from one VC to the next.[21,47] Each VC was assigned a unique identifier code so that reported cases were able to be tracked by geographic area according to VC placement.[21]

National funding environment

Funding through this period remained steady and domestic financing was augmented by external support, primarily through USAID (Figure 13). USAID funds were particularly influential in the initiation and expansion of the national surveillance system.[47] As Cohen and colleagues found in their exploration of the causes of malaria resurgence across multiple different countries, donors appeared to have reallocated funding because burden reduction efforts had been successful, only to lead to a surge in cases.[49] In contrast, El Salvador was able to maintain domestic financing for their malaria activities, including the maintenance of their surveillance system, even as cases declined and external donors withdrew their support. This consistency of financing to support maintenance of current intervention and program capacity was critical to maintaining the gains made during this period.

Figure 13. Financing and malaria cases in El Salvador, 1981–1995.[2]



- **Risk stratification continues to guide program decisions**
- **Last case of locally transmitted *P. falciparum* in 1996**
- **Prioritization of surveillance at borders and of migrant populations**
- **Integration of national malaria program into vector control program**

5.4 Continued Decline (1996–2010)

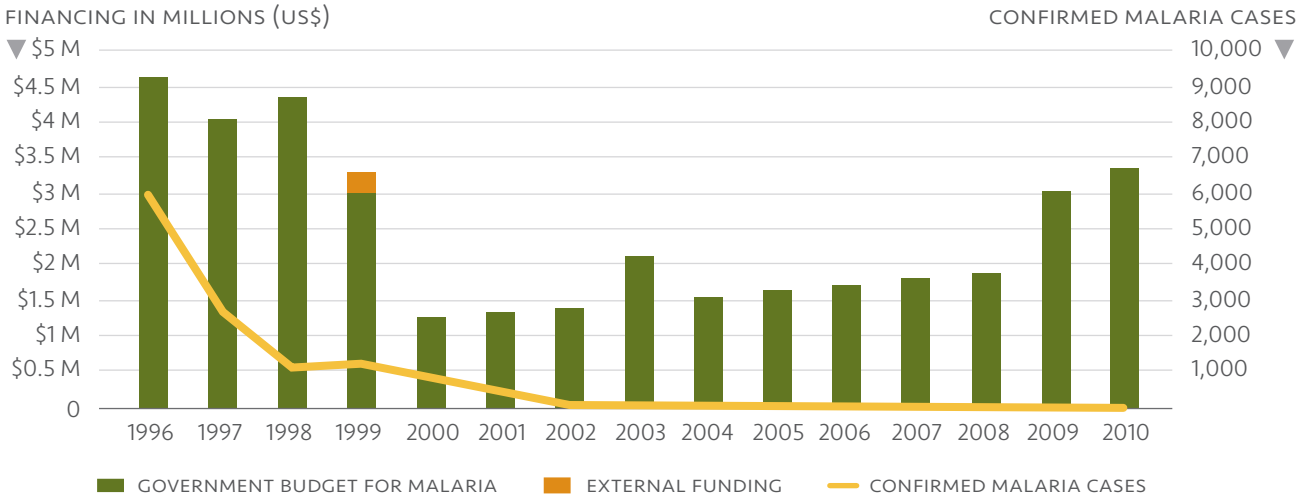
The sharp drop in malaria cases during the Rapid Decline period (1981–1995) was maintained without resurgence over the next 13 years—a period of Continued Decline. Actions taken during the previous 15 years—such as the decision to decentralize the diagnostics lab network and allocate health personnel and VCs by risk stratification—coupled with socioeconomic changes including the collapse of the cotton industry, fundamentally altered malaria receptivity in El Salvador and enabled the national program to maintain gains. Through their robust surveillance system and the ability of the VC network to quickly investigate and respond to cases as they were reported to prevent onward transmission, cases continually declined, in contrast to previous periods when case numbers had been reduced and then resurged.

El Salvador's long period of continued decline in malaria cases—though without achieving total elimination of local malaria transmission—suggests that, similar to elimination, pre-elimination may be an unexpectedly sticky state, at least in the presence of strong and responsive health and surveillance systems.

In the early 2000s, the National Malaria Program was integrated into the National Vector Control Program responsible for addressing all vector-borne diseases, as part of a national effort to decentralize the health system.

Domestic financing remained consistent even as malaria cases continued to decline. This financing enabled the National Vector Control Program to maintain a robust surveillance and response system where VCs, and other health access points, continued to collect surveillance data and respond to cases. El Salvador also launched an epidemiological surveillance system for malaria at its borders with Guatemala and Honduras to address imported cases.

Figure 14. Financing and malaria cases in El Salvador, 1996–2010.[2]



Integration of the Malaria Control Program into the Vector Control Program

In the late 1990s, MINSAL followed PAHO global recommendations, as outlined in the *Guidelines for the Preparation of Health System Profiles for the Countries of the LAC Region*, to decentralize the administrative and financial authority of its health system. Beginning in 1999, El Salvador decentralized its health sector, including malaria programming, over a period of five years.[50] MINSAL's goal throughout this process was to improve quality of life by increasing effective access to basic health services, as well as to strengthen epidemiological surveillance of emerging and re-emerging illnesses.[51] As a part of this process, the National Malaria Program was integrated into the larger National Vector Control Program.[52,53]

MINSAL established 28 basic integrated health units called SIBASI (Sistema Basico de Salud Integral, or Basic Integrated Health System) that were distributed throughout El Salvador's five zones.[54] The establishment of the SIBASI is believed to have increased access to prevention and treatment at the local level.[54] SIBASI in each zone were led by a Zonal Technical Team that was given the authority to monitor and evaluate malaria program success, facilitate operational action plans, and make budgetary decisions on allocation of malaria resources. This information was reviewed annually and reported to the National Vector Control Program through completion of annual operation plans (Annex 4).[52]

In 2009, MINSAL heightened focus on holistic primary care health services and worked directly with families and communities to establish Community Family Health Teams (Equipos Comunitarios de Salud Familiar, ECOS).[55] ECOS are made up of a medic and a few nurses, depending on the size of the community they serve, who work directly in the community to promote healthy behavior, increase awareness of available health services, identify families at risk of poor health or social inequality, and ensure community needs are represented at higher levels of the health system.[52] ECOS are active in the community, pay home visits, and are another possible entry point for referral to a health system if malaria is suspected, though testing for malaria is not a part of their specific duties.[55]

Consistent domestic financing for malaria

Despite the structural changes in malaria programming within MINSAL, El Salvador's malaria activities benefited from stable domestic financing even as malaria case numbers continued to drop (Figure 14).[2] From 2000 to 2010, as El Salvador achieved very low and continually declining case numbers, domestic financing increased slowly. In contrast, funding for malaria in Guatemala and Honduras was erratic and declined throughout much of the period (see Figure 24, page 42). Domestic funding for national vector control priorities is at the discretion of the Vector Control Program director.[21] To date, directors have prioritized continued maintenance of the malaria surveillance system and response capacity.

Robust surveillance system

Surveillance activities were supported by a strong VC network with a large number of volunteers, especially relative to El Salvador's relatively small population and low malaria case levels. Throughout this period, El Salvador consistently maintained around 3,000 VCs. In 2010 the total number of VCs was reported at 3,246.[52,56]

A stable quantity of blood samples were tested each year—approximately 100,000 annually since 2001—even as transmission declined to very low levels.[2] Blood slides were collected at various locations including "SIBASI health centers, hospitals, and by VCs." In all cases, microscopy was the method used for diagnosis. MINSAL maintained prompt diagnostic turnaround, ensuring confirmed diagnosis within 72 hours of onset of symptoms. Slides continued to be collected by paid epidemiology assistants equipped with motorcycles for transportation. Malaria register data were collected daily, and reported weekly to MINSAL through the Sistema Nacional de Vigilancia Epidemiológica de El Salvador (VIGEPES), one of the reporting streams that fed into El Salvador's overall national health information system, the Sistema Unica de Informacion en Salud (SUIS).[57]

Border surveillance

In 2000, El Salvador began border surveillance of immigrants, especially in border areas located near sugar cane and coffee fields.[57] Activities included monitoring for fever in the past 30 days, testing, and providing a single dose of chloro-primaquine prophylaxis to everyone.[24,57] Surveillance was also emphasized at transit points such as border crossings (6), airports (2), and ports (2), and in areas of migrant employment such as mills, estates, and factories.[58] Figure 15 shows El Salvador's major immigrant surveillance posts and the major transportation routes as of 2010.

Risk stratification continued to guide program decisions

Throughout the period of Continued Decline, the Vector Control Program used altitude, vector breeding sites, habitat density, and other geographic risk factors to define and map malaria risk.[57] As malaria cases dropped to very low levels, the Vector Control Program increasingly targeted use of vector control interventions. By 1997, bed nets were only being used in hyperendemic coastal areas.[59] By the 2000s, long-lasting insecticide-treated bed nets (LLINs) were no longer being distributed.[58] IRS and ultra low volume (ULV) insecticide spraying was reduced starting in the early 1990s (Figure 16).[40,58]

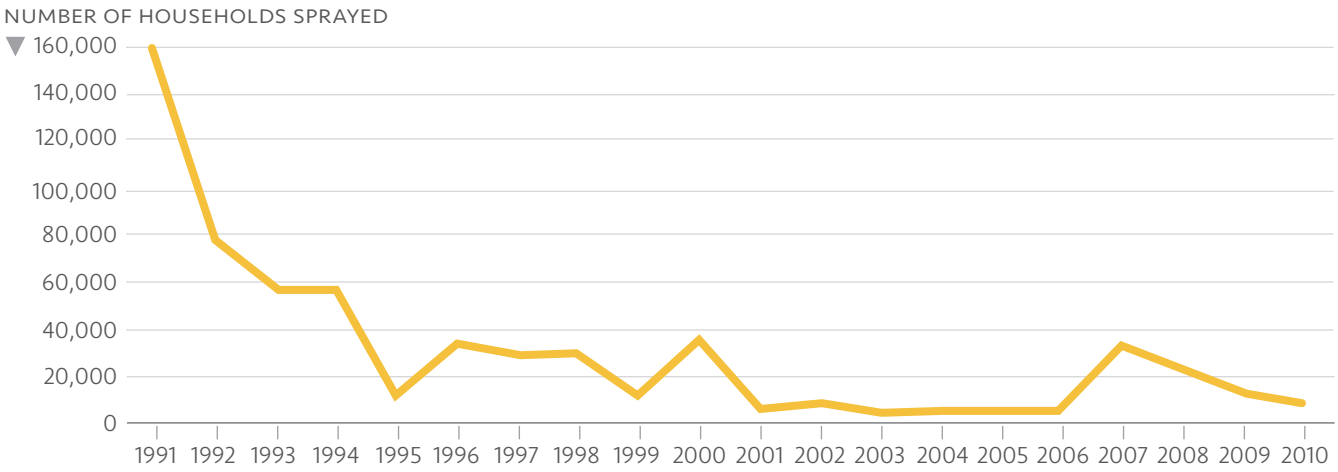
Continued use of CQ+PQ 5-day regimen

During this period, El Salvador continued to treat malaria cases with a regimen of CQ+PQ combination tablets given for five days for suspected malaria cases. Self-diagnosis and treatment of malaria was found to be high.[48] Treatment was administered either by health personnel or in the community by VCs.

Figure 15. Malaria surveillance posts at ports and borders, El Salvador 2010.[46]

Provided by National Vector Control Program, El Salvador

Figure 16. Number of households covered with IRS, 1990–2010.[2]



- **Transition of program from control to elimination**
- **Adoption of 2020 national elimination target**
- **EMMIE Global Fund regional funding mechanism launched in 2013**
- **Change in treatment regimen to 3 days of CQ + 14 days of PQ**
- **Updating national strategy to guide future approaches**

5.5 Endgame (2011–present)

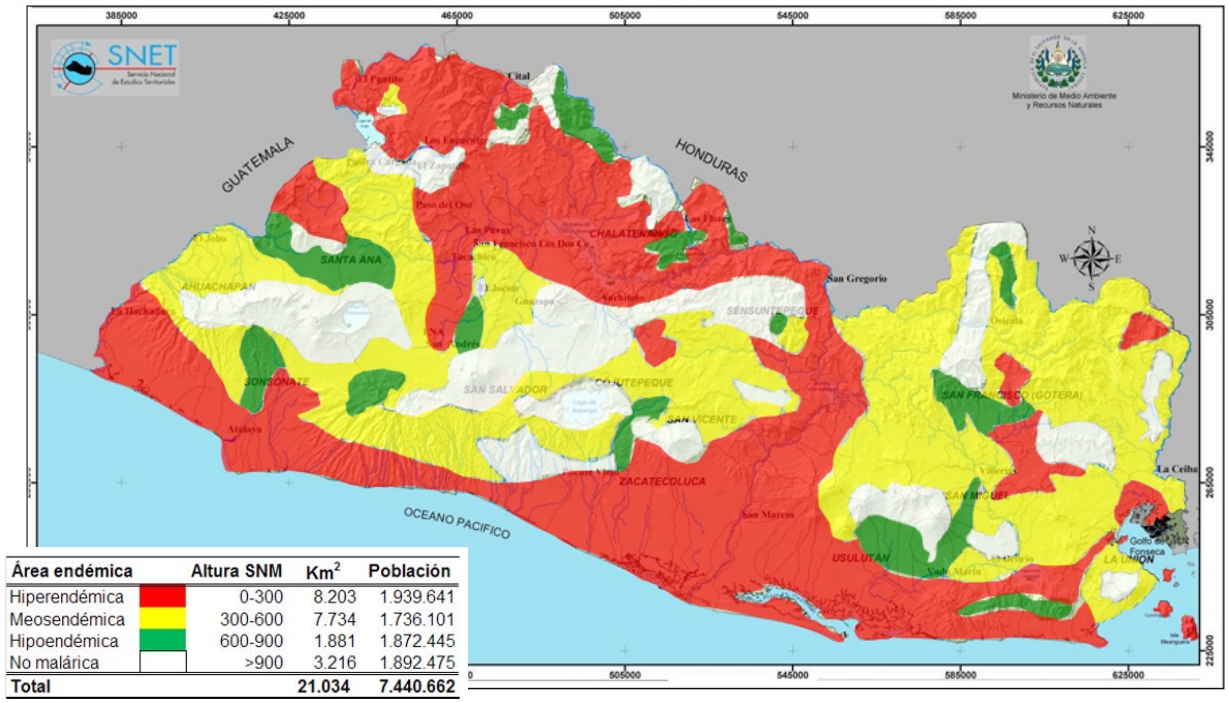
Sustained low levels of *P. vivax* cases have been maintained over the past 15 years without resurgence or elimination. In 2011, the Vector Control Program officially transitioned the program from one of control to elimination and set a national target of elimination by 2014 as outlined in their National Malaria Strategic Plan 2011–2014. The program now aims to eliminate malaria by 2020 in line with the goals in the EMMIE grant. Domestic resources remain the primary source of funding for malaria efforts in the country. Other vector-borne diseases such as chikungunya and dengue appear to dominate the focus of the Vector Control Program; nonetheless, the surveillance and response infrastructure for malaria has been maintained over time. It remains to be seen whether El Salvador will dedicate additional resources and program staff to eliminate the disease once and for all within its borders, or continue with business as usual until its neighbors make additional progress.

Continued stratification to guide concentration of resources

El Salvador continues to prioritize concentration of activities according to stratification, basing regional stratification on historical risk, altitude, and annual parasite index (Figure 17).[28] As cases continually decline and are reduced to extremely low levels, the Vector Control Program considers the presence of autochthonous cases and imported cases, the density of Anopheles mosquitoes, the available and accessible health services, and poverty levels when assessing risk in each region.[28] The quantity of blood slides taken continues to match priority risk areas.[60]

Figure 17. Epidemiological and entomological malaria risk strata, El Salvador, 2010.[46]

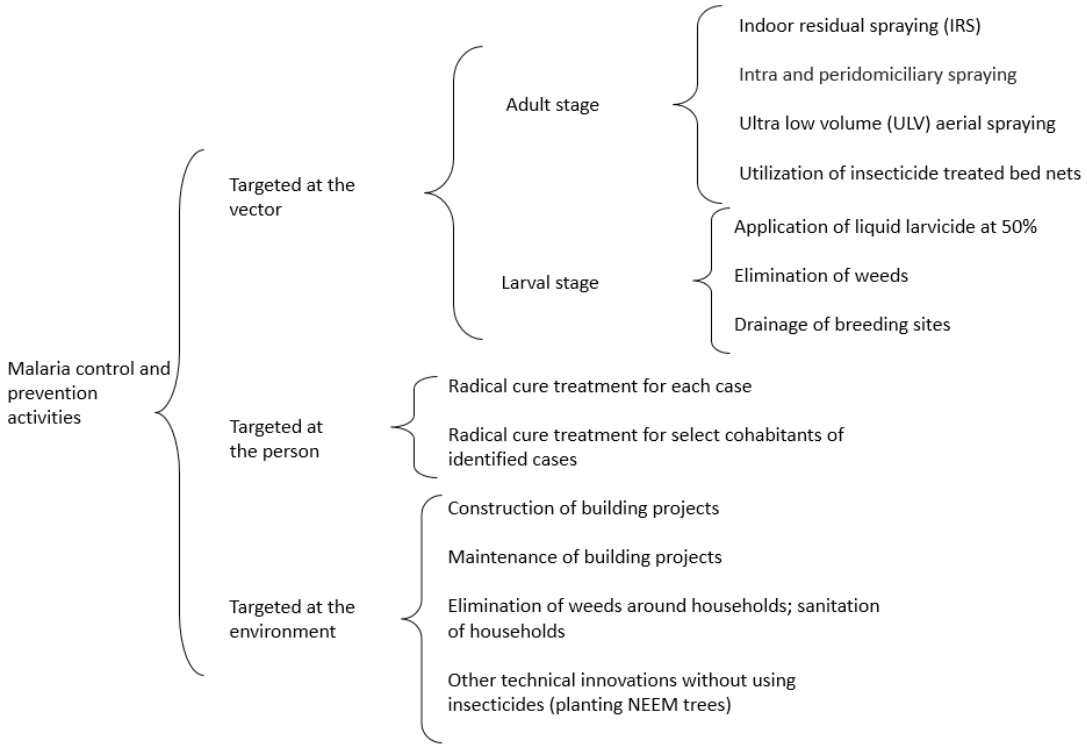
Provided by National Vector Control Program, El Salvador



Área endémica	Altura SNM	Km²	Población
Hiperendémica	0-300	8.203	1.939.641
Meosendémica	300-600	7.734	1.736.101
Hipoendémica	600-900	1.881	1.872.445
No malárica	>900	3.216	1.892.475
Total		**21.034**	**7.440.662**

Figure 18. Continuation of intervention strategies.

Provided by National Vector Control Program, El Salvador



Targeted vector control

The Vector Control Program has decreased IRS activities in recent years, concentrating IRS in clusters around foci (Figure 18). IRS is completed by paid Vector Control Program personnel.[21] Other vector control strategies include ultra low volume (ULV) spraying after an outbreak or in high-density Anopheles areas, using larvicide control in accordance with entomological parameters of focus or high-risk areas, and selective use of bed nets in high-risk areas—though this has been minimal with only 6,000 nets slated for 2011–2014 according to the national strategy.[28]

Change back to 14-day CQ+PQ course

By 2013, following global recommendations and quality control issues found in locally manufactured chloro-primaquine, El Salvador changed their treatment regimen to CQ for 3 days followed by PQ for 14 days.[41,57,58]

A 1992 review of the malaria control program activities found that only 4 to 6 percent of people who visited VCs with malaria-related symptoms were confirmed to have malaria.[40] This means that 94 to 96 percent of visitors, or over 125,000 people, received presumptive treatment from VCs in 1992 even though they did not have malaria.[2,40] According to the World Malaria Report, 124,743 courses of treatment were prescribed despite only 21 positive cases recorded in 2012.[23] Questions remain around the impact, if any, of overtreatment—or community prophylaxis—in achieving and maintaining low levels of malaria.

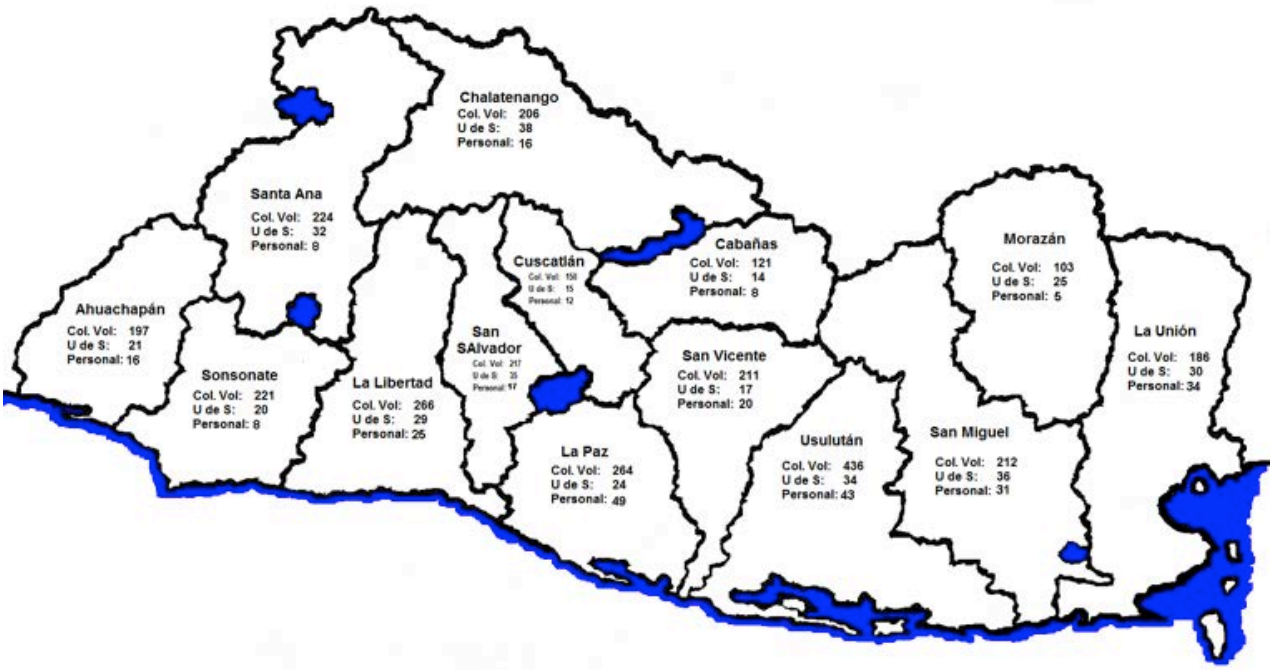
Beginning in 2010, VC responsibilities were changed to no longer include the provision of malaria treatment.[21] VCs now solely serve a diagnosis and surveillance function within the community. When a case is confirmed, the patient must seek treatment from either a local ECO, health center, or hospital.[21]

Diagnostics and quality control

To maintain quality control, all positive blood smear slides and 10 percent of negative slides must be sent to the national reference laboratory (Laboratorio Nacional de Referencia) to confirm accuracy.[52,61] The collection of slides continues to be completed by epidemiology assistants with frequency prioritized by strata. When slides are taken and examined, the following details are recorded: date the smear was taken, type of smear, type of exam completed, result

Figure 19. Number of malaria personnel and voluntary collaborators by department, 2010.

Provided by National Vector Control Program, El Salvador



when received from the lab and treatment received.[61] In 2011, according to the National Malaria Strategy, all confirmed cases received treatment, and patients then underwent follow-up testing following the course of treatment to confirm elimination of the parasite. All patients treated for *P. vivax* remain under strict surveillance with a blood smear taken monthly for three months following diagnosis to detect any possible return of infection.[62] The testing of patients following treatment also includes surveillance for parasite drug resistance.[62]

As described above, VCs collect blood samples as part of their responsibilities and are distributed throughout each department (Figure 19). If a sample is confirmed in a lab, it is entered within the VIGEPES system within 24 hours and updated weekly to the national SUIS (Unified Health Information System).[53] Malaria remains a mandatory reportable disease.[21] In 2011, only 28.1 percent of thick smear blood slides were taken by VCs. The majority of slides (66.3 percent) were taken by official medical services.[63] A small number (4.5 percent) were taken by active case detection. Only one additional case was detected during active case detection in 2011.[63] Although VCs took only 28.1 percent of the thick smear slides in 2011, they detected 47 percent of cases.[63]

El Salvador's 2011–2014 national strategic plan called for the addition of RDTs to El Salvador's diagnostic capacity, with the intention of confirming the RDT diagnosis with a blood smear. Adequate funding was not available in 2011–2014 period to implement this plan.[28,52] According to the Vector Control Program, considerations are still being given for the possibility of adding RDTs in coming years.[21] Other assessments have also recommended that El Salvador add loop-mediated isothermal amplification (LAMP) to its diagnostics arsenal to detect asymptomatic carriers.[8]

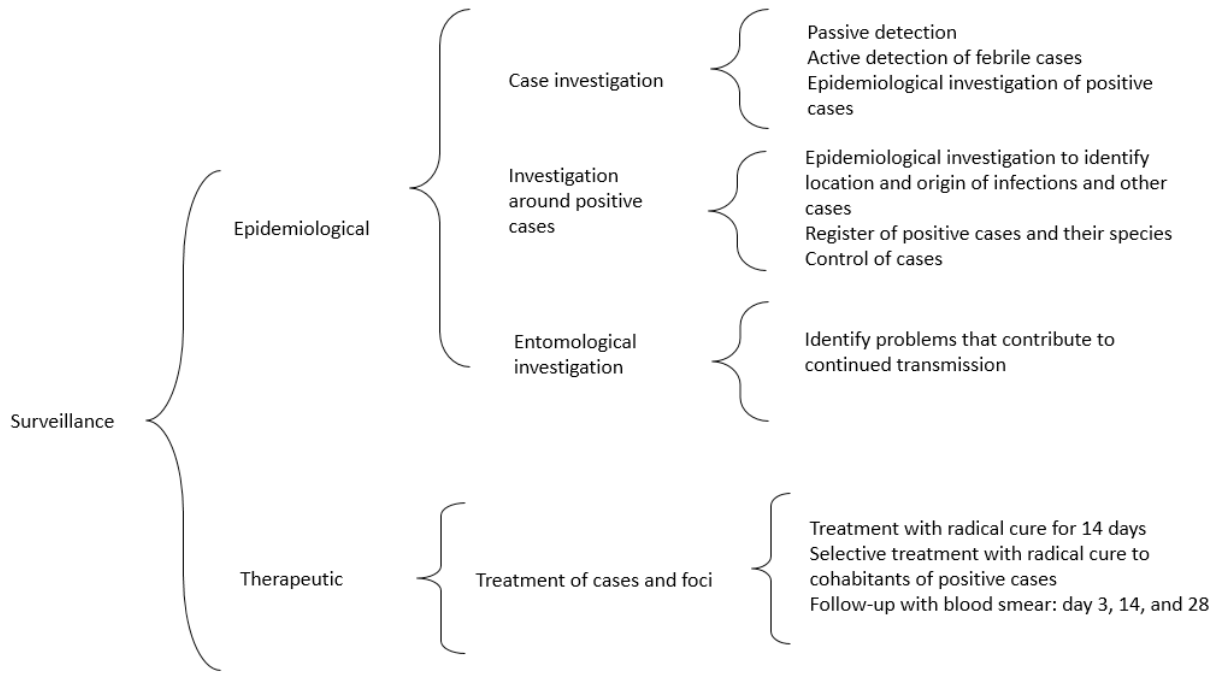
Maintenance of surveillance and response platform

El Salvador's surveillance system, VIGEPES, continues to track cases. When a case of malaria is suspected, a blood smear is taken and analyzed within 24 hours.[43] When a positive case of malaria is diagnosed, the SIBASI vector control coordinator organizes a response with VCs and local health teams within 24 hours of the case being confirmed.[43] Figure 20 details additional surveillance and response activities completed.

Forms (documenting the clinical characteristics present, risk factors, measure of transmission, monitoring, and focal actions of control taken) are completed to trigger

Figure 20. Continuation of surveillance and response system.

Provided by National Vector Control Program, El Salvador



investigation when a case of malaria (or certain other diseases) is detected to prevent transmission.[43]

Focal control actions are supposed to begin within 48 hours of case detection, investigating the case's household, neighboring households, and other places the case may have been.[43] Blood samples must be sent to the national quality control laboratory within five days for verification.[43] When two or more cases of malaria are confirmed, the health facility coordinator and vector coordinators follow "outbreak response" guidelines.[63] Further investigation is done to classify cases as either locally acquired or imported.[28] Of 9 confirmed malaria cases in 2015, 3 were autochthonous *P. vivax*, and 6 were imported *P. vivax*.[2,21]

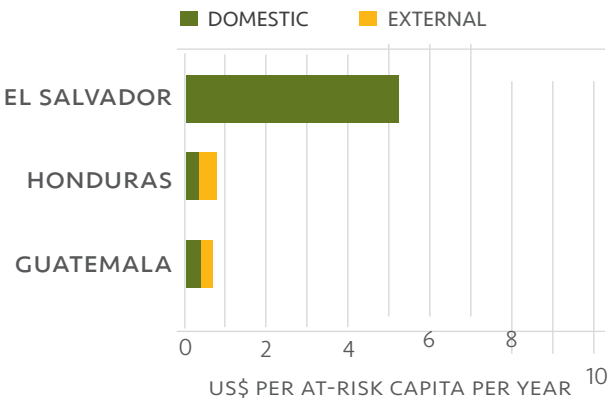
Notification of a positive case into the national surveillance system can be completed by various medical personnel: VCs, El Salvador's Institute for Social Services personnel, private lab technicians, national lab technicians, vector personnel, military medical personnel, El Salvador's Institute for Teacher's Welfare medical staff, and national health staff.[30,42]

Surveillance of migrants

The Immigration Surveillance Network (Red de Vigilancia a Inmigrantes) uses ACD by malaria personnel in encampments, farms, textile factories, and other places migrants are employed, in order to identify and test fever cases. Passive case detection is also employed by VCs and official medical personnel at border crossings (land, air, and sea).[27] In 2011 the immigration surveillance network reached 33,063 migrants, most from Guatemala, Honduras, and a few from Sudan (likely returning peacekeepers) and detected four of El Salvador's fifteen reported cases that year.[63]

Financing for elimination

Figure 21. Funding dedicated per at-risk capita for malaria control, 2012–2014 (in US$).[9]



El Salvador continues to provide consistent funding for malaria activities, and over the last five years has been the exclusive funder. There is conflicting data on the exact amount of funding allocated. Domestic funding increased steadily at an average rate of 8.8 percent annually from 2000 to 2011.[36] As shown in Figure 21, El Salvador spent more per capita at-risk than its neighbors from 2012 to 2014. Guatemala and Honduras are among the bottom of the list for the region for malaria funding, and almost half of their funding during this period came from external sources.

Until the creation of the Global Fund regional EMMIE initiative, El Salvador was not eligible to receive Global Fund funding.[64]

GFATM Initiative for the Elimination of Malaria in Mesoamerica

In 2013, in response to a recognized need for increased regional collaboration and intensified investment in Mesoamerica to achieve national and regional elimination, the Global Fund and partners created the Regional Malaria Initiative for the Elimination of Malaria in Mesoamerica (EMMIE). EMMIE aims to eliminate all autochthonous cases in ten countries—Belize, Costa Rica, El Salvador, Panama, Guatemala, Honduras, Nicaragua, Mexico, Haiti, and the Dominican Republic—by 2020 and to certify the region as malaria-free by 2025.[65] The initiative commits an investment of US$10.2 million to the region for the years 2014–2016, with Population Services International (PSI) as the Principal Recipient. The first-year priority is for all countries to improve their surveillance systems and to establish a baseline of their current malaria situation and then to focus on transmission reduction. Grant disbursements will be made according to the cash-on-delivery mechanism, making a credible baseline crucial for monitoring and evaluation program success. Each country received an initial disbursement of $200,000 to be invested in improved surveillance. From there, countries will receive reward payments—technically, reimbursements for the previous years' expenses to reduce transmission—which can then be allocated according to the country's malaria program priorities.[58,65]

SECTION 6

FINDINGS

As a result of the investigations conducted during this project (e.g., literature and document reviews and key informant interviews) and the associated data obtained, it can be concluded that El Salvador's early and continued decline in reported malaria cases is associated with interventions and strategies implemented by the National Malaria Program that were employed earlier and more systematically than in Guatemala and Honduras.

With some notable exceptions (e.g., population density), Guatemala and Honduras demonstrate geographic, socioeconomic, and malaria epidemiology similarities to El Salvador; therefore, the specific approach adopted by the El Salvador Ministry of Health (MOH) and the leadership to successfully implement beginning in the early 1980s must be considered as a strong contributing factor to their early and sustained success in the elimination of malaria.

Recent successes in malaria control and elimination in Petén, Guatemala, demonstrate that other nations in the region that follow similar strategies as those established in El Salvador may experience similar results.[56, 66]

Notable features of El Salvador's approach

- Strength of the surveillance system and data-informed decision-making
- Reach of the voluntary collaborator (VC) network
- Early stratification and targeted allocation of resources
- Consistent domestic financing for malaria

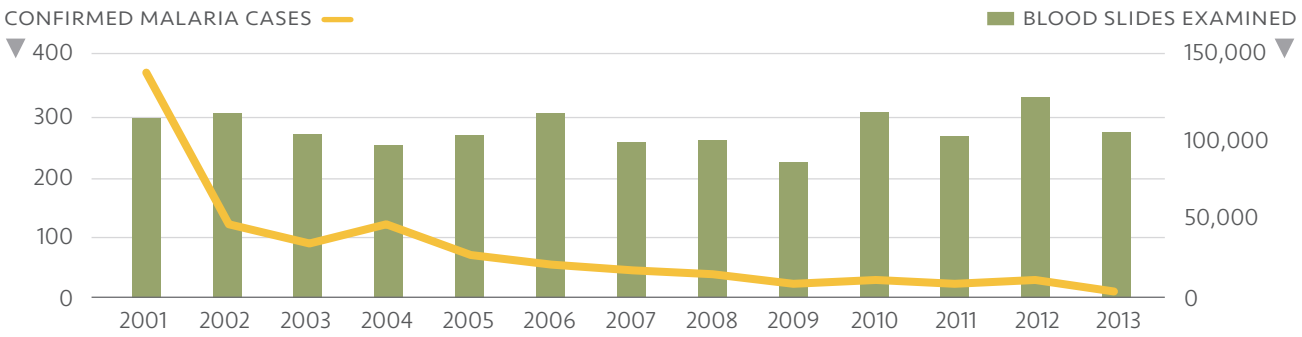
6.1 Strength of surveillance system and data-informed decision-making

The coverage and timeliness of El Salvador's malaria surveillance system during the past 30 years sets it apart from Guatemala and Honduras. Both countries still have considerable gaps in surveillance data collection that prevent a full understanding of their national malaria incidence. Additionally, while El Salvador was able to leverage data from the 1970s to improve its malaria program effectiveness, Guatemala and Honduras have been slower to take action based on surveillance data.

The presence of organized and motivated volunteer collaborators (VCs) throughout the country, complemented by intensive technical assistance and research efforts through the CDC Central American Research Station in the 1960s, generated timely data and a culture of evidence-informed decision-making.[27] In the late 1970s—many years earlier than its neighbors—the National Malaria Program built a national surveillance platform.[27]

The VC network has historically collected the bulk of El Salvador's surveillance data. By achieving high VC coverage levels across the country by the 1960s, the MOH Malaria Division was able to develop an accurate national malaria dataset that in other countries was not feasible during this time period.[27] This malaria case incidence data informed the development of a new program strategy driven by stratification during the malaria program reorientation in 1978. Stratification, primarily based on the annual parasite index, altitude, and vector habitat locations, enabled the National Malaria Program to allocate resources based on malaria risk. Also beginning in 1978, the National Malaria Program began to use malaria case data to plan interventions annually.[52] Each year, National Malaria Program staff review information collected by VCs and health facilities and through active case detection to identify trends, locate transmission foci, and target interventions such as IRS, thermofogging, and larvicides.[52] Through this annual review process and accompanying development of annual plans—known as a *Plan*

Figure 22. Quantity of blood slides examined and confirmed malaria cases in El Salvador, 2001–2013.[2]



Anual Operacional (PAO, or Annual Operational Plan)—the National Malaria Program, now the Vector Control Program, continues to adjust its strategy and operations to the changing malaria landscape as malaria incidence decreases (see Annex 4 for complete Annual Operational Plan form).

Despite the decline in reported malaria cases in El Salvador, the Vector Control Program continues to maintain a robust surveillance and response infrastructure.* Although fewer than 50 cases have been reported each year since 2006, the annual number of blood slides taken has been consistently around 100,000 (Figure 22)[2] the number of VCs has remained high (3,022 in 2010, as compared to 2,563 in 1983),[46,67] and national guidelines still call for all fever cases to be tested for malaria.[57]

Historically, Guatemala has had data quality and surveillance coverage issues that weakened its ability to track and respond to malaria trends. Although VCs have been active throughout Guatemala as in El Salvador, supervision and blood slide collection has been a major challenge in mountainous or remote areas, with supervisors often required to travel by foot or on horseback to collect slides in 12-week circuits.[67]

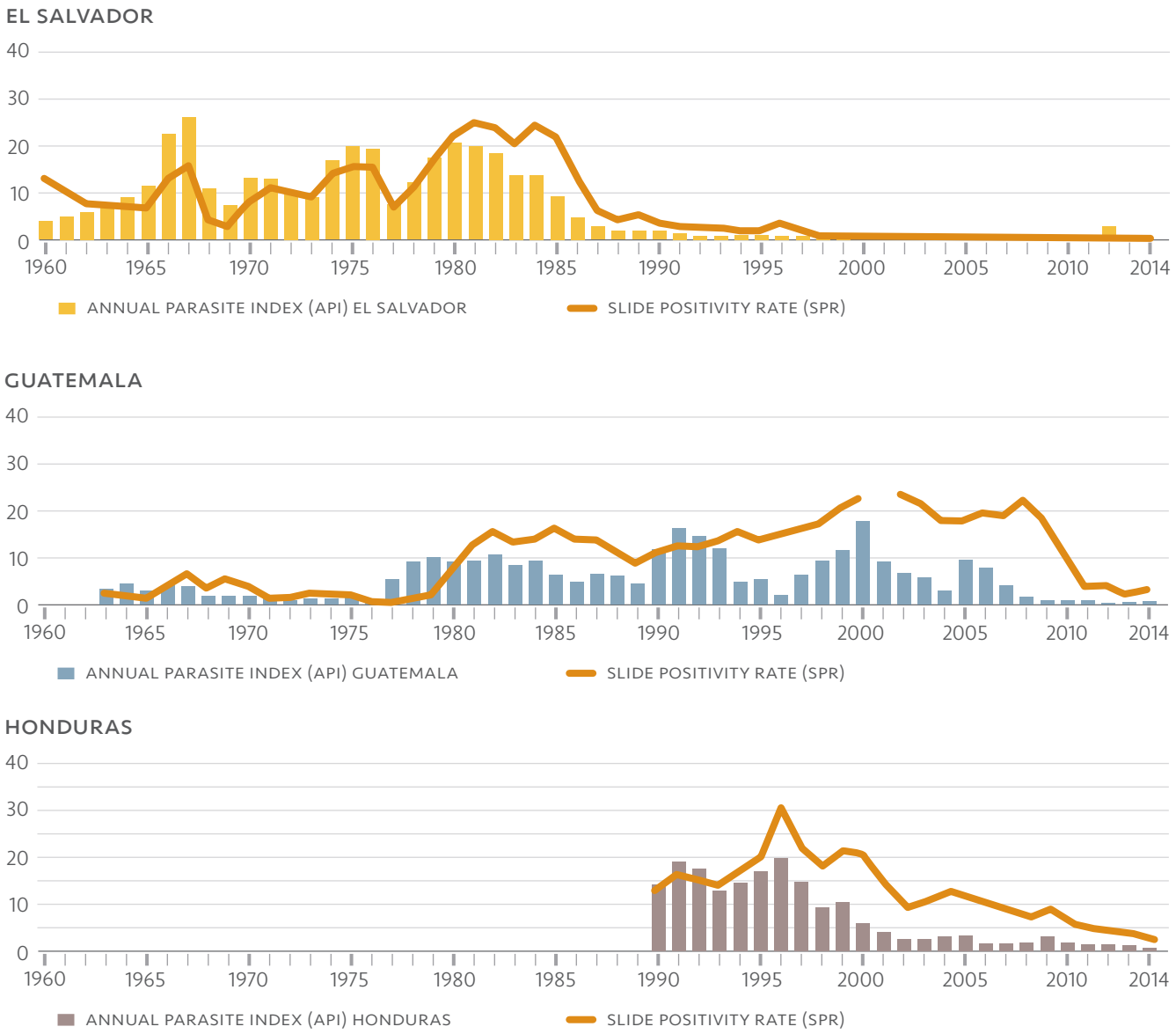
Guatemala's basic malaria indicator trends also point to data quality problems. Trends in annual parasite index (API) and slide positivity rate (SPR) diverge from 1986 to 2004.[67] While the number of reported cases and API decrease, the SPR actually increases, suggesting reduced surveillance coverage. Given that API and SPR are not independent, when compared, they should reflect similar trends if adequate quality surveillance is in place.[3] Associated with this trend is the collapse in the quantity of blood slides taken annually. In 1987, over 500,000 blood slides were taken, whereas by 1996, only 97,586 slides were taken.[2] These trends reduce the level of confidence in the reported reduction of cases, suggesting that the drop reported in the country during the mid-1990s either did not occur or was not as great as suggested by the reported decline (Figure 23).

Both Guatemala and Honduras contain large, undeveloped regions where access to health services, and to malaria surveillance in particular, has proved challenging. In Honduras, the *La Moskitia* rainforest area along the Atlantic coast has many access challenges—many communities lack roads; there is high illiteracy; many people rely on traditional medicine, causing delays in treatment seeking; the local laboratory network does not have adequate capacity for blood smear testing; the region is extremely poor; and, due to the lack of infrastructure, malaria control activities are relatively expensive.[68] Despite these challenges, Guatemala and Honduras have made substantial progress over the last decade in reducing malaria burden within their borders.

All three countries have seen an overall improvement in surveillance quality since the late 1990s, as the decentralization of their health systems became more efficient at increasing access to health services across all geographic areas and among marginalized populations. In Honduras, the biggest challenge to improving malaria surveillance is further extending coverage in *La Moskitia*.[2,68] Guatemala's principal challenge in malaria surveillance are ongoing problems with data quality. In its program scorecard, the Global Fund noted a lack of knowledge about surveillance procedures among health personnel; a lack of standardized forms, processes, and procedures; and high staff rotation, which creates a need for retraining. Additionally, there was a lack of information about patients receiving treatment following national guidelines: only 40 percent of cases could be confirmed as having received the recommended treatment.[69]

* Although a defined malaria control program no longer exists, malaria control activities and the activities of the VCs have been effectively integrated into an overall vector control program.

Figure 23. Annual parasite index (API) divergence from slide positivity rate (SPR) in El Salvador, Guatemala, and Honduras.[2]



6.2 Geographic and temporal coverage of voluntary collaborator network

Established in the 1950s during the Global Malaria Eradication Program (GMEP) period, the VC network was strengthened and expanded in subsequent decades, becoming a contributing factor to El Salvador's success in malaria case management and surveillance. While volunteer community health workers operate in many countries around the world, the VC network in El Salvador has demonstrated particular effectiveness and can serve as a model to other national malaria control programs.

The number of VCs in El Salvador has remained consistent over time. In 1968, El Salvador reported 2,384 VCs nationally.[68] By 1985, the number of VCs rose slightly to 2,563, and since 1993 the number of VCs nationally has remained around 3,000.[70] In 2010 the National Vector Control Program reported 3,022 VCs nationally.[28]

Over the past 30 years, El Salvador has relied on the VC network for most surveillance data—the deliberate concentration of VCs in rural, highly malaria-endemic areas allowed them to detect a disproportionate number of cases relative to the formal health system. In 1992, for example, VCs took 64.2 percent of all blood slides examined in the country that year and were responsible for finding 90.0 percent of all malaria cases detected.[40]

Though their relative importance has declined as access to formal health services has increased, in 2011 they still took a significant proportion of blood slides (28.1 percent of the total) and detected nearly half of all malaria cases (47 percent).[71]

In addition to providing useful, actionable surveillance data, VCs were authorized and trained to provide local diagnostic testing and treatment. In El Salvador, as in other countries in Mesoamerica, VCs were initially trained to provide presumptive treatment to all febrile patients and to take blood slides to send to a central laboratory. If the diagnosis was confirmed, the VC would administer further treatment with CQ+PQ to reduce transmission and prevent relapse in patients infected with *P. vivax*. VC responsibilities changed little over most of El Salvador's malaria history. They only stopped providing treatment in 2011, because the National Malaria Program felt that VCs were contributing to overtreatment of suspected malaria cases.[52]

Guatemala and Honduras have created similar networks of volunteer community health workers but they have generally been less effective, having difficulty sustaining high coverage levels, particularly in remote areas. In an evaluation of El Salvador's malaria surveillance system conducted around 1993, the VC system, with its resources focused on highest transmission areas, was found to be extremely cost-efficient in terms of cost per patient treated.[48] Most cases during this period, 92.4 percent, were found through the passive case detection system, which included VCs and other health facilities. The evaluation found that El Salvador's system had a sensitivity—defined as the amount of cases detected relative to the presumed amount of total (reported and unreported) cases—of just 50 percent, meaning that the system likely missed half of the total malaria cases. There are many possible explanations for this, including self-treatment, people choosing not to seek health care, and the presence of asymptomatic cases.[48] Though El Salvador's VC network's sensitivity was far from perfect, it greatly outperformed Guatemala's network, which is estimated to have had a sensitivity of only 24.9 percent during the same period.[48]

El Salvador's VC network is also correlated with increasing access to health care and contributing to better health outcomes across the board. In comparison to Guatemala and Honduras, El Salvador consistently performed better across major health indicators beyond malaria over the past decade (see Table 6).

6.3 Early stratification and targeted resource allocation

El Salvador's National Malaria Program used surveillance data to stratify the country by risk and focused resources on the highest risk areas. Stratification by key risk areas allowed intervention targeting and optimization of limited resources. The presence of and partnership with CDC strongly contributed to El Salvador's early adoption and implementation of evidence-based approaches such as risk stratification. The National Malaria Program decided where to assign VCs and National Malaria Service workers based on the risk stratification results. In higher transmission areas, more frequent visits by National Malaria Service workers helped keep VCs well-stocked with antimalarial drugs and diagnostic supplies.[27]

Another example of the programmatic changes emerging from stratification efforts in the late 1970s was the concentration of malaria diagnostic capacity in areas of highest risk. The resultant improvements in diagnostic turnaround times in higher transmission

Table 6: Millennium Development Goal health indicators, United Nations.[20]

	EL SALVADOR		GUATEMALA		HONDURAS	
	2000	2013	2000	2013	2000	2013
Children under 5 mortality rate per 1,000 births	32.4	15.7	50.7	31	38.2	22.2
Proportion of 1-year-old children immunized against measles	97	94	86	85	98	89
Maternal mortality ratio per 100,000 live births	80	69	160	140	150	120
Tuberculosis prevalence rate per 100,000 population	33	48	128	110	150	74
Deaths due to HIV/AIDS per 100,00 population	24.3	15.5	13.8	22	48	21
Proportion of births attended by skilled health personnel	92.4 (2003)	98 (2014)	40.6 (1999)	62.8 (2013)	55.7 (2001)	82.9 (2012)

areas likely contributed to El Salvador's success in reducing malaria transmission. Strengthening laboratory diagnostic capacity from 1978 to 1983 allowed most patients in El Salvador's high malaria risk areas to receive a confirmed diagnosis—followed by radical treatment with primaquine—within five days.[40] This improvement in diagnostic turnaround time significantly reduced the time in which patients could further transmit malaria. Primaquine's ability to kill the hypnozoites that cause relapse in *P. vivax* cases, and its gametocytocidal properties against *P. falciparum*, made it a useful tool for ending infections and preventing onward transmission.[72] While some areas of El Salvador did still face delays of up to 30 days during the 1980s, these areas were generally in low malaria risk areas that the National Malaria Program had deliberately deprioritized because of lower malaria incidence and less likelihood of onward transmission.[40]

Risk stratification to inform resource allocation was done earlier in El Salvador (1978) than in Guatemala and Honduras, which were less successful at improving malaria diagnostic turnaround time. Unlike El Salvador, where risk stratification-informed resource allocation meant that the longest diagnostic delays typically occurred in low-risk areas, the longest delays in Honduras and Guatemala were often in the most highly malaria-endemic regions, such as the tropical rainforests of *La Moskitia* or the *Petén* in the 1980s. The average turnaround time in some parts of Guatemala in 1983 was 73.3 days.[72] Today, the average delay in Honduras is around two weeks, though in *La Moskitia*, where malaria transmission is highest, malaria cases can still take up to 30 days to receive a curative treatment.[68]

6.4 Sustained domestic financing

Consistent and adequate funding is often cited as fundamental to gains in malaria control.[49] The progress in El Salvador provides an excellent illustration of this. El Salvador has maintained consistent domestic investment in its malaria control program (Figure 24). Support for malaria interventions in Guatemala and Honduras has been inconsistent and reliant on external financing, leading to occasional delays in procurement and implementation when funds were blocked.

Notably, and in contrast to Guatemala and Honduras, El Salvador's malaria efforts have been largely funded through domestic resources and have remained steady over time, even as the number of reported cases has steadily declined.

Cohen and colleagues, in their review of causes of malaria resurgence, cite funding issues as "the single most commonly cited reason for resurgence, mentioned in 35/75 (49 percent) of events."[49] Reasons for funding reductions or termination were not clear across all events of resurgence they examined, but in many cases, resurgences occurred after donors appeared to have reallocated funding because burden reduction efforts had been successful.[49] In contrast, El Salvador continues to invest its domestic resources in maintaining surveillance and response capacity across the country, especially in areas of ongoing transmission.

Beyond malaria, El Salvador has consistently dedicated a larger proportion of its domestic budget to health. As shown in Figure 25, El Salvador's per capita health expenditure has been higher than that of Guatemala or Honduras for the past two decades.

Higher levels of domestic commitment in El Salvador in comparison to Honduras and Guatemala cannot be explained through differences in GDP across the three countries. El Salvador was not simply a wealthier country that was able to dedicate greater funding to malaria. As seen in Figure 26, GDP growth over the last 50 years is similar across the three countries.

El Salvador's experience provides an important example of the value of consistent domestic funding to maintain a strong, responsive infrastructure to prevent resurgence. Further exploration of the factors that influenced El Salvador's decision to maintain investments in malaria infrastructure as cases declined, in contrast to its neighbors in the region, may provide useful insights for other eliminating countries in the region and beyond. Another open question, to be explored in the next section, is whether El Salvador should increase resources to make a concentrated push to eliminate within its borders or continue with its current strategy and funding levels until others in the region, notably Guatemala and Honduras, make comparable progress.

Figure 24. Financing and malaria cases in El Salvador, Guatemala, and Honduras, 1960–2013.[2]

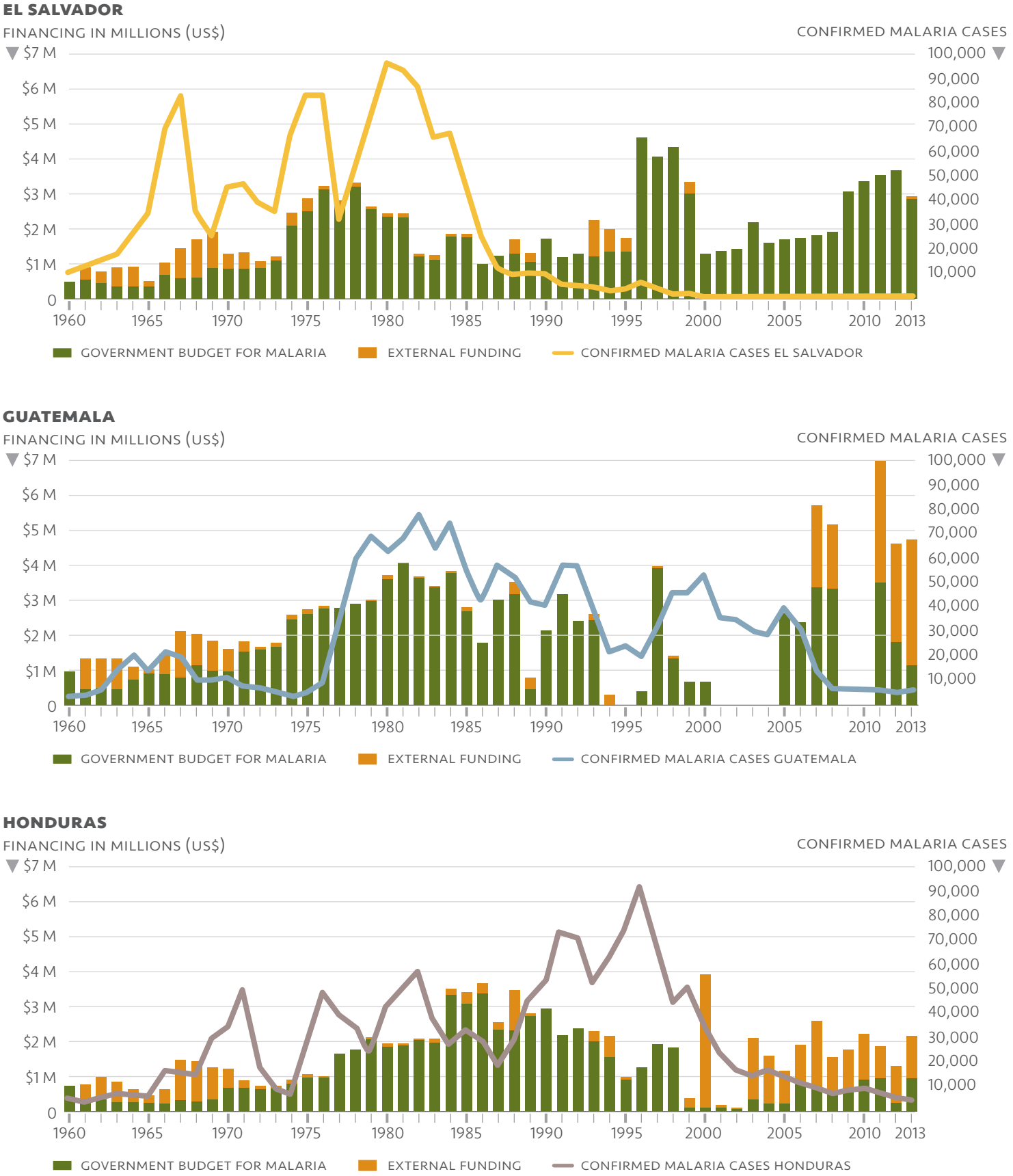


Figure 25. Health expenditure per capita in El Salvador, Guatemala, and Honduras, US$.[1]

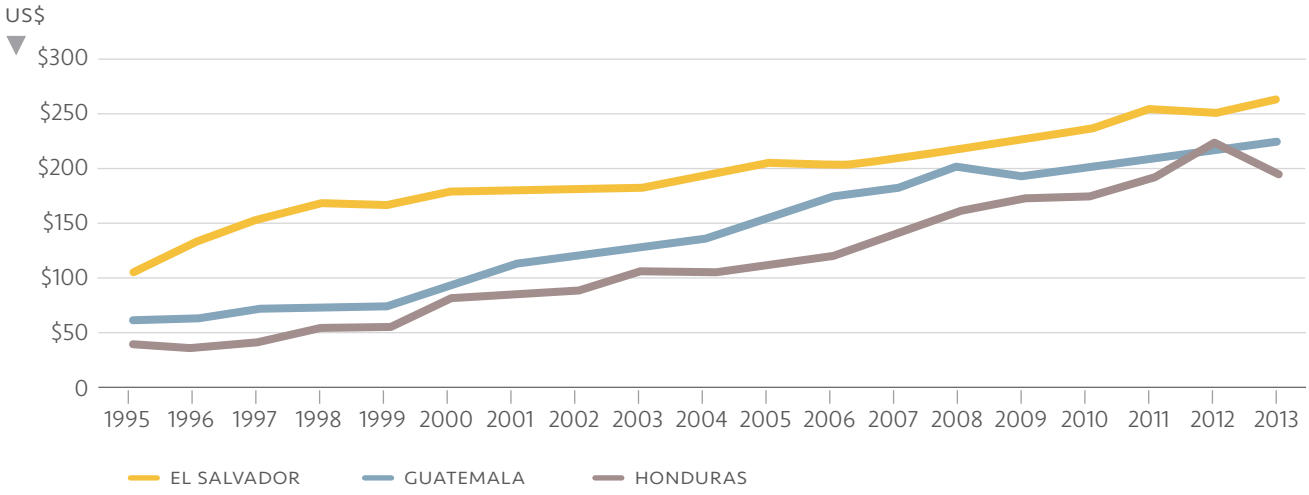
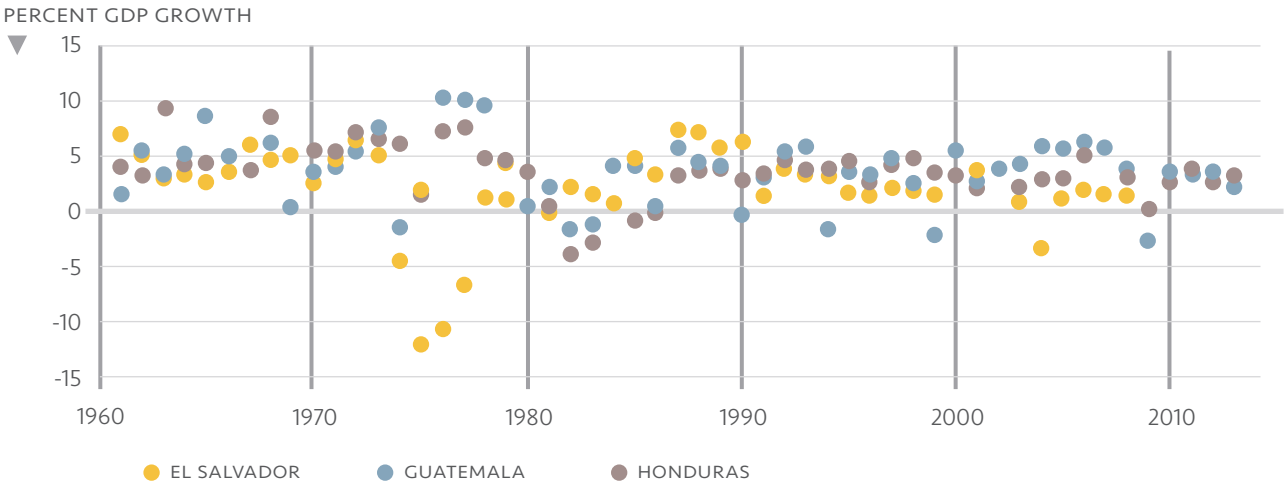


Figure 26. Annual percent GDP growth in El Salvador, Guatemala, and Honduras, US$.[1]



SECTION 7

OPPORTUNITIES AND NEXT STEPS FOR EL SALVADOR

The importation and spread of malaria from neighboring countries, risk of waning financial support, and loss of programmatic expertise are the greatest potential challenges for El Salvador as it progresses toward its stated goal of national elimination by 2020.

To date, El Salvador has been a leader in the region for its sustained financial commitment to malaria—maintaining a national surveillance system capable of tracking, treating, and investigating cases as they are reported through health facilities, VCs, and border screening. To accelerate and sustain current efforts, the following policy and programmatic efforts should be considered.

7.1 Continue to invest in national malaria expertise and community awareness-raising

As the number of malaria cases continues to decline, and activities become integrated with other vector control efforts, it will be important to maintain appropriate disease-response capacity and the knowledge and capability to diagnose and treat malaria cases along with the other, currently more common, vector-borne diseases. According to national program staff, it is necessary to "change the chip" in people's minds to continue to practice vector control strategies and seek malaria diagnosis when experiencing fever with a focused intent toward malaria elimination as a component of an integrated vector control program.[52] Multiple respondents in the national program also discussed the need to address the challenge of program expertise waning as malaria experts retire and institutional capacity is lost.[30,42] Continued investment in capacity-building is required across all levels of the system to ensure there is retention of knowledge. Given the prominence and priority of other vector-borne diseases within the country, training a new generation of integrated specialists should be a priority.

7.2 Provide technical leadership to advance regional progress

El Salvador's experience in achieving and maintaining low levels of transmission is relevant to the region and the expertise within the country should be leveraged to provide regional technical assistance and guidance. The EMMIE grant provides a platform to enhance regional collaboration and share lessons learned and best practices to accelerate regional elimination.

Supporting regional progress is in El Salvador's best interest, more so than intensifying efforts within the country itself, as a high risk of malaria importation will remain until the region eliminates. A number of recommendations have emerged to facilitate regional collaboration and progress toward elimination.[8] El Salvador has the potential to be a key regional leader in the successful implementation of the following recommendations:

- Harmonize malaria intervention strategies and policies, looking at malaria regionally instead of in-country.
- Expand and strengthen the diagnostic network to be accessible to the entire regional population at risk. In low-transmission settings (El Salvador and Costa Rica), rapidly identify positive foci to ensure adequate intervention and follow-up.
- Build and maintain a regional surveillance platform to share data, identify outbreaks, compare progress, and inform strategy.
- Pursue a regionally harmonized treatment regimen and improve treatment compliance. The introduction of tafenoquine as a replacement to primaquine (if/when it is available in a few years) could make compliance easier since treatment schedules would be shorter.
- Harmonize protocols and procedures to recruit and strengthen/retrain personnel, and harmonize regional policies.

7.3 Learning agenda

Through this research, a number of additional questions emerged that we were not able to explore fully. El Salvador, in the final paces of elimination, is confronting many of these issues today, but the

relevance of these questions applies beyond El Salvador to other eliminating countries and warrants further investigation:

- How do you motivate a country to eliminate malaria when it is in the endgame? What does a 'push' for elimination look like in this context?
- What is the appropriate geographic or administrative unit of malaria elimination? While it has been assumed that the logical unit is the country, a more effective unit often turns out to be multi-country or regional in scale because of population movement across porous borders. How can regional strategy be translated to effective planning and implementation of activities at a district or healthy facility level?
- What are the minimum requirements for an information system in terms of quality, timeliness, and efficiencies to guide, track, and maintain elimination?
- What is the role of 'stickiness' in maintaining very low levels of malaria transmission and what are the key factors in the durability of elimination once achieved?
- How and for what reason was domestic funding sustained in El Salvador over the duration of the decline? Who and what influenced decisions to maintain investments in malaria infrastructure as cases declined, and in contrast to its neighbors in the region?
- What is the most effective regional architecture to drive an elimination effort?
- How can malaria be effectively integrated into vector-borne disease or neglected tropical disease (NTD) programs? At what point in elimination efforts should integration occur?
- What is the best and most practical method for a national program to document zero transmission?

The central question for El Salvador is what actions to take next: should it invest more resources to eliminate remaining pockets of transmission or is the current course—anchored by border surveillance, case investigations, and a high-coverage surveillance system—adequate to maintain very low levels of local malaria transmission until neighboring countries, primarily Guatemala and Honduras, reduce their own malaria burdens to a point where it is appropriate to make a multinational, subregional push for elimination? El Salvador's multi-decade malaria effort is an impressive success story. As a model and historic pacesetter, El Salvador offers many lessons to countries in the Mesoamerica subregion and beyond.

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ANNEX 1
INDIVIDUALS CONSULTED

José Luis Rivas Jimenez, Supervisor de Enfermedades Transmisibles Región de Salud Central. Teleconference.

Engels Banegas, Jefe Programa Nacional de Malaria, Honduras. Teleconference.

Jose Gabriel Castillo, Fund Portfolio Manager, Latin America and the Caribbean, The Global Fund to Fight AIDS, Tuberculosis and Malaria. Teleconference.

Bernardo Hernandez Prado, Associate Professor, Institute for Health Metrics and Evaluation. In-person meeting, Seattle, WA.

Alexandre Macedo De Oliveira, Malaria Branch, CDC. Teleconference.

Dr. Sergio Aguilar, Programa Nacional de Malaria, Guatemala; **Jaime Juárez**; PAHO/WHO, Guatemala; **Sayra Chanquin**; PAHO/WHO, Guatemala; **Rodolfo Zeissig**; Director de Programa de Malaria, Guatemala. (In-person meeting, Guatemala City, Guatemala.

Ana Isabel Nieto Gómez, Coordinadora del Programa Nacional ITS/VIH/SIDA; **Jaime Enrique Alemán Escobar**, Jefe del Programa de Malaria, El Salvador. In-person meeting, San Salvador, El Salvador.

Mauricio Sauerbray, Director, Onchocerciasis Elimination Program for the Americas, previously malaria staff for CDC and USAID, El Salvador. In-person meeting, San Salvador, El Salvador.

Eduardo Romero Chèvez, Coordinador de Entomologìa, MINSAL; **Jaime Enrique Alemán Escobar**, Jefe del Programa de Malaria, MINSAL; **Marta Alicia Hernandez Ramirez**: Director de laboratorios, MINSAL; **Mirna Elizabeth Gavidia**: Colaborador Tecnico Medico Unidad de enfermedades transmitidos por vectores. In-person meeting, San Salvador, El Salvador.

Will Clara, CDC Flu assignee, El Salvador. In-person meeting, San Salvador, ES and teleconference.

Len Peruski, Regional Director, Division of Global Health Protection, CDC; **Joe P. Bryan**, Lead, International Emerging Infections Program, CDC, Guatemala. In-person meeting, Guatemala City, Guatemala.

Norma Padilla, Unidad de Malaria y Biología de Vectores, Centro de Estudios En Salud; Instituto de Investigación, Universidad del Valle de Guatemala; EMMIE Coordinator. In-person meeting, Guatemala City, Guatemala.

Rick Steketee; Kent Campbell; Caterina Guinovart; PATH. In-person meeting, Seattle, WA.

Keith Carter, PAHO/WHO senior advisor on malaria and other communicable diseases. In-person meeting, Geneva, Switzerland.

Pedro Alonso, Director, WHO Global Malaria Programme. In-person meeting, Geneva, Switzerland.

David Brandling-Bennet, Senior Advisor, Malaria, Bill & Melinda Gates Foundation. In-person meeting, Seattle, WA.

Larry Slutsker, Director for Division of Parasitic Diseases and Malaria for the CDC Center for Global Health (CGH). Teleconference and e-mail.

Monica Parise, Deputy Director for Science and Program, Division of Parasitic Diseases and Malaria, CDC. Teleconference.

Ernesto Pleites; Sub-Director, Instituto Nacional de Salud - MINSAL. Teleconference.

Luis Perez, Consultant, CHAI. Teleconference.

Carlos Enrique Hernandez Avila, Coordinador de Redes de Laboratorio, Instituto Nacional de Salud, El Salvador. Teleconference.

Carlos Enrique Hernandez Avila, Coordinador de Redes de Laboratorio, Instituto Nacional de Salud, El Salvador; **Eduardo Romero Chèvez**, Coordinador de Entomologìa, El Salvador; **Ernesto Pleites**; Sub-Director, Instituto Nacional de Salud- MINSAL. In-person meeting. San Salvador, El Salvador.

Eduardo Romero Chèvez, Coordinador de Entomologìa, MINSAL; **Mirna Elizabeth Gavidia**: Colaborador Tecnico Medico Unidad de Enfermedades Transmitidos por Vectores, MINSAL. In-person meetings. San Salvador, El Salvador.

ANNEX 2

MALARIA WEEKLY REPORT BY TOWN: DEPARTMENT OF AHUACHAPAN, WEEK 31, 1995

EMISION: 14-08-95 MINISTERIO DE SALUD PUBLICA Y ASISTENCIA SOCIAL PAG. 1

DEPARTAMENTO DE MALARIA

REPORTE DE SEMANA 31. / 1995 PARA EL DEPARTAMENTO AHUACHAPAN

LOCALIDAD	ESTA SEMANA				ULTIMAS 4 SEMANAS				ACUMULADO ANUAL			
	FAL	VIV	POS	LAM	FAL	VIV	POS	LAM	FAL	VIV	POS	LAM
EL CALVARIO	0	0	0	0	0	0	0	1	0	0	0	1
SAN SEBASTIAN	0	0	0	0	0	0	0	0	0	0	0	1
SAN JOSE	0	0	0	0	0	0	0	0	0	0	0	1
LAS FLORES	0	0	0	0	0	0	0	1	0	0	0	1
SANTA TERESA	0	0	0	0	0	0	0	0	0	0	0	1
LA GLORIA	0	0	0	0	0	0	0	1	0	0	0	1
EL NOPAL	0	0	0	0	0	0	0	0	0	0	0	1
FAVIO MORAN	0	0	0	0	0	0	0	0	0	0	0	1
SANTA MARIA	0	0	0	0	0	0	0	0	0	0	0	2
MARIA AUXILIA	0	0	0	0	0	0	0	0	0	0	0	3
SAN RAFAEL	0	0	0	0	0	0	0	0	0	0	0	1
I.V.U.	0	0	0	0	0	0	0	1	0	0	0	2
ASHAPUCO	0	0	0	0	0	0	0	1	0	0	0	3
CUYANANSUL	0	0	0	0	0	0	0	2	0	0	0	6
CHANCUYO	0	0	0	3	0	0	0	6	0	2	2	65
LA LAGUNA	0	0	0	0	0	0	0	0	0	2	2	42
LA ESCUELA	0	0	0	0	0	0	0	6	0	0	0	37
LAS PALMERAS	0	0	0	0	0	0	0	0	0	0	0	23
EL ESPINO	0	0	0	0	0	0	0	4	0	0	0	10
COL.ALFREDO E	0	0	0	0	0	0	0	3	0	0	0	7
COL.EL CARMEN	0	0	0	0	0	0	0	1	0	0	0	1
EL LIMON	0	0	0	1	0	0	0	18	0	0	0	67
LA LABOR	0	0	0	3	0	0	0	5	0	0	0	45
CHIPILAPA	0	0	0	0	0	0	0	0	0	0	0	1
LA GALERA	0	0	0	1	0	0	0	2	0	0	0	4
EL ROBLE	0	0	0	0	0	0	0	3	0	0	0	27
EL BOTADERO	0	0	0	0	0	0	0	8	0	0	0	34
SANTA ELIGIA	0	0	0	0	0	0	0	2	0	1	1	22
LA CAPILLA	0	0	0	0	0	0	0	0	0	0	0	1
PLAN DE ARENA	0	0	0	0	0	0	0	5	0	0	0	19
BERTA DE LAGO	0	0	0	0	0	0	0	0	0	0	0	5
SANTA CLARA	0	0	0	0	0	0	0	0	0	0	0	1
EL ANONAL	0	0	0	0	0	0	0	3	0	0	0	3
EL TIGRE	0	0	0	0	0	0	0	0	0	0	0	2
LOS HORCONES	0	0	0	0	0	0	0	0	0	0	0	1
LOS NANCES	0	0	0	0	0	0	0	1	0	0	0	1
LA CALERA	0	0	0	0	0	0	0	0	0	0	0	1
SAN VENANCIO	0	0	0	0	0	0	0	6	0	0	0	13
LAS VIÑAS	0	0	0	0	0	0	0	0	0	0	1	1	6
LA LEONA	0	0	0	0	0	0	0	1	0	0	0	2
EL JUNQUILLO	0	0	0	0	0	0	0	2	0	0	0	11
RANCHO GRANDE	0	0	0	0	0	0	0	0	0	0	0	7
TAHUAPA	0	0	0	0	0	0	0	1	0	0	0	16
EL BARRO	0	0	0	0	0	0	0	0	0	0	0	2
SALUTIUPAN	0	0	0	0	0	0	0	2	0	0	0	8
AGUA CALIENTE	0	0	0	0	0	0	0	0	0	0	0	2
GUAYALTEPE	0	0	0	0	0	0	0	0	0	0	0	3
LA DANTA	0	0	0	0	0	0	0	0	0	0	0	4

EMISION: 14-08-95 MINISTERIO DE SALUD PUBLICA Y ASISTENCIA SOCIAL PAG. 2

DEPARTAMENTO DE MALARIA

REPORTE DE SEMANA 31. / 1995 PARA EL DEPARTAMENTO AHUACHAPAN

LOCALIDAD	ESTA SEMANA				ULTIMAS 4 SEMANAS				ACUMULADO ANUAL			
	FAL	VIV	POS	LAM	FAL	VIV	POS	LAM	FAL	VIV	POS	LAM
EL QUEBRACHAL	0	0	0	0	0	0	0	1	0	0	0	9
GUAYACAN	0	0	0	0	0	0	0	0	0	0	0	1
LA COYOTERA	0	0	0	0	0	0	0	1	0	0	0	42
LA PERLA	0	0	0	0	0	0	0	0	0	0	0	3
LA MONTAÑITA	0	0	0	0	0	0	0	2	0	0	0	14
PUERTAS NEGRA	0	0	0	0	0	0	0	1	0	0	0	8
LAS CHINAMAS	0	0	0	0	0	0	0	3	0	0	0	24
LOS RANCHOS	0	0	0	0	0	0	0	5	0	0	0	28
EL CAPULIN	0	0	0	0	0	0	0	0	0	0	0	1
LOS ROCA	0	0	0	0	0	0	0	1	0	0	0	5
LOS HUATALES	0	0	0	0	0	0	0	0	0	0	0	2
LOS MAGUEYES	0	0	0	0	0	0	0	0	0	0	0	2
LOS BONITO	0	0	0	0	0	0	0	0	0	0	0	1
LOS TOLES	0	0	0	0	0	0	0	2	0	0	0	2
LA CHUMPA	0	0	0	0	0	0	0	0	0	0	0	4
LOMA DE LA GL	0	0	0	0	0	0	0	1	0	0	0	4
LOMA ALTA	0	0	0	0	0	0	0	0	0	0	0	6
NEJAPA	0	0	0	0	0	0	0	0	0	0	0	1
LAS BRISAS	0	0	0	0	0	0	0	1	0	3	3	29
EL LLANO	0	0	0	0	0	0	0	0	0	0	0	5
GRUPO ESCOLAR	0	0	0	0	0	0	0	2	0	1	1	17
LAS CHINITAS	0	0	0	0	0	0	0	0	0	0	0	1
EL ROSARIO	0	0	0	0	0	0	0	1	0	0	0	16
COL. EL CARME	0	0	0	0	0	0	0	1	0	0	0	1
DOÑA MARIA	0	0	0	0	0	0	0	5	0	0	0	36
SAN RAYMUNDO	0	0	0	0	0	0	0	2	0	0	0	13
LA BARRANQUIT	0	0	0	0	0	0	0	1	0	0	0	6
LA LINEA	0	0	0	0	0	0	0	3	0	0	0	8
LA BOMBA	0	0	0	0	0	0	0	0	0	0	0	2
EL MORA	0	0	0	0	0	0	0	0	0	0	0	11
COL. SAN ANTO	0	0	0	0	0	0	0	0	0	0	0	9
COL EL DULCE	0	0	0	0	0	0	0	0	0	0	0	2
COL.SAN LUIS	0	0	0	0	0	0	0	6	0	0	0	8
COL.SANTA MON	0	0	0	0	0	0	0	1	0	0	0	1
PALO PIQUE	0	0	0	0	0	0	0	0	0	0	0	9
SAN FRANCISCO	0	0	0	0	0	0	0	0	0	0	0	1
SAN ISIDRO	0	0	0	0	0	0	0	0	0	0	0	1
SAN ANTONIO	0	0	0	0	0	1	1	17	0	1	1	53
SAN ISIDRO	0	0	0	0	0	0	0	0	0	0	0	5
SAN ROQUE	0	0	0	0	0	0	0	0	0	0	0	2
OBRAJUELO	0	0	0	0	0	0	0	3	0	0	0	16
LAS MARAVILLA	0	0	0	0	0	0	0	1	0	0	0	13
LAS PAMPAS	0	0	0	0	0	0	0	0	0	0	0	3
LOS CERRITOS	0	0	0	0	0	0	0	0	0	0	0	2
LOS RANCHOS	0	0	0	0	0	0	0	3	0	0	0	6
LOS LOTES	0	0	0	0	0	0	0	2	0	0	0	15
GALERA GRANDE	0	0	0	0	0	0	0	1	0	0	0	18
SAN FRANCISCO	0	0	0	0	0	0	0	0	0	0	0	26

DEPARTAMENTO DE MALARIA

REPORTE DE SEMANA 31. / 1995 PARA EL DEPARTAMENTO AHUACHAPAN

LOCALIDAD	ESTA SEMANA				ULTIMAS 4 SEMANAS				ACUMULADO ANUAL			
	FAL	VIV	POS	LAM	FAL	VIV	POS	LAM	FAL	VIV	POS	LAM
NANCE AMARILL	0	0	0	0	0	0	0	1	0	0	0	16
LOS CHOMOS	0	0	0	0	0	0	0	1	0	0	0	31
LA ESCUELA	0	0	0	0	0	0	0	1	0	0	0	4
SANTA TERESIT	0	0	0	0	0	0	0	0	0	0	0	6
EL ARCO	0	0	0	0	0	0	0	2	0	0	0	17
LA BOMBA	0	0	0	0	0	0	0	1	0	0	0	8
EL JAVIO	0	0	0	0	0	0	0	0	0	0	0	2
PUENTE EL MUE	0	0	0	0	0	0	0	0	0	0	0	4
PEGA PEGA	0	0	0	0	0	0	0	0	0	0	0	1
SANTA ROSA	0	0	0	0	0	0	0	1	0	0	0	19
LOS CHINCHILL	0	0	0	0	0	0	0	0	0	0	0	8
LOS CRUCES	0	0	0	0	0	0	0	0	0	0	0	17
LOS QUIÑONES	0	0	0	0	0	0	0	0	0	0	0	11
LOS HERNANDEZ	0	0	0	0	0	0	0	0	0	0	0	2
LOS LLANITOS	0	0	0	0	0	0	0	0	0	0	0	9
LOS AUSOLES	0	0	0	0	0	0	0	0	0	0	0	3
EL CARMEN	0	0	0	0	0	0	0	2	0	0	0	4
SANTA CRUZ	0	0	0	0	0	0	0	3	0	0	0	14
EL PUENTE	0	0	0	0	0	0	0	1	0	0	0	2
RIO PAZ	0	0	0	0	0	0	0	1	0	2	2	29
EL DESVIO	0	0	0	0	0	0	0	2	0	0	0	12
PROFUNDEZ	0	0	0	0	0	0	0	0	0	0	0	3
EL CENTRO	0	0	0	2	0	0	0	7	0	1	1	15
EL CALVARIO	0	0	0	0	0	0	0	2	0	0	0	3
BARRIO NUEVO	0	0	0	0	0	0	0	2	0	0	0	5
COL.SAN MARTI	0	0	0	8	0	0	0	11	0	0	0	57
CARA SUCIA	0	0	0	17	0	0	0	18	0	1	1	54
LA PALMA	0	5	5	27	0	6	6	46	0	12	12	226
SANTA ELENA	0	0	0	3	0	3	3	15	0	4	4	38
LINDA VISTA	0	0	0	4	0	0	0	10	0	0	0	37
SANTA MARTA	0	0	0	1	0	0	0	1	0	0	0	14
WISNAY	0	0	0	1	0	0	0	3	0	2	2	42
NUEVA YORK	0	0	0	4	0	1	1	10	0	1	1	53
LA ISLA	0	0	0	2	0	0	0	9	0	0	0	34
EL COCO	0	0	0	0	0	0	0	9	0	2	2	74
COL.MELENDEZ	0	2	2	14	0	2	2	41	0	5	5	150
LAS SALINAS	0	0	0	1	0	1	1	3	0	1	1	13
EL CAMALOTE	0	1	1	8	0	1	1	25	0	2	2	117
CERRO PARTIDO	0	0	0	1	0	0	0	1	0	0	0	17
EL CHINO	0	0	0	4	0	1	1	12	0	3	3	108
COL.19 DE SEP	0	0	0	12	0	1	1	66	0	4	4	119
COL.LA VEINTE	0	2	2	6	0	2	2	34	0	5	5	67
COL.LIRIOS	0	0	0	2	0	0	0	7	0	0	0	10
COL.SAN JOSE	0	1	1	2	0	1	1	21	0	1	1	33
EL IRAYOL	0	0	0	4	0	0	0	5	0	1	1	27
EL COROZO	0	0	0	1	0	0	0	2	0	0	0	14
TAMASHA	0	0	0	0	0	0	0	1	0	0	0	1
LOS ENCUENTRO	0	0	0	0	0	0	0	2	0	0	0	4

EMISION: 14-08-95 MINISTERIO DE SALUD PUBLICA Y ASISTENCIA SOCIAL PAG. 4

DEPARTAMENTO DE MALARIA

REPORTE DE SEMANA 31. / 1995 PARA EL DEPARTAMENTO AHUACHAPAN

LOCALIDAD	ESTA SEMANA				ULTIMAS 4 SEMANAS				ACUMULADO ANUAL			
	FAL	VIV	POS	LAM	FAL	VIV	POS	LAM	FAL	VIV	POS	LAM
EL AMATAL	0	0	0	3	0	0	0	5	0	0	0	17
EL TALPETATE	0	0	0	0	0	0	0	4	0	0	0	18
SAN JOSE LA M	0	0	0	8	0	0	0	22	0	0	0	48
CHACALAPA	0	0	0	0	0	0	0	0	0	0	0	2
EL GOLONDRINO	0	0	0	0	0	0	0	0	0	0	0	1
COL.NUEVA	0	0	0	0	0	0	0	2	0	1	1	28
EL ZAPOTE	0	0	0	0	0	0	0	18	0	0	0	52
COL.I.S.T.A.	0	1	1	10	0	3	3	51	0	5	5	412
LA GARITA	0	0	0	0	0	0	0	25	0	2	2	139
EL PORVENIR	0	0	0	1	0	1	1	14	0	5	5	122
BOLA DE MONTE	0	0	0	0	0	2	2	51	0	4	4	79
LA DANTA	0	0	0	0	0	0	0	0	0	0	0	1
LOS LOTES	0	0	0	2	0	0	0	6	0	2	2	26
EL PUENTE	0	0	0	5	0	0	0	12	0	0	0	38
LOS MANGOS	0	0	0	0	0	0	0	0	0	0	0	1
EL MARTILLO	0	0	0	0	0	0	0	1	0	0	0	11
EL TAMBORAL	0	0	0	0	0	0	0	2	0	0	0	2
EL REMOLINO	0	0	0	0	0	0	0	0	0	0	0	3
EL JOCOTILLO	0	0	0	0	0	0	0	2	0	0	0	15
COL.OMAR	0	0	0	0	0	0	0	0	0	0	0	3
COL SAN ANTON	0	0	0	0	0	0	0	1	0	0	0	2
COL SILVA	0	0	0	0	0	0	0	0	0	0	0	3
COL SAN RAFAE	0	0	0	0	0	0	0	0	0	0	0	1
SANTA RITA	0	0	0	16	0	1	1	72	0	2	2	171
LA CEIBA	0	0	0	3	0	0	0	6	0	0	0	17
EL CONACASTE	0	0	0	19	0	2	2	34	0	2	2	63
EL ACHIOTAL	0	0	0	1	0	0	0	1	0	0	0	23
COL NUEVA ESP	0	0	0	16	0	1	1	66	0	2	2	77
COL VIOLENTES	0	0	0	19	0	1	1	58	0	1	1	85
COL LAS BRISA	0	0	0	0	0	0	0	6	0	0	0	17
LA HACHADURA	0	0	0	3	0	0	0	5	0	1	1	67
EL MORRAL	0	0	0	7	0	0	0	11	0	0	0	27
SAN MARCOS	0	0	0	0	0	0	0	7	0	3	3	64
COL.EL MILAGR	0	0	0	7	0	0	0	16	0	0	0	58
EL GUAYABO	0	0	0	0	0	0	0	1	0	0	0	3
STA.TERESA(CO	0	0	0	0	0	0	0	7	0	3	3	55
EL CASTAñO	0	0	0	5	0	0	0	16	0	0	0	29
RANCHO SAN MA	0	0	0	0	0	0	0	0	0	0	0	1
EL REFUGIO	0	0	0	0	0	0	0	0	0	1	1	65
SAN MIGUELITO	0	0	0	0	0	0	0	0	0	0	0	8
SAN ALFONSO	0	0	0	0	0	0	0	0	0	2	2	15
EL CORTIJO	0	0	0	7	0	0	0	20	0	0	0	28
EL ARCO	0	0	0	0	0	0	0	0	0	0	0	4
EL MOLINO	0	0	0	0	0	0	0	0	0	0	0	1
EL TRONCONAL	0	0	0	0	0	0	0	0	0	0	0	5
LA CEIBA	0	0	0	0	0	0	0	7	0	0	0	15
EL ESPINO	0	0	0	0	0	0	0	1	0	0	0	6
LA ESCUELA	0	0	0	0	0	0	0	0	0	0	0	3

DEPARTAMENTO DE MALARIA

REPORTE DE SEMANA 31. / 1995 PARA EL DEPARTAMENTO AHUACHAPAN

LOCALIDAD	ESTA SEMANA				ULTIMAS 4 SEMANAS				ACUMULADO ANUAL			
	FAL	VIV	POS	LAM	FAL	VIV	POS	LAM	FAL	VIV	POS	LAM
LOS APANTES	0	0	0	0	0	0	0	0	0	0	0	3
LOS TABLONES	0	0	0	0	0	0	0	0	0	0	0	2
SAN JOSE	0	0	0	0	0	0	0	0	0	0	0	1
AGUA FRIA	0	0	0	0	0	0	0	1	0	0	0	3
EL JICARO	0	0	0	0	0	0	0	0	0	0	0	2
EL NISPERO	0	0	0	0	0	0	0	1	0	0	0	16
EL RODEO	0	0	0	0	0	0	0	4	0	0	0	22
EL OBRAJE	0	0	0	0	0	0	0	0	0	0	0	1
EL ROSARIO	0	0	0	0	0	0	0	0	0	0	0	1
LA PANDEADURA	0	0	0	0	0	0	0	4	0	0	0	13
LA JOYA	0	0	0	0	0	0	0	0	0	0	0	8
LOMA LARGA	0	0	0	0	0	0	0	1	0	0	0	8
SAN JUAN	0	0	0	0	0	0	0	0	0	0	0	2
SAN RAFAEL	0	0	0	0	0	0	0	3	0	0	0	6
EL JICARO	0	0	0	0	0	0	0	0	0	0	0	1
LA FUNDACION	0	0	0	0	0	0	0	0	0	0	0	7
SAITILLAL	0	0	0	0	0	0	0	0	0	0	0	1
QUEZALAPA	0	0	0	1	0	0	0	1	0	0	0	8
SAN RAMONCITO	0	0	0	0	0	0	0	8	0	0	0	19
FINCA PRETORI	0	0	0	0	0	0	0	0	0	0	0	1
EL CORTEZ	0	0	0	0	0	0	0	1	0	0	0	1
LOS RIVAS	0	0	0	0	0	0	0	0	0	0	0	3
EL DURAZNO	0	0	0	0	0	0	0	0	0	0	0	3
EL CALVARIO	0	0	0	0	0	0	0	0	0	0	0	2
EL CENTRO	0	0	0	0	0	0	0	0	0	0	0	1
SAN ANDRES	0	0	0	0	0	0	0	2	0	0	0	4
CAUTA ABAJO	0	0	0	0	0	0	0	1	0	0	0	11
LOS RIVAS	0	0	0	0	0	0	0	0	0	0	0	1
LOS GARCIA	0	0	0	0	0	0	0	0	0	0	0	7
CAUTA ARRIBA	0	0	0	0	0	0	0	0	0	0	0	13
EL CARMEN	0	0	0	0	0	0	0	1	0	0	0	1
EL ESCALON	0	0	0	0	0	0	0	3	0	0	0	5
EL ROSARIO	0	0	0	0	0	0	0	2	0	1	1	11
LOS ALVARENGA	0	0	0	0	0	0	0	0	0	0	0	5
LOS BONILLA	0	0	0	0	0	0	0	0	0	0	0	1
LOS VALLE	0	0	0	0	0	0	0	0	0	0	0	11
EL ZARZAL	0	0	0	0	0	0	0	5	0	0	0	7
ISTAGAPAN	0	0	0	0	0	0	0	0	0	0	0	2
LA PAZ	0	0	0	0	0	0	0	1	0	0	0	12
PLATANARES	0	0	0	0	0	0	0	0	0	0	0	3
LOS PUENTECIT	0	0	0	0	0	0	0	0	0	0	0	3
SAN ANDRES	0	0	0	0	0	0	0	0	0	0	0	1
SAN MARTIN	0	0	0	0	0	0	0	4	0	1	1	25
SANTA ELENA	0	0	0	0	0	0	0	6	0	0	0	9
EL MANGLITO	0	0	0	1	0	0	0	7	0	0	0	98
LA BARRA	0	0	0	2	0	0	0	12	0	0	0	98
LA BOCANA	0	0	0	6	0	0	0	7	0	0	0	31
EL CARMEN	0	1	1	3	0	1	1	21	0	2	2	98

DEPARTAMENTO DE MALARIA

REPORTE DE SEMANA 31. / 1995 PARA EL DEPARTAMENTO AHUACHAPAN

LOCALIDAD	ESTA SEMANA				ULTIMAS 4 SEMANAS				ACUMULADO ANUAL			
	FAL	VIV	POS	LAM	FAL	VIV	POS	LAM	FAL	VIV	POS	LAM
LA MANGLERA	0	0	0	1	0	0	0	4	0	1	1	17
AHUACHAPIO	0	0	0	0	0	0	0	3	0	1	1	11
FALLA	0	0	0	0	0	0	0	7	0	3	3	37
EL ESCONDIDO	0	0	0	0	0	0	0	6	0	0	0	26
EL IXCANAL	0	0	0	2	0	0	0	2	0	0	0	3
VERSALLES	0	0	0	1	0	0	0	4	0	0	0	17
CATARINA ABAJ	0	0	0	9	0	0	0	14	0	1	1	69
CUILAPA ABAJO	0	0	0	9	0	0	0	20	0	1	1	115
LA FUERTEZA	0	0	0	14	0	0	0	22	0	2	2	53
EL MANGO	0	0	0	10	0	0	0	11	0	0	0	21
GUAYAPA	0	0	0	3	0	0	0	3	0	0	0	6
EL EMBARCADER	0	0	0	0	0	0	0	0	0	0	0	2
CUILAPA	0	0	0	0	0	0	0	1	0	0	0	6
HOJA DE SAL	0	0	0	0	0	0	0	0	0	0	0	4
EL TRIUNFO	0	0	0	0	0	0	0	4	0	0	0	8
CATARINA ARRI	0	0	0	1	0	0	0	5	0	0	0	18
GUAYAPA ARRIB	0	0	0	2	0	0	0	3	0	0	0	20
COL.NUEVA	0	0	0	5	0	0	0	64	0	8	8	231
LA BOLSA	0	0	0	0	0	0	0	1	0	0	0	6
SANTA ROSA	0	0	0	6	0	0	0	10	0	0	0	21
LOS AMATES	0	0	0	0	0	0	0	0	0	0	0	17
LA LOMA	0	0	0	0	0	0	0	7	0	0	0	7
ROSARIO ARRIB	0	0	0	1	0	0	0	1	0	0	0	1
SIERRA MORENA	0	0	0	0	0	0	0	0	0	0	0	1
LOS CALDERON	0	0	0	11	0	0	0	20	0	0	0	33
LOS HERNANDEZ	0	0	0	0	0	0	0	0	0	0	0	10
LOS LOPEZ	0	0	0	0	0	0	0	0	0	0	0	3
SAN ANTONIO	0	0	0	3	0	0	0	14	0	0	0	27
CUILAPA ARRIB	0	0	0	2	0	0	0	39	0	0	0	98
POZA DE LA CR	0	0	0	0	0	0	0	0	0	0	0	6
EL NARANJO	0	0	0	0	0	0	0	7	0	3	3	37
LAS PAMPAS	0	0	0	0	0	0	0	8	0	0	0	44
LAS DELICIAS	0	0	0	9	0	0	0	14	0	1	1	40
EL CEIBILLO	0	0	0	1	0	0	0	8	0	5	5	81
EL QUEBRACHO	0	0	0	1	0	0	0	8	0	0	0	36
EL SERENENE	0	0	0	0	0	0	0	0	0	1	1	41
EL COCALITO	0	0	0	0	0	1	1	17	0	1	1	30
EL ANGEL	0	0	0	0	0	0	0	0	0	0	0	1
LA LINEA	0	0	0	0	0	0	0	1	0	0	0	4
LA LOMA	0	0	0	0	0	0	0	0	0	0	0	1
LOS PANIAGUA	0	0	0	0	0	0	0	0	0	0	0	5
JOYA DEL PLAT	0	0	0	0	0	0	0	0	0	0	0	4
JOYA DEL ZAPO	0	0	0	0	0	0	0	1	0	0	0	1
LOS RAMOS	0	0	0	0	0	0	0	4	0	0	0	13
LA LOMA	0	0	0	0	0	0	0	0	0	1	1	2
SAN ANTONIO	0	0	0	0	0	0	0	4	0	0	0	7
EL SALITRE	0	0	0	0	0	0	0	1	0	0	0	8
KILO 5	0	0	0	0	0	0	0	0	0	0	0	3

DEPARTAMENTO DE MALARIA

REPORTE DE SEMANA 31. / 1995 PARA EL DEPARTAMENTO AHUACHAPAN

LOCALIDAD	ESTA SEMANA				ULTIMAS 4 SEMANAS				ACUMULADO ANUAL			
	FAL	VIV	POS	LAM	FAL	VIV	POS	LAM	FAL	VIV	POS	LAM
LOS PLANES	0	0	0	1	0	0	0	10	0	2	2	24
LA PALMA	0	0	0	0	0	0	0	0	0	0	0	12
SAN JUAN	0	0	0	0	0	0	0	1	0	0	0	5
EL ESPINO	0	0	0	0	0	0	0	0	0	0	0	2
APIPAL	0	0	0	0	0	0	0	0	0	0	0	4
SANTA RITA	0	0	0	0	0	0	0	0	0	0	0	1
EL TRANSITO	0	0	0	0	0	0	0	4	0	0	0	5
PILA EL NARAN	0	0	0	0	0	0	0	0	0	0	0	1
RINCON GRANDE	0	0	0	0	0	0	0	0	0	0	0	5
LA COOPERATIV	0	0	0	0	0	0	0	1	0	0	0	15
LOS CHINCHILL	0	0	0	0	0	0	0	2	0	0	0	23
EL CIPRES	0	0	0	0	0	0	0	2	0	0	0	3
TERRON BLANCO	0	0	0	0	0	0	0	0	0	0	0	2
LA UNION	0	0	0	0	0	0	0	0	0	0	0	15
EL TRANSITO	0	0	0	0	0	0	0	4	0	0	0	4
EL PARAISO	0	0	0	0	0	0	0	6	0	0	0	13
EL JOBO	0	0	0	0	0	0	0	0	0	0	0	2
LOS CHICAS	0	0	0	0	0	0	0	0	0	0	0	2
LOTIF SAN JOS	0	0	0	0	0	0	0	0	0	0	0	1
EL CENTRO	0	0	0	0	0	0	0	0	0	1	1	1
LA VEGA	0	0	0	0	0	0	0	0	0	0	0	4
EL PILAR	0	0	0	0	0	0	0	0	0	0	0	3
HDA.SAN JOSE	0	0	0	0	0	0	0	0	0	0	0	1
EL TABLON	0	0	0	0	0	0	0	0	0	0	0	3
EL JICARAL	0	0	0	0	0	0	0	0	0	0	0	2
ZANARATE	0	0	0	0	0	0	0	0	0	0	0	14
EL PORTILLO	0	0	0	0	0	0	0	0	0	0	0	11
LOS FAJARDO	0	0	0	0	0	0	0	0	0	0	0	1
LOS SERMEÑO	0	0	0	0	0	0	0	0	0	0	0	4
POTRERILLOS	0	0	0	0	0	0	0	0	0	0	0	3
GUASCOTA	0	0	0	1	0	0	0	1	0	1	1	6
LA ESCUELA	0	0	0	0	0	0	0	0	0	0	0	3
LOS PEÑATE	0	0	0	0	0	0	0	0	0	0	0	1
LAS POZAS	0	0	0	0	0	0	0	2	0	0	0	14
LA ESCUELA	0	0	0	0	0	0	0	0	0	0	0	3
LOS AGREDA	0	0	0	0	0	0	0	0	0	0	0	3
LOS HIDALGO	0	0	0	0	0	0	0	0	0	0	0	7
EL ZARAL	0	0	0	0	0	0	0	2	0	0	0	8
BUENAVISTA	0	0	0	0	0	0	0	2	0	0	0	11
SANTA LUISA	0	0	0	0	0	0	0	0	0	0	0	1
EL CENTRO	0	0	0	0	0	0	0	0	0	0	0	1
EL ROSARIO	0	0	0	0	0	0	0	0	0	0	0	2
SAN ANTONIO	0	0	0	0	0	0	0	2	0	0	0	7
T O T A L	0	13	13	370	0	33	33	1555	0	131	131	6592

ANNEX 3

REPORT OF ENDEMICITY BY SOURCE, BY DEPARTMENT, WEEKS 1–39, 1993

EMISION: 25-10-93 MINISTERIO DE SALUD PUBLICA Y ASISTENCIA SOCIAL PAG. 1

DEPARTAMENTO DE MALARIA

REPORTE DE ENDEMICIDAD Y FUENTE POR DEPARTAMENTO. SEMANAS 1.- 39. / 1993

DEPARTAMENTO	HIPERENDEMICA				MESOENDEMICA				HIPOENDEMICA				NO MALARICA			
	FAL	VIV	POS	LAM	FAL	VIV	POS	LAM	FAL	VIV	POS	LAM	FAL	VIV	POS	LAM
REGION: OCCIDENTAL																
SANTA ANA																
C. Voluntario	0	35	35	531	0	53	53	666	0	40	40	1594	1	5	6	813
B. Activa	0	1	1	500	0	9	9	792	0	2	2	266	0	0	0	21
S. Medico	0	2	2	17	0	0	0	2	0	2	2	42	0	0	0	11
E. Especiales	0	0	0	119	0	5	5	224	0	0	0	72	0	0	0	10
TOTAL	0	38	38	1167	0	67	67	1684	0	44	44	1974	1	5	6	855
AHUACHAPAN																
C. Voluntario	0	332	332	3450	0	41	41	975	0	23	23	1188	0	1	1	214
B. Activa	0	45	45	2356	0	0	0	174	0	0	0	112	0	0	0	0
S. Medico	0	29	29	378	0	0	0	123	0	0	0	78	0	0	0	1
E. Especiales	0	2	2	222	0	0	0	0	0	0	0	0	0	0	0	0
TOTAL	0	408	408	6406	0	41	41	1272	0	23	23	1378	0	1	1	215
SONSONATE																
C. Voluntario	0	472	472	5838	0	10	10	284	0	1	1	89	0	67	67	358
B. Activa	0	23	23	939	0	0	0	104	0	0	0	146	0	2	2	167
S. Medico	0	1	1	53	0	1	1	11	0	0	0	52	0	0	0	0
E. Especiales	0	0	0	47	0	0	0	8	0	0	0	0	0	0	0	1
TOTAL	0	496	496	6877	0	11	11	407	0	1	1	287	0	69	69	726
TOTAL REGION	0	942	942	14450	0	119	119	3363	0	68	68	3639	1	75	76	1796
REGION: CENTRAL																
LA LIBERTAD																
C. Voluntario	0	89	89	3575	0	39	39	1336	0	9	9	385	0	5	5	143
B. Activa	0	6	6	2664	0	3	3	948	0	0	0	94	0	0	0	47
S. Medico	0	5	5	21	0	0	0	43	0	0	0	0	0	5	5	210
E. Especiales	0	1	1	653	0	0	0	416	0	0	0	349	0	0	0	11
TOTAL	0	101	101	6913	0	42	42	2743	0	9	9	828	0	10	10	411
CHALATENANGO																
C. Voluntario	0	18	18	3216	0	12	12	1720	0	0	0	459	0	0	0	277
B. Activa	0	1	1	2448	0	0	0	996	0	0	0	131	0	0	0	9
S. Medico	0	0	0	169	0	0	0	105	0	0	0	116	0	1	1	25
E. Especiales	0	0	0	915	0	0	0	251	0	0	0	31	0	0	0	0
TOTAL	0	19	19	6748	0	12	12	3072	0	0	0	737	0	1	1	311
TOTAL REGION	0	120	120	13661	0	54	54	5815	0	9	9	1565	0	11	11	722

EMISION: 25-10-93

MINISTERIO DE SALUD PUBLICA
Y ASISTENCIA SOCIAL

PAG. 2

DEPARTAMENTO DE MALARIA

REPORTE DE ENDEMICIDAD Y FUENTE POR DEPARTAMENTO. SEMANAS 1.- 39. / 1993

	HIPERENDEMICA				MESOENDEMICA				HIPOENDEMICA				NO MALARICA			
DEPARTAMENTO	FAL	VIV	POS	LAM	FAL	VIV	POS	LAM	FAL	VIV	POS	LAM	FAL	VIV	POS	LAM
R E G I O N : METROPOLITANA																
SAN SALVADOR																
C. Voluntario	0	20	20	1323	0	48	48	3054	0	9	9	786	0	0	0	29
B. Activa	0	1	1	1560	0	3	3	707	0	0	0	173	0	0	0	0
S. Medico	0	1	1	33	0	1	1	133	0	1	1	138	0	0	0	33
E. Especiales	0	0	0	253	0	0	0	177	0	0	0	52	0	0	0	0
TOTAL	0	22	22	3169	0	52	52	4071	0	10	10	1149	0	0	0	62
TOTAL REGION	0	22	22	3169	0	52	52	4071	0	10	10	1149	0	0	0	62
R E G I O N : PARACENTRAL																
CUSCATLAN																
C. Voluntario	1	23	24	360	0	4	4	249	0	1	1	312	0	1	1	451
B. Activa	0	7	7	283	0	1	1	499	0	0	0	119	0	0	0	68
S. Medico	0	0	0	0	0	0	0	4	0	0	0	9	0	0	0	103
E. Especiales	0	0	0	362	0	0	0	273	0	0	0	125	0	0	0	0
TOTAL	1	30	31	1005	0	5	5	1025	0	1	1	565	0	1	1	622
LA PAZ																
C. Voluntario	0	190	190	3745	0	4	4	407	0	1	1	100	0	0	0	173
B. Activa	0	31	31	4002	0	1	1	44	0	0	0	7	0	0	0	15
S. Medico	0	16	16	566	0	1	1	99	0	0	0	10	0	0	0	25
E. Especiales	0	0	0	154	0	0	0	181	0	0	0	100	0	0	0	0
TOTAL	0	237	237	8467	0	6	6	731	0	1	1	217	0	0	0	213
CABAÑAS																
C. Voluntario	0	0	0	49	0	3	3	521	0	4	4	285	0	2	2	393
B. Activa	0	0	0	162	0	0	0	124	0	0	0	169	0	0	0	46
S. Medico	0	0	0	0	0	0	0	14	0	1	1	6	0	1	1	120
E. Especiales	0	0	0	0	0	0	0	0	0	0	0	222	0	0	0	0
TOTAL	0	0	0	211	0	3	3	659	0	5	5	682	0	3	3	559
SAN VICENTE																
C. Voluntario	0	34	34	1193	0	5	5	846	0	0	0	256	0	0	0	28
B. Activa	0	8	8	1062	0	4	4	486	0	0	0	533	0	0	0	5
S. Medico	0	2	2	54	0	0	0	349	0	0	0	74	0	0	0	4
E. Especiales	0	0	0	236	0	0	0	274	0	0	0	0	0	0	0	0
TOTAL	0	44	44	2545	0	9	9	1877	0	0	0	863	0	0	0	37
TOTAL REGION	1	311	312	12228	0	23	23	4292	0	7	7	2327	0	4	4	1431

EMISION: 25-10-93

MINISTERIO DE SALUD PUBLICA
Y ASISTENCIA SOCIAL

PAG. 0

DEPARTAMENTO DE MALARIA

REPORTE DE ENDEMICIDAD Y FUENTE POR DEPARTAMENTO. SEMANAS 1.- 39. / 1993

DEPARTAMENTO	HIPERENDEMICA				MESOENDEMICA				HIPOENDEMICA				NO MALARICA			
	FAL	VIV	POS	LAM	FAL	VIV	POS	LAM	FAL	VIV	POS	LAM	FAL	VIV	POS	LAM
R E G I O N : ORIENTAL																
USULUTAN																
C. Voluntario	0	242	242	10811	0	3	3	1107	0	0	0	0	0	0	0	269
B. Activa	0	22	22	2301	0	0	0	35	0	0	0	0	0	0	0	6
S. Medico	0	1	1	601	0	0	0	168	0	0	0	0	0	0	0	31
E. Especiales	0	5	5	2378	0	0	0	15	0	0	0	0	0	0	0	1
TOTAL	0	270	270	16091	0	3	3	1325	0	0	0	0	0	0	0	307
SAN MIGUEL																
C. Voluntario	0	57	57	8091	0	2	2	1053	0	0	0	42	0	0	0	75
B. Activa	0	7	7	3249	0	0	0	4	0	0	0	35	0	0	0	0
S. Medico	0	4	4	1092	0	0	0	210	0	0	0	25	0	0	0	126
E. Especiales	0	0	0	1531	0	0	0	203	0	0	0	0	0	0	0	4
TOTAL	0	68	68	13963	0	2	2	1470	0	0	0	102	0	0	0	205
MORAZAN																
C. Voluntario	0	0	0	639	0	1	1	219	0	0	0	23	0	0	0	4
B. Activa	0	0	0	41	0	0	0	0	0	0	0	0	0	0	0	0
S. Medico	0	0	0	105	0	0	0	153	0	0	0	13	0	0	0	4
E. Especiales	0	0	0	45	0	0	0	0	0	0	0	1	0	0	0	0
TOTAL	0	0	0	830	0	1	1	372	0	0	0	37	0	0	0	8
LA UNION																
C. Voluntario	0	101	101	9740	0	1	1	419	0	1	1	238	0	0	0	161
B. Activa	0	24	24	4772	0	0	0	21	0	0	0	0	0	0	0	3
S. Medico	1	8	9	1529	0	0	0	144	0	0	0	88	0	0	0	19
E. Especiales	0	2	2	1386	0	0	0	510	0	0	0	354	0	0	0	0
TOTAL	1	135	136	17427	0	1	1	1094	0	1	1	680	0	0	0	183
TOTAL REGION	1	473	474	48311	0	7	7	4261	0	1	1	819	0	0	0	703
TOTAL PAIS	2	1868	1870	91819	0	255	255	21802	0	95	95	9499	1	90	91	4714

ANNEX 4

ANNUAL OPERATIONAL PLAN (PAO, PLAN ANUAL OPERACIONAL), 2014

Geographic distribution of epidemiological areas

DISTRIBUCIÓN GEOGRAFICA DE ÁREAS EPIDEMIOLÓGICAS

Programa de Malaria

Año: _______ Nombre del Responsable del Programa: ________________________________

Región _______________SIBASI _______________ Departamento: ___________________

MUNICIPIO	Cantones					Caseríos					Barrios					Casas					Habitantes					Red de Notificación									
																										Col. Vol					S M O				
	TOTAL EXISTENTE	HIPERENDEMICA (Alto	MESOENDEMICA (Moderado	HIPOENDEMICA (Bajo	NO MALARICA (Riesgo	TOTAL EXISTENTE	HIPERENDEMICA (Alto	MESOENDEMICA (Moderado	HIPOENDEMICA	NO MALARICA (Riesgo	TOTAL EXISTENTE	HIPERENDEMICA (Alto	MESOENDEMICA (Moderado	HIPOENDEMICA	NO MALARICA (Riesgo	TOTAL EXISTENTE	HIPERENDEMICA (Alto	MESOENDEMICA (Moderado	HIPOENDEMICA	NO MALARICA (Riesgo	TOTAL EXISTENTE	HIPERENDEMICA (Alto	MESOENDEMICA (Moderado	HIPOENDEMICA	NO MALARICA (Riesgo	TOTAL EXISTENTE	HIPERENDEMICA (Alto	MESOENDEMICA (Moderado	HIPOENDEMICA	NO MALARICA (Riesgo	TOTAL EXISTENTE	HIPERENDEMICA (Alto	MESOENDEMICA (Moderado	HIPOENDEMICA	NO MALARICA (Riesgo

Indicators of positivity by malaria stratum

INDICADORES DE POSITIVIDAD POR ÁREA MALARICA, AÑOS 2007 AL 2011

Programa de Malaria

Año: ______ **Nombre del Responsable del Progarama: ________________________________**

Región _______________SIBASI _______________ Departamento: ___________________

AREAS	AÑOS	Gota Gruesa	Casos positivos a *Plasmodium*			INDICADORES			
			Total	*vivax*	*falciparum*	IAES	ILP	IPA	IFA
HIPERENDEMICA (Alto Riesgo)	2007								
	2008								
	2009								
	2010								
	2011								
MESOENDEMICA (Moderado Riesgo)	2007								
	2008								
	2009								
	2010								
	2011								
HIPOENDEMICA (Bajo Riesgo)	2007								
	2008								
	2009								
	2010								
	2011								
NO MALARICA (Riesgo Relativo)	2007								
	2008								
	2009								
	2010								
	2011								
TOTAL	2007								
	2008								
	2009								
	2010								
	2011								

Programming for antimalarial treatment

PROGRAMACIÒN DE TRATAMIENTO ANTIPALUDICO

Programa de Malaria
Año:_____ **Nombre del Responsable del Programa: _____**

Región _____SIBASI _____ Departamento: _____

NOMBRE DEL MUNICIPIO/ CANTON/ CASERIO	Población del caserío	Personas a tratar en el caserío	Tratamiento			No. de ciclos de Tx Masivo	Enero		Febrero		Marzo		Abril		Mayo		Junio		Julio		Agosto		Septiem		Octubre		Noviem		Diciem	
			Masivo	Presuntivo	Curativo		1	2	1	2	1	2	1	2	1	2	1	2	1	2	1	2	1	2	1	2	1	2

Programming of treatment of breeding sites with application of larvicides and other actions

PROGRAMACIÓN DE TRATAMIENTO DE CRIADEROS CON APLICACIÓN DE LARVICIDA Y OTRAS ACCIONES

Programa de Malaria
Año:_____ **Nombre del Responsable del Programa: _____**

Región _____SIBASI _____ Departamento: _____

NOMBRE DEL MUNICIPIO CANTON Y CASERIO	Nombre del Criadero	Caracteristicas			Tratamiento con		Enero		Febrero		Marzo		Abril		Mayo		Junio		Julio		Agosto		Septiem		Octubre		Noviem		Diciem	
		Dimensión mts^2	Permanente	Temporal	Larvicida	Otra acciòn	1	2	1	2	1	2	1	2	1	2	1	2	1	2	1	2	1	2	1	2	1	2

Larval entomological surveillance

Vigilancia Entomológica Pequisa larvaria

Programa de Paludismo
Año:_____ **Nombre del Responsable del Programa: _____**

Región _____SIBASI _____ Departamento: _____

NOMBRE DEL MUNICIPIO CANTON Y CASERIO	Nombre del Criadero	Caracteristicas			Total de pesquisas al año	Enero		Febrero		Marzo		Abril		Mayo		Junio		Julio		Agosto		Septiem		Octubre		Noviem		Diciem	
		Dimensión mts^2	Permanente	Temporal		1	2	1	2	1	2	1	2	1	2	1	2	1	2	1	2	1	2	1	2	1	2	1	2

Surveillance of immigrants

VIGILANCIA A INMIGRANTES

Programa de Paludismo
Año:_____ **Nombre del Responsable del Programa: _____**

Región _____SIBASI _____ Departamento: _____

NOMBRE DEL MUNICIPIO CANTON Y CASERIO	Nombre de la fuente de trabajo	No. de Personas	Tratamiento			No. de ciclos	Enero		Febrero		Marzo		Abril		Mayo		Junio		Julio		Agosto		Septiem		Octubre		Noviem		Diciem	
			Masivo	Presuntivo	Curativo		1	2	1	2	1	2	1	2	1	2	1	2	1	2	1	2	1	2	1	2	1	2

Timetable of IRS activities

CRONOGRAMA DE ACTIVIDADES DE ROCIADO INTRA RESIDUAL

Programa de Malaria

Año: _____ **Nombre del Responsable del Programa: _____**

Región _____SIBASI _____ Departamento: _____

MUNICIPIO, CANTÓN Y CASERIO	Casas programadas	Habitantes a proteger con la medida	Ciclos prog	Enero		Febrero		Marzo		Abril		Mayo		Junio		Julio		Agosto		Septiem		Octubre		Noviem		Diciem	
				1	2	1	2	1	2	1	2	1	2	1	2	1	2	1	2	1	2	1	2	1	2	1	2

Timetable of fumigation activities with portable equipment

CRONOGRAMA DE ACTIVIDADES DE FUMIGACIÓN CON EQUIPO PORTATIL (Térmico o ULV)

Programa de Malaria

Año:_____ **Nombre del Responsable del Progarama: _____**

Región _____SIBASI _____ Departamento: _____

MUNICIPIO, CANTÓN Y CASERIO	Casas programadas	Habitantes a proteger con la medida	Ciclos prog	Enero		Febrero		Marzo		Abril		Mayo		Junio		Julio		Agosto		Septiem		Octubre		Noviem		Diciem	
				1	2	1	2	1	2	1	2	1	2	1	2	1	2	1	2	1	2	1	2	1	2	1	2

Timetable of fumigation activities with heavy equipment

CRONOGRAMA DE ACTIVIDADES DE FUMIGACIÓN CON EQUIPO PESADO ULV

Programa de Malaria

Año: _____ **Nombre del Responsable del Progarama: _____**

Región _____SIBASI _____ Departamento: _____

MUNICIPIO, CANTÓN Y CASERIO	Casas programadas	Habitantes a proteger con la medida	Ciclos prog	Enero		Febrero		Marzo		Abril		Mayo		Junio		Julio		Agosto		Septiem		Octubre		Noviem		Diciem	
				1	2	1	2	1	2	1	2	1	2	1	2	1	2	1	2	1	2	1	2	1	2	1	2

Adult mosquito trapping entomological surveillance

Vigilancia Entomológica Captura Zancudo Adulto

Programa de Paludismo

Año: _____ **Nombre del Responsable del Programa: _____**

Región _____SIBASI _____ Departamento: _____

NOMBRE DEL MUNICIPIO CANTON Y CASERIO	Captura de zancudo adulto						Enero		Febrero		Marzo		Abril		Mayo		Junio		Julio		Agosto		Septiem		Octubre		Noviem		Diciem	
	Total de viviendas	No. de viviendas donde se realizarà captura	Abrigo animal	Intra superficie	Trampa luz	Otro tipo	1	2	1	2	1	2	1	2	1	2	1	2	1	2	1	2	1	2	1	2	1	2

Programming of epidemiological area work

PROGRAMACIÓN DE DE ÁREAS EPIDEMIOLÓGICAS A TRABAJAR

Programa de Malaria
Año: ___________ Nombre del Responsable del Programa: ________________________________
Región ______________SIBASI ______________ Departamento: __________________

MUNICIPIO	Cantones					Caseríos					Barrios					Casas					Habitantes				
	A TRABAJAR	HIPERENDEMICA (Alto Riesgo)	MESOENDEMICA (Moderado Riesgo)	HIPOENDEMICA (Bajo Riesgo)	NO MALARICA (Riesgo Relativo)	A TRABAJAR	HIPERENDEMICA (Alto Riesgo)	MESOENDEMICA (Moderado Riesgo)	HIPOENDEMICA (Bajo Riesgo)	NO MALARICA (Riesgo Relativo)	A TRABAJAR	HIPERENDEMICA (Alto Riesgo)	MESOENDEMICA (Moderado Riesgo)	HIPOENDEMICA (Bajo Riesgo)	NO MALARICA (Riesgo Relativo)	A TRABAJAR	HIPERENDEMICA (Alto Riesgo)	MESOENDEMICA (Moderado Riesgo)	HIPOENDEMICA (Bajo Riesgo)	NO MALARICA (Riesgo Relativo)	A TRABAJAR	HIPERENDEMICA (Alto Riesgo)	MESOENDEMICA (Moderado Riesgo)	HIPOENDEMICA (Bajo Riesgo)	NO MALARICA (Riesgo Relativo)

Programming of maintenance projects

PROGRAMACIÓN DE MANTENIMIENTO A OBRA FÍSICAS

Programa de Malaria
Año:__________ **Nombre del Responsable del Programa: ________________________________**

Región ______________SIBASI ______________ Departamento: __________________

NOMBRE DEL MUNICIPIO CANTON Y CASERIO	Nombre de la obra fisica	Tipo		Dimensión mts²	Mts² a dar mantenimiento	Enero		Febrero		Marzo		Abril		Mayo		Junio		Julio		Agosto		Septiem		Octubre		Noviem		Diciem	
		Ingenieria	Artesanal			1	2	1	2	1	2	1	2	1	2	1	2	1	2	1	2	1	2	1	2	1	2	1	2

Commodities needs

NECESIDADES DE INSUMOS

Programa de Malaria
Nombre del responsable del Programa: ____
Año: ______
Regiòn: _____________SIBASI: ____________________Departamento______________________

MATERIALES	Porta objeto (Láminas de vidrio)	Cubre objeto (Laminillas)	Algodón (Lb)	Colorante Giemza (cc)	Aceite Inmersión (frasco)	Alcohol (Lt)	Lápiz mina negra (c/u)	PAPELERIA									
								Papel bond Tamaño Carta/Resma		Papel bond Tamaño Oficio/Resma		Papel periódico Tamaño Oficio/Resma		Sobre Manila T Carta/Resma	Papel Carbón T Carta	Papel Higienico (Rollo)	Papel Talla (Pliego)
								Base 20	Base 16	Base 20	Base 16	Base 20	Base 16				

MEDICAMENTOS	Cloroquina	Cloroprimaquina		
	150 mg/Cientos	450 / 45 mg	150 / 15 mg	75 / 7.5 mg

INSECTICIDAS	Deltametrina PM (Kg)	Piretroide (litros)	TEMEPHOS		
			Granulado 1%	Granulado 5%	Emulsión 50%

Timetable of surveillance system supervision by risk area–VC posts, official medical services and other

CRONOGRAMA DE SUPERVISIÓN A LA RED DE NOTIFICACIÓN POR ÁREA DE RIESGO
PUESTOS DE COLABORADORES VOLUNTARIOS SERVICIOS MEDICOS OFICIALES Y OTROS.

Programa de Paludismo
Año:_____ Nombre del Responsable del Programa: _____

Región _____SIBASI _____ Departamento: _____

UBICACIÓN GEOGRAFICA DEL PUESTO DE LA RED DE NOTIFICACIÓN: MUNICIPIO, CANTÓN, CASERIO	Codigo	Área cadémica	Frecuencia de la supervisión	No. supervisiones otros cargos	Enero				Febrero				Marzo				Abril				Mayo				Junio				Julio				Agosto				Septiembre				Octubre				Noviembre				Diciembre			
					1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4

Detail of equipment and human resources

DETALLE DE RECURSO HUMANO Y EQUIPO

Nombre del responsable del Programa: _____

Año: _____

Regiòn: _____SIBASI: _____ Departamento:_____

RECURSO HUMANO	SUPERVISOR		JEFE		INSPEC. PROM. ANTIMALARIA.		ROCIADOR	ENTOMOLOGO DE E.T.V.	PROMOTOMOR DE EDUCACION ANTIMALARIA	LABORATORISTA	MOTORISTA.	COLABORADOR VOLUNTARIO DE MALARIA	TOTAL
	DEPTAL. DE MALARIA	DEPTAL. DE E.T.V.	SECTOR	CUADRILLA	SUP. LA RED	MEDIC. PREV.							

EQUIPO	Vehìculo						Microscopios						Trampa luz		
	4 Ruedas			2 Ruedas			Bactereologico			Estereoscopio					
	Total	Bueno	Malo	Total	Bueno	Malo	Total	Bueno	Malo	Total	Bueno	Malo	Total	Buena	Mala

EQUIPOS DE FUMIGACIÒN Y ROCIADO

EQUIPO PESADO			PULSFOG			DYNA FOG			SWING FOG			ASPERSORA MATABI			HUDSON X P.		
Total	Bueno	Malo	Total	Bueno	Malo	Total	Bueno	Malo	Total	Bueno	Malo	Total	Bueno	Malo	Total	Bueno	Malo


REPUBLICA DE EL SALVADOR EN LA AMERICA CENTRAL


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