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MESOAMERICAN MASTER PLAN FOR THE INTEGRATED MANAGEMENT OF DENGUE AND CHIKUNGUNYA PREVENTION AND CONTROL

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1. INTRODUCTION

The Mesoamerican Master Plan for the Integrated Management of Dengue and Chikungunya Prevention and Control (Dengue/CHIK MMP) is aimed at the countries that are part of the Mesoamerica Project: Belize, Colombia, Costa Rica, the Dominican Republic, El Salvador, Guatemala, Honduras, Mexico, Nicaragua, and Panama. Its purpose is to help reduce the social and economic effects of dengue and chikungunya in Mesoamerica. This material was prepared using the different technical documents, strategies, action plans, and resolutions undertaken by the Mesoamerican countries at the global, regional, and subregional levels.

This Mesoamerican Master Plan (MMP) has been developed within the framework of the Mesoamerican Public Health System (SMSP, Spanish acronym), a specialized mechanism designed to generate regional public goods in order to resolve common public health challenges. The governance mechanism of the SMSP includes the Meeting of Ministers of Health (CM-SMSP), the Secretariat, the Mesoamerican Public Health Institute, the Financial Strategy Committee, and the National Coordinators of the SMSP.

During the 5th meeting of the CM-SMSP held in Panama in December 2013, it was agreed that the MMPs for dengue, road safety, and primary health care would be drafted and/or updated. In October 2014, in Washington DC, it was also agreed that work would be done to update the malaria plan. In this regard, the Mexican Agency for International Development Cooperation (AMEXCID) and the Pan American Health Organization/World Health Organization (PAHO/WHO) signed a technical cooperation agreement for the preparation of the following MMPs:

1. MMP for primary health care as part of the strategy for universal access to health and universal health coverage;
2. MMP for road safety in the cities of Mesoamerica;
3. MMP to improve malaria control with the goal of elimination;
4. MMP for the integrated management of dengue and chikungunya prevention and control.

The MMPs were carried out jointly with the ministries of health and related institutions of all the countries, with the technical support of PAHO/WHO, and support from AMEXCID in the form of funding and communications with the SMSP.

The process of drafting the plans included: situation analysis; on-site and virtual meetings for the establishment of priorities, indicators and preparation of the MMP; and country visits by PAHO/WHO for technical assistance and the preparation of national and/or city-wide strategic plans.

Through the implementation of its different components, this plan is expected to reduce the dengue case-fatality rate by at least 30% by 2020, and to keep the case-fatality rate of CHIK in the Mesoamerican subregion below 1%.

2. BACKGROUND

Within the framework of the 53rd session of the Directing Council held in September 2014, the Pan American Health Organization/World Health Organization (PAHO/WHO) and the Mexican Agency for International Development Cooperation (AMEXCID) signed the “technical cooperation agreement for the preparation of MMPs for Dengue/chikungunya, Malaria, Road Safety, and Primary Health Care in the Mesoamerican Public Health System.” Through the Regional Dengue Program, the PAHO/WHO Neglected, Tropical, and Vector Borne Diseases Unit (CHA/VT) spearheaded the preparation of the *MMP for the Integrated Management of Dengue and Chikungunya Prevention and Control* (Dengue/CHIK MMP). The development of this plan has been a participatory process among the technical delegates of the Mesoamerican countries, with technical support from PAHO/WHO and the International Technical Task Force on Dengue (GTI-dengue).

Using the logical framework methodology, and with the assistance of technical experts from the Mesoamerican countries (Colombia, the Dominican Republic, Guatemala, Mexico, Nicaragua, and Panama), the GTI-dengue and PAHO/WHO staff members analyzed the Strengths, Opportunities, Weaknesses, and Threats (SWOT analysis) submitted by those countries, which allowed them to determine the priorities and content of each component of the plan (Annex).

The preparation of the Dengue/CHIK MMP document got underway during an expert workshop held in Panama from January 27-30, 2015. Subsequently, through virtual meetings held among the Mesoamerican countries, the GTI-dengue, and PAHO/WHO technical staff, this document was edited, updated, adjusted, and approved, resulting in the final version of the *MMP of Management Integrated for the prevention and control of dengue and chikungunya*.

2.1. Policies, strategies, and plans implemented

2.1.1. Dengue

During the 43rd Directing Council in September 2001, PAHO/WHO adopted Resolution CD43.R4, a political declaration that, in light of the sustained increase in cases of dengue, recommended strengthening the response of the region’s national ministries of health and promoted a “New Generation of Programs for dengue prevention and control” to encourage prevention and control through community participation and health education.

The implementation of this political framework required a practical methodological model and, in September 2003, the 44th Directing Council of PAHO/WHO passed Resolution CD44.R14, which proposed that the member countries adopt the **Integrated Management Strategy for Dengue Prevention and Control (IMS-dengue)**. IMS-dengue is a regional working tool, designed by experts from the national ministries of health and the PAHO/WHO International Technical Group of Experts on Dengue (GTI-dengue), with a view to strengthening national programs for multidisciplinary and intersectoral interventions targeting the social and environmental factors associated with transmission. Since its creation in 2003, IMS-dengue has focused on addressing the following components:

- Epidemiology
- Integrated vector management (IVM)
- Laboratory
- Patient care
- Vaccines
- Environment management
- Mass communication

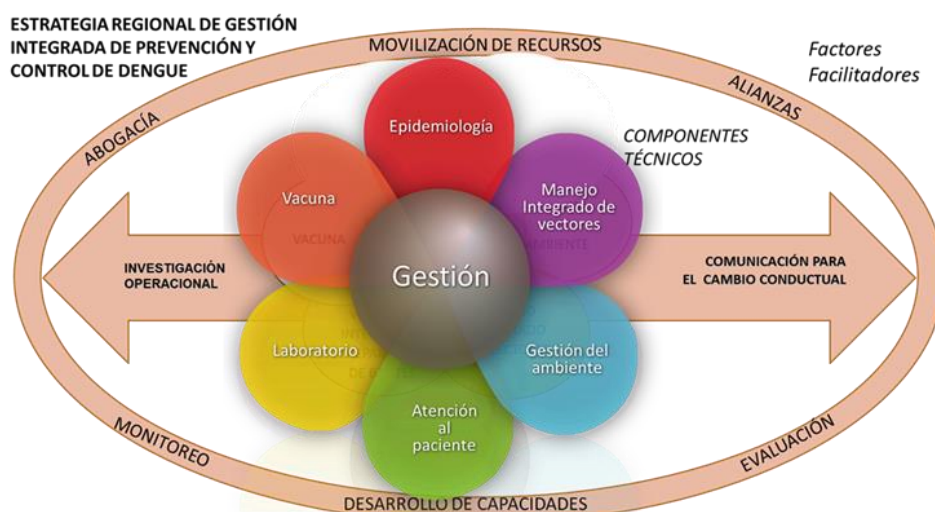
IMS-dengue aims to integrate key areas of action in the practice of dengue prevention and control, through a horizontal, intersectoral, and inter-programmatic approach. It seeks to shift national prevention and control responses toward the inclusion of community groups, especially families, in order to achieve behavioral changes and sustainable actions with respect to the social and environmental factors associated with dengue transmission.

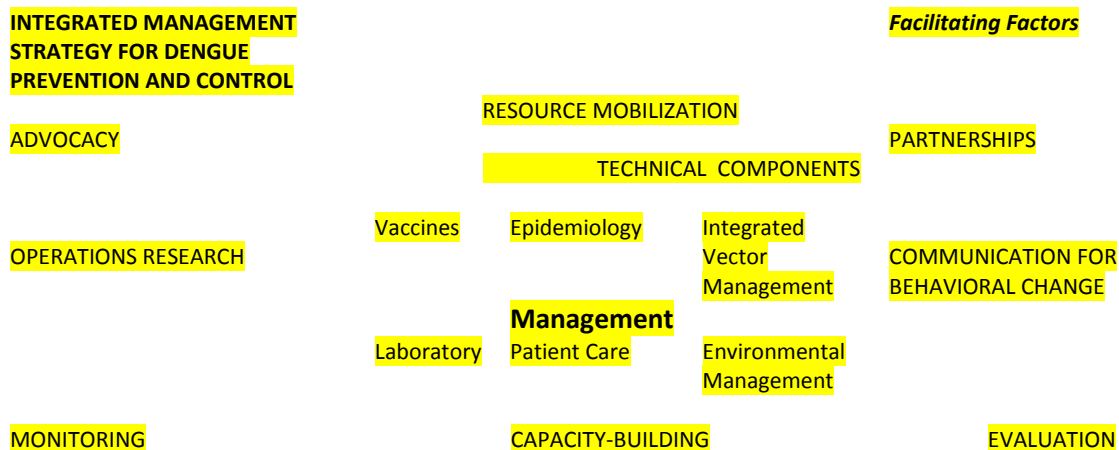
In addition, Directing Council Resolution CD44.R14 promoted the creation of the regional working group of dengue experts known as **GTI-dengue**, a group of experts who, based on regional analysis, travel to the countries to provide technical support and assistance:

1. Preparing and evaluating the national IMS-dengue
2. Drafting national preparedness plans and responses to dengue outbreaks and epidemics
3. Supporting the design of the national response to dengue outbreaks and epidemics
4. Training national technical teams in each component of IMS-dengue, in country visits and at regional or subregional events

By December 31, 2013, four subregions of the Americas (Central America, Caribbean, Southern Cone, and Andean), and 26 countries and territories had national or regional IMS-dengue programs and were in the implementation phase. Earlier, in 2007, the 27th PAHO/WHO Pan American Sanitary Conference had passed Resolution CSP27.R15 for purposes of monitoring and evaluating IMS-dengue, and urged the countries to conduct a performance evaluation of national IMS-dengue with the support of GTI-dengue. This process started in 2008, and 22 national IMS-dengue programs have been evaluated since then. In some countries, such as Mexico and Brazil, a second evaluation has been done.

Figure 1. Integrated Management Strategy for Dengue Prevention and Control in the Americas, 2015—IMS-Dengue (2015)





Source: PAHO/WHO Regional Dengue Programs

2.1.2. Chikungunya

In close collaboration with strategic partners such as the United States Centers for Disease Control and Prevention (CDC), the Dengue Laboratory Network of the Americas (RELDA), and others, PAHO has made efforts to prepare the countries of the region in light of the introduction of the CHIK virus. It has assisted with the preparation of clinical and laboratory guides, trainings, and regional workshops, and has facilitated the availability and distribution of supplies and reagents necessary for the early laboratory detection and surveillance of the virus.

In 2011, at the initiative of PAHO/WHO, the guidelines on Preparedness and Response for CHIK Virus Introduction in the Americas were drafted in a joint effort with the CDC and several regional experts. This document consolidates and systematizes recommendations for the surveillance components, including epidemiological strategies, vector management, laboratory diagnosis, clinical case management, and risk communication.

In order to confirm viral circulation, PAHO/WHO created an algorithm for laboratory diagnosis with recommendations for virological and serological identification, including biosafety. This was done with support from technical and expert partners in the region, in particular the Dengue Laboratory Network of the Americas (RELDA). Clinical trainings have also been conducted with instructors who are experts in the field, with special emphasis on developing early detection capabilities and the proper clinical management of the disease. In addition, clinical management support material and frequent updates of the available scientific material have been published.

Based on the epidemiological surveillance guidelines proposed by PAHO/WHO according to experience in other countries outside the region, and given the new epidemiological scenario presented by the establishment of the CHIK virus, the affected countries have developed their own national guidelines and protocols for surveillance and management. However, and for purposes of maximizing existing resources, the integration of CHIK surveillance with the platforms available for IMS-dengue must be examined and discussed at the national level.

3. CURRENT STATUS OF DENGUE AND CHIKUNGUNYA IN THE MESOAMERICAN REGION

3.1. Dengue

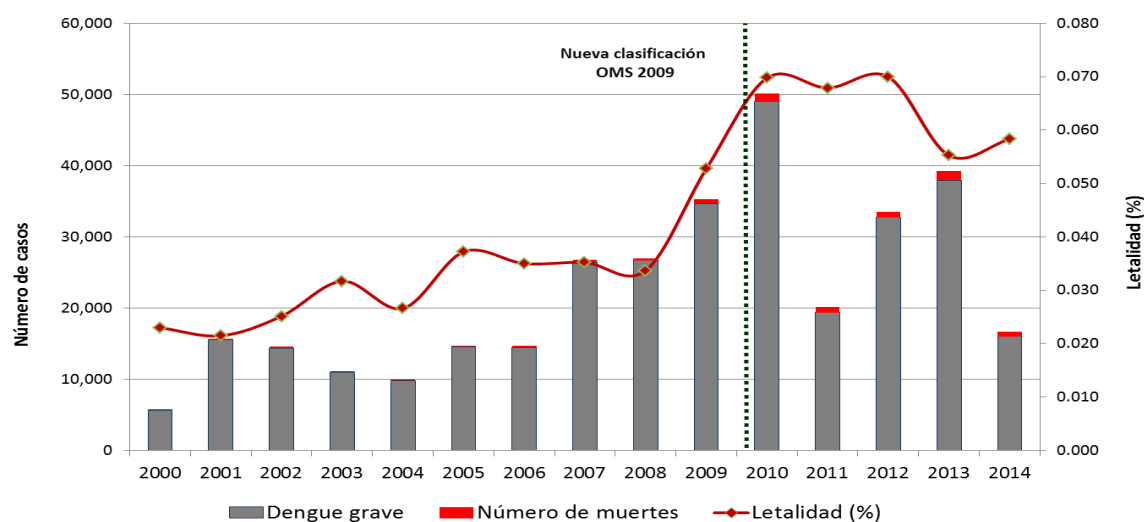
Dengue is a disease that has been evolving for more than 400 years, and WHO considers it to be the most important vector-borne viral disease, with some 50 to 100 million new infections occurring in more than 125 endemic countries each year. Eighteen (60%) of the 30 countries with the greatest incidence of dengue worldwide are located in the Americas (WHO, 2012).

3.1.1. Epidemiology of dengue in the Americas

The history of dengue in the Americas dates back to 1780, when Dr. Benjamin Rush made the first written report of a case on Dengue Fever in Philadelphia, United States of America. Since then, the disease has been present throughout the entire continent. Only Canada, continental Chile, and Uruguay have not had indigenous dengue transmission, although the vector (*Aedes aegypti*) is present in Uruguay.

Epidemiological surveillance of dengue in the Americas has been improved and strengthened in the last three decades, resulting in better and more frequent case reporting in the Region. Between the years 2010 and 2014, a total of 7.47 million cases of dengue have been reported in 50 countries and territories that systematically report their data. The increased incidence of dengue was reflected in an upsurge in the number of severe cases and a corresponding rise in the number of fatalities; however, the revised WHO dengue classification (2009) was adopted in the region in 2010, and a decline in the case-fatality rate was observed after its implementation (Figure 2).

Figure 2. Severe cases, deaths, and case-fatality from dengue in the Americas, 2000-2014



Number of cases

Revised WHO classification – 2009

Case-fatality (%)

Severe dengue

Number of deaths

Case-fatality (%)

Source: PAHO/WHO Regional Dengue Programs

3.1.2. Epidemiology of dengue in Mesoamerica, 2011-2014

After the Southern Cone, Mesoamerica is the region of the American hemisphere that reports the greatest number of suspected cases of dengue. Between 2011 and 2014, it has had 1.5 million cases of dengue (2011: 165,255 cases; 2012: 346,886; 2013: 588,355; 2014: 410,393), or 26% of all dengue cases in the hemisphere during that period. The incidence of dengue has increased in Mesoamerica, as well as in the rest of the hemisphere. In 2011, the incidence was 91.6 cases/100,000 inhabitants, increasing to 190.4 cases in 2012 and 322.6 cases in 2013. 2014 saw a decline in incidence (181.9 cases/100,000 inhabitants) from the previous year. Mexico and Colombia are the countries with the greatest number of cases due to their geographical size. However, the countries with the highest incidence during this period have been Belize, Costa Rica, El Salvador, and Nicaragua (Table 1).

Table 1. Number of suspected cases and incidence (per 100,000 inhabitants) of dengue in Mesoamerica, 2011-2014

Mesoamerica		Years			
		2011	2012	2013	2014
Mesoamerican Countries		Number of suspected cases (Incidence x 100 inhabitants)			
	Belize	469 (145.7)	1,948 (605.0)	2,690 (788.9)	5,026 (1,478.2)
	Colombia	33,207 (144.8)	49,361 (215.2)	127,219 (476.2)	105,356 (215.3)
	Costa Rica	13,854 (303.6)	22,243 (487.5)	49,868 (1,092.9)	11,140 (225.6)
	Dominican Republic	2,339 (27.5)	9,665 (113.8)	16,658 (196.1)	6,274 (63.5)
	El Salvador	20,836 (325.7)	41,793 (653.3)	28,877 (451.4)	53,460 (844.8)
	Guatemala	2,565 (21.9)	9,547 (81.7)	11,860 (101.5)	19,791 (122.7)
	Honduras	8,297 (126.2)	15,554 (185.5)	39,271 (459.0)	43,456 (498.1)
	Mexico	67,918 (61.4)	164,947 (149.1)	231,498 (209.3)	124,943 (104.3)
	Nicaragua	11,888 (228.3)	30,499 (585.6)	77,179 (1,481.9)	35,430 (571.6)
Panama	3,882 (109.1)	1,329 (37.4)	3,235 (90.9)	5,517 (141.0)	
Mesoamerican Region	Total number of cases	165,255	346,886	588,355	410,393
	Average number of cases	16,526	34.68 7	58.83 6	41,039

Average incidence	91.6	190.4	322.6	181.9
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Source: PAHO/WHO Regional Dengue Programs

Deaths from dengue for the same period (2011-2014) reached 1,166, for an annual average of 292. The case-fatality rate for dengue in Mesoamerica has been higher than the regional rate. From 2011 to 2012 it increased from 0.069% to 0.089%. However, the case-fatality rate has fallen since 2012 to 0.073% in 2014. It is important to emphasize that a more detailed analysis at the country level shows that the Dominican Republic is the nation facing the greatest challenges with respect to its case-fatality rate for dengue, presenting not only the highest rate in the subregion and in the Hemisphere, but also a clear upward trend. This situation in the Dominican Republic has a major impact on the overall case-fatality rate in the Mesoamerican subregion. An analysis excluding deaths in the Dominican Republic shows a significant downward trend, from 0.069% in 2011 to 0.059% in 2014. The countries that contribute the greatest number of dengue fatalities are Mexico, Colombia, and the Dominican Republic. Belize has been the only country without dengue fatalities in the subregion. Table 2 shows the number of deaths from dengue and its case-fatality rates.

Table 2. Number of deaths and case-fatality rate (%) for dengue in Mesoamerica, 2011-2014

Mesoamerica		Years			
		2011	2012	2013	2014
Mesoamerican Countries		Number of deaths (Case-fatality %)			
	Belize	0	0	0	0
	Colombia	42 (0.13)	51 (0.10)	161 (0.13)	166 (0.16)
	Costa Rica	0	0	1 (0.00)	0
	Dominican Republic	2 (0.09)	71 (0.73)	111 (0.67)	62 (0.99)
	El Salvador	7 (0.03)	6 (0.01)	3 (0.01)	6 (0.01)
	Guatemala	9 (0.35)	17 (0.18)	8 (0.07)	13 (0.07)
	Honduras	0	4 (0.03)	29 (0.07)	5 (0.01)
	Mexico	36 (0.05)	153 (0.09)	104 (0.04)	39 (0.03)
	Nicaragua	1 (0.01)	5 (0.02)	20 (0.03)	0
	Panama	17 (0.44)	0	8 (0.25)	9 (0.17)
Meso-american Region	Total number of deaths	114	307	445	300
	Average number of deaths	11	31	45	30

Average case-fatality rate	0,069	0,089	0,076	0,073
Average case-fatality rate without the Dominican Republic	0,069	0,070	0,058	0,059

Source: PAHO/WHO Regional Dengue Programs

All four dengue serotypes are circulating in Mesoamerica. Since 1995, when the systematic reporting of the dengue serotypes circulating in the Americas began, six countries of Mesoamerica have at some time reported the simultaneous circulation of all four serotypes. In 2014, there were four countries in Mesoamerica (Colombia, Guatemala, Mexico, and Nicaragua) that reported the simultaneous circulation of all of the dengue serotypes, a situation that increases the risk of epidemics and severe cases of the disease.

3.2. Chikungunya

Chikungunya (CHIK) is an alphavirus (Togaviridae family) transmitted through different vector mosquito species *Aedes (Ae)*. Humans are the principal amplifier host of the virus, and the infection is manifested by the sudden onset of fever and polyarthralgia. Joint pain is usually bilateral and symmetrical and can become severe and incapacitating. Mortality is infrequent and occurs mainly in older adults or in patients who present some underlying clinical condition (comorbidity). After the initial identification of the virus in 1952 in present-day Tanzania, some sporadic outbreaks of the disease were detected during the 1960s and 70s in Africa. Nevertheless, activity increased beginning in 2004 when an outbreak originating on the coast of Kenya quickly spread to the Comoro Islands and other islands of the Indian Ocean. By the summer of 2006, around 500,000 cases had been reported, additionally affecting Australia and Asia (India, Indonesia, the Maldives, Myanmar, Sri Lanka, and Thailand). In 2007, there was an outbreak of the virus transmitted through *Aedes albopictus* in Italy, in the region of Emilia-Romagna. Recent outbreaks of CHIK fever have had a significant impact on public health, both in the short and long-term.

3.2.1. Epidemiology of chikungunya in the Americas

Imported cases had been reported previously in the Americas (United States, Canada, French Guiana, Martinique, Guadeloupe, and Brazil), but it was only on December 6, 2013 that the local transmission of the CHIK virus was reported to PAHO/WHO, for the first time in the Western Hemisphere, with confirmed indigenous cases in the French territory of Saint Martin, and subsequently in Martinique, Guadeloupe and Saint Barthélemy. The virus spread rapidly to several Caribbean islands (Anguilla, Antigua and Barbuda, British Virgin Islands, Dominica, the Dominican Republic, Haiti, Martinique, Puerto Rico, Saint Kitts and Nevis, Saint Lucia, St. Maarten (Dutch section), and Saint Vincent and the Grenadines) followed by its introduction into continental territory (French Guiana and Guyana), Mesoamerica, Brazil, and countries of the Andean Region. Thus, for epidemiological week 10 (EW10) of 2015, more than 1,200,000 suspected cases of CHIK have been reported, with 25,400 laboratory-confirmed indigenous cases and 183 CHIK-related fatalities.

Within the Member States affected by the outbreak of CHIK, the situation observed in the Dominican Republic undoubtedly represents the most intense transmission recorded to date in the Region. The indigenous circulation of the virus in the country was officially

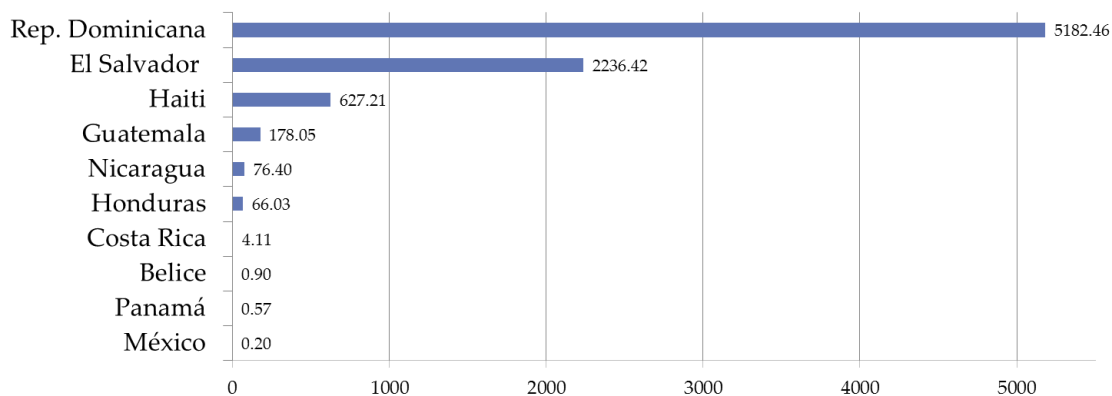
reported during EW 09 of 2014; for EW 17, 8,058 suspected cases had already been reported nationally, with an incidence of 5,182 cases/100,000 inhabitants.

3.2.2. Epidemiology of chikungunya in Mesoamerica

For Mesoamerica, a total of 719,157 suspected cases had been reported by EW 7 of 2015, with 2,832 laboratory-confirmed cases and 6 deaths. Figure 2 shows the cumulative incidences up to EW 7. The average cumulative incidence for Mesoamerica, the Dominican Republic, and Haiti, was 426.2 cases/100,000 inhabitants as of that date, with broad differences among countries that mainly reflect the degree of epidemiological evolution in each country.

With regard to epidemiological surveillance, it bears noting that CHIK was a new disease in the region and that it was not included in the epidemiological information systems. Therefore, the countries adapted existing tools and have reported the information on suspected and confirmed cases according to the PAHO/CDC definitions. The National Focal Points (NFP) for the International Health Regulations (IHR) enabled the timely reporting of the establishment of indigenous circulation in a given country.

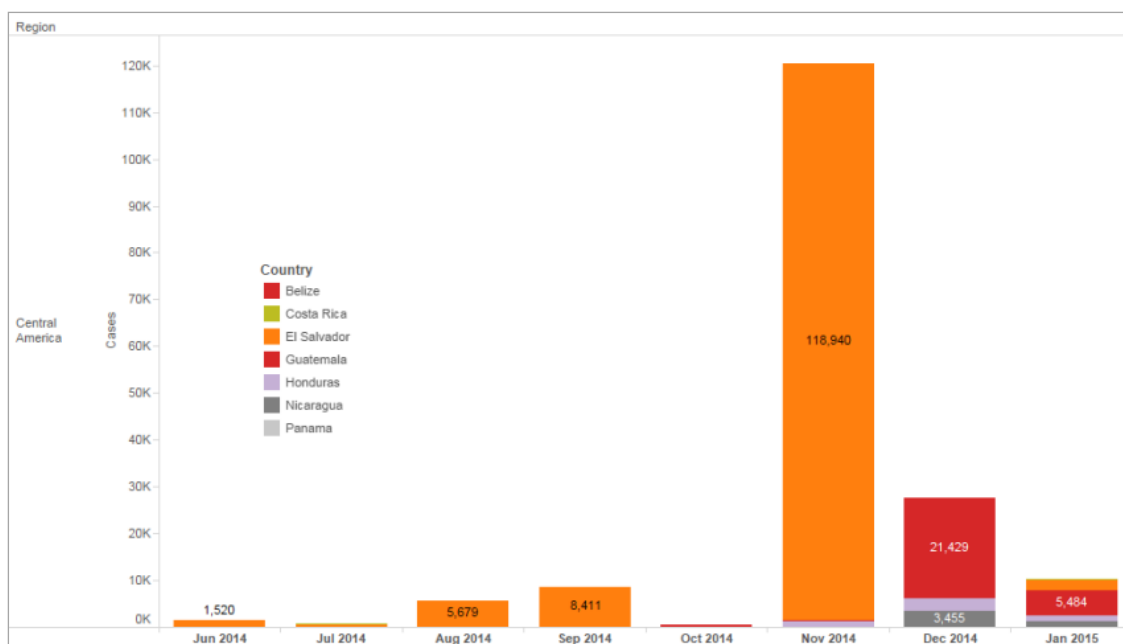
Figure 3. Cumulative incidence of cases of CHIK in Mesoamerica as of February 2015



Source: PAHO/WHO, CHA/IR chikungunya

Figure 4 shows the epidemiological curve, by month, from the introduction of the CHIK virus into the Mesoamerican isthmus. Most of the cases correspond to El Salvador (November 2014), followed by Guatemala (December 2014). Given the characteristics of the reported and published data, it is impossible to know or estimate the proportion of atypical or severe cases, or the occurrence of mother-to-child transmission.

Figure 4. Epidemic curve of cases of CHIK in Mesoamerica 2014-2015



Source: PAHO/WHO, CHA/IR chikungunya

The epidemiological situation arising from the dengue transmission season plus the introduction and sustained transmission of CHIK in the region calls for integrated efforts to prevent and control both diseases. The rapid spread of the CHIK virus, together with the simultaneous occurrence of cases or outbreaks of dengue, may cause a significant spike in the demand for medical care. For this reason, health networks and services must be prepared to meet the demand without sacrificing quality of care, and should be guided mainly by the PAHO/WHO recommendations on the clinical approach to patients with dengue or CHIK.

4. PLAN

4.1. Purpose and Objectives

The purpose of the Dengue/CHIK MMP is to help reduce the social and economic effects of dengue and chikungunya in Mesoamerica, and its objective is to reduce the dengue case-fatality rate by at least 30% by 2020 and to keep the case-fatality rate of CHIK below 1% through the implementation of its different components.

The Integrated Management Strategy for Dengue and CHIK Prevention and Control within the framework of this MMP sets forward the comprehensive nature of the components: surveillance, laboratory, patient care, integrated vector management, environment, and vaccines, as well as the promotion of scientific research and the key elements of mass communication across all of the components. At the same time, the new model emphasizes the aforementioned facilitating factors that should be taken into account during the implementation process. Next, the logical framework includes the different results, activities, and actions to be taken for their implementation at all levels within the countries and at the subregional level.

Table 3. Summary of Expected Outcomes by MMP Component

Component	Expected outcomes
Management	Implementation of the Integrated Management Strategy for Dengue and CHIK Prevention and Control based on the MMP
Epidemiology	Implementation of an integrated surveillance system for dengue and CHIK prevention and control
Laboratory	Establishment of laboratory surveillance of dengue and CHIK in each country of Mesoamerica
Patient care	Better clinical diagnosis and case management of dengue and CHIK in the Mesoamerican countries
Integrated vector management	Reduction of dengue and CHIK entomological transmission risk in the Mesoamerican countries
Environmental management	Specific multisectoral environmental management actions to reduce entomological dengue and CHIK risk
Vaccines	

4.2. Cross-cutting components

Every IMS-dengue and CHIK component should include the cross-cutting components of communication and health promotion and operations research.

4.2.1. Communication and health promotion

Communication and health promotion encourage individual and collective responsibility for the prevention and control of dengue and CHIK. They serve as a linchpin in all the components of the Dengue/CHIK MMP because communication is an indispensable action for the conveyance of physical, verbal, and written messages that influence public behavior. Health promotion is also an essential public health function that is a determining factor in quality of life.

4.2.2. Operations Research

Operations research is fundamental for “discovery, development, and the realization of interventions” (PAHO/WHO 2013) directed and/or targeted according to the spaces and conditions of each situation encountered in the dengue and CHIK prevention and control programs. It is a cross-cutting issue, given the importance of conducting operations research to generate evidence, such as:

- systematizing experiences
- identifying new tools and work techniques
- validating behaviors and educational materials
- measuring the impact of interventions
- determining the cost/benefit of interventions

4.3. Management Component

The integrated *management* of dengue and CHIK prevention and control is the planning, organization, management, execution, evaluation and monitoring mechanism of a work strategy designed to reduce dengue and CHIK transmission factors through an approach

that must be integrated as well as multidisciplinary (inter-institutional and cross-sectoral), and that contributes to political, strategic, and operational decision-making.

Table 4. Management Component: Expected Outcomes—Indicators—Sources of Verification and Assumptions

Expected outcomes	Indicators	Sources of verification	Assumptions
Adjustment and implementation of the 2015 National IMS-Dengue/CHIK based on the Dengue/CHIK MMP	<ol style="list-style-type: none"> 100% of the countries of Mesoamerica with their 2015 National IMS-Dengue/CHIK implemented by the end of 2017 based on the Dengue/CHIK MMP. 70% of municipalities with the greatest risk of transmission of dengue and CHIK with the 2015 National IMS-Dengue/CHIK implemented by 2018 	<p>2015 National IMS-Dengue/CHIK Document, based on the Dengue/CHIK MMP.</p> <p>Reports from countries and GTI-dengue monitoring and evaluation reports.</p>	<p>Political commitment and availability of technical and financial resources from countries and other sources</p>

Table 5. Management Component: Activities—Tasks—Implementation Schedule and Responsible Party

Activity	Task	Implementation schedule			Responsible party
		S	M	L	
1- Update the 2015 National IMS-Dengue/CHIK based on the Dengue/CHIK MMP	Keep the comprehensive situation analysis of dengue and CHIK up-to-date for stratification	X	X	X	GTN-dengue/CHIK and health surveillance
	Define prevention and control objectives and actions according to the prioritization/targeting of risk	X			GTN-dengue/CHIK
	Standardize criteria and competencies in the functional integration of the components of the 2015 National IMS-Dengue/CHIK.	X			GTN-dengue/CHIK
	Devise mechanisms for the implementation of the 2015 National IMS-Dengue/CHIK at all levels.	X			Parties responsible for 2015 IMS-dengue/CHIK
	Reorient/ readjust/adjust the technical, operational, and programmatic capacities of the	X	X		GTN-dengue/CHIK GTI-dengue

	national and subnational response team.				
	Prepare and execute the monitoring and evaluation plan for the implementation of the MMP, at the regional level and within each country.	X	X		GTN-dengue/CHIK GTI-dengue
	Develop and conduct national workshops to bring the 2015 National IMS-dengue/CHIK into line with the Dengue/CHIK MMP	X			GTN-dengue/CHIK GTI-dengue
2- Authorize the formation and operation of the multidisciplinary (inter-institutional and cross-sectoral) National Technical Group on dengue and CHIK.	Define the actors and functions using the legal framework and the approach of health determinants for dengue and CHIK.	X			GTN-dengue/CHIK proposes and decides the high-level authority, extrasectoral Commission or Health Council of the country.
	Set a work timetable for the National Technical Group that includes a follow-up, monitoring, and evaluation plan.	X	X		National Technical Group on VBDs
	Preparation of proceedings and technical recommendations.	X	X	X	
3- Keep political authorities informed of the epidemiological situation, its progress, and the requirements of the 2015 National IMS-Dengue/CHIK	Prepare a managerial report with pertinent technical recommendations for managers or responsible municipal or local authorities.	X	X	X	Party responsible for the 2015 National IMS-dengue/CHIK
	Use the managerial report for political accountability of the results obtained.		X	X	High-ranking political authorities
	Hold managerial follow-up meetings at the regional level with respect to the 2015 National IMS-dengue/CHIK	X		X	GTN-dengue/CHIK GTI-dengue PAHO/WHO
4- Update the communication	Update formative ¹ research on behaviors and practices.	X	X		Social scientists, academics, research

¹ Formative research is key to the development of an evidence-based communication and mobilization strategy. It includes:

- search and analysis of the scientific bibliography
- analysis of entomological indices of key recipients, epidemiological, clinical, and laboratory data
- Identification of key social actors
- qualitative research on health beliefs and practices
- quantitative surveys on knowledge, attitudes, practices, and behavior (KAPB)
- surveys to determine media use and types of available communication channels

strategies in the 2015 National IMS-Dengue/CHIK designed to improve the behaviors of key audiences					groups, GTN-dengue/CHIK, and GTI-dengue
	Identify the behavioral objectives for the target audiences.	X	X		Social scientists, academics, research groups, GTN-dengue/CHIK, and GTI-dengue
	Identify socially and culturally acceptable communication strategies.		X		Media group of the GTN-dengue/CHIK and GTI-dengue
	Implement and systematize the communication strategies identified by the GTN-dengue/CHIK		X	X	GTN-dengue/CHIK and Operational Levels

4.4. Epidemiology Component

Epidemiological surveillance is a fundamental component of the integrated management of national strategies for the prevention and control of dengue and CHIK. It will enable the provision of timely, reliable, and quality information for the design of targeted interventions during and between epidemics.

This process should be part of the national health information system and will include the monitoring and evaluation of all the IMS-dengue/CHIK components through a set of standardized indicators. The generic integrated surveillance model for dengue is currently being used, and for the first time it includes the real-time reporting of key indicators of the different IMS-dengue components. The model is presented with a general or national surveillance system and a surveillance subsystem in sentinel areas, and will make it possible to fill many information gaps that still persist with respect to dengue. Countries such as Mexico and El Salvador are currently making major progress and will play a key role in supporting the rest of the region in its implementation.

Table 6. Epidemiology Component: Expected Outcomes—Indicators—Sources of Verification and Assumptions

Expected outcomes	Indicators	Sources of verification	Assumptions
Implementation of an integrated surveillance system for dengue and CHIK prevention and control.	1- 100% of the Mesoamerican countries implement an integrated surveillance system for dengue and CHIK prevention and control by the end of	<ul style="list-style-type: none"> National epidemiological bulletins Reports to PAHO/WHO Evaluation reports of GTI-dengue and GTN-dengue IMS-dengue progress 	Changes to the national regulatory structure

•prior testing of specific materials, messages, and behaviors.

	2019. 2- 100% of the countries issue periodic epidemiological bulletins that contain an integrated analysis of the situation of dengue and CHIK as of 2017.	reports from the countries.	
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Table 7. Epidemiology Component: Activities—Tasks—Implementation Schedule and Responsible Party

Activity	Task	Implementation schedule			Responsible party
		S	M	L	
1- Update the national surveillance standards for dengue and CHIK	Programmatic integration of dengue and CHIK surveillance. Use the generic model of an integrated epidemiological surveillance system proposed for dengue as the basis.	X	X		GTN-dengue/CHIK
	Review and adjust operational definitions, indicators, integrated information flows, and the information technology platform.		X		GTN-dengue/CHIK
	Review and adjust the risk stratification criteria with an integrated approach.		X		GTN-dengue/CHIK
	Review and adjust the organization and operation of the situation rooms, especially in emergencies.		X		GTN-dengue/CHIK
2- Adapt the national surveillance systems and platforms with an integrated approach	Workshop to standardize the methodologies of analysis and epidemiological surveillance indicators of dengue and CHIK in line with the regional generic integrated surveillance protocol.	X	X		GTN-dengue/CHIK
	Identify the technological requirements of the integrated system.		X		GTN-dengue/CHIK, Information technology department
	Establish the system's information outputs and command boards (dashboard).		X		

	Plan the prevention and control response based on the analysis of information generated by the integrated surveillance system.		X	X	
3- Hold Mesoamerican coordination and monitoring meetings on the implementation of integrated dengue and CHIK surveillance, taking advantage of the regional and subregional forums (COMISCA, SICA, Mesoamerican)	Submit the issue from the new surveillance system for political approval in regional and subregional forums.	X			Ministries of Health PAHO/WHO AMEXCID
	Devise Mesoamerican coordination and monitoring mechanisms.	X	X		

4.5. Laboratory Component

It is necessary to identify the viruses circulating in the different countries, which means that the laboratory plays a key role in the surveillance of dengue and CHIK. The subregion has prioritized the strengthening of national laboratories and quality management systems in order to ensure proper laboratory surveillance, standardizing diagnostic algorithms and the classification of cases.

The Dengue Laboratory Network of the Americas (RELDA) has emphasized the role of the PAHO/WHO Collaborating Centers in the implementation of the IMS-Dengue, working jointly with the National Reference Laboratories (NRL). There is a PAHO/WHO RELDA website that allows for constant interaction among the members of the Network, especially for the dissemination of information:

http://www.paho.org/hq/index.php?option=com_content&view=article&id=4497&Itemid=39306&lang=en

The co-circulation of various arboviruses, the vaccination against yellow fever, the possible introduction of a vaccine for dengue in the Region of the Americas, and the emergence of the CHIK virus create a highly complex scenario for the etiological diagnosis of the disease and for research activities, and this should be taken into account by the national teams. It may be necessary to strengthen partnerships and step up the search for partners who support the development of research and the allocation of resources to this component.

Table 8. Laboratory Component: Expected Outcomes—Indicators—Sources of Verification and Assumptions

Expected outcomes	Indicators	Sources of verification	Assumptions
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Establishment of dengue and CHIK laboratory surveillance in every country of Mesoamerica.	1- 100% of national laboratories or reference laboratories with productive capacity for serological, virological, and molecular diagnosis.	<ul style="list-style-type: none"> • Surveillance system • Results analysis and reports • Report on capacity of national laboratories (RELDA) • Reports on the quality review process 	Ensure a budget for laboratory
	2- 100% of national laboratories or reference laboratories participate in an External Quality Assurance Program (EQAP).	<ul style="list-style-type: none"> • Proficiency test results • Reports Budgetary • Inventory of reagents/supplies 	Compliance with PAHO/WHO algorithms Trained HR

Table 9. Laboratory Component: Activities—Tasks—Implementation Schedule and responsible party

Activity	Task	Implementation schedule			Responsible party
		S	M	L	
1- Establish epidemiological and laboratory criteria for biological sampling according to surveillance protocols	Create and update the sampling and laboratory diagnosis algorithm, based on the surveillance protocols.	X			Epidemiological Surveillance and Laboratory
	Disseminate and implement the diagnostic algorithm in the domestic networks of each country.	X			Epidemiological Surveillance and Laboratory
	Hold regional meeting with experts in order to review and adjust the diagnostic algorithm.	X			Epidemiological Surveillance and Laboratory PAHO/WHO (RELDA)
2- Strengthen the surveillance and response capacity of the region's laboratory network	Promote the implementation of reference techniques (serological, virological, and molecular) for the diagnosis of dengue and other arboviruses in the national laboratories	X	X	X	WHOCC NRL PAHO/WHO (RELDA)
	Hold workshop to arrange for the transfer of new technologies for the genomic characterization of the strains dengue and their patterns of circulation	X	X	X	WHOCC NRL PAHO/WHO (RELDA)
	Arrange for the distribution of critical supplies and reagents for the support	X	X	X	NRL WHOCC

	and continuity of laboratory surveillance (create an annual strategic fund of US \$50,000)				PAHO/WHO (RELDA)
	Achieve the systematic interaction of the laboratory with the epidemiological surveillance, clinical management, and vectors components in order to ensure the adequate flow of information.	X	X	X	Epidemiological Surveillance Laboratory
3- Guarantee the quality of processes associated with laboratory diagnosis	Promote the development and implementation of quality control policies in the national laboratories and domestic networks (proficiency tests)	X		X	NRL Ministries of Health
	Maintain a continuing education and training program for national laboratory network personnel, to include the latest scientific advances in the field.	X		X	NRL WHOCC
	Regularly review the quality processes and operations of the national laboratories and domestic networks.	X	X	X	NRL WHOCC PAHO/WHO
	Arrange for the participation of national laboratories in an External Quality Assurance Program (EQAP).	X	X	X	WHOCC NRL PAHO/WHO
4- Develop research as response to epidemiological surveillance.	Identify research lines or priorities.	X	X	X	Epidemiological Surveillance and Laboratory
	Present and disseminate research findings.	X	X	X	Epidemiological Surveillance and Laboratory
	Lead, forge partnerships, and identify funding sources for operations research development (Management).	X	X	X	Ministries of Health
5- Draft budget	Prepare annual budget	X	X	X	National Reference Laboratory
	Keep up-to-date inventory of supplies and reagents.	X	X	X	National Reference Laboratory

4.6. Patient Care Component

Prompt diagnosis, the identification of warning signs, and symptomatic treatment following a differential diagnosis and the identification of the epidemiological link are key in patient care. There is currently no specific treatment to prevent dengue and CHIK infections.

Both infections have a wide spectrum of clinical manifestations ranging from an asymptomatic patient to severe forms that can lead to death, especially if they are not properly handled, and—in cases of CHIK—that can lead with much greater frequency to subacute and chronic forms of the disease.

Standardized case definitions are crucial in order to respond early to the outbreaks. The training of staff members who see patients and the reorganization of health services into different levels are decisive factors in the management of both diseases. At the same time, it is necessary to identify communication strategies directed at the person, family, and community that enable them to identify the clinical signs in order to seek prompt care through health services.

To contribute to the reduction of the case-fatality rate of both diseases, it is necessary to:

- Strengthen the capacities of healthcare workers and ensure quality in both public and private health services
- Have contingency plans that include the reorganization of health services during outbreaks/epidemics
- Optimize the response capacity of primary and secondary services
- Conduct adequate monitoring of sick patients at all times and provide appropriate orientations to the patient and/or family member when the patient is going to remain in the home

Table 10. Patient Care Component: Expected Outcomes—Indicators—Sources of Verification and Assumptions

Expected outcomes	Indicators	Sources of verification	Assumptions
Better clinical diagnosis and case management of dengue and CHIK in the Mesoamerican countries	<p>1- 100% of the countries have implemented a training plan for the diagnosis and management of patients.</p> <p>2- 100% of the countries include the PAHO/WHO clinical management recommendations in their guides.</p> <p>3- 85% of the public and private health facilities of the countries have and apply contingency plans for the reorganization</p>	<ul style="list-style-type: none"> • Reports on training plans that have been devised. • Country guides implemented in each country. • Disseminated contingency plans. 	<p>Political backing of health authorities for the implementation of the Dengue/CHIK MMP.</p> <p>Availability of human, material, and financial resources at all levels of care.</p>

	of health services.		
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Table 11. Patient Care Component: Activities—Tasks—Implementation Schedule and responsible party

Activity	Task	Implementation schedule			Responsible party
		S	M	L	
1- Strengthen the capacities of healthcare workers to ensure quality of care in both public and private health services	Print, distribute, and implement national guides on dengue and CHIK that are in line with PAHO/WHO recommendations.	X			Ministries of Health
	Conduct training in triage, timely diagnosis, and clinical epidemiological criteria, mainly for personnel at the first and second levels of care.	X	X		Ministries of Health
	Perform quality of care audits with emphasis on patients in serious condition and dengue/CHIK fatalities.	X	X	X	Committee for the review of cases from local and national primary, secondary, and tertiary care units
	Implement, validate, and disseminate courses for the training and updating of HR in patient care.	X	X	X	HR training and education units.
	Develop training workshops for public and private personnel on health services organization, including outbreak response.	X			Ministries of Health and GTN-dengue/CHIK
	Advocacy to promote the inclusion of dengue/CHIK issues in the curriculum used by healthcare human resources training entities	X	X		Ministry of Health, Academia
2-Improve the response capacity of services at the first and second levels of care in order to reduce the saturation of specialized hospitals.	Provide training to health facilities managers in management and organization of health services	X	X	X	Ministries of Health and GTN-dengue/CHIK
	Review and adjust the hospital contingency plan annually	X	X	X	Ministries of Health and GTN-dengue/CHIK

	Strengthen the capacity to manage patients with dengue (warning signs) in primary care units.	X	X	X	Ministry of Health and GTN-dengue/CHIK
3- Reach a final classification of fatalities in suspected cases of dengue/CHIK and in fever patients without a specific diagnosis, in both the public and private sectors.	Establish a mortality audit committee at the local, regional, and national levels.	X			Ministry of Health
	Refer deceased patients suspected of dengue/CHIK coinfection and fever patients without a specific diagnosis to pathology.	X	X	X	Ministry of Health
4- Comprehensively systematize educational messages on dengue and CHIKV with health promotion aimed at users of health services during care.	Contribute technical information for the preparation of educational material to be provided to patients and their family members.	X	X	X	Ministry of Health
	Provide educational talks, videos, and other forms of communication and education in the health units.	X	X	X	Ministry of Health
5-Develop clinical research	Identify high priority research needs.	X	X	X	Ministry of Health
	Include academia in research development.	X	X	X	Ministry of Health
	Plan and carry out operations research that makes it possible to evaluate key aspects of medical care at different levels.	X	X	X	Ministry of Health, Academia, PAHO/WHO

4.7. Integrated Vector Management Component

The purpose of Integrated Vector Management (IVM) is to improve the effectiveness and achieve the sustainability of vector prevention and control actions, through rational decision-making that optimizes the use of resources. This should include the following processes:

- Selection of methods based on knowledge of vector biology, disease transmission, and morbidity.
- Synergistic and synchronized utilization of multiple interventions.
- Collaboration of the health sector with other public and private sectors involved in environmental management, whose work can have an impact on vector reduction.
- Integration of the families and other key partners (education, finances, etc.) into prevention and control activities, especially at the local level.
- Establishment of a legal framework conducive to an integrated and intersectoral approach.

With regard to the important role of the general public in the implementation and sustainability of vector control measures, it is observed that the public often fails to assume shared responsibility as a fundamental and active part of the process of controlling vector breeding sites. This is due to the structural history and paternalistic role of control programs. Furthermore, in those cases where there is an adequate legal framework supporting the control measures, it is often not observed. The vector is found mainly inside residences, which means that it is necessary to implement a strategy of shared responsibility for the control of mosquito breeding sites among individuals and their families, leaving it up to the programs to establish guidelines for specific activities such as entomological surveillance, chemical control, and resistance evaluation.

The results obtained through the implementation of the national IMS-dengue and the presence of the CHIK virus in the hemisphere reveal the urgent need for the effective implementation of the IVM as a way to lower the entomological transmission risk of dengue and CHIK in our region.

Table 12. Integrated Vector Management Component: Expected Outcomes—Indicators—Sources of Verification and Assumptions

Expected outcomes	Indicators	Sources of verification	Assumptions
Reduction of entomological transmission risk of dengue and CHIK in the countries of Mesoamerica.	1- 100% of countries implement a standardized entomological surveillance system in 2017.	<ul style="list-style-type: none"> • Reports from countries (survey indicators and entomological verification) 	There is sustained political and technical commitment to entomological monitoring and vector control.
	2- 100% of countries execute the training plan on communication and community organization techniques for professional staff and entomology technicians in 2016.	<ul style="list-style-type: none"> • Training plan and reports on execution and evaluation • Reports from countries (insecticide resistance and management plan) 	The necessary human (sufficient and trained), material, and financial resources are available for entomological surveillance and vector control.
	3- 100% of countries implement the plan for monitoring and managing the resistance of vectors to insecticides in 2017.		Individual and community participation is obtained for the physical elimination of breeding sites.

Table 13. Integrated Vector Management Component: Activities—Tasks—Implementation Schedule and Responsible Party

Activity	Task	Implementation schedule			Responsible party
		S	M	L	
1- Implement a standardized entomological surveillance system in the countries of Mesoamerica.	Meeting of experts to standardize the criteria for entomological surveillance (entomological indices, periodicity, and information system) across Mesoamerica.	X			National technical group IVM component GTI-dengue PAHO/WHO
	Prepare and implement an ongoing entomology training plan at the Mesoamerican level and within each country, for professional and technical staff (needs assessment, training content, training program, etc.)	X	X	X	GTN-dengue/CHIK IVM component GTI-dengue PAHO/WHO
	Create, review, or update national guidelines on Integrated Vector Management (IVM) according to PAHO/WHO recommendations.	X	X		GTN-dengue/CHIK IVM component GTI-dengue PAHO/WHO
	Conduct a comprehensive analysis and issue reports on standardized entomological surveillance.	X	X	X	GTN-dengue/CHIK IVM component GTI-dengue PAHO/WHO
2- Train vector control personnel in communication and organization techniques for individual and community participation in order to encourage the control of vector breeding sites.	Prepare and implement an ongoing entomology training plan on communication and community organization techniques for professional and technical staff (needs assessment, training content, training program) – facilitators' course.	X	X		GTN-dengue/CHIK IVM component and the GTI-dengue health promotion program PAHO/WHO
	Monitor and evaluate the impact achieved in local areas served by vector personnel trained in communication and organization techniques for individual and community participation.	X	X	X	GTN-dengue/CHIK IVM component Health promotion program
3- Participate in the design of communication and education programs	Conduct a situation assessment of the area where an intervention is planned (social context, availability of household water, refuse collection, typology of breeding sites).	X	X		GTN-dengue/CHIK Area of health involved
	Develop communication and education programs consistent with the situation assessment of	X	X		National health promotion with GTN-dengue/CHIK

	the area where an intervention is planned, aimed at behavioral changes and sustainable environmental improvements.				
4- Ensure efficient and effective vector control as well as the rational use of insecticides.	Promote the development of new vector control strategies under an IVM approach, allowing for the incorporation of new proven, validated, and approved tools.	X	X	X	GTN-dengue/CHIK GTI-dengue PAHO/WHO
	Set up a system to monitor the quality and effectiveness of insecticide applications (personnel, equipment, insecticides, resistance, standards).	X	X	X	PAHO/WHO GTN-dengue/CHIK
	Hold workshop on the training of human resources for insecticide management and application (calibration of equipment, rate of discharge, droplet size, preparation of field formulations, and insecticide application technique).	X	X	X	GTN-dengue/CHIK IVM component GTI-dengue PAHO/WHO
	Supervision and evaluation of the control operations and their impact	X	X	X	GTN-dengue/CHIK IVM component

4.8. Environmental Management Component

The transmission of dengue and CHIK is affected by the presence of several social and environmental factors that cannot be changed exclusively by health sector interventions. In this regard, both IMS-dengue and the WHO Global Strategy for 2012-2020 emphasize the intersectoral and inter-institutional approach for their proper implementation.

The cooperation of other actors outside the health sector is needed, including the ministries of agriculture, environment, water resources, municipal authorities, and private corporations. This is based on the conviction that investments in health are worthwhile and will result in greater opportunities for success and sustainability and, ultimately, that their projects will be financially profitable. These actors are participants in a community that is co-responsible for taking daily measures that implement healthy domestic and local habits to control breeding sites.

It is very important to create and implement the legal framework that facilitates the reduction of the most frequent breeding sites, which are created by private industry (plastic and containers), the improper disposal of tires, household barrels/storage tanks with inadequate water storage, and other household containers that serve as breeding sites.

The region has had a number of experiences with laws promoting breeding site elimination, particularly in Brazil, Costa Rica, El Salvador, Panama and Paraguay; however, issues such as climate change, inadequate solid waste collection, unreliable water supplies that force people to store water unsafely, and uncontrolled and unplanned urbanization require

political and financial support at the highest level and the collaboration of all actors, including international cooperation.

Another important point is the limited behavioral change of individuals and families to achieve physical control of the breeding sites in the residences for which they are responsible. A multidisciplinary team is needed in order to investigate the causes in view of the culture and special features of each area within each country.

Table 14. Environmental Management Component: Expected Outcomes—Indicators—Sources of Verification and Assumptions

Expected outcomes	Indicators	Sources of verification	Assumptions
Execution of specific cross-sectoral environmental management actions to reduce the entomological dengue and CHIK risk.	1- 100% of countries with a working group officially formed in 2017. 2- 100% of countries execute cross-sectoral plans in 2017.	<ul style="list-style-type: none"> • Reports from countries (participating entities, management agreements and compliance) • Plans drafted • Monitoring and supervision visits 	<p>There is ongoing political commitment at the highest level.</p> <p>Entities working on issues of environmental management and transmission risks are participating actively in the working groups.</p> <p>There is a legal framework on environment and health, as well as management agreements with the involved institutions, and they are being observed.</p>

Table 15. Environmental Management Component: Activities—Tasks—Implementation Schedule and Responsible Party

Activity	Task	Implementation schedule			Responsible party
		S	M	L	
1- Form the cross-sectoral group based on the mapping of public and private sector actors involved in environmental management at the national and	Identify social actors and establish responsibilities in accordance with the sphere of activity, for its execution.	X	X		Ministry of Health GTN-dengue/CHIK and Departmental (Municipal) GT-dengue/CHIK
	Plan and carry out cross-sectoral activities of environmental management in order to reduce entomological risk.	X	X	X	GTN-dengue/CHIK and Departmental (Municipal) GT-dengue/CHIK

subnational levels.	Monitor and evaluate actions.	X	X	X	GTN-dengue/CHIK and Departmental (Municipal) GT-dengue/CHIK
	Hold regional intersectoral meeting with entities responsible for water, waste, and housing.	X			Those responsible for the environmental component of the GTN-dengue/CHIK and GTI-dengue
2-Application of environmental management laws and regulations that encourage the reduction of entomological risk for purposes of dengue and CHIK prevention.	Implement a program with three basic components: <ul style="list-style-type: none"> • Safe water management (free from breeding sites) • Final waste disposal (tires, plastics, and refuse) • Safe housing (with protection measures to keep residents from coming into contact with the vector) 	X	X	X	GTI-dengue/CHIK GTN-dengue/CHIK and Departmental (Municipal) GT-dengue/CHIK

4.9. Vaccine Component

This component has been added to the Dengue/CHIK MMP based on the recommendations made at the State of the Art Meeting on the implementation of IMS-dengue. It was noted at that meeting that a dengue vaccine is expected to become available in the medium term, and it was suggested that the regional and national strategies bear in mind that the vaccine's introduction should occur within the framework of IMS-dengue (2015), and that it should be a future component of that strategy. The vaccine will be an additional component that will contribute to the achievement of the Dengue/CHIK MMP objectives.

WHO criteria should be considered for the introduction of the vaccine, and it is crucial to have solid scientific and technical evidence of its efficacy. It is expected that every vaccine available on the market will be effective, efficacious, and safe for the four serotypes of dengue, as well as accessible and affordable.

Each country should determine its own strategy for the introduction of the vaccine. However, it is recommended that they have the necessary epidemiological information and relevant scientific evidence, including but not limited to:

- Disease burden
- Review of the national legal framework
- Adjustments to immunization programs
- Improvements in the epidemiological information system
- Operations research
- Health economics study

It was agreed not to develop this component in terms of tasks, so that once some of the vaccines are available a workshop can be held with immunization experts and personnel

from the countries of the different GTI-dengue areas, and so that an integrated strategy can be followed.

4.10. Facilitating factors

During the most recent years of implementation of IMS-dengue in the countries of the region, and as a result of the monitoring and evaluation process, it was noted repeatedly that different factors facilitated the level and degree of progress in every country or territory. These factors they were not directly targeted as key elements of the IMS-dengue process; however, they were included permanently in different parts of the document. The operational model of the WHO Global Strategy for dengue prevention and control for 2012-2020 subsequently identified these factors as key elements in the implementation process. Finally, during the adjustment and review process of IMS-dengue for the Region of the Americas, these elements were included as facilitating factors that strongly determine the degree of progress that can be achieved in each country or territory.

The facilitating factors of the current Dengue/CHIK MMP include:

4.10.1. Advocacy

Advocacy is an action that has been critical since the initial preparation of the Integrated Management Strategies for dengue and CHIK prevention and control. It is an act of communication, dissemination, persuasion, and convincing that should take place at all levels to convey the importance and potential success of the current strategy. Advocacy should start with national technical resources, which must be shown the importance and benefits to the country of implementing the new desired methodological approach to work.

The advocacy process should involve the decision-making and managerial levels of the health sector where Dengue/CHIK MMP will be implemented, and continue with increasing strength and conviction until it reaches beyond the sector. Within this advocacy process, in the extra-sectoral context, efforts must be directed toward governmental, nongovernmental, national, and local actors, and even toward the private sector. The general public must also be included as a key participant in the process in order to ensure the sustainability of community-based interventions.

The advocacy process is not an attribute of one single component of the Dengue/CHIK MMP. Advocacy is a communication action that should be inherent in all the components and at the highest managerial level.

In order for the advocacy of the MMP's implementation to have sufficient impact, it should be able to convince others, so that they in turn continue to advocate for the MMP to be promoted and implemented with all the capacity and strength needed to have an impact on the disease. This is an item that should be constantly on our agenda, in order to consolidate and lend sustainability to the entire process of implementing the Strategy.

4.10.2. Partnerships

The approach to the problem of dengue is of such magnitude and technical complexity that it cannot be incumbent solely upon the health sector to respond. And even with the best, most perfectly developed technical strategies, it would be impossible to have an impact on

many of the indicators of this disease. Morbidity is one such indicator, due to the tremendous adaptability of the vector transmitter—the *Ae. aegypti* mosquito—to domestic life and the significant diversity of safe breeding sites it has managed to find within and around residential housing. Because control of the disease currently depends fundamentally on vector control, solid strategic partnerships are needed in order to increase and improve interventions on the mosquito breeding sites that are now purely domestic. Schools, workplaces, ministries, churches, and the general public should join forces in combating the vector in order to achieve a greater impact on its physical and/or chemical control, which now entails more specialized measures that include the use of pesticides—a very complex measure that must be handled in a controlled fashion by the health sector. The problem requires a comprehensive response, not just one that is sector-based, and all types of partnerships to prevent and control vector transmission are key.

4.10.3. Resource mobilization

One of the major historical problems with vector control strategies has been the resource gap. Only some programs currently have the necessary resources for surveillance and vector control activities, but in no case are they sufficient to address the complexity of the transmission factors. Within the framework of the current Dengue/CHIK MMP, resource needs must be substantially met in order to improve technical activities in the short- and medium-term. A remark frequently heard among groups of vector control experts is that dengue outbreaks are controlled with surplus resources and not with resources that are lacking. We should modify this remark and say that the adequate planning of resources of all types (human, material, and financial) is needed in order to provide the appropriate surveillance and control response to the disease, with full knowledge that the significant complexity of addressing transmission factors must be met with public policies and sustainable development strategies that come with major investments in the social and environmental sphere, if we are to rid ourselves permanently of these diseases.

4.10.4. Capacity-building

The permanent strengthening and development of national capacities is one of the missions of our organization, but it is also a permanent mission of the health systems in our countries. The operational model of IMS-dengue/CHIK requires us to be very proactive in the training of human resources within each component in each country. Not only do we require personnel to have a technical background in their area of expertise but we also need for them to be skilled in ways of interacting and integrating scientific thought with the other components in order to improve the response to the disease and achieve a greater impact.

There are components such as the IVM component where there are very few new tools for the work and there is a need for ongoing research to find new tools and/or technologies or methodologies that are able to improve the current levels of control. The search for partnerships with other sectors of academia and prominent scientific institutions or centers should be ongoing. With good planning efforts, it should go beyond the daily work needed for control, and allow us to plan and carry out new research that can ultimately provide us with greater capacity in the prevention and control response.

5. MONITORING AND EVALUATION

During the initial Latin American efforts to implement an IMS-dengue, the monitoring and evaluation process was carefully planned. In the last 5 years of implementation, 22 countries were externally evaluated and the logical frameworks of the national IMS-dengue included the different process indicators or impact that would be monitored by the national teams and the GTI-dengue.

In the current national IMS-dengue/CHIK interventions, it bears noting that managing indicators of impact on control is quite difficult and that they will be imprecise due to the known transmission dynamic of both diseases and the diversity of environmental and social transmission factors. Accordingly, a great deal of importance will be placed on the process indicators and on monitoring the quality of the technical work, which is something that can and should be improved.

It is crucial for the countries to have good national indicators and internal evaluation and monitoring processes at the subnational levels, regardless of the degree to which the work performed within the components is integrated. The level of responsibility should be very clear, so as to take the necessary measures to continually promote the implementation process. The GTI-dengue will continue to conduct comprehensive external evaluations in each Mesoamerican country.

6. BUDGET

The following budget includes the funding gap broken down by component for the Dengue/CHIK MMP project, which will be implemented over three years.

To develop this budget, those tasks that require funding have been extracted, while the rest will be financed with funds from the 10 Mesoamerican countries, demonstrating their commitment to reducing the social and economic burden of dengue and CHIK in Mesoamerica.

A funding gap of US\$2,282,600 is estimated for the execution of all the activities of the MMP during these three years. The details of the budget are listed in the table below.

Table 16. Regional Budget for the Dengue/CHIK MMP by Component, Tasks, and Implementation Schedule.

Component	Tasks	Description	Implementation schedule			Cost
			Year 1	Year 2	Year 3	
Management Component	Prepare and execute the monitoring and evaluation plan for the implementation of the MMP, at the regional level and within each country.	Technical assistance to each country with the participation of 5 experts	X	X		\$125,000
	Develop and implement national workshops to bring the 2015 National IMS-dengue/CHIK into line with the Dengue/CHIK MMP.	Training in each Mesoamerican country	X			\$150,000
	Hold regional managerial follow-up meetings on the 2015 National IMS-dengue/CHIK.	Two meetings with representatives of the Mesoamerican countries	X		X	\$80,000
	TOTAL Management Component					\$355,000
Epidemiology Component	Standardize the methodologies of analysis and dengue and CHIK epidemiological surveillance indicators in accordance with the regional generic integrated surveillance protocol.	Regional technical assistance with the participation of representatives of the Mesoamerican countries	X	X		\$240,000
	TOTAL Epidemiology Component					\$240,000

Laboratory Component	Review and adjust the diagnostic algorithm.	Technical meeting with 8 experts to adjust algorithms	X			\$40,000
	Technical cooperation to ensure the transfer of new technologies for the genomic characterization of the strains dengue and their patterns of circulation.	A regional workshop with the participation of representatives of the Mesoamerican countries	X	X	X	\$120,000
	Arrange for the distribution of supplies and critical reagents for the support and continuity of laboratory surveillance.	Creation of a strategic fund. Annual expenditures of \$50,000 for three years.	X	X	X	\$150,000
	Promote the development and implementation of quality control policies in the national laboratories and domestic networks.	Administration of proficiency tests	X		X	\$40,000
	Maintain a training and continuing education program for national laboratory network personnel and include the latest scientific advances in the field.	National trainings in all the Mesoamerican countries	X	X	X	\$200,000
	Regularly review the quality and operational processes of the national laboratories and domestic networks.	Technical missions to each country	X	X	X	\$75,000
	TOTAL Laboratory Component					
Patient Care Component	Implement national dengue and CHIK guidelines consistent with PAHO/WHO recommendations	Printing, translation, and distribution of guides	X			\$50,000
	Perform quality of care audits with emphasis on patients in serious condition and dengue/CHIK fatalities.	External evaluation missions to each country	X	X	X	\$50,000
	Implement, validate, and disseminate courses for the training and updating of HR in patient care.	Annual regional workshops with all the Mesoamerican countries	X	X	X	\$240,000
	Plan and conduct operations research that makes it possible to evaluate key aspects of medical care at different levels.	Multicentric regional research	X	X	X	\$80,000
	TOTAL Patient Care Component					
Integrated Vector Management	Standardize the entomological surveillance criteria (entomological indices, periodicity, and information system) across Mesoamerica.	Meeting with experts in entomology.	X			\$40,000

Component	Prepare and implement an ongoing entomology training plan for professional and technical staff, at the Mesoamerican level and within each country.	Regional technical assistance in entomology.	X	X	X	\$130,000
	Prepare and implement an ongoing training plan for professional and technical staff on communication and community organization techniques.	Annual regional facilitators' course.	X			\$40,000
	Hold human resources training workshop on insecticide management and application.	One regional workshop per year.	X	X	X	\$120,000
TOTAL Component Integrated Vector management						\$330,000
Environmental Management Component	Hold intersectoral regional meeting with entities responsible for water, waste, and housing.	Regional Meeting with experts and entities responsible for water, waste and housing in the Mesoamerican countries.	X			\$50,000
	TOTAL Integrated Vector Management Component					
SUBTOTAL						\$2,020,000
13% PSC						\$262,600
TOTAL						\$2,282,600

7. ANNEX. Consolidated SWOT diagrams developed with the country teams

As part of the preparation of the Dengue/CHIK MMP, meetings were coordinated with the offices of the Mesoamerican countries (Mexico, Guatemala, Belize, El Salvador, Honduras, Nicaragua, Costa Rica, Panama, Colombia and the Dominican Republic) with the national teams responsible for dengue and CHIK in order to develop a SWOT analysis to serve as input for the preparation of the Plan. The comprehensive findings of these analyses are as follows:

Strengths

- National IMS-dengue plans in all countries
- National regulations on clinical management, organization of services, and monitoring of dengue and CHIK patient care
- Political and budgetary backing of IMS-dengue in most of the countries
- At least one staff member trained in each IMS-dengue component (laboratory, patient care, surveillance, vector control, risk communication), IHR
- National epidemiological surveillance systems with significant advances in recent years, real-time systems (Mexico and El Salvador) that serve as reference point for the other countries
- Weekly data analysis of the status of dengue throughout the country
- New health models (organization and functions) that make it possible to improve National IMS-dengue agencies
- Consolidated national laboratory network, with quality control supported by RELDA and monitoring of viral circulation in most of the countries
- Availability of human and financial resources in some countries of the subregion to support the development of operations research (Colombia and Mexico)
- Mexico has begun work to evaluate insecticide resistance that could involve the rest of the countries of Mesoamerica

Opportunities

- Growing support of high-ranking government authorities
- Existence of intersectoral committees in all countries
- Development of policies that facilitate the implementation of multisectoral coordination
- Other potential funding sources that make it possible to support the less developed components of the IMS-dengue, such as IVM
- Strengthen intersectoral interventions to address dengue and CHIK in view of growing support from private business and the media
- Local governments with participatory health budgets
- Existing legal framework that supports the actions
- Legislative proposals to modify public housing construction standards in areas where vector-borne diseases are endemic
- Availability and development of technological infrastructure in the countries, such as GIS

- Regional projects to standardize operational definitions and indicators of structure, process and outcome (Generic Integrated Protocol for Dengue Surveillance in the Americas)
- Availability in some countries of institutions with experience in education, operational resource training, and research
- Development and strengthening of PHC
- Experience working under an approach of epidemiological/entomological risk stratification in some countries
- Technical PAHO/WHO assistance with support from WHO Collaborating Center and GTI-dengue
- Possibility of obtaining resources for the intensification of national and international CHIK and dengue training programs

Weaknesses

- Limited financial resources, available primarily during outbreaks/epidemics
- Limited trained human resources, especially those trained in IVM (entomologists) and in mass communication
- Excessive workload of managers
- High staff turnover at all levels
- No budget for CHIK
- Outdated national standards on some components, such as IVM
- Monitoring of compliance with standards and evaluation of actions is not systematic
- Duplication of efforts by health ministries and other institutions of the sector
- Lack of IMS-dengue implementation plan at the local level
- Disjointedness of the technical components of IMS-dengue
- Limited operations research
- Administrative processes that keep financial resources from reaching the places to which they are allocated and at the time they are most needed
- Media campaigns are not systematic and there is minimal participation on the part of the Director of Health Promotion
- The educational programs for professional healthcare personnel are not adapted to the epidemiological needs of the country
- Physicians and paramedical staff do not have clinical management experience with CHIK patients
- Lessons learned during outbreaks are not taken into account for future contingent situations
- Insufficient leadership of the health sector to channel the different institutional and societal efforts

Threats

- Limited participation of the general public
- Non-renewal of operational personnel upon leaving
- Inadequate approach to the social determinants (water, sanitation, uncontrolled urbanization, etc.)
- Government budget policies that limit the creation of staff vacancies due to cuts in funding (national and cooperation funds)
- Periodic change of authorities due to state and municipal elections
- Disjointedness of national intersectoral committees after change of political authorities
- Population migration abroad and to the interior of the countries, from endemic to non-endemic areas
- Disjointedness of the program components
- Exaggerated expectations with the potential introduction of a vaccine
- Insecticide manufacturers and distributors hinder the process for rational insecticide management by contesting resistance study findings
- Public demand for the use of insecticides without participating in the elimination of risks in residential housing
- Irrational management of insecticides for agricultural and urban use continues to foster vector resistance since few options are currently available
- Unsafe conditions in neighborhoods and communities that hinders work in those areas
- Hospital capacity exceeded during major outbreaks (CHIK)
- Availability on the market of rapid tests not recommended by health authorities
- Climate change

8. ACRONYMS

Abbreviation	Meaning
Ae.	<i>Aedes</i>
AMEXCID	Mexican Agency for International Development Cooperation
CDC	Centers for Disease Control and Prevention
CHA/VT	Neglected, Tropical, and Vector Borne Diseases Unit
CHIK	Chikungunya
CHIKV	Chikungunya virus
CM-SMSP	Council of Ministers of the Mesoamerican Public Health System
Dengue/CHIK MMP	Mesoamerican Master Plan for the Integrated Management of Dengue and Chikungunya Prevention and Control
EQAP	external quality assurance program
EW	epidemiological week
GIS	geographic information systems
GTI-dengue	International Technical Group of Experts on Dengue
GTN-dengue/CHIK	National Technical Group of Experts on Dengue and Chikungunya
IHR	International Health Regulations
IMS-dengue	Integrated Management Strategy for Dengue Prevention and Control in the Americas

IMS-dengue (2015)	New Integrated Management Strategy for Dengue Prevention and Control in the Americas, 2015
IVM	integrated vector management
KAPB	Knowledge, Attitudes, Practices, and Behaviors
L	long-term / used in Activity —Tasks—Implementation Schedule and Responsible Party Tables
M	medium-term / used in Activity —Tasks—Implementation Schedule and Responsible Party Tables
MMP	Mesoamerican Master Plan
National IMS Dengue/CHIK 2015	2015 National Integrated Management Strategy for Dengue and CHIK Prevention and Control (Strategy based on Dengue/CHIK MMP)
NFP	National Focal Points
NGO	nongovernmental organization
NRL	national reference laboratories
PAHO	Pan American Health Organization
PHC	primary health care
RELDA	Dengue Laboratory Network of the Americas
S	short-term / used in Activity —Tasks—Implementation Schedule and Responsible Party Tables
SMSP	Mesoamerican Public Health System
SWOT	Strengths, Opportunities, Weaknesses, and Threats
VBD	vector-borne diseases or vector-borne diseases
WHO	World Health Organization
WHOCC	WHO Collaborating Centers

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