

Integrated Sustainable Framework for the Elimination of Communicable Diseases in the Americas



PAHO



Pan American
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An integrated, Sustainable Framework to Elimination
of Communicable Diseases in the Americas.
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I. Acronyms

CAICET	Servicio Autónomo Centro Amazónico de Investigación y Control de Enfermedades Tropicales "Simón Bolívar" (Venezuela [Bolivarian Republic of])
CD	Communicable disease
CDE	Communicable Diseases and Environmental Determinants of Health (PAHO)
DALYs	Disability-adjusted life-years
EMTCT	Elimination of mother-to-child transmission
EMTCT+	Elimination of mother-to-child transmission Plus
EOT	Elimination of transmission
EPHP	Elimination as a public health problem
FPL	Family, Health Promotion and Life Course (PAHO)
HA	Health Analysis Unit, Evidence and Intelligence for Action in Health Department (PAHO)
HBV	Hepatitis B virus
HCV	Hepatitis C virus
HIV	Human immunodeficiency virus
HPV	Human Papilloma virus
HSS	Health Systems and Services (PAHO)
IDB	Inter-American Development Bank
IMS-dengue	Integrated Management Strategy for Dengue (PAHO)
ITFDE	International Task Force for Disease Eradication, of the Carter Center
IVM	Integrated vector management
LF	Lymphatic filariasis (parasite <i>Wuchereria bancrofti</i>)
MDA	Mass drug administration
MMDP	Morbidity management and disability prevention
MOH	Ministry of health
MTCT	Mother-to-child transmission
NGO	Non-governmental organization
NMH	Noncommunicable Diseases and Mental Health (PAHO)
NIDs	Neglected infectious diseases
NTDs	Neglected tropical diseases
PAHO	Pan American Health Organization
PANAFTOSA	Pan American Foot-and-Mouth Disease Center (PAHO)
PCT	Preventive chemotherapy
PHC	Primary health care
PHE	Public Health Emergencies (PAHO)
SDGs	Sustainable Development Goals
STH	Soil-transmitted helminthiasis
TB	Tuberculosis
USAID	United States Agency for International Development
WASH	Water, sanitation, and hygiene
WG	Working group
WHO	World Health Organization
YF	Yellow fever

II. Background

BRIEF HISTORY OF COMMUNICABLE DISEASE ELIMINATION IN THE AMERICAS


In the 1870s, a yellow fever epidemic struck Argentina, Brazil, Paraguay, and Uruguay, and within eight years, had spread to the United States, where it killed more than 20,000 people. Maritime transport, which was expanding rapidly along with international trade, was the main channel for the international spread of disease at the end of the 19th century. The need to control the spread of epidemics from one country to another to protect people's health and countries' economies led to the creation in December 1902 of what is today known as the [Pan American Health Organization](#) (PAHO). During its more than 110-year history, PAHO has played a key role in important hemispheric and world disease elimination achievements, including leading the eradication of smallpox and polio from the Americas, and supporting countries in the elimination of endemic transmission of measles and rubella, as well as congenital rubella syndrome. Today, the world stands on the edge of a historic public health success with the imminent eradication of dracunculiasis (guinea-worm disease) and polio. Additionally, the countries of the Americas, together with their global partners and with technical support from PAHO, are approaching the regional elimination of malaria and several neglected infectious diseases including leprosy, lymphatic filariasis, and onchocerciasis (river blindness), and have achieved substantial reductions in the adverse impact of Chagas disease, soil-transmitted helminthiasis, schistosomiasis, and fascioliasis in children and other populations at risk. Regarding mother-to-child transmission (MTCT) of viral and bacterial diseases, one of the best examples comes from Cuba: in 2015 Cuba was validated by PAHO/World Health Organization (WHO) as the first country to have eliminated MTCT of HIV and syphilis (Caffe et al. 2016). Eliminating MTCT of HIV, syphilis, hepatitis B, and Chagas disease in the Americas is now within reach. These success stories highlight the huge comparative advantage this Region has in disease elimination. Regional successes in disease control and elimi-

nation will also directly support the United Nations Sustainable Development Goals (SDGs), as we discuss next.

UNITED NATIONS SUSTAINABLE DEVELOPMENT GOALS AND HEALTH

As the countries of the world transition from the United Nations Millennium Development Goals (MDGs, 2000-2015) to the current 17 [Sustainable Development Goals](#) (SDGs, 2016-2030), United Nations Member States are adopting new language to match the paradigm shift: as there is now a recognized need to ensure sustainability of their efforts to reach the new goals, many of which are health-related. However, even throughout this transition, old threats persist and new ones are impacting the Region, such as the introduction, spread, and endemization of Chikungunya and Zika viruses, the rise of the burden of important noncommunicable diseases and conditions (diabetes, cancers, and obesity), and extensive environmental degradation and climate change, which create space for the emergence or re-emergence of zoonotic diseases that could become epidemic or pandemic threats (Ostfeld 2017).

SDG 3 (Ensure healthy lives and promote well-being for all at all ages) directly targets specific maternal and child health improvements and communicable diseases control and elimination. SDG 3.1 is set to reduce the global maternal mortality ratio to less than 70 per 100,000 live births by 2030. SDG 3.2 focuses on reducing neonatal mortality and ending deaths of newborns and children under 5 years of age by proper preventive public health action. SDG 3.3 focuses on ending the epidemics of AIDS, tuberculosis, malaria, and neglected tropical diseases, and combating hepatitis, waterborne diseases, and other communicable diseases, which include vector-borne diseases, by the year 2030.



Introduction: Integrated,
Sustainable Communicable
Disease Elimination
Framework and Linkages

1. Introduction: Integrated, Sustainable Communicable Disease Elimination Framework and Linkages

VALUE OF LINKAGE TO THE SDGS

With the adoption of the SDGs by the Member States of the United Nations, WHO and its Regional Offices have a mandate to develop ways and means to accomplish SDG 3, including SDG 3.3, by 2030. PAHO, as the WHO Regional Office for the Americas, will prioritize not only ending these epidemics but eliminating these diseases. Moreover, the World Health Assembly has committed to achieving universal health coverage in a framework of health services delivery, which includes improved access to medicines, health care workforce development, strengthening laboratory systems, integrated and equitable service provision (including primary health care strengthening), and financing. The framework for communicable disease (CD) elimination described in this concept note aligns closely with SDG 3.3 (and other health-related SDGs), and envisions making progress towards the SDGs using a life course approach, which allows the integration and sustainability of health services delivery through a broad range of actions.

Interventions to eliminate not only the transmission but the negative health effects of CDs will need to be sustained through 2030 and beyond, into the post-elimination period for each disease eliminated. In order to ensure sustainability, the framework for disease elimination will need to be in alignment with PAHO's [Strategy for Universal Access to Health and Universal Health Coverage](#) (2014), and WHO's [Framework for Action on Strengthening Health Systems to Improve Health Outcomes](#) (2007), look for opportunities to pursue integrated CD elimination through a [Health in All Policies](#) advocacy position, and utilize these for financing and other resource mobilization. Also, Member States have committed to the United Nations SDGs, in which they have agreed to try to achieve universal health coverage by 2030. The framework for regional disease elimination by 2030 developed here outlines an objective and a bold agenda for 2030, promoting both universal access to

health and health systems strengthening. As such, the framework can benefit from the Health in All Policies approach.

Exploring the relation between our integrated CD elimination framework and the wider SDGs, we first look in more detail at SDG 3. WHO and academic partners recently described how the cross-cutting efforts to end neglected tropical disease (NTD) transmission will contribute directly to the attainment of SDG 3.3 and, directly or indirectly, of nearly all other SDGs (Bangert et al. 2017). Similar points have been made regarding the contribution of the elimination of [malaria](#) and HIV, and combating [viral hepatitis](#) (targeted for regional elimination in the Americas). SDG 3.7 is set to ensure “by 2030, universal access to sexual and reproductive health-care services, including for family planning, information and education, and the integration of reproductive health into national strategies and programs,” to which the elimination of MTCT of HIV, hepatitis B virus (HBV), syphilis and Chagas disease will contribute. SDG 3.8 sets out to “achieve universal health coverage, including financial risk protection, access to quality essential health-care services and access to safe, effective, quality and affordable essential medicines and vaccines for all.” Articulation of primary care services and of higher levels of health services that deliver medicines, vaccines, and treatments needed for the elimination of several CDs such as malaria, leprosy, MTCT of HIV, HBV, and Chagas disease, will contribute to the latter part of SDG 3.8.

SDG 3 is linked to SDG 5, which seeks to achieve gender equality and empower all women and girls. SDG 5 aims to provide women and girls with equal access to education, health care, decent work, and representation in political and economic decision-making processes. Equal access to primary health care needed for elimination of CDs can be effectively addressed through enhanced health care services to women and girls (such as for HIV, HPV, HBV, hepatitis C virus (HCV), syphilis, Chagas disease, and toxoplasmosis) and will contribute to SDG 5. Disabilities, stigma,



Malaria testing in Dominican Republic

1. Adapted from personal communication from Dr. Mirta Roses Periago, former Director of PAHO, 5 September 2017.

2. Adequate access to clean water supply is needed to repair walls, floors, cracks, and crevices of houses where some Chagas vectors shelter and hide.

and discrimination linked to HIV/AIDS, leprosy, and other NTDs disproportionately affect women and girls directly and as caregivers for others affected in their families and communities. Meanwhile, anemia and malnutrition resulting from some NTDs impair the developmental and cognitive capacity for better educational achievement and represent another added burden on women and girls.¹

Access to adequate supplies of safe and potable water and basic sanitation in at-risk communities is needed to reduce or help stop transmission of schistosomiasis, soil-transmitted helminthiasis (STH), trachoma, cholera, and even Chagas disease², and bring an end to open defecation. Two of the eight targets for SDG 6 on clean water and sanitation (Ensure availability and sustainable management of water and sanitation for all) will be supported by successful elimination of these five diseases in the Americas: “By 2030, achieve universal and equitable access to safe and affordable drinking water for all” and “By 2030, achieve access to adequate and equitable sanitation and hygiene for all and end open defecation, paying special attention to the needs of women and girls and those in vulnerable situations.” Those leading the CD elimination effort should examine how it and the projects it will generate can be used to report back to WHO and the United Nations on its impact towards achieving the SDGs.

VALUE OF LINKAGES WITH GLOBAL AND REGIONAL STRATEGIES

In the work ahead to eliminate the burden of multiple CDs, we need to remain very cognizant of how it will link and be framed not only by the SDGs but also by ongoing United Nations, WHO, and PAHO global and regional strategies for improving health and well-being. These strategies, as well as the SDGs and their indicators, may be particularly useful to offer insights to intersectoral and community-based interventions, in the context of poverty reduction, disease control, and universal access to health care.

The strategies and plans of action of PAHO and WHO are the result of significant public health work and serve not only as a basis for integrated disease elimination, but help shape its vision, goal, and targets. Thus, the integrated disease elimination framework described in this concept note encompasses United Nations and WHO global strategies and articulates across PAHO’s regional resolutions, strategies, and their accompanying plans of action and targets. Among the most important are those listed in Annex 1. In 2017, the WHO Director-General established five WHO Flagship Initiatives to contribute significantly to the attainment of the SDGs by 2030, one of which is a “Fast-track to Elimination.” In August 2017, the draft first report of the WHO Working Group on Initiatives for Change presented an outline for the Fast-track to Elimination initiative, which is expected to include reporting and validation, communications and partnership, strategic information, fundraising, management and human resources, and norms; all WHO Regions have been invited to participate in the initiative. The integrated framework to disease elimination described in this concept note, with proposed progressive target dates up to 2030, is well aligned with the draft outline of the fast-track initiative.

In the work ahead to eliminate the burden of multiple CDs, we need to remain very cognizant of how it will link and be framed not only by the SDGs but also by ongoing United Nations, WHO, and PAHO global and regional strategies for improving health and well-being.



Conceptual Framework
and Objective

2. Conceptual Framework and Objective

CONCEPTUAL FRAMEWORK

The conceptual framework for integrated CD elimination aims to reduce the burden and tackle the elimination of a set of CDs prevalent in the Americas. This framework is both strategic and standardized and can be adopted, adapted, and implemented by PAHO Member States, Associate Members, and Participating States with territories in the Region. Indeed, for Region-wide CD elimination to occur, elimination will have to be achieved in all 52 Member States and territories in the Americas. The framework will require focused, long-term political and financial commitment, as historically observed (globally) in country commitment to polio and measles eradication in the Americas.

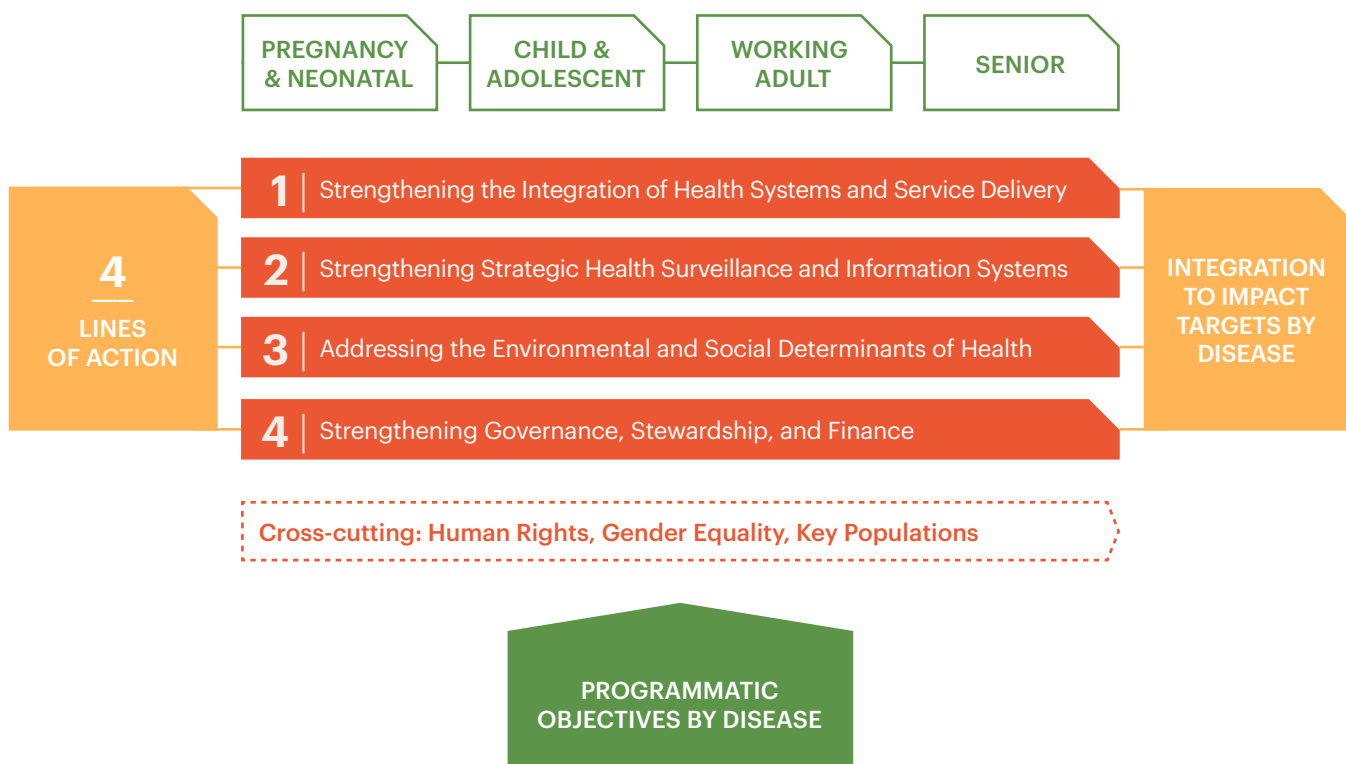
Additionally, public-health approaches promoted by WHO based on the principles of simplification, standardization, decen-

tralization, equity, patient and community participation, and optimal use of available human resources will facilitate achievements of elimination.

The conceptual framework for integrated CD elimination aims to reduce the burden and tackle the elimination of a set of CDs prevalent in the Americas.

In many cases, the prevention of transmission requires sequential interventions targeted to specific life course phases (e.g., during pregnancy, mothers and their infants, preschoolers, school-age children, adolescents, adult workers in agriculture, commerce and industry, and the elderly). Complementary interventions undertaken by direct action or through collaboration can be targeted to other key populations at risk: indigenous and Afro-descendant

FIGURE 1. CONCEPTUAL FRAMEWORK: LINES OF ACTION FOR INTEGRATED COMMUNICABLE DISEASE ELIMINATION IN THE AMERICAS THROUGH THE LIFE COURSE



communities, the disabled, the unemployed, those living in dwellings of poverty or the homeless, and the incarcerated. The conceptual framework builds on these interventions and focuses on these relevant populations, and it is composed of five lines of action coherent with the principles of human rights, gender equality, equity and civil society and community engagement for poverty reduction (Figure 1).

OBJECTIVE

The objective of this concept note and the framework it outlines is the elimination of a group of CDs and related conditions and the negative health effects they generate (diseases listed in Table 1 below), which together create a tangible burden on affected individuals, their families and communities, and on health care systems throughout the Region.

One can deduce that there is an intangible social cost of misery, hopelessness, and despair among individuals, families, and entire communities, which is not measured in disease burden studies.

3. DALYs: Disability-adjusted life years, a summary measure of population health based on estimates of premature mortality and non-fatal health loss. DALYs estimate the number of years of life lost due to premature death, as well as years of healthy life lost due to disability from disease/ill-health and injury.

Though there is no unified consensus on the best measures to use for the public's health and a nation's epidemiologic situation, it is common for the disease burden to be measured by disease rates (incidence, prevalence, etc.), disease-specific death rates, comparative morbidity and mortality rates, geographic distribution, and disability-adjusted life years (DALYs).³ The current epidemiological situation, including data on disease rates or geographic distribution for the diseases in Table 1, is discussed below in Section 4. Hotez et al. (2008) were the first to review and compare the burden of DALYs in Latin America and the Caribbean—for NTDs, HIV/AIDS, malaria, and TB—as it existed about 10 years ago. Though the regional burden of TB, malaria, and neglected infectious diseases (NIDs) is somewhat less than it was 10 years ago, work (and schooling) continue to be lost to illness and premature death or disability, and the need for stepping up disease elimination efforts is evident in all communities living in vulnerable conditions.

One can deduce that there is an intangible social cost of misery, hopelessness, and despair among individuals, families, and entire communities, which is not

measured in disease burden studies. Collectively, the burden of disease and these difficult-to-measure social costs prevent the full achievement of health as a human right, and reveal the ethical case for stepping up disease elimination efforts in the Americas, to benefit individuals, families, and communities that are the most neglected and deprived in today's society.

MEANING OF DISEASE ELIMINATION FOR INDIVIDUALS, FAMILIES, AND COMMUNITIES IN THE AMERICAS

Though disease names are listed in Table 1, each disease is really a story of individuals and families, and of neglected populations. It is the migrant family from Brazil's dry interior now living by the lakeside favela of Lagoa do Olho d'Agua in Jaboatão dos Guararapes (next to Recife) where they fish for dinner and work as laborers and street vendors, or the Yanomami clan family hunting, gathering, and farming along the rainforest border of Brazil and Venezuela. It is the story of the hungry young rural couple scratching out a living in a village in the dry tropical forest near Villa Nueva, Chinandega, in northern Nicaragua, or the migrant family from southern Mexico living in a colonia of Hidalgo County, South Texas, without household water and sewerage, or the undernourished Haitian family surviving with their goats in their hut on the denuded hillsides near Léogâne. These individuals and families tell us the true hard story of being neglected, the existing inequity they live in, the remaining wide burden of communicable diseases in our Region, and epitomize why we must eliminate those diseases.

The CD elimination framework is one suited to benefiting populations living in vulnerable conditions (where most of these diseases occur) and supporting abolition of inequity (expressed in health rights). As such it works in line with the poverty reduction strategies of the World Bank and the Inter-American Development Bank (IDB), wherein some of their current programs supporting conditional cash

transfers for health and education and housing and urban development, or the *Piso Firme* program for housing improvement, urban development and health, can support or link to specific activities in the CD elimination agenda (STH and Chagas disease, for instance).

Taking these data and information together, the elimination of this set of CDs should be able to reduce disease rates to zero or near zero. It should also indirectly help reduce those difficult-to-measure social costs—if done together with health care systems strengthening in each country, access to sufficient financing, and sufficient political and managerial capital invested in CD elimination through 2030. The framework challenges the ways in which health care is currently provided and outlines some ways to change what is currently done and lead us to a regional goal of eliminating CDs; it compiles and organizes interventions that are currently scattered or loosely grouped together. The framework will, therefore, facilitate and promote linkages, synergies, and interdepartmental collaboration, aiming at the pursuit of a well-identified organizational goal. The list of existing health risks and health problems in the Americas extends beyond the diseases listed in Table 1, and as such, this concept note will not be addressing, for instance, the common vaccine-preventable diseases of childhood (such as neonatal tetanus and mumps), nor certain other CD problems such as antimicrobial resistance and selected NIDs causing lesser disease burdens). We will illustrate and demonstrate the what (what is possible) more than the how (exactly how it can be done). In suggesting what is possible we are drawing on lessons learned, best practices, and successful outcomes from evidence-driven interventions, not

only from CD but other areas of public health. By doing this, a real opportunity to integrate (and make operational) universal access to health and the elimination of infectious diseases is presented, and quantitative and qualitative measurements can be established.

The existing PAHO CD elimination agenda will need to be accelerated, especially in the face of the continuing epidemiologic transition with the concomitant rise of the burden of noncommunicable diseases (some of which already overlap or interact with CDs) and growing resource constraints both in the countries and in PAHO; otherwise, there is a real risk of slowing or losing the gains we have made in the Region towards the near-elimination of CDs such as lymphatic filariasis (LF), trachoma, Chagas disease, malaria, and TB. It is time to move to the next stage in the disease elimination agenda of the Region.



Mapping out the Framework
of Communicable Disease
Elimination

3. Mapping out the Framework of Communicable Disease Elimination

A map of the framework for CD elimination includes a set of definitions and common terminology to be used, and a description of diseases, dimensions, and deadlines proposed here, along with a discussion of the investment case for CD elimination.

DEFINITIONS

Beginning with the work of the [International Task Force for Disease Eradication](#) (ITFDE) at the Carter Center in the 1980s and extending to the more recent work of the [WHO Strategic and Technical Advisory Group for Neglected Tropical Diseases](#), we have seen an evolution of specific scientific definitions for terms such as control, elimination, and eradication during the last three decades (see Box 1 in the Annex). Definitions have evolved (and improved) as we discovered ever more complex epidemiological situations for some diseases and new understanding of the nuances of disease transmission cycles, new vectors or reservoirs, and new interventions for prevention, treatment, and cure. For example, the definition of elimination has evolved from cessation of transmission of a disease in a single country, continent, or other limited geographic area (ITFDE's early definition) to today's more nuanced terms and definitions as used by WHO: *elimination as a public health problem* (EPHP) is defined by the achievement of measurable global targets set by WHO in relation to a particular disease (e.g., for MTCT of syphilis, LF), and when reached, continued actions are required to maintain the targets or advance towards elimination of transmission. The process of documentation of EPHP is called *validation*. *Elimination of transmission* (EOT) is defined as the reduction to zero of the incidence of infection caused by a specific pathogen in a defined geographical area, with minimal risk of reintroduction, as a result of deliberate efforts. The process of documentation of EOT is called *verification*. EPHP and EOT are distinguished from *eradication*, which is the permanent reduction to zero of a specific pathogen as a result of deliberate efforts, with no more risk of reintroduction. The process of documentation of eradication (e.g., for yaws) is called *certification*. See Box 1 for further details.

The framework in this concept note will rely on a set of common definitions of

disease elimination and eradication from the recent work of the WHO Strategic and Technical Advisory Group for Neglected Tropical Diseases (2014-2015) and of other recent WHO expert committees, advisory committees or technical programs on malaria, TB, HIV, and sexually transmitted infections.

In sum, we now have new scientific clarity and agreement in the public health community that elimination and eradication are not synonyms (and that elimination is nuanced). Moreover, there is a real biological distinction between elimination, eradication, and extinction. Challenges yet remain as these three terms are ones which members of the media and laypersons often confuse during common discourse, in conversation and writing.

Understandingly, historically much of the focus of CD control and prevention has been to stop disease transmission, through development and deployment of vaccines, insecticides, quarantine, or other technical or clinical measures. However, elimination of the negative health effects of CDs goes beyond stopping transmission and should also include other dimensions which more fully reflect WHO's definition of health: "*Health is a state of complete physical, mental and social well-being and not merely the absence of disease or infirmity.*" These are captured in the four dimensions discussed in the next section.

DISEASES, DIMENSIONS, AND DEADLINES

To expand our regional efforts in disease elimination under this framework, some new dimensions of elimination are proposed. The framework as shown in Table 1 (below) sets out a list of diseases, a description of dimensions of existing and proposed (new) elimination actions, and deadlines (not mere targets) for each disease, consistent with existing PAHO and WHO target dates for elimination, while suggesting new elimination deadlines for



Integrated healthcare campaign to prevent leprosy, trachoma blindness, and STHs among school-age children, Pernambuco, Brazil

diseases or dimensions not previously covered in current PAHO and WHO resolutions and action plans.

Along with EPHP, this framework includes four other dimensions of CD elimination. These are emphasized so that we will have a different way to look at what we are trying to achieve by stretching our public health work to eliminate the burden of each disease by the year 2030: depending upon the disease, its modes of transmission, and epidemiological situation. These dimensions give us a more quantitative view of elimination, i.e., factors that can be easily counted, are more inclusive of all ages and key populations, and which focus on improving quality of life, consistent with today's ethical standards for public health agencies, the SDGs, and WHO's concept of Health for All.

When disease transmission ends, then new generations of individuals will not be facing the premature deaths, illness, and disability associated with those diseases. During the process to reach no transmission, and given the legacy or ongoing health burden of many CDs, such as lep-

rosy, LF, and chronic Chagas disease, we must not only continue to reach EPHP but tackle in a broader way the dimensions of mortality (deaths), morbidity (illness), and disability. For each disease, target dates set by PAHO/WHO or new deadlines being suggested for consideration by PAHO are shown; these range from the period 2015 (target dates overdue) to different intervals up to 2030. Deadlines for the elimination of some diseases in some countries are "low-hanging fruit," such as the elimination of schistosomiasis in Saint Lucia, or of trachoma in Guatemala.

FIGURE 2. FOUR DIMENSIONS OF ELIMINATION OF THE BURDEN OF COMMUNICABLE DISEASES



TABLE 1. COMMUNICABLE DISEASES AND CONDITIONS - CANDIDATES FOR REGIONAL ELIMINATION IN THE AMERICAS: CURRENT TARGET DATES, DIMENSIONS OF WHAT IS POSSIBLE TO ACHIEVE BY THE YEAR 2030, ASSOCIATED PROPOSED DEADLINES, AND DESCRIPTIONS

DISEASE/ INFECTION/ CONDITION	CURRENT WHO/PAHO TARGET DATES FOR ELIMI- NATION (OR ERADICATION)	ELIMINA- TION AS A PUBLIC HEALTH PROBLEM (EPHP)	DIMENSIONS OF WHAT IS POSSIBLE BY 2030				PROPOSED PAHO RE- GIONAL DEADLINES (elimination dates) and description of dimensions of what is possible by the year 2030 at latest (for diseases or dimensions not previously targeted for elimination by PAHO)
			NO TRANS- MISSION TO HUMANS (incl. elimination of transmission [EOT], and elimina- tion of mother-to- child transmission [EMTCT])	NO MORTALITY (deaths)	NO MORBIDITY (illness)	NO DISABILITY	
HUMAN RABIES dog-mediated	2030: WHO target of ending dog-mediated rabies deaths by 2030 2022: PAHO target of 35 countries to have eliminated dog-mediated human rabies and put in place measures to prevent disease resurgence or reintroduction			✓ no deaths from dog-mediated human rabies by 2022			2022 – Proposed fast-tracking in the Americas, add no mortality from dog-mediated rabies virus infection. [Possibly reachable by 2020]. If no dog-mediated rabies transmission occurs (due to high dog vaccination coverage and all dog-bite victims quickly getting post-exposure prophylaxis), no mortality should occur. Implement PAHO POA CD55/15 (2016) and reach indicator targets.
HIV - MTCT	2030: WHO target of EMTCT (validation) 2020: PAHO target to reduce rate of MTCT of HIV to 2% or less			✓ no deaths in children from MTCT by 2020			2020 – Add no mortality in children arising from MTCT, since this pathway is to be eliminated, and any MTCT pediatric cases are to have access and treatment with HIV antiretroviral therapy. Implement PAHO EMTCT Plus Strategy (2017).
HBV - MTCT	2030: WHO target of EMTCT (validation) 2020: PAHO target to reduce hepatitis B surface antigen prevalence among 4-to 6-year old children to 0.1% or less			✓ no deaths in children by 2020		✓ no severe disability in children which would require transplantation	2020 – Add no pediatric deaths and no severe disability in Region which would require transplantation in children, since new pediatric cases which arise should not progress to death or to a clinical stage where transplantation is needed, due to receiving pediatric vaccination, screening, and adequate clinical management. Implement PAHO EMTCT Plus Strategy (2017).
YELLOW FEVER EPIDEMICS	No WHO target exists (2017)		✓ no new epidemics of urban YF transmitted (by <i>Aedes aegypti</i>)	✓ no deaths among new cases, 2018-2030			2018-2030 – This establishes a Maintenance EOT goal for 2018-2030, maintaining that no new urban YF epidemics shall occur (transmitted by <i>Aedes aegypti</i>); made possible by full implementation of vector components of PAHO IMS-dengue strategy. Add no mortality arising from new cases of urban YF, result of rapid case detection and rapid case management.

DISEASE/ INFECTION/ CONDITION	CURRENT WHO/PAHO TARGET DATES FOR ELIMI- NATION (OR ERADICATION)	ELIMINA- TION AS A PUBLIC HEALTH PROBLEM (EPHP)	DIMENSIONS OF WHAT IS POSSIBLE BY 2030				PROPOSED PAHO RE- GIONAL DEADLINES (elimination dates) and description of dimensions of what is possible by the year 2030 at latest (for diseases or dimensions not previously targeted for elimination by PAHO)
			NO TRANS- MISSION TO HUMANS (incl. elimination of transmission [EOT], and elimina- tion of mother-to- child transmission [EMTCT])	NO MORTALITY (deaths)	NO MORBIDITY (illness)	NO DISABILITY	
CERVICAL CAN- CER (from HPV)	2030: PAHO target of EPHP, to reduce cervical cancer incidence to < 4/100,000 and premature mortality (deaths) by one-third by 2030.						Note: No additional interventions or dates are added. Pursue PAHO target of 2030.
CHAGAS DISEASE <i>Trypanosoma cruzi</i>	2015: AHO target of EOT by blood transfusion; target was achieved 2020: PAHO target of EMTCT with ≥90% of children cured of Chagas infection with post-treatment negative serology 2020: PAHO/WHO target of EOT of principal interdomi-ciliary vectors 2022: PAHO target of 16 countries to have eliminated Chagas disease, and put in place measures to prevent disease resurgence or reintroduction			✓ no neonatal morbidity by 2025			2025 – Add no neonatal morbidity, through rapid congenital case treatment of infected newborns (neonates). Add new routine pre-natal screening and treatment of at-risk women before pregnancy. Implement PAHO POA CD55/15 (2016) and reach indicator targets. Implement PAHO EMTCT Plus Strategy (2017).
MALARIA <i>Plasmodium falciparum</i> and <i>Plasmodium. vivax</i>	2030: WHO target of EOT of <i>P. falciparum</i> and <i>P. vivax</i> 2016: PAHO POA CD55/13 targets further reduction of malaria mor-bidity and deaths by 40% or more (based on 2015 official figures); and “implemen-tation of efforts to eliminate malaria in 18 of the 21 endemic countries and attainment of malaria-free status in at least four countries.”			✓ no deaths from <i>P. falciparum</i> and <i>P. vivax</i> in chil-dren at risk by 2030			2030 – Add no mortality from <i>P. falciparum</i> and <i>P. vivax</i> in children at risk [if measurable], since timely screening and rapid treatment should allow avoidance of mortality and contribute to EOT. Implement PAHO POA CD55/13 on malaria elimination (2016) and reach indicator targets on reduction in malaria morbidity, deaths, and malaria [transmis-sion] elimination, as well as implementation of innova-tive approaches to address challenges in countries where progress has been limited; pre-vention of the reestablishment of malaria in countries that have been declared malaria-free.

DISEASE/ INFECTION/ CONDITION	CURRENT WHO/PAHO TARGET DATES FOR ELIMI- NATION (OR ERADICATION)	ELIMINA- TION AS A PUBLIC HEALTH PROBLEM (EPHP)	DIMENSIONS OF WHAT IS POSSIBLE BY 2030				PROPOSED PAHO RE- GIONAL DEADLINES (elimination dates) and description of dimensions of what is possible by the year 2030 at latest (for diseases or dimensions not previously targeted for elimination by PAHO)
			NO TRANS- MISSION TO HUMANS (incl. elimination of transmission [EOT], and elimina- tion of mother-to- child transmission [EMTCT])	NO MORTALITY (deaths)	NO MORBIDITY (illness)	NO DISABILITY	
LEISHMANIASIS - CUTANEOUS/ MUCOCUTANE- OUS (C/MCL) <i>Leishmania brazil- iensi; L. mexicana complexes</i>	2022: PAHO target to reduce the pro- portion of children with C/MCL in 8 countries by 50%.				✓ no morbidity in at-risk children under age 10 by 2030		2030 – Add no morbidity in at-risk children under age 10, an indicator of successful surveillance, screening and treatment of children in at-risk areas. Implement PAHO POA CD55/15 (2016) and reach indicator targets. Implement new PAHO (2017) leishmania- sis control action plan.
LEISHMANIASIS - VISCERAL (VL) <i>Leishmania cha- gasi/infantum</i>	2022: PAHO target to reduce lethality rate of visceral leishmaniasis in 8 countries by 50%.			✓ reduce lethali- ty rate to zero in urban areas by 2030			2030 – Add reduce lethality rate to zero in urban areas, by improved clinical case manage- ment, and control of dog reser- voirs to reduce transmission, complemented by improved solid waste management for vector control. Implement PAHO POA CD55/15 (2016) and reach indicator targets. Implement new PAHO control action plan (2017).
SCHISTOSOMI- ASIS <i>Schistosoma mansoni</i>	2015: WHO target of EOT in Caribbean [EOT underway, overdue]. 2020: WHO target of EOT in all Latin America and the Caribbean.			✓ no deaths in at-risk popula- tions by 2030		✓ from neu- ro-schistosomia- sis by 2030	2030 – Add no new mortality and no new cases of neu- ro-schistosomiasis. Possible through screen, test and treat at-risk populations and/or targeted preventive chemotherapy (PCT) or mass drug administration (MDA) of at-risk populations. If EOT occurs by 2020, no new mortality; and no new cases of neuro-schistosomiasis should occur after 2030. Implement PAHO POA CD55/15 (2016) and reach indicator targets.
SOIL-TRANSMIT- TED HELMINTHIA- SIS (STH) (4 human nema- tode species)	Current WHO guidelines: Reduce to <1% the number of infections of moderate and high intensity in at-risk preschool and school-age children.			✓ no child deaths from ascariasis bowel obstruction by 2030			2030 – Add no mortality from ascariasis (bowel obstruction) reported in children, per hospital records. If PCT or MDA anthelmintic coverage for at-risk preschool and school-age children is 75% or higher in endemic zones with moderate and high-intensity areas, then child deaths from <i>Ascaris lumbricoides</i> bowel obstruction should be avoidable. Implement PAHO POA CD55/15 (2016) and reach indicator targets.

DISEASE/ INFECTION/ CONDITION	CURRENT WHO/PAHO TARGET DATES FOR ELIMI- NATION (OR ERADICATION)	ELIMINA- TION AS A PUBLIC HEALTH PROBLEM (EPHP)	DIMENSIONS OF WHAT IS POSSIBLE BY 2030				PROPOSED PAHO RE- GIONAL DEADLINES (elimination dates) and description of dimensions of what is possible by the year 2030 at latest (for diseases or dimensions not previously targeted for elimination by PAHO)
			NO TRANS- MISSION TO HUMANS (incl. elimination of transmission [EOT], and elimina- tion of mother-to- child transmission [EMTCT])	NO MORTALITY (deaths)	NO MORBIDITY (illness)	NO DISABILITY	
ONCHOCERCIASIS (river blindness) <i>Onchocerca volvulus</i>	2015: PAHO/ WHO target of EOT (verification); [EOT underway but overdue; only two foci remain] 2022: PAHO target of six countries to have eliminated onchocerciasis and put in place meas- ures to prevent disease resurgence or reintroduction				✓ no ocular mor- bidity, by 2022	✓ no blindness, now to 2030	Now to 2030 – Add a Maintenance goal for no new blindness cases, now to 2030 (and beyond), since elimination (prevention) of new cases of blindness was achieved prior to 2009. Add elimination of ocular mor- bidity by 2022, which is nearly achieved in the remaining two active foci since MDA is admin- istered up to four times a year. [Possibly reachable by 2020] Use of 2016 WHO Guidelines for verification of elimination of hu- man onchocerciasis. Implement PAHO POA CD55/15 (2016) and reach indicator targets.
LYMPHATIC FILA- RIASIS (LF) <i>Wuchereria ban- crofti</i>	2020: WHO target of EPHP, globally (validation) 2022: PAHO target of six countries to have eliminated LF and put in place measures to prevent disease resurgence or reintroduction	WHO target of EPHP, globally			✓ no acute attacks, also known as acute dermatolym- phangioadenitis, by 2025; ✓ no morbidity from untreated lymphedema by 2025 (morbidity management)	✓ no disabling hydrocele by 2025 (disability prevention)	2025 – Add no acute attacks and no untreated lymphede- ma through provision of primary health care (PHC) services. Add no disability from hydrocele, result of completing the backlog of hy- drocele surgeries. Use of 2017 WHO guidelines for validation of EPHP of LF, which includes vector transmission, infection and a minimum care package of morbidity management and disability prevention (MMDP). Implement PAHO POA CD55/15 (2016) and reach indicator targets.
CYSTICERCOSIS from <i>Taenia solium</i>	2020: WHO target to ensure coverage with PCT of at least 75% of the global population requiring it			✓ no deaths in children by 2030	✓ no morbidity in communities at risk by 2030	✓ no new cases of neuro-cystic- ercosis in chil- dren by 2030	2030 – Add no mortality in children, through improved early case detection and management and treatment, as measured by hospital/clinical records and death certificates. Add no morbidity in commu- nities at risk, via PCT or MDA against <i>T. solium</i> adult worms, as measured by PCT program records. Add no new cases of neuro-cysticercosis in children, through improved case de- tection and management, and evidenced in hospital records. Implement PAHO POA CD55/15 (2016) and reach indicator targets.

DISEASE/ INFECTION/ CONDITION	CURRENT WHO/PAHO TARGET DATES FOR ELIMI- NATION (OR ERADICATION)	ELIMINA- TION AS A PUBLIC HEALTH PROBLEM (EHPH)	DIMENSIONS OF WHAT IS POSSIBLE BY 2030				PROPOSED PAHO RE- GIONAL DEADLINES (elimination dates) and description of dimensions of what is possible by the year 2030 at latest (for diseases or dimensions not previously targeted for elimination by PAHO)
			NO TRANS- MISSION TO HUMANS (incl. elimination of transmission [EOT], and elimina- tion of mother-to- child transmission [EMTCT])	NO MORTALITY (deaths)	NO MORBIDITY (illness)	NO DISABILITY	
FASCIOLIASIS <i>Fasciola hepatica</i>	2020: WHO target to ensure coverage with PCT of at least 75% of the global population requiring it			✓ no deaths in at-risk school-age children by 2030	✓ no morbidity in at-risk school-age children and adults by 2030		2030 – Add no deaths in at-risk school-age children, through screening and early treatment or PCT/MDA, as measured by hospital/clinical records and death certificates. Add no severe morbidity (hepatic damage and severe anemia) in at-risk school-age children and adults, through screening and early treatment or periodic PCT/MDA, as measured by program and PCT records. Complemented by food safety (vegetables), health education, and livestock management. Implement PAHO POA CD55/15 (2016) and reach indicator targets.
TRACHOMA <i>Chlamydia trachomatis</i>	2015: PAHO target of EPHP, using the SAFE strategy* [EHPH underway but overdue] 2020: WHO global target of EPHP, using the SAFE strategy (Validation)	WHO global target of EPHP, using the SAFE strategy					Note: No additional interventions or dates are added. Pursue WHO target of 2020. EHPH, by reduction in prevalence of cases of trachoma trichiasis “unknown to the health system” to <1 case/1,000 and a reduction in the prevalence of trachomatous inflammation—follicular (the active trachoma sign) in children aged 1-9 years to <5%, by use of the SAFE strategy. Link SAFE to water, sanitation, and hygiene (WASH). Implement PAHO POA CD55/15 (2016) and reach indicator targets.
LEPROSY <i>Mycobacterium leprae</i>	2020: WHO global target of EPHP 2020: WHO targets of zero disabilities among new pediatric patients; and Grade II disability rate of one case in 1 million persons	WHO global target of EPHP, by multidrug therapy, MMDP, plus legislation against discrimination					Note: No additional interventions or dates are added. Pursue WHO target of 2020. EHPH, by screening and treatment of all at-risk persons and MMDP. EPHP also includes no countries with legislation discriminating against people with leprosy by 2020-2030. Use of the WHO (2016) Global Leprosy Strategy 2016-2020. Implement PAHO POA CD55/15 (2016) and reach indicator targets.
SYPHILIS, MTCT <i>Treponema pallidum ssp. pallidum</i>	2015: PAHO target of EMTCT [underway but overdue] 2030: WHO global target EMTCT (validation)			✓ no deaths of infected neonates by 2020			2020 – Add no stillbirths and neonatal deaths from MTCT of syphilis (per hospital and clinic records), due to prevention by serological screening of at-risk women and penicillin treatment of pregnant women at antenatal clinics.

When disease transmission ends, then new generations of individuals will not be facing the premature deaths, illness, and disability associated with those diseases.

DISEASE/ INFECTION/ CONDITION	CURRENT WHO/PAHO TARGET DATES FOR ELIMI- NATION (OR ERADICATION)	ELIMINA- TION AS A PUBLIC HEALTH PROBLEM (EPHP)	DIMENSIONS OF WHAT IS POSSIBLE BY 2030				PROPOSED PAHO RE- GIONAL DEADLINES (elimination dates) and description of dimensions of what is possible by the year 2030 at latest (for diseases or dimensions not previously targeted for elimination by PAHO)
			NO TRANS- MISSION TO HUMANS (incl. elimination of transmission [EOT], and elimina- tion of mother-to- child transmission [EMTCT])	NO MORTALITY (deaths)	NO MORBIDITY (illness)	NO DISABILITY	
YAWS <i>Treponema pallidum ssp. perentue</i>	2030: WHO global target						No evidence of transmission in the Americas. Yaws is targeted for global eradication. The confirmation of global eradication will require certification through WHO, including evidence from each WHO Region.
TUBERCULOSIS (TB) <i>Mycobacterium tuberculosis</i>				✓ no deaths from TB by 2030 (multidrug-resistant TB excluded)			2030 – Add no mortality, result of adequate screening, test and treatment of suspect cases and high-risk populations. Note: Indicators will need to exclude or address mortality from multidrug-resistant TB.
CHOLERA <i>Vibrio cholerae</i>	2030: WHO target of EPHP by reducing cholera deaths by 90% by 2030	WHO target of EPHP		✓ no deaths from epidemic cholera by 2030			2030 – Add, eliminate deaths from epidemic cholera in the Americas. (WHO target to reduce cholera deaths by 90% by 2030, was set in October 2017)
FOOT-AND-MOUTH DISEASE	2020: in the Americas	Eradication in domestic bovids	✓				2020 - No transmission to humans (already a rare event).
OPEN DEFECACTION (environmental determinant of health)	2030	EPHP by 2030					2030 - Coincides with SDG 6.2.
POLLUTING BIOMASS COOKING FUELS (environmental determinant of health)	2030	EPHP by 2030					2030 - Coincides with SDGs 3.9 and 7.1.

✓ means adding the disease or characteristic, to a list of what is possible to achieve by the year 2030 compared to current goals, targets, or practices, while being evidence-based or science-based.

* Trachoma SAFE: S, Surgery, for all trachoma trichiasis cases. A, Antibiotics, to reduce reservoir of eye infection. F and E, Face-washing and environmental improvement, to reduce transmission.

The interventions and recommendations in this concept note for elimination of CDs will reduce important burdens of transmission, mortality, morbidity, and /or disability, and thus reduce the cycle of poverty and benefit the lives of many neglected or vulnerable individuals and populations. The diseases selected are those for which, per criteria noted by Hopkins (2013), there is evidence of the scientific feasibility of elimination and which are seen by PAHO as amenable (with some variation) to political will and popular support.

In summary, this concept note anticipates the elimination of a large number of CDs, expanding the list from the elimination of eight neglected infectious diseases (and the control of five others) in the Plan of Action for the [Elimination of Neglected Infectious Diseases and Post-Elimination Actions 2016-2022](#), and adds several viral infections transmitted from mother to child, as well as malaria, cholera, and preventing YF epidemics. It also incorporates the recommendations and conclusions of the PAHO Regional Consultation on Disease Elimination in the Americas (PAHO 2015,

draft available from PAHO/CDE). This effort is not starting from zero: the countries of the Region have made significant advances in disease elimination and control this century, as is noted in Box 2 (in the Annex) and in PAHO's 2017 [Health in the Americas](#) report.

INVESTMENT CASE

The investment case for elimination of these diseases in the Americas will need to be further developed, but already some researchers have done so for several diseases, at the global level. For example, in a global systematic review of malaria control versus elimination, Shretta et al. (2016) calculated that the annual per capita cost of malaria control to a health system ranged from US\$ 0.11 to US\$ 39.06 (median: US\$ 2.21) while that for malaria elimination ranged from \$0.18 to \$27 (median: \$3.00). Meanwhile, the benefit-cost ratios of investing in malaria control and elimination ranged from 2.4 to over 145. A fact sheet of the [WHO Stop TB program](#) in 2014 notes that TB was identified as one of the best buys among the MDGs with a return of \$43 for each dollar in diagnosis and treatment, while the [Stop TB Partnership](#) estimates the five-year Global Plan to End TB 2016-2020 would produce a US\$ 1.2 trillion overall economic return on investment and US\$ 85 return on each dollar invested. The TB investment case is further described by Kunii et al. (2016).

The global investment case for elimination of NTDs was described for 17 diseases in the Third WHO Report on Neglected Tropical Diseases, Investing to Overcome the Global Impact of Neglected Tropical Diseases (WHO, 2015a), in which the investment case is made on both cost-effectiveness and equity grounds. The report notes NTDs will need to be an integral part of universal health coverage, and without it the effort may fail. Hollingsworth et al. (2015) developed the investment case to support achievement of the WHO 2020 global elimination goals for nine NTDs, using quantitative analyses and modeling of transmission and control measures. De Vlas et al. (2016) describe how much health will be gained (in terms of mortality avoided and lower DALYs lost due to disability) by concerted efforts to control or eliminate NTDs. For the period 2015-2030, per WHO (2015a), recent estimates for domestic investment in NTDs elimination and control to be achieved through universal coverage are US\$ 33 billion, plus an additional US\$ 4.3 billion from the international donor community including continuing pharmaceutical donations. Globally, for five major NTDs treated by mass drug administration (MDA), Redekop et al. (2017)

calculated the favorable economic benefit to individuals of achieving the 2020 targets for five preventive chemotherapy NTDs (LF, onchocerciasis, schistosomiasis, STH, and trachoma): the net benefit in productivity gain is expected to be US\$ 27.4 and US\$ 42.8 for every dollar invested during the periods 2011-2020 and 2021-2030, respectively. The impact varies between NTDs and regions, since it is determined by disease prevalence and the extent of disease-related productivity loss (Redekop et al. 2017). The investment case has been made for the elimination of some specific NTDs in the Americas; for example, the cysticercosis disease burden in Latin America was described by Torres (2015), while WHO (2016) has described three principle reasons to invest in the elimination of neurocysticercosis resulting from *Taenia solium* infection, a leading cause of preventable epilepsy. The general investment case for leprosy elimination is laid out by Tiwari and Richardus (2016).

Where possible, the expected return on investment, the projected costs of inaction (status quo or control, no elimination), and the expected positive benefits on poverty reduction should be developed, estimated, understood, and compared to the projected costs of elimination for our Region. These are tasks well-suited to health economists and WHO Collaborating Centers. Research and development may be needed to fill knowledge gaps, such as in modeling of CD elimination, costing and cost-effectiveness analysis of packages of interventions, and climate change impacts on the pace and sustainability of CD elimination for our Region.

The investment case for integrated CD elimination also needs to be made by economists and natural resource experts in the face of global and regional climate change, where the expectation is to see greater variation and systemic changes in ecosystems resulting in the potential to increase transmission or dispersion of NTDs and other CDs (see Moreno 2006), more communities displaced by climate change, and greater human intrusions into previously undisturbed natural habitats and the diseases, vectors, and reservoirs they harbor. Though the economic costs of extreme weather events on health in Latin American and the Caribbean are not yet well estimated (Schmitt et al. 2016), given the direction of most climatic trend analyses, the opportunity cost for the elimination of the diseases we target in this effort will only increase as climate change intensifies. The opportunity costs of delaying the rapid and scaled-up implementation of CD elimination efforts are important to consider.



Snapshot of Communicable
Disease Elimination in the
Americas

4. Snapshot of Communicable Disease Elimination in the Americas

The number and scope of CDs in the Americas is large and wide, so the framework presented here will focus only on a key group presenting a significant disease burden on the more vulnerable populations in the Region, and does not focus on all the common childhood vaccine-preventable diseases nor on the control of other NIDs such as cystic echinococcosis and strongyloidiasis. Several highlights of regional progress in CD elimination for the period of 2009-2017 are shown in Box 2.

The current epidemiological situation of each is briefly described here, while some key needed responses are described here and further on, set out in a manner which shows interventions that can be taken both within and outside the health sector, revealing how an integrated framework to elimination of the CD burden can be reached (see Table 2 in the Annex). Note that not all CDs in the elimination agenda are present in every country. Each country will analyze its own epidemiological situation and determine which diseases they will tackle or step up actions and interventions. For example, Mexico has now eliminated onchocerciasis and trachoma, but still faces challenges with malaria, leprosy, human rabies by dog bite, Chagas disease, TB, and cysticercosis. It is important to note that not all these diseases are present in every country and territory, so it will not be necessary to work in all countries on each disease. Schneider et al. (2011) mapped out the presence of several NIDs in the Region, and subsequent specific studies on the current distribution of leishmaniasis, STH, schistosomiasis, rabies, malaria, and yellow fever, have been published by PAHO staff.

HUMAN RABIES (dog-mediated). Remarkable efforts over the last four decades by the endemic countries, PAHO, and other partners have reduced the human rabies burden in Latin America from 285 cases in 1970 to just 10 cases in 2016 (reported only from Guatemala and Haiti). Almost all cases of human rabies result from dog bites, so the elimination of canine rabies must be part of the regional effort to eliminate deaths from dog-mediated rabies in humans. If so-called hot spots of dog-maintained rabies are still present and free-roaming dog populations remain large, people living in hot spots will remain at risk (Velasco-Villa et al. 2017). Educational interventions about avoiding dog bites and about what to do if bitten (i.e., quickly seek post-exposure

prophylaxis from health care providers) are critical and should accompany all dog vaccination campaigns.

HIV/AIDS. An estimated 2 million people in Latin America and the Caribbean are living with HIV. Latin America and the Caribbean has the highest coverage of antiretroviral treatment among low- and mid-income settings worldwide (55% in 2015), which is responsible for a 25% reduction in AIDS-related deaths since 2010, but insufficient to curb the steady occurrence of new infections. An estimated 100,000 new HIV infections have occurred in the Region each year since 2008, with 64% concentrated in key populations and their sexual contacts. “Champion” countries in the Region, like Brazil, were fast in implementing WHO’s “treat all” recommendation, which will decrease the treatment gap and contribute to a reduction in new infections. In addition, countries are advancing towards adopting a “combination prevention” approach and to implementing scalable prevention interventions with a focus on key populations. As such, strengthening intersectoral work to address structural barriers to key populations’ access to services and retention in care, including stigma and discrimination, remains a challenge to reaching elimination by 2030.

HIV—MTCT. One of the greatest public health success stories, globally and in particular in the Americas, has been the development and implementation of interventions to prevent mother-to-child transmission (MTCT) of HIV. Antiretroviral treatment coverage among pregnant women living with HIV rose from 55% in 2010 to 88% in 2015, and the estimated MTCT rate decreased from 15% in 2010 to 8% in 2015. New HIV infections in children (0-14 years old) declined by 55% between 2010 and 2015, from 4,700 in 2010 to 2,100 in 2015, and an estimated 28,000 new HIV infections were averted in the same period. However, in order to achieve and sustain

the targeted rate of 2% MTCT, maternal and child health and sexual and reproductive health services, and access, need to be strengthened for vulnerable adults and adolescents.

HBV. In the Americas, more than 125,000 deaths each year are associated with viral hepatitis, of which 99% are due to HBV and HCV infection. Also, an estimated 2.8 million people are living with hepatitis B, 2.1 million of them in Latin America and the Caribbean. About 88,000 new hepatitis B infections were expected in the Region by 2016, along with 10,000 new cases of chronic hepatitis B (56% of them transmitted from mother to child during birth). Vaccination during the first 24 hours of birth prevents the transmission of hepatitis B from mother to child. Some 21 countries and territories in the Americas recommend universal hepatitis B vaccination of newborns, and 15 countries and territories recommend the vaccine for children born to mothers with the disease. Mortality and morbidity in viral hepatitis results from chronic infection with hepatitis B or C (or indeed hepatitis D), resulting in cirrhosis and liver cancer. Viral hepatitis infection is responsible for around 80% of the global burden of liver cancer. While stopping transmission prevents new infections, treatment with antiviral medicines reduces the progression of liver disease and saves lives by preventing cirrhosis and liver cancer. In 2013, there were an estimated 125,700 deaths from viral hepatitis in the Region, over 80% from HCV. This was an increase of 134% since 1990. In 2015, PAHO's Member States approved the Plan of Action for the Prevention and Control of Viral Hepatitis, to guide country and regional interventions leading to control and elimination. This was aligned with the Global Health Sector Strategy for Viral Hepatitis (approved at the World Health Assembly in May 2016) which has the goal of the elimination of viral hepatitis as a public health threat by 2030.

YELLOW FEVER EPIDEMICS. Fourteen countries in the Region are endemic for YF, but only five countries reported cases of YF in the period 2011-2016. Between 2010 and 2016, a total of 269 confirmed cases were reported. Despite the widespread presence and sometimes dense populations of *Aedes aegypti* in many cities large and small in Latin America, the Caribbean, and parts of the United States of America, urban YF has been considered for decades as eliminated in the Americas. The Region remained free of urban YF outbreaks until 2008,

when Paraguay (with support from PAHO) stopped a local outbreak of urban YF in an unvaccinated population of San Lorenzo, a suburb of Asunción. That outbreak ended, and the Region is now again considered free of classical urban YF. However, the ongoing urban epizootics of YF in some cities of central coastal Brazil began in December 2016 and were associated with 448 human cases and 144 deaths by 17 March 2017. Here, the vector involved may be a forest canopy mosquito species and not *Ae. aegypti*, which points out the clear need to avoid epizootic spill-overs of the virus into the domestic *Ae. aegypti* populations and to eliminate the threat of *Ae. aegypti*-transmitted YF in urban areas of the Americas. Active YF surveillance, vaccination of highly at-risk populations and thorough, continuous *Ae. aegypti* control is needed to stop the risk of transmission in urban areas. Very recently, PAHO and collaborators published a new assessment of the geographic patterns and environmental factors associated with human YF presence in the Americas (see Hamrick et al. 2017).

CERVICAL CANCER. In the Americas each year about 72,000 women are diagnosed with cervical cancer, in which nearly all the deaths are the result of infection with certain types of human papillomavirus (HPV), a sexually transmitted infection. On average more than 34,000 women have been dying from cervical cancer and it is among the leading causes of cancer deaths among women in 23 countries of our Region. However, cervical cancer can be prevented through HPV vaccination, screening, and treatment of precancerous lesions. The HPV vaccine is recommended for girls age 9 to 14 and is available in 35 countries of the Region as of 2018. However, in the majority of countries, the HPV vaccine coverage rate with the recommended two doses has not reached 80% of the target population. Cervical cancer screening is recommended primarily for women aged 30 to 49 years, and an estimated 32 million women in the Region are eligible for screening which, when coupled with treatment, can save lives. Towards the elimination of cervical cancer as a public health problem in the Region, the regional target is to reduce the number of new cases (incidence) and to reduce deaths by at least one-third by 2030. This can be reached through primary prevention including dissemination of information, education and HPV vaccination which needs to occur along with improving cervical cancer screening and treatment of precancerous lesions, and strengthening access to cancer

diagnosis, treatment, rehabilitation and palliative care.

NEGLECTED INFECTIOUS DISEASES. In 2016, PAHO's Governing Bodies approved the Plan of Action for the Elimination of Neglected Infectious Diseases and Post-elimination Actions 2016-2022, which addresses the surveillance, management, control, and elimination of a group of 13 diseases: Chagas disease, cystic echinococcosis/hydatidosis, fascioliasis, human plague, leishmaniasis, leprosy (Hansen's disease), lymphatic filariasis, onchocerciasis, rabies transmitted by dogs, schistosomiasis, soil-transmitted helminthiasis, taeniasis/cysticercosis, and trachoma. The six-year plan provides six lines of action to reduce morbidity, disability, and mortality; address stigma; and speed up efforts to eliminate these NIDs as public health problems and eliminate them where possible. The plan includes multidisease approaches involving other diseases and intersectoral actions to reach the targets. Several of these NIDs, along with other CDs, are further discussed below.

CHAGAS DISEASE. Chagas disease is the most common of all neglected infectious diseases in the Americas. Infection generally affects the poorest rural and peri-urban areas of Latin America and the Caribbean, where 80% of cases are caused by insects that transmit the disease. However, migration to urban areas and congenital transmission are shifting the epidemiology over time. Transmission occurs principally via bites and contamination from certain domiciliary triatomine bug vectors, as well as blood transfusion (and organ transplantation), MTCT, and oral transmission by consuming contaminated drinks and food. The disease is endemic in 21 countries in the Americas; currently about 70 million individuals live in endemic areas and are at risk of contracting the disease. It affects some 6 million people, and each year about 30,000 new cases resulting from vectorial transmission are reported. An estimated 1.1 million women of child-bearing age are infected and an estimated 8,000-15,000 newborns are infected each year during pregnancy (congenitally). Vector surveillance, control of domestic vectors by use of safe indoor residual spray, and blood safety are the principle interventions for the elimination of transmission, along with housing improvements (which require access to capital and other resources). Family education in food safety and sanitary inspections of food service facilities will help prevent oral

transmission. Expectant mothers should be screened for the disease and treated per PAHO guidelines. PAHO guidelines for clinical management and treatment of Chagas disease in the Americas are in development by the PAHO Chagas disease program, which in the meantime recommends that all persons with active infection and inactive chronic infection receive selected anti-Chagastic medicines during nearly any stage of life (though not in women during pregnancy). Babies of infected mothers should be tested and, if found infected, treated with pediatric formulations of these anti-Chagastic medicines. The new PAHO Elimination of Mother-to-child Transmission (EMTCT) Plus strategy includes the elimination of MTCT of Chagas disease. Also, a recent pilot study in rural Guatemala demonstrated the success of a community-based neonatal screening strategy for newborns in their first month after birth (Pennington et al. 2017).

MALARIA. Malaria is caused by the parasites *P. falciparum* and *P. vivax*. Between 2000 and 2015, the number of cases of malaria in the Americas declined by 62%, from about 1.18 million cases to 451,242 cases. Malaria deaths fell in the same time period from 410 deaths to 98, demonstrating the low-hanging fruit of regional malaria elimination. WHO defines malaria elimination as *"the interruption of local transmission of a specified malaria parasite species in a defined geographic area. Continued measures are required to prevent the re-establishment of transmission."* Countries that have achieved at least three consecutive years of zero local cases of malaria are eligible to apply for WHO certification of malaria elimination. Currently, 18 (of 21) endemic countries of the Americas are expressing official commitment to malaria elimination, through recent initiatives like the Malaria Zero Alliance, which is targeting the elimination of malaria on the island of Hispaniola, shared by Haiti and the Dominican Republic. Two countries (Argentina and Paraguay) are currently certified for malaria elimination (2019) and 13 more are expected to follow within the next several years. Yet, serious challenges remain in other countries. In September 2016, the PAHO Directing Council approved by Resolution CD55.R7, a Plan of Action for Malaria Elimination 2016-2020, which includes the following five Strategic Lines of Action to guide regional efforts: (i) Universal access to good-quality malaria prevention interventions, integrated vector management, and malaria diagnosis and treatment; (ii) Reinforced malaria surveillance towards



Pregnant women receive special attention to prevent HIV and congenital syphilis transmission from mother to child in Cuba.

evidence-based decision making and response; (iii) Strengthened health systems, strategic planning, monitoring and evaluation, operational research, and country-level capacity building; (iv) Strategic advocacy, communications, and partnerships and collaborations; and (v) Focused efforts and tailored approaches to facilitate malaria elimination and prevent reestablishment in malaria-free areas. Also, in April 2017, WHO published its Framework for Malaria Elimination, which is being adapted to the Americas and its Plan of Action.

LEISHMANIASIS—CUTANEOUS AND MUCOCUTANEOUS.

Cutaneous and mucocutaneous leishmaniasis is endemic in 18 countries of the Region, of which 17 reported cases to PAHO/WHO during the period 2001-2015, for a total of 845,775 reported cases, with an average of 54,742 cases a year (PAHO 2017a). The transmission, prevention, and treatment of leishmaniasis are complex in the Americas. The new PAHO plan of action for surveillance and control of leishmaniasis (including cutaneous/mucocutaneous) provides goals, objectives, and indicators for surveillance, diagnosis, treatment, and leishmaniasis vector control (PAHO 2017a) along with the PAHO Plan of Action for the Elimination of Neglected Infectious Diseases and Post-elimination Actions 2016-2022.

LEISHMANIASIS—VISCERAL. During the period 2001-2015, 52,176 cases of visceral leishmaniasis were registered with PAHO/WHO, distributed among 12 countries of the Region. Though 96% of these cases (50,176) were reported by Brazil, an increase in the number of reported cases has been observed in Argentina and Paraguay since 2001. In 2015, 3,456 cases were registered with PAHO/WHO, of which 257 (7.4%) were coinfections of visceral leishmaniasis and HIV. The proportion of coinfections has been steady at an annual average of 7% between 2012 and 2015. Also, in 2015, 268 deaths were reported to PAHO/WHO, a lethality of 7.7%, similar to the annual average of the last four years (6.9%) (PAHO 2017a). As for the cutaneous/mucocutaneous forms, the new PAHO plan of action for surveillance and control of the leishmaniasis (PAHO 2017a) also provides goals, objectives, and indicators for surveillance, diagnosis, treatment, and vector and reservoir control for the visceral form, and addresses the issue of visceral leishmaniasis/HIV coinfection.

SCHISTOSOMIASIS—*S. Mansoni*. About 1.6 million children were estimated to need

treatment for schistosomiasis in the Region in 2015, primarily in Brazil and Venezuela, and active treatment programs operate in both countries, where the principle challenges remain. Two countries in the Region (Antigua and the Dominican Republic), as well as the French Overseas Departments of Guadeloupe, and Martinique, the UK Overseas Territory of Montserrat, and the United States Commonwealth of Puerto Rico may have eliminated schistosomiasis transmission. A recently completed PAHO-led epidemiological survey in Saint Lucia completed in 2017 found no evidence of schistosomiasis transmission. Further evaluation is needed in Suriname, though it may be close to eliminating transmission. Active case detection and mapping, targeted preventive chemotherapy with donated medicine through the primary care system, health education and provision of basic sanitation, potable water, and improved hygiene are the pillars of schistosomiasis control and elimination in the Region, accompanied by environmental management for snail host control.

SOIL-TRANSMITTED HELMINTHIASIS (STH).

In the Americas in 2016, 43.9 million children aged 1-14 living in 24 countries remain at risk from morbidity (stunting, anemia) from STH. About 7.95 million preschool children were treated through MDA in 2016 in the Region, with 36% of the total needing treatment; and of 31.4 million school-age children, 26.3 million needed treatment and received it. As with schistosomiasis, active surveillance and mapping, targeted preventive chemotherapy with donated medicines (for children), health education and provision of basic sanitation, housing improvements, potable water, and improved hygiene are the principle interventions to control these intestinal worm infections and prevent deaths from severe ascariasis, thus linking STH control and elimination to water, sanitation, and hygiene (WASH) programming.

ONCHOCERCIASIS. Out of the six original endemic countries and 13 foci for human onchocerciasis (river blindness), as of 2017, 11 foci have eliminated transmission (with four countries verified by WHO by the end of 2016 as free from transmission and ocular morbidity), and only 2 foci remain with ongoing low-level transmission. In 2016, about 21,000 people were treated, of the approximately 29,000 people who needed treatment; all live in the Yanomami indigenous area in the two neighboring foci at the border between Brazil and Venezuela. Strengthening the cooperation between

Brazil and Venezuela in border areas is key to intensifying efforts towards regional elimination. Active entomological surveillance (vector infectivity), preventive chemotherapy by MDA 2-4 times a year using donated medicine, and health education are the proven keys to onchocerciasis elimination in the Americas. PAHO's partner, the Onchocerciasis Elimination Program for the Americas, established a formal process for post-elimination surveillance and actions in the Region, with PAHO serving in a monitoring role.

LYMPHATIC FILARIASIS (LF). About 7.8 million people living in four countries in the Americas required preventive chemotherapy for LF as of 2016, mainly in parts of Haiti, but also in Guyana and in one endemic focus in the Dominican Republic. About 4.1 million of the Region's eligible people were treated in 2016. By 2017, transmission has been eliminated in several states in Brazil and in most of the metropolitan area of Recife. Guyana re-started preventive chemotherapy by MDA. Rather similar to onchocerciasis, MDA once a year using donated medicines along with health education are the demonstrated keys to elimination of LF transmission in this Region. It must be (but is currently not always) accompanied by active case surveillance for lymphedema-elephantiasis, hydrocele and acute dermatolymphangioadenitis, and continual treatment access for all those suffering from these three conditions (i.e., morbidity management and disability prevention). Periodic, standardized transmission assessment surveys are used to provide milestones to the verification of interruption of transmission. At the same time, improvements in basic sanitation, drainage, and solid waste management are complementary WASH-related actions for the vector of LF, which also reduce exposure to some other CDs. The lessons learned from developing the investment case for LF eradication (not just elimination) are described by Kastner et al. (2016); the conclusion drawn is that scaling-up MDA coverage to all endemic communities immediately provides the most favorable results to move forward on elimination and set the stage for possible eradication (since the human disease has no animal reservoir).

CYSTICERCOSIS. Cysticercosis from *Taenia solium* mainly affects the health and livelihoods of rural populations in Latin America and the Caribbean, in addition to imported cases together with a few locally acquired cases reported in the USA. In fact, besides

leading to epilepsy and death in humans, cysticercosis also reduces the market value of pigs and makes pork unsafe to eat. Bern et al. (1999) estimated that, on the basis of average prevalence rates in areas of endemicity of 6%-10%, there were 23,500 to 39,000 symptomatic neurocysticercosis cases in Peru alone. In Latin America, an estimated 75 million persons live in areas where cysticercosis is endemic, and around 400,000 were estimated to have symptomatic disease. Cysticercosis contributes substantially to neurological disease in Peru and in all of Latin America. In 1993, the ITFDE identified cysticercosis as theoretically amenable to be controlled and declared eradicable if new tools became available. New tools for diagnosis and treatment and new interventions are now available to make elimination of transmission of *T. solium* (and therefore cysticercosis) and prevention of cysticercosis and neurocysticercosis deaths feasible in the Americas. The principle interventions to stop transmission and reduce cases of neurocysticercosis (manifesting as epilepsy) directly or indirectly are the following: access to treatment; surveillance, mapping, identification, and treatment of taeniasis cases; health education; improved sanitation and safe water provision; improved pig husbandry; anthelmintic treatment (and even vaccination) of pigs; and improved meat inspection and processing of meat products. See Okello and Thomas (2017) for a recent review.

FASCIOLIASIS. In Latin America, principally in two countries of the highland Andean subregion, an estimated 250,000 people living in indigenous communities are at risk of fascioliasis from *Fasciola hepatica*, a zoonotic parasitic infection that is often fatal if left untreated. PAHO/WHO and Bolivia demonstrated proof of the principle of safety and efficacy of preventive chemotherapy by annual MDA with a donated medicine in school-age children, where parasite egg reduction rates and proportion of high-intensity infections dropped (Villegas et al. 2012). A subsequent campaign in the department of La Paz resulted in a drop of prevalence from 17% in 1997 to 2% in 2013 (PAHO 2016), indicating the potential to reduce prevalence to zero. Regular preventive chemotherapy with the indicated donated medicine and health education can lead to the prevention of deaths in children and adults. Education can focus on safe food preparation (fresh-water plants and vegetables), as well as potable water sourcing, which may play a further role in the prevention of infection.

It is important to note that not all these diseases are present in every country and territory, so it will not be necessary to work in all countries on each disease.

In a One Health approach, control of fascioliasis in domestic livestock is mandatory, as it can help reduce transmission to humans, and should be accompanied by animal host infection monitoring.

TRACHOMA. An estimated 5.2 million people in three countries of the Americas required preventive chemotherapy for trachoma in 2016 (data from WHO Weekly Epidemiological Record No. 40, 6 October 2017). By 2016, Mexico had been validated by WHO as having eliminated trachoma, and Guatemala is entering this process, while Colombia and Brazil are continuing mapping and extending drug treatment and eye surgery. However, Peru has recently found trachoma cases in its frontier with Colombia. Other countries in the Region are yet to be explored under the possibility of existing trachoma-favorable conditions, so evidence is being gathered to confirm or dispose of the hypothesis. Key strategies for trachoma elimination and prevention of blindness are manifest in the SAFE strategy (surgery, antibiotics, face-cleaning, and environmental improvement) and include preventive chemotherapy by MDA of a donated medicine at least once, trachoma trichiasis eye surgery as clinically indicated; and for primary prevention, the provision of potable water and sanitation, health education in the communities for improved hygiene (especially face-washing and hand-washing), and environmental improvement.

LEPROSY. In 2016, the Americas recorded about 19,384 new cases occurring in six countries, principally Brazil. The regional elimination goal of less than one case per every 10,000 inhabitants is sought in all the principal administrative divisions of each country. All countries except Brazil have met this goal at the national level, and Brazil is close. Countries are also targeting a second goal of having less than one per million new cases with grade 2 disability by the year 2020; in 2016, Brazil reported only 1,736 such cases among a population of about 209 million people. Key strategies for leprosy elimination and prevention of disability in the Region include active early detection of cases (especially children), and contact tracing and treatment; early case detection, diagnosis, and individual multidrug therapy; and morbidity management (rehabilitation) and disability prevention—all operated through integrating leprosy services in the primary health care system, which is far from functional or perfect. Also, the key is health education to create awareness of

the disease and its treatability, along with the further goal to combat and end social stigma against patients and their families. Leprosy elimination is now guided by the WHO Global Leprosy Strategy 2016-2020, published in 2016.

SYPHILIS. As a background to the situation of MTCT of congenital syphilis in the Americas (discussed next), WHO estimated that approximately 2 million adolescents and adults had syphilis infection in 2012 in the Americas; and almost 1 million are newly infected every year in the Region. While countries in the Americas have important variations on the burden of syphilis, specific population groups are disproportionately affected by the disease. For example, while the seroprevalence in the general population in the Region is estimated to be 0.4%, the median seroprevalence among female sex workers is 2.3% and 10.3% among men who have sex with men. Though more current data are difficult to locate, Kitayama et al. (2017) recently published their protocol for a systematic review of syphilis prevalence and incidence in four high-risk groups during the period 1980-2016, which will provide a more up-to-date picture of syphilis in the Americas. Reducing the incidence of syphilis infection remains a major challenge for most countries of Latin America and the Caribbean to achieve and sustain the 2030 global and regional targets. In 2016, PAHO's Member States approved the Plan of Action for the prevention and control of HIV and Sexually Transmitted Infections 2016-2021 to address this challenge. PAHO, through technical cooperation with countries and sub-regional meetings with sexually transmitted infections program managers, is supporting the roll-out of the plan at the national level.

CONGENITAL SYPHILIS—MTCT. In 2015, PAHO estimated 22,800 cases of congenital syphilis in the Region of the Americas and a rate of 1.7 cases per 1,000 live births, an upward trend in both case numbers and rate. Screening for syphilis among pregnant women with at least one prenatal care visit has increased by 6 percentage points since 2011, reaching 83% in 2015; while syphilis treatment coverage has been stagnant since 2011, estimated at 84% in 2015. The adoption and implementation of key policies show the strong political commitment to eliminate MTCT of HIV and syphilis since the approval of the EMTCT strategy by PAHO Member States in 2010. However, the translation from national political commitment into practice has been more chal-

lenging and complex for the elimination of congenital syphilis than for MTCT of HIV. While the Region has high overall antenatal care coverage, lack of access, late access, and poor-quality antenatal care still affect an estimated 14% of pregnant women in Latin America and the Caribbean. Considering the progress made and gaps for the Region to achieve the goal of elimination, an intensified, focalized, intersectoral, and more effective response that incorporates evidence-based innovations is still required. A second phase of the regional elimination strategy has been initiated to ensure achievement of the elimination of MTCT of HIV, syphilis, and other infections and diseases such as Chagas disease and perinatal hepatitis B, known as EMTCT Plus.

YAWS. Yaws (infection by the bacterial spirochete *Treponema pallidum* ssp. *pertenue*) is considered by PAHO as eliminated in the Americas, with the last reported cases (which were treated) occurring in coastal Ecuador in the 1990s (Solomon et al. 2015). However, as part of the WHO process of certification of global eradication by 2020, surveillance or surveys may become necessary in this decade, as part of the preparation of a regional dossier demonstrating evidence of hemispheric eradication. Given that trachoma and yaws have been known to occur in the same often highly-marginalized and isolated populations, surveillance or surveys could be combined (see Solomon et al. 2015) and conducted through the primary health care (PHC) system.

TUBERCULOSIS (TB) (M. tuberculosis). The Americas have been the first to reach the Millennium Development Goals on TB by 2015 (e.g., to halt and begin to reverse TB incidence, and halve prevalence and mortality in comparison with the 1990 levels). The Latin American and Caribbean countries are first aiming to reach a low TB incidence (defined as <10 cases per 100,000 population) on the path to TB elimination. PAHO (2017b) notes that 218,700 TB cases were diagnosed and reported in 2015, for an incidence of 22.1 cases per 100,000 population, while the overall incidence for 2000-2015 was down by an average of 1.8% per year. On the other hand, the Region had 4,508 cases of multidrug-resistant TB in 2015. In a separate measurement, WHO estimated that 268,500 TB cases still occurred in the Region in 2015 (incidence rate of 27.1 cases per 100,000 population), among which were the 218,700 notified cases. More than half of the incident cases were concentrated in four countries: Bra-

zil, Haiti, Mexico, and Peru. The mortality rate was 1.9 per 100,000 inhabitants with 19,000 deaths estimated (excluding TB/HIV deaths). Some 12% of the TB cases were co-infected with HIV. (HIV co-infection is one of the greatest risk factors for the development of TB and death from the disease.) These important challenges exist, and were acknowledged when PAHO's Member States approved a [Plan of Action for the Prevention and Control of Tuberculosis](#) in 2015. This plan builds on the WHO End TB Strategy of 2015, which has targets for TB prevention, care, and control for 2030. It supports WHO's action framework towards TB elimination in low-incidence countries with its eight priority actions. Based on it, PAHO has supported the development of the *Hoja de Ruta para la Eliminación de la Tuberculosis en Latinoamérica y el Caribe 2016-2025* [Road Map for Tuberculosis Elimination in Latin America and the Caribbean] by the *Asociación Latinoamericana de Tórax* [Latin American Thorax Association], which includes eight components and specific actions and indicators to pursue TB elimination in the region (Rendon et al. 2016). Five countries of the Region are considered by PAHO as eligible for reaching elimination soon: Canada, Chile, Costa Rica, Cuba, and the United States of America. Others, such as some countries in the Caribbean, will most likely follow. Effective TB control should include inter-programmatic collaboration with HIV and diabetes control, and other public health programs, depending on the predominant risk factors in the countries. In addition, careful planning and implementation is needed to successfully control TB in large cities, and several such cities are now using the special eight-component framework of PAHO's initiative for the [Control of TB in Large Cities](#) (in Spanish) for these conditions.

CHOLERA. During 2010-2016, cholera cases were reported in only four countries in the Region (Cuba, Dominican Republic, Haiti, and Mexico). Haiti reported about 179,000 cases and 3,390 deaths in 2010, and 340,311 cases in 2011, the largest number in the Region. Cholera continues in Haiti, where it is now considered endemic, with 36,045 cases reported in 2015. From the beginning of the 2010 outbreak in Haiti through the end of 2013, cases were also reported from Cuba (469 cases and 3 deaths), the Dominican Republic (32,778 cases and 488 deaths), and Mexico (203 cases and 1 death). Prior to 2010, Haiti had been free of cholera for many decades, and the declining number of cases and



Person being tested for possible Chagas disease infection in Chile

deaths shows the potential for the country (while keeping its neighbor the Dominican Republic also free of cholera) to eliminate cholera once again; Ivers (2017) provides details on how Haiti can pursue this opportunity. Intensified case surveillance and provision of oral rehydration therapy to all suspect and known cholera cases, accompanied by other medicines and health interventions, health and hygiene education, and provision of adequate safe water supply and basic sanitation, are the cornerstones for combating cholera's spread and preventing deaths.

FOOT-AND-MOUTH DISEASE. Foot-and-Mouth Disease has historically been a devastating disease hampering production of many domestic cloven-hoofed livestock in the Americas and particularly affecting the cattle industry; rarely it has been a zoonosis. North America, Central America, and the Caribbean are foot-and-mouth disease -free territories without the use of vaccines. South American countries, except Venezuela, are now recognized by the World Organization for Animal Health as Foot-and-Mouth Disease free with and without vaccination, as of 2018. This represents over 334 million heads of cattle protected from the disease in South America. The target in the Americas now is the elimination (in this case, regional eradication) of foot-and-mouth disease virus in domestic cattle and buffalo. The principle tool available for the control and elimination infection in the Americas is vaccination of all domestic cattle in the remaining areas of risk of foot-and-mouth disease. The Region's current main challenge is to progress to elimination of the foot-and-mouth disease virus in domestic cattle in Venezuela, and sustain the elimination program there based on regular vaccination of the domestic cattle and buffalo populations at risk for a sufficient period of time to stop viral transmission, then move to the status of being FMD-free without vaccination. With its elimination, the risk of foot-and-mouth disease transmission and occurrence in humans will be basically at zero.

OPEN DEFECATION. In 2015, almost 19 million of people in the Region still practiced open defecation, and 14 million of those are part of the rural population versus 5 million of the urban population, with the highest percentage living in Haiti and Bolivia. However, in the Region some countries have already progressed in reducing open defecation. For example, in rural Mexico 29% of the population practiced open defecation in 2000, but by 2015 this

has been reduced to 6%, in Cuba the corresponding figures were 5% and 1% and in Uruguay they were 5% and 0.6%, per data from WHO and UNICEF. The regional elimination target, in the context of achieving access to adequate and equitable sanitation and hygiene for all, is to end open defecation by 2030 paying special attention to the needs of women and girls and those in vulnerable situations. There are available tools to reach the goal including a massive scale-up of community-directed safe water and basic sanitation systems for all households, which when reached will see millions more people protected from the adverse health effects of open defecation which range from inadvertent infection with enteric bacteria and viruses and parasites, along with childhood anemia, malnutrition and growth stunting and long-term impaired cognition to which open defecation contributes. As well, the stigma and physical threats that girls and women face when forced to practice open defecation will come to an end.

POLLUTING BIOMASS COOKING FUELS. The use of solid fuels like wood and charcoal, and kerosene for household-level cooking produces household indoor air pollution, one of the main environmental risk factors in the Americas, affecting some 90 million people and causing an estimate of 83,000 deaths and more than 2.3 million DALYs in 2016, per PAHO estimates. Overall, in 14 out of the 35 countries in the Region, 10% or more of the population still use polluting cooking fuels. This type of pollution is directly associated with a number of very adverse health effects and represents a particularly great hazard to pregnant women and their fetuses. Polluting biomass cooking fuels increase the risk of acute lower respiratory infections like pneumonia in children and the risk of chronic obstructive pulmonary disease, lung cancer, cataracts, ischemic heart disease, and stroke in adults, as well as chronic disabling conditions like asthma and chronic obstructive pulmonary disease in the young and old, and sometimes fatal conditions like COPD and lung cancer in adults and seniors. They also contribute to weakening people's immune systems thus leading to more vulnerability to TB and HIV infections. Substitute technologies and cleaner energy sources (i.e., electricity) and alternative cooking fuels (e.g., liquid propane gas) are available and will need to be promoted and made available as affordable substitutes for the biomass cooking fuels, to end this public health problem by 2030.



Vision, Goal, and Targets for
Integrated Communicable
Disease Elimination



5. Vision, Goal, and Targets for Integrated Communicable Disease Elimination

Instead of maintaining the status quo, the vision is to have future generations free of the burden of a set of CDs in the Americas, beginning no later than 2030. The overarching goal is to steadily eliminate burdensome CDs by 2030.

The CD elimination goal can be met by continuing efforts at elimination as a public health problem, and achieving a wider “formula for four dimensions” of CD elimination, on or before 2030, through:

- Targeting no transmission of dog-mediated human rabies, HIV-MTCT, HBV-MTCT, urban YF reoccurrence, Chagas disease, malaria (*Plasmodium falciparum* and *Plasmodium vivax*), visceral leishmaniasis in urban areas, schistosomiasis, onchocerciasis, LF, syphilis-MTCT, and yaws.
- Targeting no mortality from dog-mediated human rabies, HIV-MTCT in children, HBV-MTCT, urban YF reoccurrence, *P. falciparum* malaria, visceral leishmaniasis, schistosomiasis, STH (ascariasis), cysticercosis from *T. solium*, fascioliasis (*F. hepatica*) in school-age children, syphilis-MTCT, TB, and epidemic cholera.
- Targeting no morbidity from three diseases: STH (bowel obstruction), trachoma, and LF (acute attacks, lymphedema).
- Targeting no disability from HBV-MTCT (clinical cases requiring transplantation), cutaneous/mucocutaneous leishmaniasis, schistosomiasis (neuroschistosomiasis), onchocerciasis (blindness), LF (hydrocele), cysticercosis from *T. solium* (neurocysticercosis), trachoma (blindness), and leprosy.

As well, opportunities exist to eliminate foot-and-mouth disease in cattle, and eliminate the adverse environmental and health conditions of open defecation and indoor air pollution in homes arising from inefficient biofuels uses in cooking.

For each disease, PAHO will use existing PAHO- or WHO-approved specific clinical and/or epidemiological definitions and indicators of no transmission, no mortality, no morbidity, and/or no disability. Also, working with key stakeholders, PAHO will create a new set of programmatic indicators of elimination for monitoring and progress reporting.

The vision, goal, and targets reflect the concept of the integrated CD elimination framework. As a part of tackling the four dimensions of CD elimination, some of the Region’s Member States and territories will need to redouble their efforts by strengthening, expanding, and integrating several classes of intervention, during different phases of the life course. Table 3 shows where each disease may be more readily targeted for specific types of interventions through four major life course phases: pregnancy and the neonatal period, childhood and adolescence, working adult, and senior. Policies and programmatic action plans on disease elimination for each life cycle phase or age group, and/or key (vulnerable) populations within each, can be developed at country/local level.

DISEASE	LIFE COURSE PHASE				COMMENTS
	PREGNANCY AND NEONATAL PERIOD	CHILDHOOD AND ADOLESCENCE	WORKING ADULT	SENIOR	
HUMAN RABIES		✓	✓	✓	No post-exposure prophylaxis during pregnancy
HIV-MTCT	✓				
HBV-MTCT	✓	✓	✓		
Ending YELLOW FEVER epidemics		✓	✓	✓	No vaccine during pregnancy
CHAGAS, incl. MTCT	✓	✓	✓	✓	
MALARIA– <i>Plasmodium falciparum</i> form	✓	✓	✓	✓	
MALARIA– <i>Plasmodium vivax</i> form	✓	✓	✓	✓	
LEISHMANIASIS CUTANEOUS/MUCOCUTANEOUS		✓	✓	✓	No treatment in neonatal period
LEISHMANIASIS, VISCERAL		✓	✓	✓	No treatment in neonatal period
SCHISTOSOMIASIS	✓ Diagnosis only	✓	✓	✓	
STH	✓ 2nd & 3rd trimester	✓	✓	✓	
ONCHOCERCIASIS		✓	✓	✓	
LF	✓	✓	✓	✓	
CYSTICERCOSIS from <i>T. solium</i>	✓ Diagnosis only	✓	✓	✓	
FASCIOLIASIS (<i>F. hepatica</i>)	✓ Early pregnancy	✓	✓	✓	
TRACHOMA	✓	✓	✓	✓	
LEPROSY	✓ Diagnosis only	✓	✓	✓	
SYPHILIS, MTCT	✓				
YAWS	✓	✓	✓		
TB	✓	✓	✓	✓	
CHOLERA, epidemic	✓	✓	✓	✓	





Lines of Action for Integrated
Communicable Disease
Elimination

6. Lines of Action for Integrated Communicable Disease Elimination

Integrated CD elimination can be approached at the larger scale by planning health care services delivery for larger geo-demographic groups (such as those living in urban, peri-urban, or rural areas). It can also be approached with a life course lens, as shown in Table 3, and further focused by matching up life course phases with common locales in which integrated health services that support CD elimination can be delivered to people in these life phases, i.e. home-delivered, school-delivered, worksite/workplace-delivered, and public space-delivered (e.g., community markets, plazas and parks, neighborhood centers, and faith centers).

Public health actions happen at the country level, and interventions are implemented at the local level, be it in urban, peri-urban, or rural areas.

Thus, public health actions happen at the country level, and interventions are implemented at the local level, be it in urban, peri-urban, or rural areas. It is here that the promotion of health and human security and Health in All Policies become most important to the lives of the disadvantaged, and where important movements like Healthy Cities and Healthy Spaces take place. The lines of action of the integrated framework for CD elimination at the country level (outlined below) are mutually complementary and jointly define the provision of a comprehensive set of interventions needed to prevent new infections, stop (or reduce) mortality, stop (or reduce) morbidity, and prevent or correct/minimize disability. Their ultimate effectiveness and ability to meet elimination targets is dependent upon the commitment and resource investments of the PAHO country office, the ministry of health (MOH) (and other government authorities), local partners, and external partners to the integrated CD elimination framework. For each of the four lines of action, the PAHO country office will need to provide the country with technical cooperation, and central levels of government and all partners will need to support actions at the local/municipal level. The following suggestions are of-

ferred for actions at the country level and with local partners.

LINE OF ACTION 1: STRENGTHENING THE INTEGRATION OF HEALTH SYSTEMS AND SERVICE DELIVERY

PROPOSED ACTIONS AT COUNTRY LEVEL

- At country and local levels, intensify strategic information about the elimination of CD through maternal and child health, family and life-course services, community health services, specialized clinics, and environmental health services.
- Undertake structural, functional and administrative adjustment of tasks, schedules, etc., to complete the CD elimination agenda at the country level.
- Develop a country office level agenda for supporting the CD elimination corporate goal, collaborating with the five technical departments in PAHO headquarters: Communicable Diseases and Environmental Determinants of Health (CDE); Evidence and Intelligence for Action in Health (EIH); Family, Health Promotion and Life Course (FPL); Non-communicable Diseases and Mental Health (NMH); Health Systems and Services (HSS).
- Ensure medicines, diagnostics, and supplies are available and affordable locally.
- Strengthen laboratory and diagnostic services at the primary care and higher levels of service.
- Provide training and capacity-building of PHC workers and community health workers/volunteers on how integration works at the PHC and local level.
- Support MOH to create human resources, talent retention, and career paths for its health care workers and volunteers supporting disease elimination programs, especially since their jobs could end once a disease is eliminated.



Handwashing to prevent infectious diseases transmission in Haiti

- At the local level, improve national laboratory networks, laboratory quality, and supply-chain management (clinical and environmental laboratory services, transport and delivery services), for medicines, diagnostic test kits, other kits, insecticides, environmental lab, and environmental monitoring supplies.
- Promote and provide local technical cooperation to MOH for integrated health care delivery, especially at the PHC level, to reach CD elimination.
- Undertake mapping and modeling of vectors and reservoirs, vector insecticide resistance, and trends.
- Establish country-level working groups with MOH to produce guidance documents on integrated control, elimination, prevention, and post-elimination monitoring and evaluation, based on PAHO and WHO guidelines, technical reports, and orientation from their technical advisory groups, in order to create necessary norms and regulations (e.g., mandatory reporting of certain diseases, conditions, and diagnosis and treatment).

WHO/PAHO WITH PARTNERS

- Provide technical cooperation, training and consultation to individual countries and subregions on strengthening local health systems.
- Seek continued and additional support from international partners for strengthening national laboratory networks, laboratory quality, and supply-chain management.
- Provide technical cooperation, training, and consultation on improving national laboratory networks, laboratory quality, and supply-chain management norms and practices, including quality assurance/quality control evaluation where requested.
- Support integrated health care delivery especially at the PHC level, to reach CD elimination.

LINE OF ACTION 2: STRENGTHENING STRATEGIC HEALTH SURVEILLANCE AND INFORMATION SYSTEMS

PROPOSED ACTIONS AT COUNTRY LEVEL

- Approach CD elimination using existing health systems and services and existing programs.
- Strengthen CD surveillance and mapping, control, elimination, prevention, and post-elimination monitoring at the country level.
- Undertake combined mapping of all diseases and conditions targeted for elimination, human populations at risk, and key geographic and demographic characteristics.

WHO/PAHO WITH PARTNERS

- Provide support to strategic databank development and improvement.
- Exchange monitoring and evaluation data and information.
- Provide technical cooperation, training, and consultation on health information and analysis, and environmental monitoring for public health.
- Mobilize resources to complete CD elimination by 2030.

LINE OF ACTION 3: ADDRESSING THE ENVIRONMENTAL AND SOCIAL DETERMINANTS OF HEALTH

PROPOSED ACTIONS AT COUNTRY LEVEL

- PAHO country office with MOH to address through intersectoral collaboration on the common environmental and social determinants of poverty that adversely affect access to health services, social participation, sustainable development, and health equity needed for achieving CD elimination. This should take into consideration actions to simultaneously achieve SDGs and take advantage of existing initiatives for Healthy Cities, Healthy Municipalities and Healthy Spaces.
- Promote and help implement local intersectoral collaboration for improvements for basic water and sanitation access, drainage, solid waste management, housing improvement, and animal husbandry needed for successful CD elimination, and for elimination of open defecation and substitution



Indoor air pollution from cooking fuels in Colombia

**Integrated CD
elimination can
be approached at
the larger scale by
planning health
care services
delivery for larger
geo-demographic
groups.**

of safer forms of energy for polluting cooking biofuels.

- Support MOH and other key ministries for country-level environmental monitoring. Monitor key environmental determinants of the targeted CD, including deforestation, peri-urban growth, heat and drought (crops and livestock), new settlements and roads, new dams, and water projects.
- Promote and use social participation and local participatory planning and mapping, for determining the key pathways to CD elimination.
- Map the resources at the local level, such as schools, mayors, and Healthy Cities/Municipalities to further intersectoral collaboration and learning from local communities, to rapidly advance CD elimination.

WHO/PAHO WITH PARTNERS

- Continuing and additional financial support from international partners for intersectoral collaboration for improvements for basic water and sanitation access, drainage, solid waste management, housing improvement, and animal husbandry and improved household energy sources for cooking, and the broader sustainable development agenda.
- Provide coordinated technical cooperation, training and consultation on intersectoral collaboration for improvements for basic water and sanitation access, drainage, solid waste management, housing improvement, and animal husbandry, and improved household energy sources for cooking.
- Mobilize resources, apart and collectively, to complement and complete CD elimination by 2030.
- Support financial investments to address the social determinants of health and reduce socioeconomic gaps related to poverty and endemization of CD, which in turn will help countries reach health equity and sustainable development goals.

LINE OF ACTION 4: STRENGTHENING GOVERNANCE, STEWARDSHIP, AND FINANCE

PROPOSED ACTIONS AT COUNTRY LEVEL

- Further develop trust and partnerships with municipal governments and civil society for the collective goal of CD elimination.
- Promote and utilize a Health in All Policies approach in governance, stewardship, and finance, by the PAHO country office and MOH, to facilitate CD elimination.

WHO/PAHO WITH PARTNERS

- Continued and additional support from international partners to strengthen municipal government, civil society participation, community engagement, to facilitate CD elimination.
- Provide technical cooperation, training, and consultation on strengthening municipal government, civil society participation, community engagement for sustainable development and health equity leading to CD elimination, and improved environmental conditions.
- Mobilize local, subregional and regional resources to complement and complete CD elimination by 2030.
- Provide support to establish and grow a Health in All Policies approach in governance, stewardship, and finance, to facilitate CD elimination.

ACTIVITIES AND PACKAGES OF INTEGRATED HEALTH SERVICES SUPPORTING THE FOUR LINES OF ACTION

Supporting the framework shown in Section 2, Figure 1 (above) and its four Lines of Action, a set of common activities and packages of integrated health services delivery exist, which include (or can include) CD targeted for elimination, and which can be applied regionally in select life-course phases and at various scales: home, school, work, health facilities, and community (block, neighborhood/village/municipality).

In the process of control and elimination of CD, the affected person or family first has contact or gains access to health care services, whether those services come to his/her home, school, or work-

place, or the person travels to a primary care clinic or another local provider of health care services. Initial examination or screening may occur, followed by a diagnosis (laboratory or clinical), then long- or short-term treatment and case management, including referral and counseling services as needed.

The following are some examples of integrated health services activities and packages that support CD elimination are in current use in some countries, while others are presented here as suggestions (not prescriptions) and concepts for internal discussion within the Organization.

ACTIVITIES

- **Integrated surveillance and monitoring.** Examples: Ensuring hospital admissions and death records cover the array of CDs targeted for elimination. Addition of selected CD targeted for elimination to appropriate existing surveillance activities (e.g., adding neuroschistosomiasis to acute flaccid paralysis syndromic surveillance in areas of co-endemicity).
- **Screening, early diagnosis, and prompt treatment through integrated health services for preschoolers and mothers.** Examples: During perinatal appointments and well-baby clinics, screening (followed by planned treatment or referral) for certain CDs targeted for elimination, like leprosy, Chagas disease and cutaneous leishmaniasis in the pregnant woman, or newborn or young child. In the case of HIV and syphilis, elimination of these diseases can be achieved by leveraging the maternal and child health or immunization platforms to maximize access and availability of CD services, engaging other public health programs like Maternal and Child Health; the Expanded Program on Immunization; Reproductive, Maternal, Newborn and Child Health; Adolescent Health.
- **BEST framework for NTDs.** The **BEST framework** developed in 2017 by the NTD NGO Network (NNN) offers a comprehensive and cross-sectoral approach towards NTD control and elimination, creating connections between behavior change (respecting health as a human right), social inclusion (respecting the SDGs), treatment (reflecting alignment with universal health coverage, and directed to people in different life courses/age groups), and environment (including a One Health perspective). Another option is the inclusion of morbidity management and disability prevention (MMDP) services within PHC services at the local community level. Marchal et al. (2011) have laid out the rationale for including NTD control programs in general health services.
- **Integrated preventive chemotherapy for children and adults.** Examples: Through MDA of anthelmintics in preschool or school-age children, and adults, MDA provided for simultaneous treatment of STH and LF, STH and onchocerciasis, or STH and fascioliasis in both children and adults. Cutaneous leishmaniasis screening could be added in risk areas. Screening for onchocerciasis (nodules), trachoma, cutaneous leishmaniasis and other skin conditions (scabies etc.) is done in the Yanomami area of Venezuela and southern Colombia (excluding onchocerciasis). Already, PHC teams from **CAICET** in Venezuela screen and treat Yanomami communities for malaria, onchocerciasis, scabies and tungiasis during quarterly visits. Such integrated programs can be done with similar groupings of endemic diseases in other indigenous or isolated rural communities in the Region.
- **Integrated screening and treatment of school-age children.** Examples: Recent annual mass campaigns on NIDs in Brazil to provide screening and referral of at-risk school-age children for leprosy and trachoma, and MDA for STH, schistosomiasis, and trachoma. Integrated screening of school-age children for malaria and STH in El Salvador has been successful.
- **Combining vaccination campaigns or planned community outreach services with other CD elimination interventions.** Examples: Childhood vaccination catch-up campaigns can be combined with vaccination of dogs against rabies in dual-risk areas, with PHC and zoonoses control working together (in a One Health approach). Other integrated packages include coordinated deworming for STH, fascioliasis, or schistosomiasis, child vaccination and vitamin A distribution done together in a maternal-child health program.



Mantenga esta ventana abierta para prevenir la transmisión de la tuberculosis

DESECHOS PUNZOCORTANTES

- **Integrating environmental health with CD elimination.** Environmental determinants of health, environmental risk factors, and environmental interventions are often very important in the public health efforts to prevent, control, and eliminate CD, perhaps particularly in urban environments (Latin America and the Caribbean are >70% urbanized). Sanitary conditions in streets and marketplaces are related to vector (rodent) proliferation, the status of urban infrastructure such as sewerage and piped water systems, and solid waste collection and disposal, and the monitoring and control of water quality and accessibility all play a role in the health status of all families including those afflicted with CD. Also, global and regional climate change are macro factors affecting health and disease, and community resiliency during epidemics, and may affect medium- and long-term efforts to eliminate disease transmission, particularly vector-borne diseases. There are several environmentally related CDs targeted for elimination; examples include trachoma, STH, LF, and schistosomiasis, and if we include the built environment, then Chagas disease and TB may be added. Coordinated efforts between environmental health and CD elimination programs are necessary to optimize prevention and elimination of CDs.

PACKAGING

- **Consolidated platform of PAHO's EMTCT+ strategy.** In recognition of the strength of a shared platform for health services delivery around CDs, in 2016 PAHO and WHO established the group on EMTCT+ (PAHO 2017c). The group aims to extend this working model of multi-disease elimination orchestrated through the PHC system, which is already implemented in this Region and will continue to expand. The platform creates a unique opportunity to address EMTCT of other infections such as hepatitis B and Chagas disease in endemic areas of the Americas, beyond the current purpose of eliminating vertical HIV transmission and congenital syphilis. In EMTCT+, joint screening is done for syphilis, HIV, hepatitis B, and Chagas disease, and treatment or referrals arranged for a pregnant woman or newborn.
- **Integrated vector management (IVM) – multiple vectors.** Where there is ge-


ographic overlap (cases of urban malaria, urban dengue, urban Chagas disease) or several diseases with the same vector (*Ae. aegypti* transmitting dengue, Chikungunya, and Zika viruses), IVM planning and principles can be and have been used with success for control and advancing towards the elimination of transmission. IVM of dengue vectors in Latin America and the Caribbean is being tackled under PAHO's Integrated Management Strategy for Dengue Prevention and Control in the Americas (IMS-dengue model), which includes clinical diagnosis and treatment, laboratory, and patient management.

- **SAFE model of trachoma with WASH.** A recent systematic review and meta-analysis (Stocks et al. 2014) of WASH activities or interventions showed a strong positive effect of water, sanitation, and hygiene improvement on the prevention and control of trachoma, making it clear that WASH activities support parts of the SAFE model used for trachoma elimination. As these authors note, there is "...strong evidence to support F and E components of the SAFE strategy. Though limitations included moderate to high heterogeneity, low study quality, and the lack of standard definitions, these findings support the importance of WASH in trachoma elimination strategies and the need for the development of standardized approaches to measuring WASH in trachoma control programs."
- **Multi-disease WASH.** Traditionally, WASH programs have been implemented for control of diarrheal diseases, including cholera, and some food-borne illnesses. Programs addressing these water- and food-borne diseases can also include tackling trachoma (hand and face hygiene) and STH control and be combined with housing improvements (housing sector). Similar to the evidence for WASH and SAFE, a recent systematic review and meta-analysis of WASH activities or interventions and STH (Strunz et al. 2014) showed a strong positive effect of water, sanitation, and hygiene improvement on the prevention and control of STH infections. As these researchers note, "while further research is warranted to determine the magnitude of benefit from WASH interventions for STH control, these results call for multi-sectoral, integrated intervention packages that

are tailored to social-ecological contexts.” Freeman et al. (2013) and Waite et al. (2016) laid out the rationale for intersectoral collaboration and the wider evidentiary argument for integrating WASH and NTD control, which will also contribute to ending open defecation.

- **MMDP and integrated chronic CD management.** To manage morbidity (chronic illness) and prevent or treat disability, it is possible to package together persons suffering from elephantiasis and hydrocele (from LF infection), leprosy and/or tuberculosis, who can have aspects of their screening, diagnosis, treatment, and case management programs (and perhaps primary prevention and stigma interventions) coordinated and managed by one of the responsible branches of health services of the MOH, such as the national TB-leprosy or NIDs program, or through PHC services, which have training and installed capacity for case management.
- **NCD management with CD elimination.** The management of some chronic noncommunicable diseases, like severe diabetes affecting the lower limbs, can fit well with aspects of CD elimination programs, such as management of patients also infected with leprosy or leg and foot lymphedema resulting from LF infection—another angle of MMDP.
- **Integrated tropical skin disease model.** In a recent policy and clinical review, Mitjà et al. (2017) discussed in considerable detail the evidence and opportunity to provide integrated training, assessment, treatment, and referral, as well as prevention and management of neglected tropical skin diseases, including leprosy and other NIDs, and how these could also be tackled together to address other diseases often seen as co-infections (like TB).
- **Multi-plex screening.** Multi-plex serological (see Arnold et al. 2017) and PCR-based screening for multiple diseases may prove very valuable in CD elimination and control programs, when this emerging technology completes validation and becomes and more available in the Region. Individuals who test positive for infections as identified by multi-plex testing, may be then referred for treatment, disease management, and prevention of disability. The multi-plex serological approach is being validated in Haiti by U.S. Centers for Disease Control and Prevention and partners, and is even being adapted to accept eluted dried blood placed on filter paper by finger-prick, instead of liquid samples from direct venous or capillary blood draws.
- **One Health focus.** PHC and zoonoses control can work together at the country level to vaccinate, screen and/or treat/refer patients to PHC and other health care facilities. For example, in co-endemic or co-zoonotic areas, inter-programmatic coordination or integrated health services can tackle several common and severe zoonoses such as rabies, visceral leishmaniasis, and perhaps YF virus. On the animal reservoir side, urban veterinary or zootechnic officers may expand the circle of domestic and wild zoonotic animal reservoirs they keep under regular surveillance.
- **Integrated malaria control and elimination.** Following the model of the PAHO Plan of Action for Malaria Elimination 2016-2020, objective 4.2, “...integrate malaria efforts with maternal and child health in community and local health care programs, communications and social mobilization, health promotion and education interventions, programs on neglected diseases, and occupational health...” (e.g., for mining, timber, and sugarcane workers).
- **IMS-dengue.** PAHO and the Member States and territories successfully use the recently developed **Integrated Management System for Dengue Prevention and Control**, which has seven key interacting components: epidemiology, laboratory, environment, patient care, IVM, social communication, and more recently, vaccines. IMS-dengue is currently undergoing adaptation to help address disease and vector surveillance and case management for individuals infected or co-infected with a combination of dengue, Chikungunya, and/or Zika viruses or at risk of YF virus infection; other mosquito-borne arboviruses (encephalitic arboviruses) could be evaluated as well. IMS-dengue is a key part of the wider PAHO Strategy for Arboviral Disease Prevention and Control (PAHO CD55/16 of 2016).
- Other packaging can be devised and tested.





Proposed Organizational
Structure and
Implementation for
Integrated Communicable
Disease Elimination

7. Proposed Organizational Structure and Implementation for Integrated Communicable Disease Elimination

PROPOSED ACTIONS AT PAHO HEAD-QUARTERS LEVEL

A corporate goal of CD elimination is proposed to be established. A “One Goal” approach within PAHO will be necessary for success. An efficient organizational structure for an integrated elimination (and post-elimination) program at the headquarters level of PAHO will be to establish a functional Secretariat led by CDE, HSS, and FPL. The conservative approach will be to reorganize the work of different technical departments according to diseases and specific cross-cutting functions (which might require Executive Management approval). Significant support is expected from established Technical Advisory Groups engaged with PAHO in support of various goals of prevention and elimination. Also, one or more inter-departmental work groups (WG) will work for long-term efforts in integrated elimination of a set of diseases and post-elimination actions (CDE with HSS, FPL and Strategic Fund; CDE with Health Emergencies [PHE] on arboviruses), while time-limited task forces (TF) will undertake other integrated tasks (e.g., CDE with NMH; CDE with PHE; CDE with External Relations, Partnerships and Resource Mobilization [ERP] for resource mobilization for an integrated CD elimination agenda). The Secretariat and the WGs could offer annual reports to Executive Management or the Strategic Advisory Group once a year. WGs and TFs have not been commonly used in PAHO to date, except for epidemic emergencies and high-level initiatives from the Director. A culture change needs to be encouraged and managed when technical units from different departments begin to work together to support the framework through multiple arms of work.

A decision will need to be made about whether there will be merely simple coordination of investments and support from each department for CD elimination, perhaps through the WGs or TFs, or whether there needs to be a change in the architecture or structure of certain departments to

ramp up integrated technical cooperation among the countries and reach a corporate goal of CD elimination. These issues must be decided along with the establishment of a Secretariat with WG and TFs focused on true organization-wide integration, and what terms of reference will need to be developed to guide such a change. Coordinated investments of PAHO’s resources (financial, human, material, and information technology) will be needed to meet the corporate goal. Simultaneously, the necessary shifts in human resources and the identification of current and potential future financing of the framework will need to be examined. Suggested key activities for proposed actions at PAHO headquarters level are provided in Annex 2.

It is possible that existing bilateral donors such as the U.S. Agency for International Development (USAID), Canada, and the Spanish Agency for International Development Cooperation will take a strong interest in the integrated, sustainable framework to CD elimination since they have made independent investments during the last decade for elimination and control of NTDs, HIV, malaria, TB, and vector control. Also, potential new donors from both the public and private sector may be interested in providing support, including large and small regional foundations, and bilateral agencies of the Scandinavian countries, which have a history of exploring novel approaches to solving global problems and have a strong vested interest in the SDGs and equity. Indeed, as PAHO Deputy Director Dr. Isabella Danel notes, “...the best way to create equity is to eliminate diseases.”

PROPOSED ACTIONS WITH PAHO COUNTRY OFFICES AND PAN AMERICAN CENTERS

Much expertise is found in staff in our country offices and centers, so the involvement of some country and center staff in WG and TF will be appropriate, with PAHO/WHO Representative/Center Director consent. In turn, the work of the WG and TF

will need to be coordinated with targeted country office and the three PAHO Centers (Pan American Foot-and-Mouth Disease Center [PANAFTOSA], Latin American Center of Perinatology, Women and Reproductive Health [CLAP/WR], Latin American and Caribbean Center on Health Sciences Information [BIREME]). Also, some country offices (PAHO/WHO Representatives) and Center Directors may find it convenient to establish their own WG or TF in-house in order to work in an integrated manner towards CD elimination or post-elimination efforts. Indeed, the real groundwork for technical collaboration with MOH and other ministries will need to occur in each country. PAHO/WHO Representatives will need to fully buy into the framework in order to achieve success and reach targets on time.

PROPOSED ACTIONS BETWEEN PAHO/WHO AND PARTNERS

PAHO WGs and TFs can benefit from the participation of external subject matter experts or other representatives as needed; such individuals can be invited observers, ex officio members or regular members of a WG or TF. For key donors of certain elimination interventions (e.g., USAID's support to malaria, HIV, TB, and NIDs elimination), it may be important to invite such participation. Similarly, for such intersectoral interventions as improved water supply and sanitation or housing improvement, it may be advisable to invite to PAHO WG, an expert from other United Nations agencies (United Nations Children's Fund [UNICEF], Food and Agriculture Organization [FAO]), multilateral banks and agencies (e.g., Piso Firme program, World Bank), global health-focused agencies and foundations (Carter Center, ITFDE, Task Force for Global Health, Bill and Melinda Gates Foundation), governmental and bilateral agencies (the United States Government's Department of Health and Human Services, Centers for Disease Control and Prevention, Public Health Service, USAID, Fogarty/National Institutes of Health, Food and Drug Administration, Environmental Protection Agency, National Academy of Sciences, National Aeronautics and Space Administration, Department of Defense; and the Department for International Development [United Kingdom], the Spanish Agency for International Development Cooperation, Canada), WHO Collaborating Centers and regional centers of excellence (universities and research insti-

tutions). The same applies to subregional agencies such as the Caribbean Public Health Agency and subregional development banks.

Particularly for country offices, it may be useful to invite observers from the MOH, legislators and regulators at local and national levels (e.g., municipal government leaders or representatives in municipal councils), or experts from municipal health, environmental, and infrastructure departments, if appropriate in the political context of the country and the technical cooperation profile of the country office. Also, the country office may benefit from extending invitations to experts or observers from NGOs, non-governmental development organizations, and key civil society and business groups, to participate in select WGs or TFs. As PAHO headquarters and country offices organize to implement the integrated CD elimination agenda, the leaders, representatives, and subject matter experts may help facilitate the achievement of targets.

As a next step after the approval of the concept note, and in order to further progress in preparing for this integrated CD elimination framework, two additional tools are proposed to be prepared: (1) an annex containing a general technical platform for life-course and population-targeted sets of interventions, and (2) a table that will identify some critical factors and cross-cutting barriers that shape the feasibility of eliminating these selected CDs in the Americas, to 2030.

What remains now is to embark on building the political support from the national to the municipal level, with our partners and the many branches of civil society, and prepare or amend those action plans needed to fulfill our goal of CD elimination in the Americas.



Vaccinated dog at a rabies vaccination campaign in Bolivia

III. References

- Arnold BF, van der Laan MJ, Hubbard AE, Steel C, Kubofcik J, Hamlin KL, et al. Measuring changes in transmission of neglected tropical diseases, malaria, and enteric pathogens from quantitative antibody levels. *PLoS Negl Trop Dis* 2017;11(5):e0005616. <https://doi.org/10.1371/journal.pntd.0005616>
- Bangert M, Molyneux DH, Lindsay SW, Fitzpatrick C, Engels D. The cross-cutting contribution of the end of neglected tropical diseases to the sustainable development goals. *Infectious Diseases of Poverty* 2017;6:73. doi: 10.1186/s40249-017-0288-0
- Bern C, Garcia HH, Evans C, Gonzalez AE, Verastegui M, Tsang VC, et al. Magnitude of the disease burden from neurocysticercosis in a developing country. *Clin Infect Dis* 1999 Nov;29(5):1203-1209.
- Caffe S, Perez F, Kamb ML, Gomez Ponce de Leon R, Alonso M, Midy R, et al. Cuba validated as the first country to eliminate mother-to-child transmission of human immunodeficiency virus and congenital syphilis: lessons learned from the implementation of the global validation methodology. *Sex Transm Dis* 2016 Dec;43(12):733-736. doi: 10.1097/OLQ.0000000000000528.
- Centers for Disease Control and Prevention. Recommendations of the international task force for disease eradication. *Morbidity and Mortality Weekly Report* 1993;42(RR-16):1-38.
- de Vlas SJ, Stolk WA, le Rutte EA, Hontelez JA, Bakker R, Blok DJ, et al. Concerted efforts to control or eliminate neglected tropical diseases: how much health will be gained? *PLoS Negl Trop Dis* 2016;10(2):e0004386. doi: 10.1371/journal.pntd.0004386.
- Dowdle WR. The principles of disease elimination and eradication. *Bull WHO* 1999;76(2):22-25.
- Dowdle WR, Hopkins DR, eds. *The eradication of infectious diseases. Dahlem Workshop Report*. J. Lupp, series ed. Chichester: John Wiley & Sons; 1998.
- Freeman MC, Ogden S, Jacobson J, Abbott D, Addiss DG, Amnie AG, et al. Integration of water, sanitation, and hygiene for the prevention and control of neglected tropical diseases: a rationale for inter-sectoral collaboration. *PLoS Negl Trop Dis* 2013;7(9):e2439. doi: 10.1371/journal.pntd.0002439.
- Hamrick PN, Aldighieri S, Machado G, Leonel DG, Vilca LM, Uriona S, et al. Geographic patterns and environmental factors associated with human yellow fever presence in the Americas. *PLoS Negl Trop Dis* 2017;11(9):e0005897. <https://doi.org/10.1371/journal.pntd.0005897>
- Hollingsworth TD, Adams ER, Anderson RM, Atkins K, Bartsch S, Basáñez MG, et al. Quantitative analyses and modelling to support achievement of the 2020 goals for nine neglected tropical diseases. *Parasit Vectors* 2015;8:630. doi: 10.1186/s13071-015-1235-1.
- Hopkins DR. Disease eradication. *N Engl J Med* 2013 Jan 3;368(1):54-63.
- Hotez PJ, Bottazzi ME, Franco-Paredes C, Ault SK, Periago MR. The neglected tropical diseases of Latin America and the Caribbean: a review of disease burden and distribution and a roadmap for control and elimination. *PLoS Negl Trop Dis* 2008;2(9):e300. <https://doi.org/10.1371/journal.pntd.0000300>
- Ivers LC. Ending cholera transmission in Haiti. *N Eng J Med* 2017;376(2):101-103.
- Kastner RJ, Stone CM, Steinmann P, Tanner M, Tediosi F. Lessons learned from developing an eradication investment case for lymphatic filariasis. *Adv Parasitol* 2016;94:393-417. doi: 10.1016/bs.apar.2016.08.004.
- Kitayama K, Segura ER, Lake JE, Perez-Brumer AG, Oldenburg CE, Myers BA, et al. Syphilis in the Americas: a protocol for a systematic review of syphilis prevalence and incidence in four high-risk groups, 1980-2016. *Syst Rev* 2017;6:195. doi: 10.1186/s13643-017-0595-3 2017.
- Kunii O, Yassin MA, Wandwalo E. Investing to end epidemics: the role of the Global Fund to control TB by 2030. *Trans R Soc Trop Med Hyg* 2016;110(3):153-154. doi: 10.1093/trstmh/trw005
- Marchal B, Van Dormael M, Pirard M, Cavalli A, Kegels G, Polman K. Neglected tropical disease (NTD) control in health systems: the interface between programmes and general health services. *Acta Tropica* 2011;120:S177-S185. doi: 10.1016/J.ACTATROPICA.2011.02.017
- Mitjà O, Marks M, Bertran L, Kollie K, Argaw D, Fahal AH, et al. Integrated control and management of neglected tropical skin diseases. *PLoS Negl Trop Dis* 2017;11(1):e0005136. doi: 10.1371/journal.pntd.0005136
- Moreno AR. Climate change and human health in Latin America: drivers, effects, and policies. *Reg Environ Change* 2006;6(3):157-164. <https://doi.org/10.1007/s10113-006-0015-z>
- Okello AL, Thomas LF. 2017. Human taeniasis: current insights into prevention and management strategies in endemic countries. *Risk Manag Healthc Policy* 2017;10:107-116.
- Ostfeld R. 2017. Comment: Biodiversity loss and the ecology of infectious disease. *Lancet Planet Health* 2017;1(1):e2-e3. [http://dx.doi.org/10.1016/S2542-5196\(17\)30010-4](http://dx.doi.org/10.1016/S2542-5196(17)30010-4)
- Pan American Health Organization. Regional consultation on disease elimination in the Americas (draft). CHA department, PAHO, unpublished. Washington, DC: PAHO. 2015; 87 pp.
- Pan American Health Organization. *Plan of action for the elimination of neglected infectious diseases and post-elimination actions 2016-2022*. Washington, DC: PAHO; 2016.
- Pan American Health Organization. 2017a. *Plan of action to strengthen surveillance and control of leishmaniasis in the Americas 2017-2022*. Washington, DC: PAHO; 2017a.

- Pan American Health Organization. 2017b. Health in the Americas, 2017. *Summary: Regional Outlook and Country Profiles*. Washington, DC: PAHO; 2017b. <https://www.paho.org/salud-en-las-americas-2017/?lang=en>
- Pan American Health Organization. 2017c. *Elimination of mother-to-child transmission of HIV and syphilis in the Americas. Update 2016*. Washington, DC: PAHO; 2017c.
- Pennington PM, Juárez JG, Arrivillaga MR, De Urioste-Stone SM, Doktor K, Bryan JP, et al. Towards Chagas disease elimination: neonatal screening for congenital transmission in rural communities. *PLoS Negl Trop Dis* 2017;11(9):e0005783. <https://doi.org/10.1371/journal.pntd.0005783>
- Redekop WK, Lenk EJ, Luyendijk M, Fitzpatrick C, Niessen L, Stolk WA, et al. The socioeconomic benefit to individuals of achieving the 2020 targets for five preventive chemotherapy neglected tropical diseases. *PLoS Negl Trop Dis* 2017;11(1):e0005289. doi: 10.1371/journal.pntd.0005289.
- Rendon A, Fuentes Z, Torres-Duque CA, Granado MD, Victoria J, Duarte R, et al. Roadmap for tuberculosis elimination in Latin American and Caribbean countries: a strategic alliance. *Eur Respir J* 2016;48:1282-1287. doi: 10.1183/13993003.01549-2016
- Schmitt LH, Graham HM, White PC. Economic evaluations of the health impacts of weather-related extreme events: a scoping review. *Int J Environ Res Public Health* 2016;13(11):1105. <http://doi.org/10.3390/ijerph13111105>
- Schneider MC, Aguilera XP, da Silva Jr JB, Ault SK, Najera P, Martinez J, et al. Elimination of neglected diseases in Latin America and the Caribbean: a mapping of selected diseases. *PLoS Negl Trop Dis* 2011;5(2):e964. <https://doi.org/10.1371/journal.pntd.0000964>
- Shretta R, Avanceña AL, Hatefi A. The economics of malaria control and elimination: a systematic review. *Malar J* 2016;15:593 doi: 10.1186/s12936-016-1635-5.
- Solomon AW, Marks M, Martin DL, Mikhailov A, Flueckiger RM, Mitjà O, et al. Trachoma and yaws: common ground? *PLoS Negl Trop Dis* 2015 Dec 3;9(12):e0004071. doi: 10.1371/journal.pntd.0004071.
- Stocks ME, Ogden S, Haddad D, Addiss DG, McGuire C, Freeman MC. Effect of water, sanitation, and hygiene on the prevention of trachoma: a systematic review and meta-analysis. *PLoS Medicine* 2014;11(2):e1001605. doi: 10.1371/journal.pmed.1001605.
- Strunz EC, Addiss DG, Stocks ME, Ogden S, Utzinger J, Freeman MC. Water, sanitation, hygiene, and soil-transmitted helminth infection: a systematic review and meta-analysis. *PLoS Medicine* 2014;11(3):e1001620. doi: 10.1371/journal.pmed.1001620.
- Tiwari A, Richardus JH. Investment case concepts in leprosy elimination: a systematic review. *Lepr Rev* 2016 Mar;87(1):2-22.
- Torres JR. Cysticercosis disease burden in Latin America. In C. Franco-Paredes, J.I. Santos-Preciado, eds. *Neglected Tropical Diseases – Latin America and the Caribbean*. Vienna: Springer-Verlag; 2015.
- Velasco-Villa A, Escobar LE, Sanchez A, Shi M, Streiker DG, Gallardo-Romero NF, et al. Successful strategies implemented towards the elimination of canine rabies in the Western Hemisphere. *Antiviral Res* 2017 Jul;143:1-12. doi: 10.1016/j.antiviral.2017.03.023.
- Villegas F, Angles R, Barrientos R, Barrios G, Valero MA, Hamed K, et al. Administration of triclabendazole is safe and effective in controlling fascioliasis in an endemic community of the Bolivian Altiplano. *PLoS Negl Trop Dis* 2012;6(8):e1720. doi: 10.1371/journal.pntd.0001720
- Waite RC, Velleman Y, Woods G, Chitty A, Freeman MC. Integration of water, sanitation and hygiene for the control of neglected tropical diseases: a review of progress and the way forward. *Int Health* 2016;8(suppl 1):i22-i27. <https://doi.org/10.1093/inthealth/ihw003>
- World Health Organization. 2015a. *Investing to Overcome the Global Impact of Neglected Tropical Diseases, Third WHO Report on Neglected Tropical Diseases*. Geneva: WHO; 2015a
- World Health Organization. 2015b. *Water sanitation and hygiene for accelerating sustaining progress on neglected tropical diseases: a global strategy 2015-2020*. Geneva: WHO; 2015b. Available at: http://apps.who.int/iris/bitstream/10665/182735/1/WHO_FWC_WSH_15.12_eng.pdf?ua=1
- World Health Organization. Preventable epilepsy: *Taenia solium* infection burdens economies, societies and individuals: a rationale for investment and action. Geneva: WHO; 2016.

IV. Annexes

ANNEX 1. PAHO, WHO, AND UNITED NATIONS STRATEGIES AND PLANS OF ACTION MOST RELEVANT TO COMMUNICABLE DISEASE ELIMINATION IN THE AMERICAS

- [United Nations Sustainable Development Goals](#) (especially Goal 3) (2015)
- WHO [Health Systems Strengthening Framework for Action](#) (2007)
- [WHO Global Strategy for Women's, Children's, and Adolescents' Health 2016-2030](#) (2016)
- UNAIDS [Global Plan towards the Elimination of New HIV Infections Among Children by 2015 and Keeping Their Mothers Alive](#) (2011)
- WHO [End TB Strategy](#): global strategy and targets for tuberculosis prevention, care, and control after 2015 (2014)
- WHO Global Health Sector Strategies on [HIV, viral hepatitis and sexually transmitted infections](#) 2016-2021 (2016)
- WHO Global Technical Strategy for [Malaria](#) 2016-2030 (2015)
- WHO [Framework for Malaria Elimination](#) (2017)
- WHO [Roadmap on NTDs](#) (2012) and WHO [Resolution on NTDs](#) (2013)
- WHO [WASH and NTDs](#) Global Strategy 2015-2020 (2015)
- PAHO Strategy for [Universal Access to Health and Universal Health Coverage](#) (2014)
- PAHO [Plan of Action on Health in All Policies](#) (2014) and [Health in All Policies Road Map](#) (2015)
- PAHO Plan of Action for the [Prevention and Control of Viral Hepatitis](#) (2015)
- PAHO Plan of Action for the Prevention and Control of [HIV and Sexually Transmitted Infections](#) 2016-2021 (2016)
- PAHO Plan of Action for the Prevention and Control of [Tuberculosis](#) (2015)
- PAHO Plan of Action on [Immunization](#) [2016-2020] (2015)
- PAHO Strategy and Plan of Action for [Chagas Disease Prevention, Control and Care](#) (2010)
- PAHO Strategy for [Arboviral Disease Prevention and Control](#) (2016)
- PAHO Plan of Action for the Elimination of [Neglected Infectious Diseases and Post-Elimination Actions](#) 2016-2022 (2016)
- PAHO Plan of Action for [Malaria Elimination](#) 2016-2020 (2016)
- PAHO [Roadmap for Tuberculosis Elimination in Latin American and Caribbean countries: A Strategic Alliance](#) (2016)
- PAHO [Plan of Action to Strengthen the Surveillance and Control of Leishmaniasis in the Americas](#) 2017-2022 (2017)
- PAHO Strategy and Plan of Action for the [Reduction of Chronic Malnutrition](#) (2010)
- PAHO [EMTCT Plus Framework](#) (2017)
- PAHO Plan of Action for the Prevention and Control of [Non-Communicable Diseases in the Americas](#) 2013-2019 (2013)

ANNEX 2. PAHO, WHO, AND UNITED NATIONS STRATEGIES AND PLANS OF ACTION MOST RELEVANT TO COMMUNICABLE DISEASE ELIMINATION IN THE AMERICAS

FOR LINE OF ACTION 1

- Secure political, financial, and administrative support and prioritization of integrated CD elimination in headquarters (and with WHO headquarters) to focus on the long game/end game of CD elimination.
- Reorient work and organization of CDE (and other involved departments and centers) to focus on the long game/end game and a corporate goal of CD elimination. Same applies at country office level.
- Establish WG and TF to enhance inter-unit, inter-departmental, inter-agency and partner coordination (headquarters and country level).
- Establish WG to determine how best to base the integrated CD elimination framework in a Universal Health Care approach, such that health care itself is shifted to encompass relatively new areas of work (CD control and elimination) which currently or in the past were stand-alone programs minimally related to the broader health care services.
- Enhance coordination at headquarters (and country level) to improve access to vaccines, antimalarials, deworming, and other NID medicines, and key commodities such as long-lasting insecticidal bed nets, vector control products (from PAHO's Special Funds), and water disinfection equipment, latrine slats from other sources as needed.
- Intensify strategic information about the elimination of CD through maternal and child health, family and life-course services, community health services, specialized clinics, and environmental health services.
- Integrate CD elimination interventions vertically within existing CD control units including veterinary public health (PANAFTOSA), and with EIH/HA.
- Ensure close collaboration and coordination between CDE, HSS, the PAHO Special Funds, as well as with FPL and NMH.
- Increase access to PAHO's Special Funds, and improve supply chain management (medicines, diagnostic test kits, insecticides, other kits and supplies).
- Intensify external resource mobilization to ensure completion of CD elimination by 2030.
- Improve the Region's national laboratory networks, country laboratory quality (quality assurance/quality control), in coordination between CDE and HSS/MT.
- Improve supply chain management (clinical and environmental laboratory services, transport and delivery services), for medicines, diagnostic test kits, other kits, insecticides, environmental lab and environmental monitoring supplies.
- Utilize the concept of Public Health Functions to determine the optimal paths of health services delivery to support CD elimination.
- Coordinate, promote, and provide regional-level technical cooperation to the Member States and territories for integrated health care delivery, especially at the PHC level, to reach CD elimination.

FOR LINE OF ACTION 2

- Identify CD determinants, spatial distribution, and burden at the Regional level.
- Improve health analysis capacity at all levels, working with local academic partners and WHO Collaborating Centers.
- Establish a Strategic Databank for CD elimination. Determine data and information needs and availability and modify the existing health information systems databank which will be needed for PAHO's CD elimination work, including monitoring and evaluation of progress.

- Identify the Lessons Learned from the Region's successes in eliminating polio, measles etc., to inform the modification of the current health information systems databank.
- Define and develop an integrated regional CD elimination agenda and plan of action, using strategic data and analysis.
- Strengthen the conduct and coordination of regional CD surveillance and mapping, control, elimination, prevention, and post-elimination monitoring at the headquarters level.
- With a household and neighborhood view, map and analyze at Regional level the basic infrastructure needs with a reorientation to helping fulfill the CD elimination agenda.
- Set up a Communicable Diseases Elimination Observatory for the Region, to disseminate lessons learned and policy guidance at country level to high-level decision-makers (see models at that Massachusetts Institute of Technology's Abdul Latif Jameel Poverty Action Lab and Public Health England), as well as to highlight PAHO and WHO guidelines and technical notes on integrated disease elimination.

FOR LINE OF ACTION 3

- Strengthen basic infrastructure related to desired health outcomes, such as WASH, solid waste management, housing, animal husbandry, thus linking to other health-related SDGs, especially SDG 5 and SDG 6. Coordinate or partner with IDB, World Bank, and other basic infrastructure investors, to support CD elimination.
- Monitor at the regional level the key environmental determinants of the targeted CD, including regional and frontier views of deforestation, peri-urban growth, climate change, agriculture and livestock change, new settlements, large dams, and water projects.
- Address through intersectoral collaboration the common social determinants of poverty that adversely affect access to health services, social participation, and equity, so no one is left behind in the process to eliminate CD. CDE and other technical departments

may strengthen collaboration with CDE to fast-track and sustain CD elimination efforts.

FOR LINE OF ACTION 4

- Strengthen national and civil society participation, and community engagement (direct action, collaboration), including through local initiatives such as Healthy Cities and Healthy Spaces.
- Engage national governments and civil society (civil society organizations, faith-based groups, university and research institutions, private sector) to provide stewardship and finance the elimination agenda at the local level
- Promote and utilize a Health in All Policies approach in national governance, stewardship, and finance, and negotiation with donors.

Box 1. Evolution of Terms

THE INTERNATIONAL TASK FORCE FOR DISEASE ERADICATION 1989-1992⁴

Control: Reduced incidence or prevalence of a disease or condition; control measures are still required.

Elimination: Refers to cessation of transmission of a disease in a single country, continent, or other limited geographic area, rather than global eradication (e.g., polio in the Americas). It is also theoretically possible to eliminate a disease in humans while the microbe remains at large (e.g., neonatal tetanus). Although a disease itself may remain, a particularly undesirable clinical manifestation of it may be prevented entirely (e.g., blindness from trachoma) or new transmission interrupted (e.g., infectious yaws). Control of a disease or its manifestations to a level that it is no longer considered a public health problem, as an arbitrarily defined qualitative (e.g., onchocerciasis in West Africa) or quantitative (e.g., leprosy incidence below one case per 10,000 population) level of disease control.

Eradication: Reduction of the worldwide incidence of a disease to zero as a result of deliberate efforts, obviating the necessity for further control measures. True eradication usually entails eliminating the microorganism itself or removing it completely from nature.

4. U.S. Centers for Disease Control and Prevention. 1993. Recommendations of the International Task Force for Disease Eradication. MMWR 42(RR-16):1-38. Link: <https://www.cdc.gov/mmwr/PDF/rr/rr4216.pdf>

THE 1997 DAHLEM WORKSHOP REPORT

Control: The reduction of disease incidence, prevalence, morbidity, or mortality to a locally acceptable level as a result of deliberate efforts; continued intervention measures are required to maintain the reduction. Example: diarrheal diseases.

Elimination of disease: Reduction to zero of the incidence of a specified disease in a defined geographical area as a result of deliberate efforts; continued intervention measures are required. Example: neonatal tetanus.

Elimination of infections: Reduction to zero of the incidence of infection caused by a specific agent in a defined geographical area as a result of deliberate efforts; continued measures to prevent reestablishment of transmission are required. Example: measles, poliomyelitis.

Eradication: Permanent reduction to zero of the worldwide incidence of infection caused by a specific agent as a result of deliberate efforts; intervention measures are no longer needed. Example: smallpox.

Extinction: The specific infectious agent no longer exists in nature or in the laboratory. Example: none.

Sources: Dowdle and Hopkins, eds., 1998⁵; Dowdle 1999⁶

5. Dowdle WR and Hopkins DR, eds. 1998. The Eradication of Infectious Diseases. Dahlem Workshop Report. J. Lupp, series ed. Chichester: John Wiley & Sons. Link: <https://tinyurl.com/y3pnlkjm>

6. Dowdle WR. 1999. The principles of disease elimination and eradication. Bull. WHO 76(2):22-25. Link: <http://www.who.int/iris/handle/10665/260633>

WHO STRATEGIC AND TECHNICAL ADVISORY GROUP ON NEGLECTED TROPICAL DISEASES 2014, AS AMENDED MAY 2015⁷

Control: Reduction of disease incidence, prevalence, morbidity, and/or mortality to a locally acceptable level as a result of deliberate efforts; continued intervention measures are required to maintain the reduction.

Elimination as a Public Health Problem (EPHP): A term related to both infection and disease. It is defined by achievement of measurable global targets set by WHO in relation to a specific disease. When reached, continued actions are required to maintain the targets and/or to advance [towards] the interruption of transmission. The process of documenting elimination as a public health problem is called validation.

Elimination of Transmission (EOT) (also referred to as “interruption of transmission”): Reduction to zero of the incidence of infection caused by a specific pathogen in a defined

geographical area, with minimal risk of re-introduction, as a result of deliberate efforts; continued actions to prevent reestablishment of transmission may be required. The process of documenting elimination of transmission is called verification.

Eradication: Permanent reduction to zero of a specific pathogen, as a result of deliberate efforts, with no more risk of reintroduction. The process of documenting eradication is called certification.

Extinction: Eradication of the specific pathogen so that it no longer exists in nature or the laboratory, which may occur with or without deliberate efforts.

Editor’s note: Certification occurs under an International Commission. In a similar process, as part of the Global Polio Eradication Initiative, in 1994 the WHO Region of the Americas was certified polio-free.

⁷ Report of the WHO Strategic and Technical Advisory Group for Neglected Tropical Diseases 2015, 8th meeting. https://www.who.int/neglected_diseases/NTD_STAG_report_2015.pdf?ua=1

Box 2. Highlights of Regional Progress 2009-2017

- Colombia, Ecuador, and Mexico were the first countries in the world to receive WHO verification of elimination of human onchocerciasis; Guatemala was verified in 2016. The number of people needing treatment for onchocerciasis in the region declined from more than 336,000 in 2009 to just over 25,000 in 2015.
- Mexico has been validated by WHO as having eliminated trachoma as a public health problem as of 2017.
- Seventeen Central and South American countries have eliminated vector-borne transmission of Chagas disease in all or part of their national territory.
- All countries in the Americas except Brazil have eliminated leprosy as a national public health problem.
- Fourteen countries are considered free of local malaria transmission.
- Three countries, Costa Rica, Suriname, and Trinidad and Tobago, were removed from the list of endemic countries for lymphatic filariasis in 2011, and have not reported any local transmission, while Brazil, Dominican Republic, and Haiti are close to elimination of transmission.
- More than 5 million preschool children in the Region were treated for soil-transmitted helminthiasis in 2015, 40% of the total needing treatment; and of the 32 million school-age children, 20.4 million needing treatment also received treatment.
- Six countries and territories in the Caribbean may have eliminated the transmission of schistosomiasis, but there are still some areas with transmission in limited foci.
- Cases of human rabies transmitted by dogs continue to be limited to a small number of geographical areas.
- By 2017, 20 countries and territories reported data compatible with the elimination targets of mother-to-child transmission of HIV and 15 with congenital syphilis. In the Americas, Cuba in 2015, followed by six other Caribbean countries and territories, were validated by WHO for the dual eliminations.
- The number of reported cases of neonatal tetanus declined from 22 in 2011 to 13 in 2017; only in Haiti does it continue to be a public health challenge.

ANNEX 3. TABLE 2. OPTIONS FOR INTEGRATED RESPONSE FOR DISEASE ELIMINATION BASED ON ARRAY OF INTERVENTIONS

COLOR KEY

■ Virus ■ Protozoa & Metazoa ■ Bacterial & Bacterial-like ■ Environmental determinants

DISEASE BY INTERVENTIONS POSSIBLE	HOUSING IMPROVEMENTS	WASH IMPROVEMENTS	FOOD SAFETY	SOLID WASTE MGMT.	ANIMAL HUSBANDRY IMPROVED	OTHER COMMUNITY INFRA-STRUCTURE INCL. DRAINAGE	LOCAL HABITAT MGMT.	COMMUNITY POVERTY REDUCTION	IVM - INTEGRATED VECTOR MGMT.	DOG VACCINATION	STRAY DOG CONTROL	VERTEBRATE ANIMAL RESERVOIR MGMT.	EDUCATION FOR BEHAVIOUR CHANGE	PHC ACCES & SERVICE	MCH CLINICS	SPECIAL CLINICS INCL. DIALYSIS, FEVER, SKIN, EPILEPSY	VX AND IMMUNIZATION	RX AND TX (CONVENTIONAL)	SURVEILLANCE - PASSIVE & ACTIVE OPTION OF COMMUNITY-OPERATED	MAPPING	ENVIR. MONITORING - LOCAL ECOLOGICAL CHANGE	PREVENTIVE CHEMOTHERAPY USING MDA- MASS DRUG ADMINISTRATION	MMDP- MORBIDITY MANAGEMENT AND DISABILITY PREVENTION	SECONDARY PREVENTION - EARLY DETECTION & PROMPT INTERVENTION TO CONTROL DISEASE & MINIMIZE DISABILITY
RABIES (by dog)					✓			✓		✓	✓	✓	✓	✓			✓	✓	✓	✓				
HIV-MTCT								✓					✓	✓	✓	✓	✓	✓	✓	✓				✓
HBV-MTCT								✓					✓	✓		✓	✓	✓	✓	✓				
YF EPIDEMICS	✓	✓		✓		✓	✓	✓	✓			✓	✓	✓			✓	✓	✓	✓	✓		✓	
HPV								✓					✓	✓	✓		✓			✓				
FMD (cattle)					✓							✓					✓ cattle			✓	✓			
CHAGAS DISEASE	✓		✓		✓		✓	✓	✓			✓	✓	✓	✓			✓	✓	✓				✓
MALARIA PF/PV	✓	✓				✓	✓	✓	✓				✓	✓	✓	✓		✓	✓	✓	✓			
LEISH C/MC	✓			✓	✓	✓	✓	✓	✓		✓	✓	✓	✓	✓	✓		✓	✓	✓	✓	✓	✓	✓
LEISH VISCERAL	✓			✓	✓	✓	✓	✓	✓		✓	✓	✓	✓	✓	✓		✓	✓	✓	✓	✓	✓	✓
SCHISTO		✓				✓	✓	✓	✓			✓	✓	✓				✓	✓	✓	✓			✓
STH	✓	✓	✓	✓		✓	✓	✓	✓				✓	✓				✓	✓	✓		✓		
ONCHO							✓	✓	✓				✓	✓				✓	✓	✓	✓	✓		✓
LF	✓	✓		✓		✓		✓					✓	✓				✓	✓	✓		✓	✓	✓
CYSTICERCOSIS			✓	✓	✓			✓				✓	✓	✓		✓		✓	✓	✓				
FASCIOLIASIS		✓	✓		✓			✓	✓			✓		✓	✓			✓	✓	✓	✓	✓		✓
TRACHOMA		✓				✓	✓	✓	✓				✓	✓	✓	✓		✓	✓	✓		✓		✓
LEPROSY								✓				✓	✓	✓				✓	✓	✓				✓
TUBERCULOSIS	✓							✓					✓	✓	✓		✓	✓	✓	✓			✓	✓
SYPHILIS-MTCT								✓					✓	✓	✓	✓	✓	✓	✓	✓				
YAWS								✓					✓	✓				✓	✓	✓				✓
CHOLERA		✓	✓	✓		✓		✓					✓	✓	✓			✓	✓	✓				✓
OPEN DEFECATION	✓	✓						✓					✓							✓	✓			
POLLUTING BIOMASS COOKING FUELS	✓							✓												✓	✓			



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