Guyana's National Action Plan for Neglected Infectious Diseases

2022 – 2027

MINISTRY OF HEALTH
GUYANA

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Acronyms & Abbreviations

Ag	Antigen
CL	Cutaneous Leishmaniasis
DEC	Diethylcarbamazine Citrate
DOT	Directly Observed Therapy
ELISA	Enzyme Linked Immuno Sorbent Assay
EMTCT+	Framework for elimination of mother-to-child transmission of HIV, Syphilis, Hepatitis B, and Chagas
EU	Evaluation Unit (for LF)
FFS	Fite Faraco Stain (for Leprosy)
FTS	Filariasis Test Strip (for LF)
G2D	Grade 2 Disability (in Leprosy)
GPELF	Global Program to Eliminate Lymphatic Filariasis
ICT	Immunochromatographic Antigen Card (test for LF)
IDA	Mass drug administration with Ivermectin, DEC and Albendazole (for LF)
IEC	Information, Education and Communication
IU	Implementation Unit (for LF)
LF	Lymphatic Filariasis
LLIN	Long Lasting Impregnated Nets
M&E	Monitoring and Evaluation
MB	Multibacillary (Leprosy)
MCH	Maternal and Child Health
MCL	Mucocutaneous Leishmaniasis
MDA	Mass Drug Administration (for LF, STH)
MDT	Multidrug Therapy (for Leprosy)

MoH	Ministry of Health
NCDR	New Case Detection Rate
NGO	Non-Governmental Organization
NID	Neglected Infectious Disease
NPHRL	National Public Health Reference Laboratory
NTD	Neglected Tropical Disease
PAHO	Pan American Health Organisation
PB	Paucibacillary (Leprosy)
PCR	Polymerase Chain Reaction
QA	Quality Assurance
QC	Quality Control
SDG	Sustainable Development Goal(s)
SSS	Slit Skin Smear (for Leprosy)
STH	Soil Transmitted Helminthiasis
SWOT	Strengths, Weaknesses, Opportunities and Threats
TAS	Transmission Assessment Survey (for Lymphatic Filariasis)
WASH	Water Sanitation and Hygiene
WHO	World Health Organization
ZN	Ziehl Neelson stain (for Leprosy)

Definitions

Term	Definition
Autochthonous:	Domestic or indigenous disease transmission
Control of Cutaneous Leishmaniasis:	As CL has a sylvatic cycle in Guyana, elimination is not feasible. CL is targeted by WHO for control. The WHO target is for countries to detect and report 85% of all cases and treat 95% of reported cases.
Elimination of Chagas Disease as a public health problem:	Domestic Triatomine infestation less than 1%.
Elimination of Leprosy:	No new autochthonous cases as a result of interruption of transmission.
Elimination of Leprosy as a Public Health Problem:	Less than one Leprosy case per 10,000 population.
Elimination of Soil Transmitted Helminthiasis as a Public Health Problem:	Less than 2% of STH infection of moderate and heavy intensity due to *Ascaris lumbricoides, Trichuris trichiuria, Necator americanus* and *Ancylostoma duodenale.*
Grade 2 Disability in Leprosy:	Visible deformities.
One Health:	An integrated, unifying approach that aims to sustainably balance and optimize the health of people, animals, and ecosystems.
Soil Transmitted Helminthiasis:	Infection with intestinal parasites, i.e. *Strongyloides stercoralis* (roundworms), *Ascaris lumbricoides* (roundworms), *Trichiuris trichiuria* (whipworms), *Necator americanus*, *Ancylostoma duodenale* (hookworms).

Executive Summary

This integrated plan of action for elimination of selected neglected infectious diseases in Guyana focuses on five diseases: Leprosy, Lymphatic Filariasis, Chagas Disease, Cutaneous and Mucocutaneous Leishmaniasis and Soil Transmitted Helminthiasis.

Sections 1 to 7 present the Situation Analysis which references three global and regional framework documents for neglected infectious diseases, i.e. the WHO NTD roadmap 2021-2030, the PAHO plan of action for neglected infectious diseases (2016 – 2022) and the PAHO Disease Elimination Initiative (2019). The situation analysis provides general geographic, political, administrative, demographic, environmental and socio economic information on Guyana. It also characterises the health system and the draft Vision 2030 national health strategic plan. The Neglected Infectious Disease (NID) programs in Guyana are described including organizational structure, laboratory support, surveillance systems, and current strategies for prevention, control and elimination. Section 7 of the Situation Analysis concludes with a SWOT Analysis of the NID programs.

Section 8 presents the integrated national NID Plan of Action, including Vision, Mission, Guiding Principles and Strategic Objectives and Enabling Priorities.

The *Enabling Priorities* are:

1. Governance, Advocacy and Leadership.
2. Communication between Central NID programs and regional health services.
3. Proper budgeting and adequate funding.

The *Strategic Objectives* are:

1. Strengthen NID and vector surveillance.
2. Mainstream NID diagnosis, care and case management in the central and regional health services.
3. Strengthen laboratory capacity and quality, for NID and vector diagnosis and detection.
4. Improve NID program management, integration, resources and operational research.
5. Increase knowledge and awareness of NID's, and reduce stigma and discrimination.
6. Collaborate with other sectors and programs including WASH, rehabilitation services, Amerindian Affairs, and Maternal and Child Health program.

The expected outcomes, key actions, timelines, performance indicators and responsibility matrix are specified for each strategic objective.

The Appendices provide:

1. Disease specific approaches for control and elimination.
2. Milestone plan.
3. Monitoring and evaluation indicators**.**

1

Situation Analysis

1.1 Introduction

Neglected tropical diseases are ancient diseases of poverty that inflict a devastating human, social and economic burden on more than 1 billion people worldwide, predominantly in tropical and subtropical areas, among the most vulnerable marginalised populations.[12] In the Americas region, PAHO uses the term "Neglected Infectious Diseases". Although the WHO roadmap identifies a diverse group of 20 neglected tropical diseases, this National Action Plan will address five diseases in Guyana, i.e. Chagas Disease, Cutaneous Leishmaniasis, Leprosy, Lymphatic Filariasis, and Soil Transmitted Helminthiasis.

The following section will describe relevant global WHO and regional PAHO frameworks for the elimination of neglected infectious diseases.

1.2 WHO NTD Roadmap

The WHO Roadmap, "Ending the neglect to attain the SDG's: a road map for neglected tropical diseases 2021 – 2030" sets global targets and milestones to prevent, control, eliminate or eradicate neglected tropical diseases over the next decade. It also sets cross-cutting targets aligned with WHO's 13th Global Program of Work 2019 – 2023 and the Sustainable Development Goals.

The elimination of NID's will facilitate the achievement of Universal Health Coverage as well as several Sustainable Development Goals. SDG Target 3.3 is to "end the epidemics of NTD's by 2030" as part of Goal 3 – "Ensure healthy lives and ensure wellbeing for all at all ages." Under the banner of Universal Health Coverage, the population at risk for NID's should be protected against catastrophic out-of- pocket health expenditures.

[1] WHO, Ending the neglect to attain the SDGs: a road map for neglected tropical diseases 2021 – 2030. https://www.who.int/publications/i/item/9789240010352

The roadmap proposes three pillars or principles to achieve the targets through cross-cutting activities for multiple diseases. The pillars are:

1. Accelerate programmatic action.
2. Intensify cross-cutting approaches that can address multiple NID's.
3. Change operating models and culture to facilitate country ownership.

The roadmap advocates for country ownership, though national NID program leadership and mainstreaming NID programs into national health plans, budgets and systems to improve coverage and sustainability. Neglected infectious disease treatment and care should be included in the national package of essential health services. Health facilities in the national health system should provide NID interventions from prevention to diagnosis, treatment, care and rehabilitation. NID data management should be included in the national health information system. Similarly, the national medicine supply and logistics systems should provide NID medicines, and the national pharmacovigilance system should cover adverse drug reactions to NID medicines. NID capacity building should be included in the Ministry of Health's standard training modules or staff induction training.

Partners will support countries to address gaps, strengthen capacity and achieve targets. Community engagement will assist with program implementation, follow up and review.

The WHO NTD roadmap also recommends integration of program delivery platforms across multiple diseases. A relevant example for Guyana would be an integrated skin NTD strategy that addresses Leprosy, Lymphatic Filariasis, and Cutaneous Leishmaniasis. Some of the program elements that could be integrated for these diseases include:

- Planning, monitoring and evaluation of skin NTD's;
- Information systems for reporting and response, e.g. integrated distribution maps;
- Training health care workers on integrated case detection, clinical care, diagnosis, treatment and morbidity management;
- Support services such as mental health, stigma and discrimination, and psychosocial support;
- Social mobilisation and community health education on skin NTD's to facilitate early reporting, and treatment seeking, as well as self-care.

High level political will is required for multisectoral action at the national level. Clear organisational roles and responsibilities must be delineated to maximise collaboration and efficiency. The NTD roadmap recommends multisectoral coordination between the Ministry of Health and Vector Control, WASH, mental health and disability services, in order to provide psychological support and counselling, treatment and morbidity management and disability support as well as training in self-care. Concerted action will be required between national and local governments for local program delivery and monitoring.

NID awareness campaigns should include the services responsible for maternal and child health. Coordination with the education sector is necessary for campaigns that are conducted in schools, such as MDA for Lymphatic Filariasis and Soil Transmitted Helminths. An example of coordination with WASH is to share micromaps of endemicity of WASH related NTD's, in order to target NTD hotspots for WASH interventions. Joint social mobilisation campaigns could be conducted to increase awareness of improved health outcomes resulting from behaviour change, such as safe water and hand hygiene.

The WHO NTD Roadmap has a monitoring and evaluation framework as a companion document. The M&E framework facilitates reporting against standard defined indicators to improve accountability and responsive action. There is a need to strengthen, integrate and mainstream monitoring and evaluation into national health information systems. High quality monitoring and evaluation at the national level enables assessment of progress against national, regional and global targets and health SDG's. The M&E framework measures impacts and outcomes rather than inputs, processes and outputs. Each country is encouraged to develop its own theory of change that assesses inputs, processes and outputs. The roadmap also has a sustainability framework companion document that promotes the same approaches as the framework, but recommends political, social, economic, and environmental analysis in order to identify root causes of gaps and develop strategies to address the gaps.

1.3 PAHO Plan of Action for Neglected Infectious Diseases (2016 to 2022)

In 2016, PAHO's Executive Committee approved the Plan of Action for the Elimination of Neglected Infectious Diseases and Post Elimination Actions 2016-2022. The Plan of Action addresses the surveillance, management, control and elimination of 12 neglected infectious diseases found in the Americas including Chagas Disease, leishmaniasis, leprosy, lymphatic filariasis and soil transmitted helminths that are found in Guyana.

The objectives of the Plan of Action that are relevant for Guyana's National Action Plan for NID's include:

- Interrupting the transmission of and eliminating NIDs for which there are cost effective tools: Chagas Disease, Leprosy (Eliminated as a public health problem) and Lymphatic Filariasis.
- Preventing, controlling, and reducing the burden of disease from NIDs for which there are integrated and innovative management tools: Cutaneous Leishmaniasis and soil-transmitted helminthiasis.
- Reducing the risk of recrudescence or reintroduction of any NID in the post-elimination phase.

The strategic lines of action to achieve these objectives that are relevant for Guyana are:

Table 1: NID Strategic Lines of Action, with indicators and target (selected for relevance to Guyana's NID's)

Strategic Line of Action 1: Strengthen innovative and intensified disease surveillance, diagnosis and case management of NIDs.		
Objective	**Indicator**	**Guyana's status**
1.1 Reduce the proportion of children with cutaneous leishmaniasis	1.1.2 Number of endemic countries that have reduced the proportion of children under 10 years old with cutaneous leishmaniasis by 50%	No data
1.2 Accelerate actions to interrupt domiciliary transmission of Chagas disease by the principal vectors	1.2.1 Number of endemic countries and territories where the entire endemic country or territory, or the endemic territorial subdivision, has a domestic infestation index (either by the principal triatomine vector species or by the substitute vector) of less than or equal to 1%	No data
1.3 Further reduce the burden of leprosy	1.3.1 Number of endemic countries and territories with a high burden of leprosy that have less than one new case per million population with grade 2 disabilities at diagnosis	Guyana has a total population of approximately 750,000, and a low burden of Leprosy. In 2020, only 1 new case had grade 2 disabilities at diagnosis, in region 3.
	1.3.2 Number of endemic countries that have eliminated leprosy as a public health problem at the first subnational level.	Guyana has eliminated Leprosy as a public health problem. Current national prevalence is 0.44
Strategic Line of Action 2: Strengthen preventive chemotherapy and increase access to basic health care for NID		
2.1 Increase access to preventive chemotherapy for populations at risk of selected NIDs according to	2.1.1 Number of endemic countries that have achieved the recommended treatment	LF – IDA/MDA was done successfully in all eight (8) endemic regions with more than 65% coverage in 2019 and 2021.

PAHO/WHO recommendations	target coverage of the population at risk of lymphatic filariasis & STH necessary to interrupt transmission, depending on the country's epidemiological situation	STH- LF MDA activities included the distribution of Albendazole which is used in STH chemoprophylaxsis from as early as 2017 to 2021 via household, school and fixed point strategies. However, same was not done in Regions 8 & 9.
Strategic Line of Action 3: Strengthen integrated management of vectors		
3.1 Strengthen integrated management of NID vectors	3.1.1 Number of NID-endemic countries that have applied strategies related to the integrated management of vectors, according to their epidemiological situation	No data available
	3.1.2 Number of endemic countries that have strengthened their capacity in terms of NID entomology, according to their epidemiological situation	No data available
Strategic Line of Action 4: Adopt intersectoral approaches to reduce the risk of NID transmission through improved access to safe water, basic sanitation, and hygiene		
4.1 Develop new partnerships and networks of partners and stakeholders in NID-endemic countries to tackle the social determinants of health and improve living conditions	5.1.1 Number of NID-endemic countries that establish new networks or groups of partners and stakeholders to support the development and implementation of inter programmatic and/or intersectoral actions designed to improve living conditions (e.g., potable water, basic sanitation and hygiene, improved housing) in communities at high risk of transmission of NID, depending on the country's epidemiological situation	No data available

4.2 Adopt the WHO WASH-NTD strategy (2015), as adapted for NID endemic countries in the Region	5.2.1 Number of NID-endemic countries that use the framework of the WHO WASH-NTD strategy as part of national or subnational approaches to tackling NID	WASH strategies are used for LF and leishmaniasis at the central level however, these activities are not yet decentralized.
Strategic Line of Action 5: Incorporate innovative approaches supported by operational/ implementation research to eliminate disease transmission and address NID post-elimination actions and new priorities		
5.1 Develop and implement actions to monitor and sustain the achievement of control and elimination of NIDs in countries that have reached specific elimination goals	5.1.1 Number of NID-endemic countries that have achieved the goals of elimination of one or more NIDs and have developed and put in place measures to prevent disease resurgence or reintroduction of Chagas disease & Lymphatic Filariasis	Guyana has eliminated Leprosy at the national level as a public health problem. LF once the surveillance surveys are passed should be eliminated in 2026
	5.1.2 Number of NID-endemic countries that have established and implemented cross-border initiatives to carry out joint prevention, control, and elimination actions related to Lymphatic Filariasis in affected populations living in border areas	No data available
5.3 Compile evidence of the epidemiological status of other NID that affect population groups living in vulnerable conditions	5.3.1 Number of former endemic countries and territories that compile evidence to support the elimination of Lymphatic Filariasis	LF not yet eliminated

1.4 PAHO Disease Elimination Initiative: A Policy for an Integrated Sustainable Approach to Communicable Diseases in the Americas (2019)

This initiative includes HIV/AIDS, Tuberculosis, Hepatitis B and C and Malaria as well as the Neglected Infectious Diseases. The initiative has 4 strategic lines of action.

1. Strengthening the integration of health systems and service delivery.

2. Strengthening strategic health surveillance and information systems.

3. Addressing the environmental and social determinants of health, including WASH, housing, climate change, gender inequity, sociocultural factors, and poverty.

4. Strengthening governance, stewardship and finance, including:

    - Interprogrammatic & intersectoral collaboration
    - Coordination and collaboration between central and local government
    - Participation by public and private sector, civil society
    - Clear roles & responsibilities for each organisation
    - Integrated packages of integrated services, such as:
        - Integrated surveillance & monitoring
        - Single visit screen & treat approach in primary care
        - Integrated preventive chemotherapy
        - Integrated screening, diagnosis and treatment of preschool & school age children

2

Guyana Profile

2.1 Geography & Climate

Guyana is located on the northeast Atlantic coast of South America and bordered by Venezuela, Suriname, and Brazil. It is the only English-speaking country on the continent. Despite its geographic location in South America, Guyana is considered a Caribbean country due to its political and cultural history. Guyana boasts many natural resources and productive agricultural land. The population is approximately 750,000, 70 percent of which live on the narrow, fertile coastal plain. The interior remains sparsely populated and features pristine rainforests and savannahs. The country has 3 major ecological areas, which are:

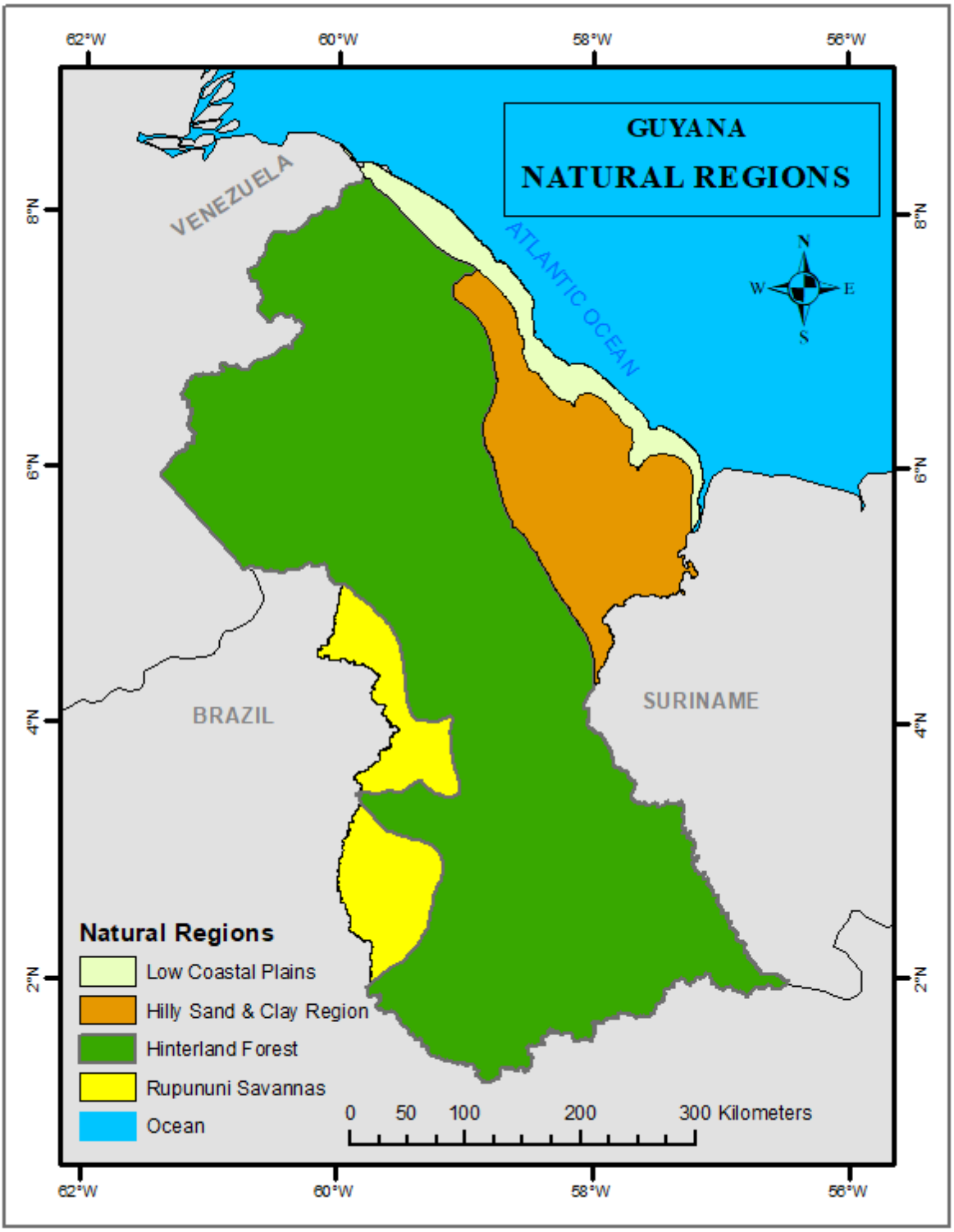
1. The Low Coastal Plain: The Low Coastal Plain is a narrow belt that borders the Atlantic Ocean. It is approximately 9,120 square kilometers in area and 1 to 3 meters below sea level. The length of the Atlantic Coast is approximately 440 kilometers or 270 miles. The coastal area has two wet and two dry seasons with average annual rainfall of 1,500 to 2,000 mm.

2. The Hilly Sand and Clay Region: The Hilly Sand and Clay Region is mostly covered in low to medium height scrub vegetation. It is located south of the Low Coastal Plain, with an area of approximately 28,920 square kilometers.

3. The Hinterland Forest: The Hinterland Forest comprises about 73% of the country's land mass with an area of approximately 156,450 square kilometers. The region is known for its mountain ranges (Kanuku, Pakaraima, Imataka and Acarai) and dense tropical forest. The forest area is characterised by hot days, cool nights and heavy rainfall.

4. The Rupununi Savannah: The Rupununi Savannahs were named after the Rupununi River situated in the South-West Region of Guyana. The forested Kanuku Mountains divide the area into the North and South Savannahs. The vegetation consists of mostly grassland, shrub, and low trees with hills. The savannah area has one wet and one dry season.

Figure 1: Map of Guyana's natural regions
Source: Guyana Lands and Surveys Commission



2.2 Political Situation & Administration

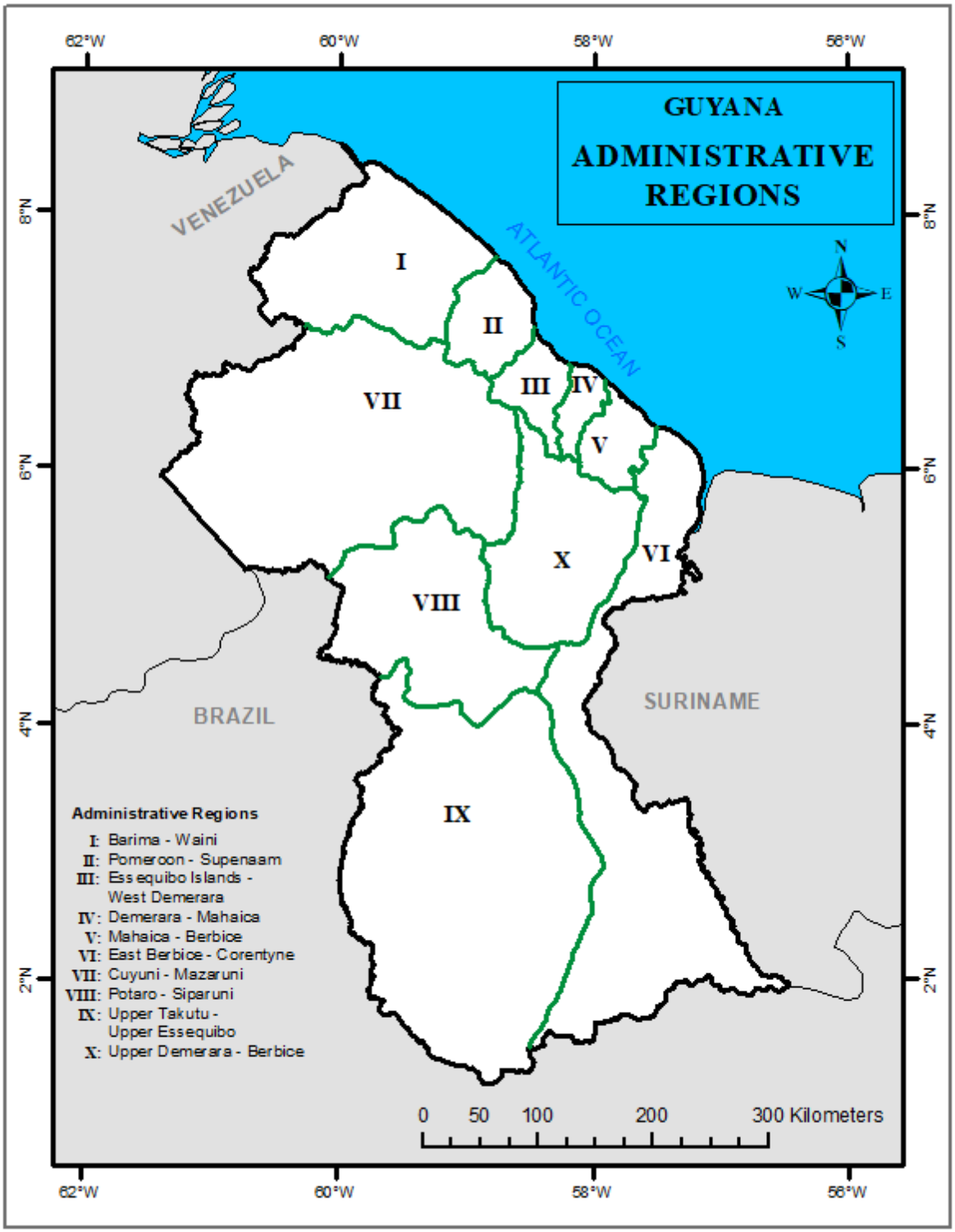
The Cooperative Republic of Guyana is a multiparty democracy. Guyana has a semi-presidential parliamentary style government with a constitution. The President is the Head of State and elected by popular vote as the leader of a party list in parliamentary elections. The Prime Minister is the Head of Government and is appointed by the President. The National Assembly is unicameral. Presidential elections must take place at least once every five years, without term limits. The National Assembly consists of 65 seats. Members are elected by popular vote, each with a five year term.

Local government

Guyana is divided into ten administrative regions. Each regional democratic council (RDC) is led by a council chairman and is responsible for the delivery of services to their catchment population. RDC's are elected for terms of up to five years and four months. Regions are divided into 65 Neighbourhood Democratic Councils, 6 municipalities and 76 Amerindian Village Councils.

Figure 2 shows a map of Guyana's 10 administrative regions.

Figure 2: Map of Guyana's Administrative Regions
(Source: Guyana Lands and Surveys Commission)



2.3 Demographic Profile

Guyana's most recent census was in 2012. At that time, the population was 746,955[3]. About 75% of the population lives on the low coastal plain and approximately 28% in urban areas. Georgetown, the capital is home to 20.7% of the country's population.

Guyana is a racially diverse society, with 39.9% of the population of East Indian descent, 29.2% of African descent, 19.9% of mixed heritage and 9.5% Amerindian or indigenous. The rest of the population (1.5%) is of European or Chinese origin.

The indigenous peoples are known locally as 'Amerindians' and comprise nine distinct groups, three in coastal areas, and six in the forest and savannah areas of the interior. The indigenous peoples include Arawaks, Wai Wai, Caribs, Akawaio, Arecuna, Patamona, Wapixana, Macushi and Warao.

The official language of Guyana is English. Amerindian dialects, Creole, Hindi, and Urdu are also spoken.

2.4 Economic and socio-economic profile

Guyana is currently classified as an upper middle-income economy. According to the World Bank, Guyana's per capita GDP has grown from $4,580 in 2010 to $6,955.9 in 2020.

Previous to the discovery of oil, the Guyanese economy exhibited moderate economic growth, based largely on agriculture and the extractive industries. The economy was heavily dependent upon the export of six commodities, sugar, gold, bauxite, shrimp, timber, and rice, which represented nearly 60% of the country's GDP and which were highly susceptible to adverse weather conditions and fluctuations in commodity prices. Guyana closed or consolidated several sugar estates in 2017, drastically reducing sugar production by more than half in 2018. Much of Guyana's economic growth between 2018 and 2020 came from a surge in gold production.

In January 2018, an estimated 3.2 billion barrels of oil were discovered offshore. Guyana became a petroleum-producing nation in December 2019. Guyana's economy grew by 14.5% in the first semester of 2020. The World Bank has predicted that the economy would grow by 20.9 per cent in 2021, the highest growth rate in the Latin America and Caribbean (LAC) region for that year. According to the Inter-Development Bank (IDB), the poverty rate in Guyana, measured as the percentage of people living on less than $5.50 per day, reached 41.2% in 2017. The IDB has also shown that poverty disproportionately affects the country's rural non-coastal areas where it amounts to more than 50%. The latter statistic denotes significant disparities in poverty

[3] Guyana Statistical Bureau

concentration along ethnic lines since approximately two-thirds of the Guyanese population living in the rural interior communities are indigenous.
Malnutrition seriously affects the indigenous population. Statistics indicate that 25% of indigenous children are stunted, a figure much higher than the national average. It is also estimated that 16% of newborn indigenous children in Guyana are underweight (below 2500g at birth).

The brain-drain of skilled workers in Guyana hinders necessary contributions to development in various economic sectors such as healthcare. As of 2021, Guyana's unemployment rate stood at 15.6%. A 2017 study found that the percentage of unemployed youth exceeded 20%. This factor makes it difficult to keep trained professionals in the country.

The literacy rate among adults over 15 years is 85%.
The Gender Inequality Index rank in 2014 was 114.
The Human Development Index rank in 2014 was 124.

2.5 Health system and profile

Guyana operates a universal healthcare system, meaning that every citizen and resident of Guyana has access to the system's facilities and services. Health care is provided through a national health program implemented by the Ministry of Health in collaboration with the Regional Democratic Councils of the ten administrative regions, a regional health authority for each region, and six state-owned organisations including the Georgetown Public Hospital Corporation and the Guyana Sugar Corporation (GUYSUCO). Private health care services, including hospitals, diagnostic and treatment centers, laboratories and pharmacies contribute approximately 20% of the total service package and are regulated by the Ministry of Health.

The health system of Guyana is highly decentralised. The Ministry of Local Government is responsible for financing, managing and providing public health care services. Guyana is divided into 10 health regions that provide primary, secondary and tertiary health care. There are five levels of health care that operate on a referral basis.

- Level 1: 166 local health posts in the country that provide primary and preventive health care services for common diseases.
- Level 2: 109 health centers that provide primary health care.
- Level 3: 19 district hospitals that consist of more than 450 beds each and have departments of gynecology and dental care.
- Level 4: 4 regional hospitals with more than 600 beds each and can provide diagnostic services and other specialized services in general medicine, general surgery and obstetrics.
- Level 5: One national referral hospital in Georgetown with more than 900 beds, provides specialist services along with national psychiatric hospital.

Despite this network of health services, access to health services in the more remote areas of the country remains challenging.

The Vision 2020 national health plan for the period 2013 to 2020 included plans for communicable diseases (HIV/AIDS, Sexually Transmitted Infections, Tuberculosis, malaria, neglected and zoonotic diseases) as well as non-communicable diseases. The Vision 2030 health sector plan is currently being developed and it also addresses communicable and non-communicable diseases, including the neglected infectious diseases.

Guyana is experiencing an epidemiological transition. Communicable diseases are still prominent in the disease profile while there is the increasing burden of the chronic noncommunicable diseases. The reduction of infectious diseases in Guyana can be attributed to several factors including better sanitation and a strong immunization programme as well as the technical and financial support of donors that have resulted in the improved control of malaria, tuberculosis, and HIV/AIDS and the vaccine preventable diseases. In 2018, Guyana's health expenditure represented 5.94% of the national budget. In 2019, health expenditure per capita for Guyana was 326 US dollars[4].

The life expectancy for Guyana in 2021 was 70.04 years, a 0.16% increase from 2020. Life expectancy for females was 73.1 years and for males was 66.9%. The life expectancy has increased steadily over the past 20 years. In 2019, the infant mortality rate was 24.4 deaths per 1000 live births. This has declined steadily since 2009. The maternal mortality ratio for 2017 was 169 deaths per 100,000 live births. In 2018, the ratio of physicians to population was 1.819 per 1000 population and ratio of nurses and midwives was 0.8 per 1000 population[5]. According to the UNDP Human Development Report of 2019, 96% of Guyana's population has access to improved drinking water while 86% of the population is using improved sanitation facilities.

2.6 National Health Strategic Plan

As of February 2022, the National Health Vision 2030 is in the advanced draft stage. The Vision is to achieve universal access and universal health coverage ensuring all people in Guyana are among the healthiest in the Caribbean and the Americas by the year 2030.

Mission: The Ministry of Health will create an enabling environment for the delivery of quality, effective and responsive health services, and prevention measures to improve the physical, mental and social wellbeing of all people in Guyana.

The plan has nine strategic goals:

[4] WHO Global Health Expenditure Database
[5] Source: World Bank

1. Health Services and Healthcare Delivery Model: A health care delivery model focused on health needs, quality of care, and people-centered that relies on integrated services as the basis of the health system in Guyana.

2. Leadership and Governance: The Ministry of Health is strengthened to lead and steward the implementation of a new health system model to achieve Universal Access and Universal Health Coverage.

3. Human Resources for Health: The health system has the capacity to develop and sustain a competent and efficient workforce to achieve the goals of Health Vision 2030.

4. Health Systems Financing: An equitable and sustainable health financing system is instituted ensuring financial risk protection in health in Guyana.

5. Evidence-informed decision-making: Timely, accurate, reliable information to enhance evidence for decision-making is used at all levels of the health system. This goal addresses a robust health information system, integrated surveillance system, monitoring and evaluation unit, and health research agenda.

6. Supply chain management for drugs, medical supplies and medical products: Equitable access to essential, quality, safe and effective medicines and medical products.

7. Health emergency and disaster risk management: The health system's capacity to prepare, monitor and respond to health emergencies and disasters is strengthened.

8. Partnerships and participation of state and non-state actors: A policy environment is created for improved partnerships and engagement of non-state actors, ensuring equitable access, financial risk protection and quality of care.

9. Priority health conditions and social determinants of health: Actions on prevention, treatment, rehabilitation and on their determinants in the life course are strengthened to achieve universal access and universal health coverage. One of the performance targets for goal 9 is "**Ending the epidemics** of AIDS, tuberculosis, malaria **and neglected tropical diseases by 2030**".

3

Neglected Infectious Disease Programs in Guyana

The five neglected infectious diseases addressed by this national action plan include Lymphatic Filariasis, Cutaneous and Mucocutaneous Leishmaniasis, Chagas Disease, Soil Transmitted Helminthiasis and Leprosy. Lymphatic Filariasis, Leishmaniasis and Chagas Disease are transmitted by insect vectors. Of these five Neglected Infectious Diseases, only Leprosy is notifiable.

3.1 NID Surveillance

Disease surveillance is very important in order to measure the incidence, prevalence and geographical distribution of specific diseases, to identify trends and monitor the progress of disease elimination programs.

The current national disease surveillance system is paper-based rather than digital. Hard copies of the completed surveillance forms are transported from the regions to the statistical department in Georgetown, where data is entered by the statistical unit in the Ministry of Health. The data is sent to the national surveillance unit, where the data is analysed. The COVID-19 pandemic has diverted attention and staff from routine surveillance activities. There are plans to decentralise and digitalise the national health information system, including disease surveillance, but the timeframe remains unclear. The surveillance department needs additional staff, and improved capacity on statistics, modelling and mapping. The Ministry of Health intends to employ surveillance officers in all regions in 2022.

Disease maps are invaluable tools to describe and understand the density and distribution of specific diseases. However, except for Lymphatic Filariasis, neglected infectious disease distribution maps are not available in Guyana. These maps would be required in order to formulate region-specific elimination plans and monitor progress.

Leprosy is the only notifiable neglected infectious disease in Guyana. Surveillance is generally weak for Lymphatic Filariasis, Leishmaniasis, Chagas Disease and Soil Transmitted Helminthiasis. Surveillance data is available for Leprosy and Lymphatic Filariasis. A new Public Health Act is being drafted and the list of notifiable diseases is being revised. This presents an opportunity to add the Neglected Infectious Diseases to the list.

The Epidemiology and Surveillance Department distributes the S-4 form for Infectious Diseases to the regional health centres and facilities, which are expected to submit this report on a monthly basis. The S-4 form includes, inter alia, confirmed cases of Filaria, Leprosy, Leishmaniasis, Chagas and Worm Infestation. However, the challenge is for the regional health authorities to obtain laboratory confirmation of these neglected diseases as very few hospital laboratories are capable of NID diagnosis. Although the NID's are included on the reporting forms, they are very rarely reported through this national surveillance system. Therefore, it is difficult to measure incidence, prevalence, and distribution with confidence.

The surveillance system also distributes a medical practitioner form that includes Leprosy and Bush Yaws (Cutaneous Leishmaniasis). This is the form used to report notifiable diseases to the Ministry of Health.

The NID department intends to make LF, Leishmaniasis, and Chagas Disease notifiable, so that they would be added to the medical practitioner form. However, the challenge of laboratory confirmation would require additional capacity building of hospital laboratory staff in the relevant regions, as well as continuous availability of equipment and reagents.

The syndromic surveillance form includes skin infections (without lab confirmation). This form should be submitted on a weekly basis. It would not be possible to identify the neglected tropical diseases from this form without further investigation.

Very little data is reported on Neglected Infectious Diseases as not much testing is done in the regions. The Epidemiology and Surveillance Department does not share NID data with the NID program. Therefore, the NID and Leprosy programs have created their own forms and have instituted a parallel reporting system. This has created some confusion among the Regional Health Officers who are more familiar with the national surveillance forms. Many Regional Health Officers were not aware of the reporting forms for the Neglected Infectious Disease unit. However, the NID and Leprosy programs are required to report on their respective diseases to WHO, and therefore require timely and accurate data.

3.2 NID Program: Organisational Structure

The Neglected Infectious Disease program is administratively under the Vector Control Services of the Ministry of Health. This program addresses Lymphatic Filariasis, Cutaneous and Mucocutaneous Leishmaniasis, Soil Transmitted Helminths, and Chagas Disease. The NID

program employs 2 Government Medical Officers, one of whom serves as NID focal point. It also employs 1 registered nurse, 1 nursing assistant and 1 field assistant who serves as a clerk. In 2020, the NID program employed 4 medical doctors, however 2 were reassigned to other units. This unit provides program management for the elimination of the above 4 NID's, as well as clinical diagnosis and treatment for NID's in the NID clinic in Georgetown. It organises and manages field campaigns including Mass Drug Administration and Transmission Assessment Surveys for Lymphatic Filariasis, NID surveillance and reporting, as well as training of regional health doctors and nurses on NID diagnosis, confirmation and treatment. The program staff design and produce NID related Information Education and Communication Materials.

This department is severely understaffed to conduct its responsibilities for the elimination of four Neglected Infectious Diseases. It is also recommended to separate program management and surveillance from clinical diagnosis, diagnostic testing and case management.

The Public Relations Department of the Ministry of Health is capable of providing assistance with health promotion and the production of IEC materials.

The Neglected Infectious Disease Department is constrained by a lack of dedicated transportation for fieldwork. Office space and NID clinic space are also inadequate for purpose. Computer hardware and software are outdated and should be replaced.

The organogram of the NID department is found in Figure 3. The organisational structure of the Vector Control Services is found in Figure 4.

Figure 3: Neglected Infectious Disease programme organogram

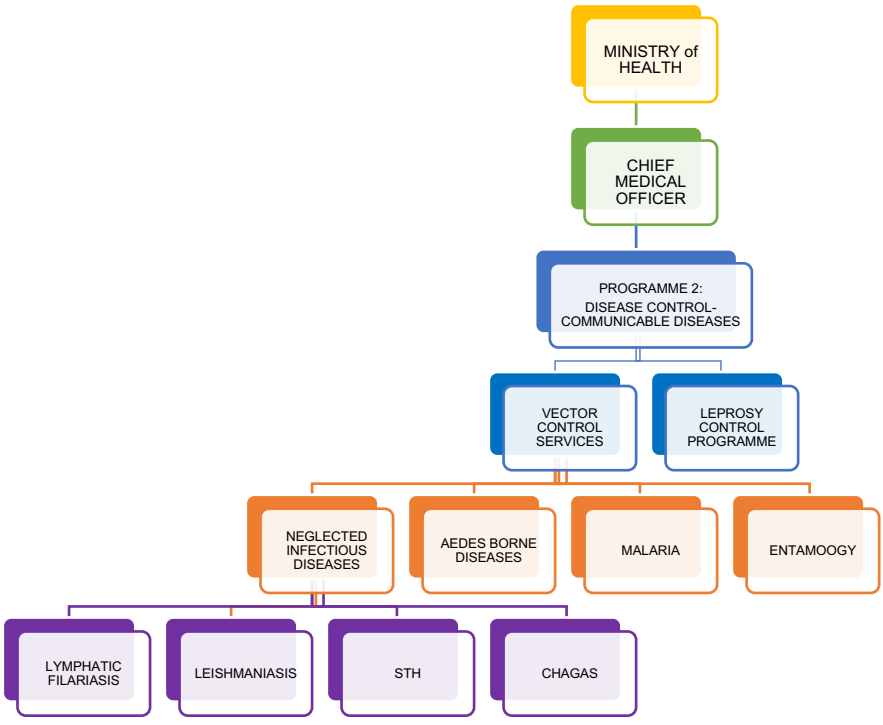
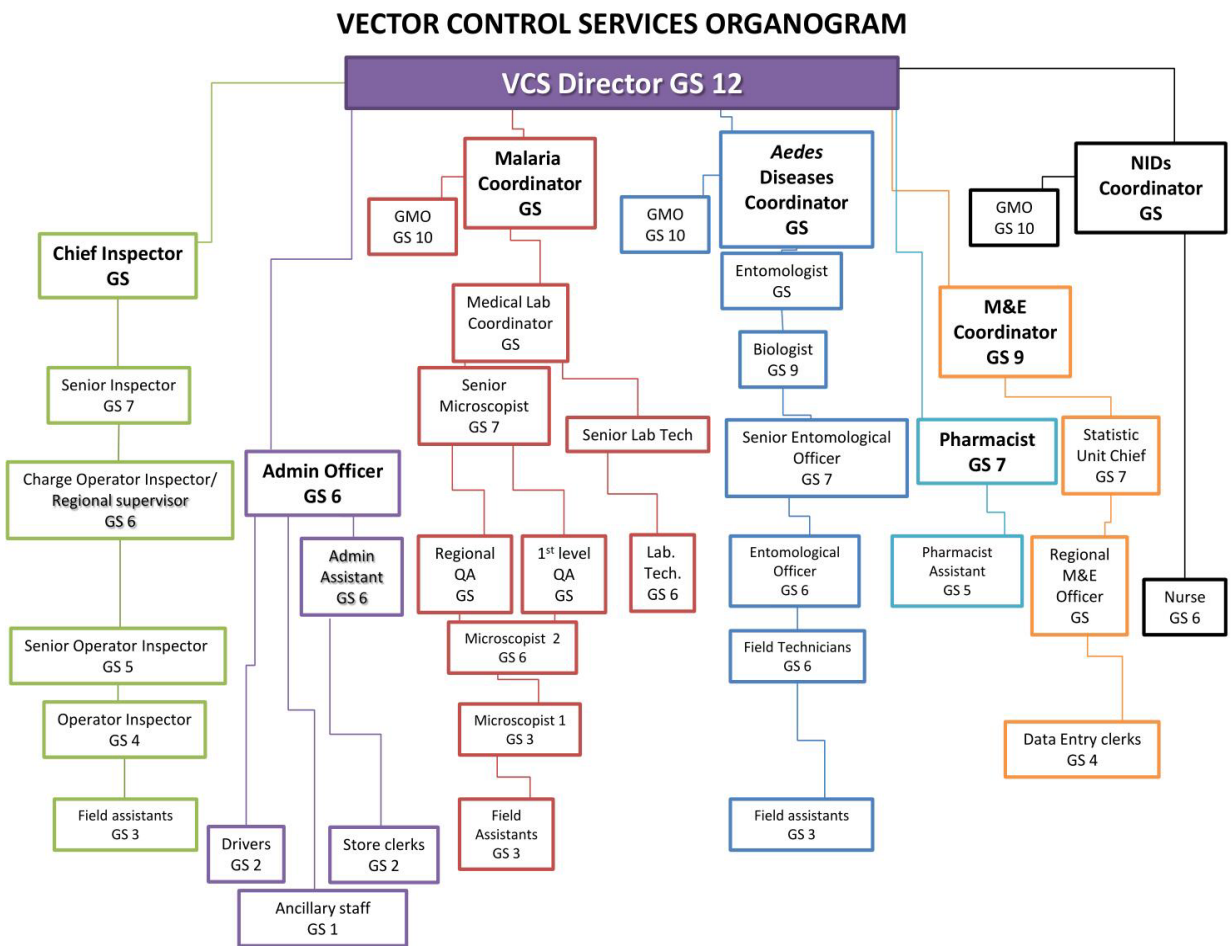


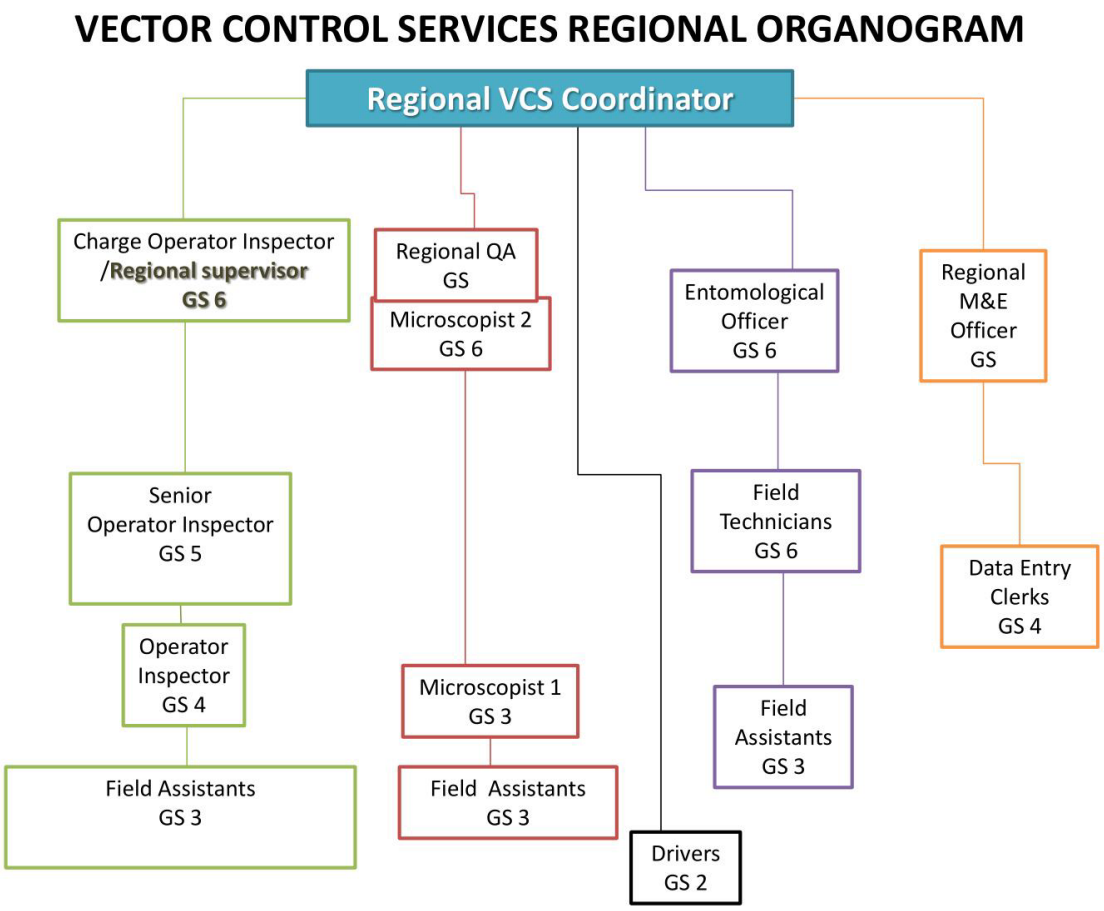
Figure 4: Vector Control Services



3.3 Vector Control Services

Figure 5 shows the structure of the Vector Control Services in the regions of Guyana. The Vector Control Services has significant infrastructure for Malaria, both centrally and regionally, that could benefit the Neglected Infectious Disease program. This includes malaria supervisors in each region, entomological (vector control) officers who work mostly on Aedes identification and control, as well as field technicians and assistants, microscopists, M&E officers and data entry clerks.

Figure 5: Organogram for the Vector Control Services in the regions of Guyana



3.3.1 Vector Control Unit

The Vector Control Unit under the Vector Control Services works primarily on Aedes mosquitoes for malaria control. The unit also works on Anopheles mosquitoes when there are special projects with funding. The unit employs 12 biologists, 3 entomology technicians and 35 field assistants in Region 4. There are 15 field assistants in Region 3, 30 in region 5 and 8 field assistants in region 6. Regions 1, 7, 8 and 9 each have 1 entomology technician and 1 field assistant respectively.

The field assistants conduct routine surveillance for mosquitoes, treat breeding sites with larvicide, and sensitise the residents on mosquito control. They sample mosquito larvae for studies, and these are identified by entomology technicians.

In 2014, some of the Vector Control Officers were trained on Leishmaniasis taxonomy and parasite identification, but most of the trainees are no longer with the Unit. Key informants from the Vector Control Unit reported that the unit conducted a survey for triatomine bugs, the vector of Chagas Disease, in 2017, however no data can be produced for this strategic plan.
Some of the Vector Control officers have been trained in mapping using QGIS software. GIS data is collected in the mosquito surveillance program however this cannot be used as the unit does not have shapefiles for Guyana.

Regional VCS Coordinators manage the Vector Control activities outside Georgetown. Field assistants conduct indoor residual spraying if Aedes adulticide is required. The insecticide used is Fendona.

The Vector Control Unit is willing to provide entomological support to Lymphatic Filariasis, Chagas and Leishmaniasis elimination, however it lacks capacity in sandfly and triatomine bug identification and control. Training would be required on LF, Chagas and Leishmaniasis, including the biology, identification and control of phlebotomine sandflies and triatomine bugs.

As the NID Program is administratively under the Vector Control Services, there is excellent potential for the vector borne NID's (Lymphatic Filariasis, Chagas Disease and Cutaneous Leishmaniasis) to piggy-back on the human resources already in place in many parts of Guyana for vector control. These officers could participate in vector surveillance and control. Training would be required on the NIDs and their insect vectors (Culex for LF, Lutzomyia sandflies for Leishmaniasis, and Triatomine bugs for Chagas Disease).

There is also potential for the malaria coordinators in the regions to participate in NID surveillance and local elimination. If the Ministry of Health decides to expand their responsibilities, their job descriptions would have to be amended and their capacity would have to be systematically increased through training.

3.3.2 Tropical Disease Laboratory

The Tropical Disease Laboratory is part of the Vector Control Services. The laboratory tests mostly for dengue, but can also read blood smears for LF microfilaria and do microscopy for Leishmaniasis.

This laboratory is not a member of the national health laboratory network, but plans to join this network in the near future. The Tropical Disease Laboratory does not have a quality assurance program in place, but this would be necessary to join the national laboratory network. It is recommended to join the network and implement quality control and assurance in the lab.

The laboratory is using an outdated sampling method for Leishmaniasis. One staff has been trained on Leishmania sampling and diagnosis, but has not been able to translate those skills to practical use due in part to supply management and internal hinderances among the human resource. Staff have been reassigned for COVID 19 diagnosis and therefore the laboratory is currently short staffed. The laboratory needs more equipment, lab protocols and training. With these inputs, particularly the training and laboratory protocols, the lab could offer laboratory confirmation for Chagas Disease and Soil Transmitted Helminths. There is a need for annual refresher training. A quality assurance program is also urgently required, in order to have confidence in NID test results, for both diagnostic and surveillance purposes.

4

Neglected Infectious Disease Programs in Guyana

4.1 Lymphatic Filariasis

4.1.1 Disease

The filarial parasite *Wuchereria bancrofti* is the agent of Lymphatic Filariasis in Guyana and mosquitoes of the Culex spp. are the main vectors responsible for its transmission. *Culex quinquefasciatus* is the most frequent vector.

Morbidity is caused by damage to lymphatic vessels by adult parasite nests and microfilaria released in the blood. Impaired lymphatic function causes lymphedema, often of peripheral limbs and hydrocele (swollen scrotum). Acute painful episodes of adenolymphangitis may also occur. Chronic lymphatic filariasis can cause long term disability, stigma and discrimination and mental health problems.

4.1.2Global Program to Eliminate LF

In 2000, WHO established the Global Programme to Eliminate Lymphatic Filariasis (GPELF) to stop transmission of infection with mass drug administration (MDA) and to alleviate suffering among people affected by the disease, through morbidity management and disability prevention (MMDP). The WHO recommended core strategic interventions to eliminate Lymphatic Filariasis include:

- ***Preventive chemotherapy:*** Mass Drug Administration in endemic areas with Ivermectin, Diethylcarbamazine, and Albendazole, known as IDA. The combination of these 3 medicines can safely clear almost all microfilariae from the blood of infected people within a few weeks, whereas the 2 drug combination of Albendazole and DEC takes several years. The population in an Implementation Unit no longer requires MDA when the prevalence of infection has been reduced to such low levels that transmission is

considered no longer sustainable. Multiple rounds of MDA with effective coverage (≥65% coverage of the total population consuming the medicines) are required to achieve the desired effect. WHO recommends sentinel and spot-check community surveys, followed by a transmission assessment survey (TAS) to measure the impact of MDA and determine whether levels of infection have decreased below target thresholds.

- ***Morbidity management*** of limbs affected by lymphedema: skin care and hygiene, exercises and elevation to prevent progression.

- ***Hydrocelectomy surgery*** for hydrocele cases.

- ***Antifilarial medication*** to treat active infection.

- ***Vector control:*** Reduction of mosquito breeding habitats by hygiene and improved drainage and insecticide treated bednets where Anopheles is the vector.

WHO has targeted LF for elimination as a public health problem. The WHO indicator for Lymphatic filariasis is population requiring MDA.

4.1.3 Lymphatic Filariasis in Guyana

In 2001, an LF survey was conducted on school aged children in Guyana, using immunochromatographic antigen card (ICT) tests. The survey found a total of 217 children were positive for LF, or 9.33% of those sampled. At that time, Regions 2, 3, 4, 5, 6 and 10 were found to be endemic throughout, while Regions 7, 8 and 9 were partially endemic with transmission only in well-defined foci. Transmission rates were negligible in Region 1. The highest prevalence rate of 30.5% was found in Georgetown. Males were 1.5 times more affected than females, and positive rate increased with age, so that older children were more likely to be infected. Clinical manifestations of LF in adults include lymphedema and occasionally hydrocele in men.

Table 2: Classification of regions as endemic, non-endemic and partially endemic according to ICT results, Guyana 2001

Regions and areas	Nº ICT	Nº positive	Nº negative	% positive (range)	Endemic status
Region 1	250	2	248	0.8	Non-endemic
Region 2, Suddie	150	9	141	4.5	Endemic
Region 3, West Coast, West Bank	200	13	187	6.5	Endemic

Regions and areas	Nº ICT	Nº positive	Nº negative	% positive (range)	Endemic status
Region 4 (Georgetown, South, North/West, East)	334	102	232	30.5 (8.0 to 37.0)	Endemic
Region 4 (East Bank, East Coast)	266	19	157	7.1 (6.7 to 21.9)	Endemic
Region 5	125	17	108	13.6 (4.0 to 36.0)	Endemic
Region 6	250	20	230	5.7	Endemic
Region 7	150	5	145	4.0	Partially endemic (LF transmitted in isolated foci only)
Region 8	150	6	144	4.0	Partially endemic (LF transmitted in isolated foci only)
Region 9, Lethem	250	4	246	1.6	Partially endemic (LF transmitted in isolated foci only)
Region 10, Linden	200	20	180	10.0 (4.0 to 20.0)	Endemic
TOTAL	**2325**	**217**	**2018**	**9.3**	**…**

Source: Mapping Lymphatic Filariasis Transmission in Guyana, 2001

4.1.4 Guyana's LF elimination program

From 2003, Guyana distributed Diethylcarbamazine Citrate (DEC) fortified salt as a strategy to interrupt LF transmission. The product was launched in July 2003 and initial sales were promising. However, consumer confidence was impacted by problems associated with discoloured salt, followed by disruptions in supply. The DEC fortified salt was sold in a competitive market and the cost of unfortified salt was usually less, therefore this strategy was discontinued due to insufficient consumer demand. [6]

In 2009, Guyana initiated mass drug administration with Diethylcarbamazine citrate and Albendazole in regions 2, 5 and 6. In 2010, Mass Drug Administration was also conducted on several thousand persons in Region 8. Before the initiation of MDA, 3 sentinel sites were identified for monitoring and evaluation purposes, including 2 in Georgetown (Region 4) and 1 in Corentyne (Region 6).

[6] Lammie, P. Milner, T. Houston, R. "Unfulfillled potential: using Diethylcarbamazine-fortified salt to eliminate lymphatic filariasis", Bulletin of the World Health Organisation, 2007, 85: 545-549.

Guyana conducted MDA campaigns in Regions 4 and 5 in 2014 and 2015. During 2016, the MDA was expanded to four endemic regions: 3, 4, 5 and 10, but the minimum threshold coverage was not achieved in any of the regions. Some changes in the MDA strategy brought a positive outcome in terms of MDA coverage in 2017. All regions achieved at least 65% of coverage as follows: Region 3 (74.0%), Region 4 (94.7%), Region 5 (84.8%) and Region 10 (89.6%).

4.1.4.1 LF Remapping survey 2018-2019[7]

In 2018-2019, a serological LF remapping survey was conducted in Regions 1, 2, 6, 7, 8 and 9 as part of the annual round of MDA. The survey found that Regions 8 and 9 were no longer endemic for LF. Regions 2 and 6 remained endemic, while Regions 1 and 7 were endemic only in specific IU's.

Table 3 shows the number of children tested and FTS positive in each one of the EUs and the decision made by the Minister of Health. A total of 7,198 children were tested in the six regions and 33 of them were found FTS positive. In 6 out of 34 EUs, the number of FTS positive children was above the critical cut off value: EU2.1, EU6.2, EU6.3, EU6.4, EU6.5 and EU6.6. As shown in the map (figure 2). Four EUs reported FTS positive number of cases equal to the cut-off value and in those EUs the decision made was to implement the MDA-IDA considering all of them were located close to an endemic area (EU1.5, EU2.2, EU2.3, and EU7.1).

Table 3. Number of children tested and positive, cut-off and decision made per Evaluation Unit in Guyana

Region (Number of EUs)	**Evaluation Unit ***	**Target Sample size** *(Children 6 to 14 years)*	**Nº children tested**	**Cut-off** *(> critical value)*	**FTS positive**	**Decision**
1 (6 EU)	1.1. Mabaruma 1	220	209	1	0	No MDA
	1.2. Mabaruma 2	300	373	2	0	No MDA
	1.3. Baramita	247	200	5	0	No MDA
	1.4. Matarkai (excluding Baramita)	300	467	2	0	No MDA
	1.5. Moruca 1	300	259	2	2	MDA-IDA*
	1.6. Moruca 2	300	309	2	0	No MDA

[7] Ministry of Health- Guyana, PAHO/WHO. (2019). *Remapping Lymphatic Filariasis Transmission in Regions I, II, VI, VII, VIII and IX in Guyana, 2018-19 Draft Report*.

2 (6 EU)	EU 2.1: Anna Regina/Good Hope/Pomona	320	194	2	3	MDA-IDA**
	EU 2.2: Lower Pomeroon River	320	132	2	1	MDA-IDA*
	EU 2.3: Amerindian Villages	273	155	5	1	MDA-IDA*
	EU 2.4: Amerindian Villages Inland	69	59	3	0	No MDA
	EU 2.5: Dredge Creek	44	39	1	0	No MDA
	EU 2.6: Bethany & Moshabo	129	109	1	0	No MDA
6 (6 EU)	6.1. Corentyne River	178	174	4	0	No MDA
	6.2. Upper Corentyne	320	328	2	8	MDA-IDA**
	6.3. Central Corentyne & Black Bush Polder	320	221	2	4	MDA-IDA**
	6.4. Lower Corentyne	320	168	2	3	MDA-IDA**
	6.5. East Canje/New Amsterdam/West Canje	320	159	2	4	MDA-IDA**
	6.6. East Bank Berbice/ Baracara	210	179	1	3	MDA-IDA**
7 (5 EU)	7.1. Lower Mazaruni 1	300	338	2	1	MDA-IDA*
	7.2. Lower Mazaruni (72 Miles)	48	46	1	0	No MDA
	7.3. Middle Mazaruni	194	155	5	0	No MDA
	7.5. Upper Mazaruni 1	300	317	2	0	No MDA
	7.6. Upper Mazaruni 2	114	54	3	0	No MDA
8 (4 EU)	8.1. Mahdia, Campbell Town, Princeville	358	286	6	1	No MDA
	EU 8.2: Rest of Sub region 2	126	110	3	0	No MDA

	8.3. Pakaraima North Paramakatoi	210	298	1	0	No MDA
	8.4. Pakaraima North Kato	220	251	1	0	No MDA
9 (6 EU)	9.1. Central Rupununi	300	383	2	1	No MDA
	9.2. South Central Rupununi	220	255	2	0	No MDA
	9.3. North Rupununi	220	265	2	0	No MDA
	9.4. Deep South Rupununi	220	326	2	0	No MDA
	9.5. South Pakaraimas	210**	328	2	1	No MDA
	9.6. Gunns Strip	60	60	1	0	No MDA
Total	N= 33 EUs	6,859	7198		33	

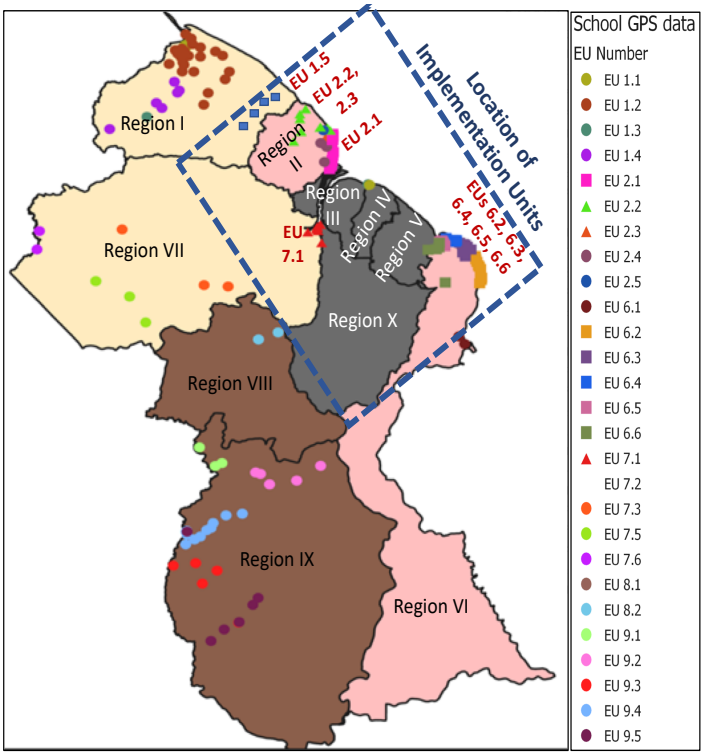
** EU failed according to the critical cut-off value*

*** The number of FTS positive children was below the cut-off value but the decision made was to implement the MDA-IDA considering that those EUs were located close to an endemic area and reported LF transmission in LF survey-2001.*

[ω] The sample size in EU7.1 was not completed because in May 2019 a group of experts met in Guyana to discussed the preliminary results and given that the cut-off value was achieved by that time with n=151 children tested and this EU is located close to Regions 3, 4 and 10, the decision was to implement the MDA in that EU.

Figure 6: LF remapping survey in Regions 1, 2, 6, 7, 8 and 9, Guyana

Figure 2.
GPS location of schools and decisions made by EUs in the Regions included in the LF remapping survey: I, II, VI, VII, VIII and IX, Guyana



Notes:

- "Mature" Regions III, IV, V and X (see the regions filled in grey color)
- Symbols used in naïve regions to show FTS results and IDA decisions by EU:
  - circle (no IDA)
  - square (FTS+ cases above cutoff)
  - triangle (FTS + cases below cutoff, decision made considering epidemiologic, geographic and demographic information).

Source: Data base of remapping survey, Guyana MoPH, VCS

In summary, based on the critical cut-off value and also taking into consideration epidemiologic, population similarities and geographic location of each one of the EUs, 10 EUs were categorized as endemic: one in Region 1 (EU1.5), three EUs in Region 2 (EU 2.1, 2.2 and 2.3), five EUs in Region 6 (6.2, 6.3, 6.4, 6.5 and 6.6) and one EU in Region 7 (EU7.1).

4.1.4.2 LF Sentinel Site Survey 2019[8]

The purpose of this study was to assess the level of LF transmission in the 4 "mature" regions in order to complete the information of all 10 regions and have updated information before starting the MDA using IDA. These four "mature" regions had not been included in the remapping survey during October and November 2018.

All four of the sites chosen for this study in Guyana had experienced MDA previously, and permitted better understanding of the social context in the communities where IDA were to be introduced, including their feelings about adverse events, history of participation as well as preferred methods to receive information.

[8] Niles, R. A., & Morice, A. (n.d.). Pre – IDA Lymphatic Filariasis Transmission Assessments in Region III, IV, V and X in Guyana 2019. University of Guyana.

The primary objective of this research was to evaluate and assess the current status of LF infection in four coastal endemic Regions of Guyana following years of Double therapy Mass Drug Administration Campaign and prior to the introduction of the triple drug (IDA) therapy.

Blood was collected directly from the finger and tested using the Alere Filariasis Test Strip (FTS) to detect *W. bancrofti* from persons five years and older, from at least 300 participants per site. The survey took place in four sentinel sites, one each per region.

Anyone who tested positive by FTS was considered a positive case and was shortlisted for microfilaria testing. Additionally, acceptability data were gathered via a validated questionnaire from participants 18 years and older, each from a total of 100 households.

A total of thirty nine (3.2%) participants tested positive during the sentinel site survey across all four regions. Region 4 recorded the highest proportion of positive Ag cases (7.9%), while Region 5 recorded no Ag positive. Additionally Region 10 recorded the second highest proportion of positive cases (3%) followed by Region 3 (2%) as seen in the figure below.

Figure 7: Flow Chart detailing breakdown of participants by Regions and Laboratory Results

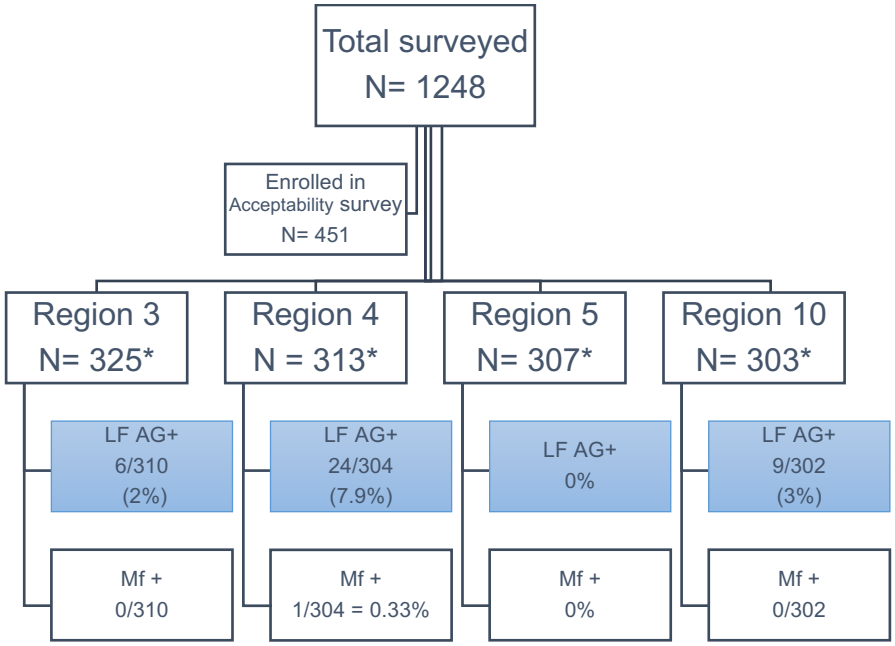


Table 4: LF positive cases distribution by Region

Variables	Region 3		Region 4		Region 10		Total		Chi square P value
	Frequency	%	Frequency	%	Frequency	%	Frequency	%	
Total positive cases	6/310	1.94%	24/304	7.85%	9/302	2.98%	39/1,219	3.2%	0.71

The study outcomes and discussions suggest that the MDA implemented in the four endemic regions was successful in these highly endemic areas and could be implemented in the smaller 'naïve' regions. This study provided evidence that LF transmission was ongoing in the study regions, and they should continue MDA to lower LF prevalence. Additionally, further investigation to access acceptability of the triple-drug therapy was recommended to guide the future MDAs using the triple-drug therapy.

In 2019, following the recommendation of PAHO/WHO, the Ministry of Health in Guyana elected to employ the IDA triple drug strategy (Ivermectin, DEC and Albendazole) for the annual Mass Drug Administration campaigns in 2019 and 2020. This change was introduced because the use of IDA was expected to increase the effectiveness of MDA on interrupting transmission, and therefore hasten the achievement of elimination. IDA campaigns were conducted in 8 regions (1, 2, 3, 4, 5, 6, 7 & 10) in 2019 and 2021. The MDA/IDA campaign planned for 2020 was postponed to February and March 2021 due to COVID. The MDA/IDA campaign in 2021 achieved over 71% coverage.

The MDA campaign was a collaboration between the NID program of the Ministry of Health, the Regional Health Authorities and PAHO/WHO. The NID program staff conducted community mobilisation before the campaign, and trained drug distributors from the region. Microplanning and Monitoring and Evaluation plans were employed. Drug distributors were required to observe the consumption of all medication (DOT), rather than just distributing the tablets. The Regional Health authorities contribute human and transportation resources to the campaigns.

Table 5: MDA/IDA coverage 2019 and 2021[9]

Implementation Unit /Region	Target Population	MDA coverage (N, %)			
	(Census)	IDA 2019		IDA 2021	
		Treated	%	Treated	%
I	5,740	4,266	74.3	4,551	79.3
II	45,143	33,301	73.8	31,279	69.3
III	107,785	80,770	74.9	85,070	78.9
IV	311,563	238,437	76.5	215,651	69.1
V	49,820	35,061	70.4	38,968	78.2

[9] Source: NID Program Lymphatic Elimination – Mass Drug Administration Report 2019, 2021

Implementation Unit /Region	Target Population	MDA coverage (N, %)			
	(Census)	IDA 2019		IDA 2021	
		Treated	%	Treated	%
VI	108,233	81,867	75.6	73,017	67.4
VII	9,806	9,533	97.2	9,098	93.0
X	39,992	27,082	67.7	28,698	71.7

Guyana received all the IDA drugs through donations facilitated through PAHO/WHO from GlaxoSmithKline (Albendazole), Mectizan (Ivermectin), and Eisai Company LTD (DEC). PAHO also provided FTS kits for Transmission Assessment Surveys and funding to support MDA fieldwork.

Pre-TAS survey was conducted in Regions 1, 2, 3, 4, 5, 6, 7 and 10 in late 2021 and early 2022. TAS is planned for the 4th quarter of 2022.

4.1.5 Laboratory Diagnosis

The standard method for diagnosing active infection is the identification of microfilariae in a blood smear by microscopic examination. The microfilariae that cause lymphatic filariasis circulate in the blood at night (called nocturnal periodicity). The recommended time for sample collection for Wuchereria is between 10 PM and 2 AM. Night blood surveys are used to identify areas of LF endemicity. Night blood surveys were suspended in Guyana from March 2020 until March 2022 due to COVID curfew. Resumption of night blood surveys is planned for April 2022.

Guyana has the Alere Filariasis Test Strip (FTS) test kit that is a qualitative point of care diagnostic tool that detects *Wuchereria bancrofti* circulating antigen in human blood, serum or plasma. This test is used for mapping filariasis endemic areas and assessing the success of elimination efforts, for example in Transmission Assessment Surveys.

The Tropical Disease Laboratory, which is part of the Vector Control Services, conducts microscopy on blood smears to diagnose microfilaria. This is done both for surveillance (Night Blood Survey) and diagnostic purposes. The Tropical Disease Laboratory does not currently have a quality control or quality assurance programs.

4.1.6 Case management

Guyana does not have documented national treatment guidelines for clinical cases of Lymphatic Filariasis. Microfilaria positive patients are treated with DEC for 12 days or single dose IDA (Ivermectin, DEC and Albendazole). Acute lymphangitis cases are treated symptomatically, with analgesics for fever and pain, oral antibiotics for infection, and wound management if any visible lesions. They are advised to stay hydrated and rest and keep the limb cool and elevated.

4.1.6.1 Morbidity Management Disability Prevention (MMDP)

MMDP is provided to lymphedema patients at the NID clinic in Georgetown. These patients are also trained in self-care and provided with posters and brochures on self-care. In 2020, the NID clinic saw 142 LF patients, with a total of 387 clinic visits. Patients with comorbidities or complications were referred to the Georgetown Public Hospital for specialised treatment and care. Patients were also referred to their closest health centers for follow up. Home and institutional visits are conducted for chronic lymphedema patients with limited mobility or who have defaulted on treatment. However, the home visits are constrained by a lack of dedicated transportation for the NID staff to do home visits and ensure there was effective care and management of the complications to prevent secondary infections by bacteria and fungus.

4.1.7 Training

The NID program provides MMDP training to health centers that have lymphedema patients and the capacity to provide care. Such training was suspended in 2020 due to COVID. The program also provides MDA/IDA training to drug distributors before MDA campaigns, and TAS participants before TAS surveys. The Program is challenged with the rapid turnover of trained staff or reassignment to other programs.

4.1.8 Surveillance

LF is not currently notifiable in Guyana. It is recommended to make it notifiable to improve reporting and surveillance information.

4.2 Soil Transmitted Helminthiasis

4.2.1 Disease

Soil Transmitted Helminthiasis is defined as infection with intestinal parasites, including *Ascaris lumbricoides, Trichiuris trichuria* (whipworm*), Necator americanus* and *Ancylostoma duodenale* (hookworms), and *Strongyloides stercoralis* (roundworms). Such infections may cause anemia, malnutrition, impaired physical or cognitive development, abdominal pain and diarrhea. Transmission occurs through eggs or larvae in feces contaminating soil in areas with poor sanitation. *Strongyloides stercoralis* can cause hyperinfection syndrome and death.

4.2.2 WHO recommendations for control

WHO recommended core strategic interventions include:

- Preventive chemotherapy in preschool and school age children. Albendazole or mebendazole are effective against *Ascaris lumbricoides*, *Trichiuris trichuria* and hookworms. These should be administered once per year where the STH prevalence is greater than 20% and twice per year where STH prevalence is greater than 50%. Ivermectin should be added to the MDA where the prevalence of *Strongyloides stercoralis* is greater than 10% or a high prevalence of *Trichiuris trichiuria* is found.
- WASH: provision of sanitation and waste management facilities.
- Improved hygiene practices: prevention of open defecation, hand washing and access to clean water in homes.
- Case management: treatment of individuals in endemic areas.
- Women of child bearing age should receive anthelmintic treatment through antenatal care.

WHO has targeted Soil Transmitted Helminthiasis for elimination as a public health problem. The WHO target for 2020 is for 75% of preschool and school age children in need of treatment that are regularly treated.

The indicator for elimination of STH as a public health problem is less than 2% of STH infections have moderate or heavy intensity due to *Ascaris lumbricoides, Trichiuris trichiuria, Necator americanus and Ancylostoma duodenale.*

Another WHO indicator is the number of countries including Ivermectin in preventive chemotherapy in all areas endemic for *Strongyloides stercoralis.*

4.2.3 Soil Transmitted Helminthiasis in Guyana

Very little data exists on the prevalence and distribution of Soil Transmitted Helminths in Guyana. A cross sectional survey conducted in Silver City, Linden in 2017 found 15/26 (57.6%) of the children (age 5 to 15) were infected with at least one helminth and 5/26 (19%) had double infections[10]. Among the parasites found, *Ascaris lumbricoides* was the most prevalent (38%) followed by *Enterobius vermicularis* (19%), *Trichuris trichiura* (15%) and hookworm (3.8%).
An earlier study in Mahdia, Guyana in children under the age of 12 found that the most common intestinal helminth parasite was hookworm (28.2%) followed by *Ascaris lumbricoides* (18.8%) and then *Trichuris trichuria* (14.1%)[11].

[10] Arthur-McKenzie, J. Ansari, AA, Short Communication: the diversity of intestinal parasitic helminths in children of Silvercity, Linden, Guyana. Biodiversitas 19 (4), 1289 – 1293.
[11] Lindo, J.F et al, Intestinal parasites among young children in the interior of Guyana. West Indian Med. J. 2002 Mar 51(1), 25-7.

Soil Transmitted Helminthiasis cases have been reported from hospitals and health centers, but very little testing is done to identify the specific helminths. These are very rarely reported through the national surveillance system. There is no comprehensive morbidity or distribution data on helminths in Guyana.

Anthelmintics are widely available and are prescribed when helminthiasis is suspected or confirmed in health centres.

4.2.4 Disease control interventions in Guyana

The large scale distribution of Albendazole and Ivermectin for Lymphatic Filariasis MDA contributed to reducing morbidity of STH. However, this has occurred only in LF endemic areas of Guyana. See Table 5 for most recent MDA in 2021.

Under the Maternal and Child Health (MCH) Program, children are dewormed twice per year from age 1 to 5 years. Under the school health program, children must be dewormed before they enter school. Pregnant women are also dewormed under the MCH program.

There is no formal national plan for the elimination of Soil Transmitted Helminths. The STH plan should be a collaborative effort between the NID and MCH departments, as well as other agencies including the Ministry of Education, Regional Health Services and possibly the Ministry of Amerindian Affairs. The first step should be a baseline survey to determine the prevalence, distribution and severity of each helminth species, to formulate the plan and to measure progress. In addition to mapping the STH severity and distribution, deworming interventions for each target group by the LF IDA and MCH programs should be mapped.

4.3 Chagas Disease

4.3.1 Disease and epidemiology

Chagas Disease is a potentially life threatening illness caused by infection with the protozoan parasite *Trypanosoma cruzi.* The condition is mainly chronic, and commonly associated with coinfections and comorbidities.

There are six possible routes of transmission. They are:

1. Vector borne through the feces and urine of triatomine bugs in the Americas.
2. Oral or foodborne.
3. Congenital.
4. Transfusional through blood products.
5. Through organ transplants.
6. Through laboratory accidents.

During the acute and chronic phases, most patients have no symptoms or nonspecific symptoms. Without treatment, up to 30% of cases develop cardiac alterations and up to 10% develop digestive, neurological or mixed alterations. After infection, muscle and nerve damage can cause cardiac arrhythmias and or heart failure and sudden death.

4.3.2 WHO recommendations for elimination

WHO has targeted Chagas Disease for elimination as a public health problem. The WHO global goal is domestic triatomine infestation less than 1%. Monitoring this indicator would necessitate vector surveillance in homes.

Core strategic interventions recommended by WHO include:

- WASH: hygienic food preparation, transportation, storage and consumption
- Vector control: indoor residual spraying to remove triatomine bugs
- Housing improvements: crack free walls, replacement of thatched roofs.
- Use of bed nets
- Blood and organ screening to prevent transmission
- Treatment of girls or women of childbearing age to prevent congenital transmission.

Case management: treatment with 2 antiparasitic medications, benznidazole and nifurtimox can cure infection in acute or early chronic phase or curb progression of the disease. Lifelong medication or surgery may be necessary for specific heart and/or digestive alterations.

The actions required to evaluate elimination of 4 transmission routes are:

1. Implement updated protocols on surveillance and verification of transmission interruption.
2. Target active screening of high risk population groups.
3. Strengthen compulsory reporting of acute and chronic cases.

4.3.3 Chagas Disease in Guyana

Triatomine bugs are present in forested areas of Guyana. These bugs have been found in thatched roof homes in the interior, usually housing Amerindians. The disease is an occupational hazard of those who work in forested areas such as miners, loggers, soldiers and hunters. Regions 1, 8 and 9 are considered to have the highest risk.

Chagas is not notifiable in Guyana and there is little or no surveillance. The disease should be made notifiable to increase reporting. The rapid test is not currently used in Guyana, but there are plans to introduce it. However, the Blood Bank performs ELISA screening for blood donations and the NPHRL performs the confirmation of the disease. During key informant interviews, the Regional Health Officers of regions 8 and 9 reported cases of Chagas Disease in their regions,

based on clinical diagnosis rather than tests. These regions do not currently have the capacity to test for Chagas.

4.3.4 Disease control interventions in Guyana

There is currently no formal plan or strategy to eliminate Chagas Disease in Guyana. The key weakness is in identification of Chagas cases, especially in the regions where the risk is high.

The blood transfusion services screen donated blood by doing an antibody ELISA test for IgG. In March 2022, the laboratory will change from ELISA to chemiluminescent test for IgG. This laboratory has quality assurance in place. In a study published in 2012, a seroprevalence rate of 1 in 286 blood donors was reported.[12]

The following table shows the number of Chagas positive ELISA tests found by the National Blood Transfusion Services by year. This was in donated blood, which has a selection bias, and is presumably from healthy donors. It cannot be considered surveillance data.

Table 6: Chagas antibody positive samples by year, 2016 to 2018

Year	Number of samples positive for Chagas antibody
2016	137
2017	147
2018	87
2019	0
2020	117
2021	176

The Vector Control Services are notified of positive results. Blood donors are informed if their Chagas test is positive, and they are referred to the NID clinic. They would have to travel to Georgetown to seek treatment.

The blood transfusion services laboratory does not have a confirmatory assay, so a second ELISA test with higher sensitivity and specificity is conducted at the National Public Health Laboratory if the first ELISA test is positive. The blood transfusion services will be changing from ELISA to chemiluminescent testing in March. The blood transfusion services would like to add capacity to conduct PCR test for Chagas as a confirmatory assay.

The organ transplantation services screens donated kidneys for Chagas Disease. The ELISA test is currently conducted at the blood transfusion services laboratory.

[12] Bwititi, PT & Browne, J. Seroprevalence of Trypanosoma cruzi in blood donors at the National Blood Transfusion Services – Guyana" West Indian Med. J. 2012 Sept. 61(6) 559-63.

Insecticide impregnated bed nets are distributed in Guyana for malaria control.

The Maternal and Child Health Program does not include Chagas screening or treatment as part of the antenatal program. However, the perinatal strategy is currently under review and will include Chagas screening and prevention in the future.
PAHO donates Nifurtimox tablets for the treatment of Chagas Disease to the Neglected Infectious Disease program in Guyana. PAHO also intends to provide Chagas SD Bioline rapid kits for testing. This test should be introduced in regions 1, 8 and 9 where the risk of Chagas is high.

4.3.5 Recommendation

A national plan to eliminate Chagas Disease should be prepared, based on other South American countries' plans (e.g. Brazil and Argentina). The PAHO Chagas Disease program leader can provide technical assistance and review Guyana's plan. The PAHO EMTCT+ framework provides guidelines for prevention of Mother to Child Transmission of Chagas. Capacity needs to be developed in the forested regions of Guyana for case detection, diagnosis (including laboratory testing) and management. For example, blood films that are examined microscopically for malaria could also be screened for Trypanosoma cruzi. Surveillance should be enhanced to map endemic areas, plan targeted interventions and identify and investigate outbreaks. The Ministry of Health plans to develop a diagnostic protocol for Chagas Disease.

4.4 Cutaneous and Mucocutaneous Leishmaniasis

4.4.1 Leishmaniasis

Leishmania is a flagellated protozoan parasite. The vectors are phlebotomine sandflies. In the Americas, the vector is Lutzomyia spp. Sandflies bite either at night or at sunrise and sunset. They lay eggs in soil, sand or decaying organic material. Sandflies can fly only short distances and then hop on surfaces. Vector control involves spraying of insecticide around homes. The disease is associated with population displacement, poor housing, lack of financial resources, malnutrition and weak immunity. Only 10 to 25% of those infected by Leishmania will develop disease.

Cutaneous leishmaniasis begins with a papule at the sandfly bite site, which develops into an ulcer, then a scar. The Leishmania parasite remains at the infection site.

Mucocutaneous leishmaniasis is a severely disfiguring disease caused by *Leishmania braziliensis,* transmitted by Lutzomyia sandflies. Lesions are found on the mucous membranes of the nasopharyngeal complex and occasionally the genitalia. The Leishmania parasites migrate away from the infection site. If left untreated, the nasal septum, lips and soft palate can be destroyed, causing severe mutilation of the face.

4.4.2 WHO recommendations

Cutaneous Leishmaniasis is targeted by WHO for control rather than elimination. Core strategic interventions recommended by WHO are:

1. Vector control: insecticide spraying around homes, insecticide treated nets and environmental management.
2. Rodent control.

3. Case management: The treatment depends on the type of disease, concomitant pathologies, parasite species and geographic location. Local treatment with pentavalent antimonials, paramomycin, and possibly cryotherapy and/or thermotherapy. Systemic treatment with liposomal amphotericin B, pentavalent antimonials and/or miltefosine.

4. Early diagnosis, based on clinical signs and rapid diagnostic tests, with prompt treatment are important to prevent disfigurement.

The WHO target is for countries to detect and report 85% of all cases and treat 95% of reported cases.

4.4.3 Leishmaniasis in Guyana

Cutaneous and mucocutaneous Leishmaniasis are reported in Guyana, especially forested and swampy areas of the interior. The disease is known locally as “bush yaws”. The causative organism in Guyana is *Leishmania guyanensis*. The vectors are the sandflies *Lutzomyia umbratilis* and *Luzomyia anduzei*[13]. The disease has a sylvatic cycle in Guyana, however the wildlife reservoir is unknown. This sylvatic cycle will make the disease impossible to eliminate, so the goal is control. The number of human cases is affected by weather, moisture, temperature, vegetation, vector presence and vector density.

Cutaneous leishmaniasis is an occupational disease of forest workers, such as miners, loggers, field staff of Guyana Gold and Geology Mines Commission, Guyana Forestry Commission, Guyana Lands and Survey Commission, as well as hunters and the Defense Forces in Guyana.

[13] PAHO/WHO, Manual of Procedures for Surveillance and Control, Leishmaniases in the Americas, 2019.

Table 7: Cases of Cutaneous and Mucocutaneous Leishmaniasis in Guyana and Suriname reported to PAHO by year

Year	Guyana	Suriname
2012	7	594
2013	4	382
2014	64	390
2015	132	241
2016	396	255
2017	21	132
2018	27	118
2019	19	130
2020	12	122
2021	3	-

Table 7 has data on number of CL and MCL cases reported to PAHO between the years 2012 and 2020. Suriname's cases are included for comparison purposes. Both countries have similar ecosystems with forested areas in the interior, however Suriname has reported many more cases, except in 2016. **It appears that Leishmaniasis is under diagnosed and under reported in Guyana.** Some patients from Regions 8 and 9 seek treatment in Brazil and these cases are frequently not notified to the Guyana Ministry of Health.

Cutaneous Leishmaniasis is not a notifiable diseases in Guyana. It should be made notifiable to increase reporting and surveillance.

The Public Health Ordinance is currently being revised to develop a Public Health Act. The list of notifiable diseases will also be updated. This is an opportunity for 4 NID's (Lymphatic Filariasis, Chagas Disease, Cutaneous and Mucocutaneous Leishmaniasis and Soil Transmitted Helminths) to be added to the list of notifiable diseases.

The Tropical Disease Laboratory needs to develop a diagnostic protocol for Leishmania, update its sampling method and obtain Giemsa stain, and supplies for the skin smears/scrapings. More staff need to be trained on Leishmania diagnosis and QC/QA. This is very important because patients cannot be treated unless the laboratory confirms Leishmania.

4.4.4 Case management

Clinical signs[14]

The symptoms of Cutaneous Leishmaniasis begin with a sandfly bite, which develops into a half centimeter macule surrounded by a halo. After 1 to 2 days, this progresses to a papule which forms a round painless node, which grows and ulcerates.

Mucosal or Mucocutaneous Leishmaniasis usually occurs several months or years after a person recovers from Cutaneous Leishmaniasis. The initial site is frequently the mucous membrane of the nasal septum. This becomes severely deformed and hypertrophies to a condition known as "tapir nose". This can extend to the palate causing infiltrative and proliferative lesions of the soft palate and pharynx, which may cause dysphonia if the larynx is affected. Serious cases may result in weight loss, progressing to emaciation, suffocation or superinfection.

If the nose is compromised, the patient may have a permanent sensation of over dryness, an irritative cough, pruritus or pain and scabs. The disease can cause swallowing disorders.

4.4.5 Leishmania testing

The clinical leishmaniases spectrum is very broad and can be confused with other diseases. Therefore, early diagnosis of leishmaniases is very important. Early diagnosis makes it possible to administer specific treatment in a timely manner, in turn controlling the natural history of the disease, relieving signs and symptoms, and improving patients' quality of life. The latter is particularly true for patients with CL, ML or MCL, who experience more social stigma because of the physical and psychological sequelae of the disease.

Laboratory diagnosis is needed to confirm clinical suspicion and epidemiological findings of leishmaniases. A laboratory procedure is vital for confirming the case and safely formulating specific treatment. Diagnostic tools vary depending on the different clinical forms of the disease. Therefore, leishmaniases diagnosis should be made through visual detection of the parasite. However, it is not always possible to see or isolate the parasite, which means that the diagnosis should also be clinical, or, wherever possible, complemented by specific immunological tests (indirect methods).

Currently, the principal tools available for leishmaniases diagnosis are based on the detection of amastigotes in samples from skin lesions, mucous membranes, tissues, or lymph nodes. The Tropical Diseases Laboratory has staff trained in skin scraping and microscopic diagnosis of Leishmania. However the laboratory does not have the Giemsa stain required for Leishmania microscopy. The laboratory is using an outdated sampling method for Leishmaniasis. One staff

[14] PAHO/WHO Manual of Procedures for Surveillance and Control, Leishmaniasis in the Americas, 2019.

has been trained on Leishmania sampling and diagnosis, but has not been able to apply those skills to practical use due in part to supply management and internal hindrances among the human resources of the lab. The laboratory has a shortage of qualified staff and no quality control or assurance program. There is a need to standardise diagnostic tools and protocols.

The Policy Board of the Ministry of Health has tabled the Montenegro test for cutaneous and mucocutaneous Leishmaniasis. This refers to the delayed hypersensitivity test that evaluates the patient's exposure to Leishmania. It is usually applied in the patient's left forearm. It is mainly used as a support tool for the diagnosis of mucosal forms and in epidemiological studies to evaluate whether the person had previous contact with the parasite. Although it is a highly sensitive and specific test, it does not allow for differentiation between previous or current infection.[15]

Table 8: Leishmania positive and negative tests between the years 2017 and 2021 in the Tropical Disease Laboratory

Year	Positive tests	Negative tests	Total tests
2017	24	4	28
2018	14	13	27
2019	10	28	38
2020	11	22	33
2021	4	21	25

4.4.6 Treatment

Guyana does not currently have documented treatment guidelines for Leishmaniasis. The course of treatment for Leishmaniasis is 21 consecutive days and patient compliance is often an issue due to the means of administration of the drugs and the requirement for monitoring of the hematology and chemistry profile of the cases.

The Neglected Infectious Disease clinic examined 46 Leishmaniasis cases in 2020, of which 13 were newly confirmed, 28 suspected and 5 were follow up cases. In 2021, the clinic saw 6 cases between January and May, of which 3 cases were treated. Treatment had to be stopped in two cases due to adverse reaction to the intramuscular Meglumine antimonate. The intravenous (IV) Meglumine is much better tolerated by patients.

Some of the regional clinical services have procured the intramuscular Meglumine Antimonate. There is concern that this could cause adverse drug reactions among Leishmaniasis patients. Although Guyana does not have a national pharmacovigilance system, adverse drug reactions can be reported to the Food and Drugs Department of the Ministry of Health.

[15] PAHO/WHO Manual of Procedures for Surveillance and Control of Leishmaniases in the Americas (2019)

The Caribbean Public Health Agency (CARPHA) is developing a pharmacovigilance system for the Caribbean, under the Caribbean Regulatory Systems (CRS) Strengthening project. The responsible officer in CARPHA is Dr. Rian Extavour, Email extavori@carpha.org

4.4.7 Control measures

There is currently no formal plan or strategy for Leishmania control in Guyana. More robust disease surveillance would be required in order to identify endemic pockets of the disease. Vector surveillance would also be helpful to identify high risk areas. Capacity needs to be built in endemic regions for early diagnosis, based on clinical signs and rapid diagnostic test, and prompt initiation of treatment, to prevent disfigurement. As the treatment is toxic, it is recommended to monitor hematology and chemistry profiles of patients before, during and after therapy.

The WHO target is for countries to detect and report 85% of all cases and treat 95% of reported cases. However, due to weak surveillance in remote areas of Guyana's hinterland, there is currently no accurate data for the denominator.

4.5 Leprosy

4.5.1 The disease

Leprosy is a communicable disease caused by the bacillus *Mycobacterium leprae*. It has a long incubation period, which averages approximately 5 years. Untreated leprosy can cause disabilities, social exclusion, spreading of the infectious agent and stigma and discrimination. The disease can affect the skin and peripheral nerves. It can cause permanent damage to skin, nerves, ears, the face, hands and feet. Infection is transmitted by droplets from the nose and mouth during prolonged close contact with untreated leprosy patients. It is often related to poverty. Stigma and discrimination pose challenges to diagnosis, surveillance, treatment and rehabilitation/cure.

The disease is found in "pockets" or "hotspots" in different parts of the country especially in socio-economically deprived settings.

4.5.2 WHO recommendation

The WHO recommended core strategic interventions for the Elimination of Leprosy include:

- Preventive chemotherapy: post exposure prophylaxis to all contacts of detected and consenting cases, with single dose rifampicin (SDR).
- WASH: access to clean water for wound care and routine self-care including daily soaking of hands and feet to prevent secondary disabilities. Ensure hygiene, water and sanitation in health care facilities.

- Case management: Early detection of cases to contain spread of infection and prevent disabilities. This is usually achieved through active case search, contact screening and prompt treatment with Multi Drug Therapy or Post Exposure Prophylaxis. Multi Drug Therapy (MDT) for 6 to 12 months with Dapsone, Rifampicin and Clofazimine.
- Periodic monitoring, detection and treatment of Type 1 and 2 immunological reactions and nerve damage.
- Management of Adverse Drug Reactions (ADR)
- Counselling patients and psychological first aid
- Prevention of disability, wound care and management of disability through self-care
- Rehabilitation to optimise patient functioning in community
- Reduction of stigma and discrimination to promote inclusion in society
- Counselling of patients' families and health education of communities

WHO has targeted Leprosy for elimination. The WHO indicators for Leprosy include:

- Number of countries with zero new autochthonous leprosy cases
- Annual number of new leprosy cases detected
- Rate (per million population) of new cases with grade 2 disability
- Rate (per million population) of new paediatric cases with leprosy

4.5.3 Leprosy Control in Guyana

The Guyana Leprosy Control Program is a centrally sponsored Health Scheme of the Ministry of Health, Guyana. It is a sub-programme of Program 2, Disease Control. The Leprosy program is administered separately from the Neglected Infectious Disease Program, and is based in the Skin Clinic located in The Palms Senior home in Georgetown.

Between 1958 and 1971, leprosy patients were treated in a Leprosy Hospital located in Mahaica. Since 1971, the program has applied a "Find and Treat" approach to Leprosy control in the home. The overall goal of the program is "To enhance and improve the effectiveness of the existing medical services in the treatment of leprosy patients and leprosy control by initiating and accelerating the process of leprosy control into the general health services eventually leading to the eradication of the disease."

The objectives of the Leprosy Control Program include:

- To reduce the transmission of the bacillus *M. leprae* at the sub-regional level in Guyana to a prevalence of less than 1 case per 10,000 population by 2030
- Reduce the prevalence of Grade 2 disabilities among new cases by 50% from the present baseline by 2030
- To detect zero (0) cases of Grade 2 disabilities among pediatric leprosy patients by 2030
- To screen 100% of family contacts of all new cases of Leprosy
- To start multi-drug therapy (MDT) in all new cases of Leprosy at the moment of diagnosis.

- To maintain an adequate diagnostic service and case finding system, mainly based on active and passive case finding and systematic examination of contacts to reduce the proportion of new cases with disability.
- To have achieved 100% of the paucibacillary patients, who started MDT nine months earlier, having completed six monthly doses of MDT and 100% of the multibacillary patients who started MDT 18 months earlier, having completed 12 monthly doses of MDT.
- To have achieved integration of leprosy control activities into the general health services by the year 2030
- To scale up leprosy prevention alongside integrated active case detection using preventative chemotherapy with single dose rifampicin (SDR) by year 2030.

The Strategies employed to achieve Leprosy Elimination in Guyana are:

- Decentralized integrated leprosy services through the General Health Care system
- Early detection and complete treatment of new leprosy cases
- Carrying out household contact survey in detection of multibacillary (MB) and child cases
- Early diagnosis and prompt MDT, through routine and special efforts
- Organization of peer counselors with collaboration of Social Services to ensure that patients comply with medications
- Strengthening of Disability Prevention and Medical Rehabilitation Services
- Information, Education and Communication (IEC) activities in the community to improve self-reporting to Primary Health Centre and reduction of stigma
- Intensive monitoring and supervision at Primary Health and Community Health Centres

4.5.4 Human Resources for Leprosy Program

The organogram for the Leprosy Control Program is found in Figure 8. The Guyana Leprosy Control program is headed by a Director who reports to the Director of Disease Control. The Leprosy program employs a leprologist, a dermatologist, 3 government medical officers, 1 community health visitor, 1 registered nurse, 1 medical technologist, 2 nursing assistants, a typist clerk/receptionist, maid and a driver.

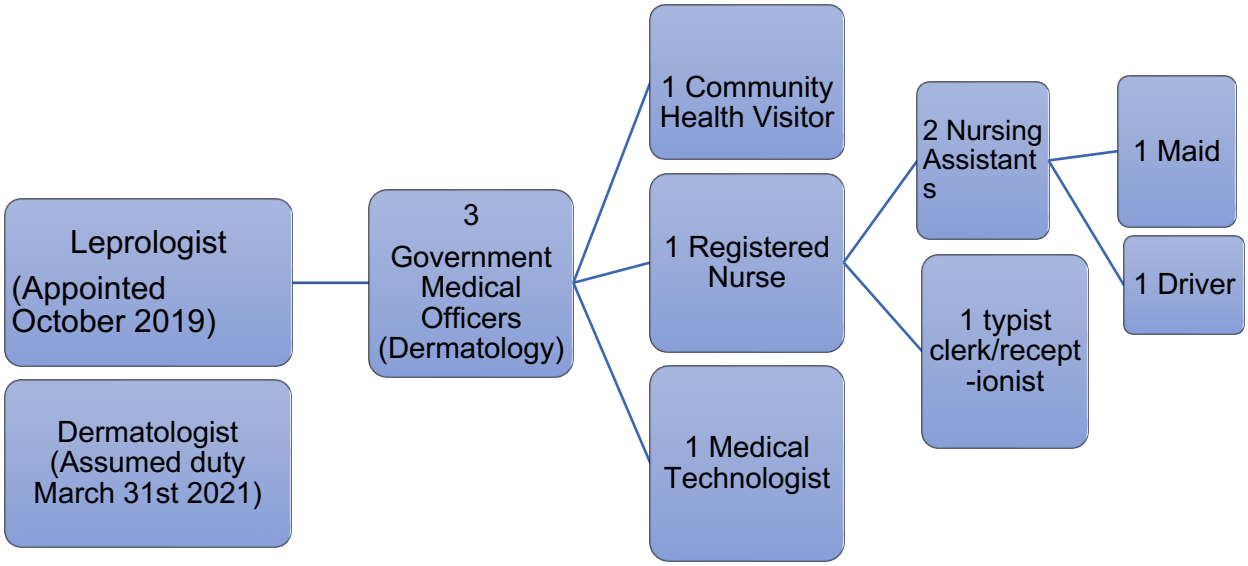
Once again, it is recommended to separate the clinical diagnostic, laboratory confirmation and case management services from program management and surveillance. A medical social worker is needed to provide social support and counselling to persons affected by Leprosy, along with a pharmacist, and a budget administrative assistant. It is recommended to separate program management from clinical diagnosis and case management.

The program staff visit Leprosy patients' homes to examine persons in contact with the patients and to assess the family's socio-economic situation. The Leprosy Control Program is severely constrained by a lack of dedicated transportation for fieldwork. A vehicle was purchased for this program, however it has been reassigned to a different department. The vehicle that is currently being used was donated by the Netherlands Relief Fund in 2004. It is in very poor mechanical and physical condition and it is not safe or reliable for transporting program staff to the field.

Recommendation

It is recommended that a special NID unit of the Ministry of Health be created that would include Leprosy, Lymphatic Filariasis, Leishmaniasis, Chagas Disease and Soil Transmitted Helminths. This would facilitate joint planning, monitoring and evaluation, surveillance, training, information sharing and shared laboratory space.

Figure 8: Organogram for Leprosy Control Program



4.5.5 Leprosy diagnosis, surveillance and treatment

Guyana has achieved elimination of leprosy as a public health problem, defined by WHO as a prevalence rate of less than 1 case per 10,000 inhabitants. The dermatology program of the Ministry of Health manages 14 monthly dermatology clinics located in Regions 3 (3 clinics), 4 (5 clinics), 5 (1 clinic), 6 (3 clinics), and 10 (2 clinics). The clinics in Regions 1 (1 clinic), 2 (2 clinics), and 7 (1 clinic) are visited every quarter. Regions 8 and 9 are visited once or twice a year but have not been visited recently, due to COVID and lack of funding. The clinics are staffed with nurses and are supposed to receive regular visits from the national Leprosy control team.

Transportation is a critical need for the Leprosy program staff to visit regions 2, 3, 4, 5, 6 and 10, for case detection, diagnosis, treatment, follow up, contact screening and socio-economic assessment of families.

The Leprosy program has trained community health workers on identification of leprosy, signs and symptoms and referral to the dermatology clinic in Georgetown. Two (2) health workers per region were trained in 2016, and this was repeated in 2017 and 2018. Trainees included doctors, nurses, midwives and community health workers (CHWs). The objective was to train these health care workers to treat uncomplicated cases in their local health centres and hospitals, however most patients preferred to come to Georgetown for treatment, due to stigma. Also, the trained doctors, nurses and midwives have left these regions thus regular training is required for incoming health care workers.

Leprosy cases in region 9 often seek diagnosis and treatment in Brazil, where this is provided at no cost to the patient. Such cases are not usually reported to Guyana's disease surveillance system. This surveillance data is essential for Guyana's Leprosy program to monitor cases, hotspots and progress towards elimination. Every single confirmed case must be reported in order to verify elimination. Close contacts should also be screened and, once Guyana adopts chemoprophylaxis, these should be treated with single dose rifampicin.

Thalidomide is banned in Guyana, due to concerns about teratogenic effects in pregnant women. The Leprosy Program has suggested that an MOU be signed between Brazil and Guyana with the aim of introduction of a few thalidomide tablets to treat male patients with reactions.

4.5.6 Laboratory diagnosis

The diagnosis of leprosy can be made by the observation of one or more of the following symptoms:

1. Hypopigmented or reddish skin patches with definite loss of sensation;
2. Thickened peripheral nerves; and
3. Acid-fast bacilli on skin smears or biopsy specimens.

The skin clinic in Georgetown has a laboratory that can diagnose Leprosy microscopically. The slit-skin smear (SSS) is the conventional method of leprosy detection. There is no official lab protocol for the slit skin smear technique in Guyana's leprosy program. This test is not in routine use outside of the skin clinic in Georgetown.

The Leprosy Control Program uses the Ziehl Neelson (ZN) stains for revision of slit skin smears. The stains currently in use expired since 2019. At the present time, even though the unit has the capacity to do skin biopsies, there is no access to Fite-Faraco stains for staining of skin tissues. Even if these stains are procured, difficulties will be encountered by the patients since a private pathologist would need to review the skin tissues and this is relatively expensive for most patients.

4.5.7 Leprosy case management

Guyana has national treatment guidelines for Leprosy. Multi Drug Therapy is offered at no cost to the patient, with the medications provided by PAHO through the NTD drug donation program. No shortages of medication have been reported.

Treatment of leprosy

The treatment regimen for leprosy patients in Guyana was altered as of January 2020 to comply with the new WHO guidelines. The current WHO and Guyana guidelines recommend a 3-drug regimen of rifampicin, dapsone and clofazimine for all leprosy patients, with a duration of treatment of 6 months for PB leprosy and 12 months for MB leprosy[16]. This represented a change from the previous standard treatment for PB leprosy, which was rifampicin and dapsone for 6 months, due to some evidence indicating better clinical outcomes with a 3-drug, 6-month regimen over a 2-drug, 6-month regimen. A potential advantage of using the same three drugs for PB and MB leprosy is simplification of treatment (i.e., the same blister pack could be used for treating both types of leprosy) and reduced impact of misclassification of MB leprosy as PB leprosy, since all patients will receive a 3-drug regimen.

For MB leprosy, the current standard treatment is a 3-drug regimen for 12 months. Evidence on the potential benefits and harms of a shorter (6-month) 3-drug regimen was limited and inconclusive, with a potential increase in the risk of relapse. Therefore, the Guidelines Development Group determined that there was not enough evidence of equivalent outcomes to support a recommendation to shorten the treatment duration for MB leprosy.

For rifampicin-resistant leprosy, the guidelines recommend treatment with at least two second-line drugs (clarithromycin, minocycline or a quinolone (like Levofloxacin) plus clofazimine daily for 6 months, followed by clofazimine plus one of these drugs for an additional 18 months. There are currently 2 patients in Guyana who are on alternative treatment regimen due to allergy to rifampicin. The Policy Board of the Ministry of Health has tabled this alternative treatment regimen to be incorporated into the Leprosy treatment guidelines.

No testing is currently available in Guyana for antimicrobial resistance in patients. This would be an important capacity to develop. However, post exposure prophylaxis of close contacts with single dose rifampicin is not practised in Guyana. This policy change has also been tabled by the Policy Board of the Ministry of Health. This is one of the core WHO recommended interventions for elimination of Leprosy.

[16] From https://apps.who.int/iris/bitstream/handle/10665/274127/9789290226383-eng.pdf?sequence=10&isAllowed=y

Table 9: Epidemiologic data on Leprosy[17]

Year	New cases	Prevalence per 10,000	Number of new cases with Grade 2 disabilities	Number of multibacillary (MB) leprosy	Number of cases on chemo-therapy	Registered number of cases on surveillance
1990	34	0.1	No data	No data	84	222
1994	27	0.6	No data	No data	43	144
2008	28	0.79	8/28 (30%)	22/28 (79%)	58	101
***2012**	17	0.52	6/17 (35%)	14/17 (82%)	38	98
***2013**	20	0.36	7/20 (35%)	17/20 (85%)	27	17
***2014**	28	0.36	5/28 (18%)	17/28 (61%)	23	11
2015	29	0.41	10/30 (33%)	20/29 (69%)	29	10
***2016**	52	0.74	11/52 (21%)	38/52 (73%)	54	16
***2017**	67	1.4	11/67 (16%)	56/67 (84%)	100	10
2018	49	0.72	12/49 (24%)	41/49 (84%)	54	44
2019	27	0.75	8/27 (30%)	22/27 (81%)	60	25
***2020**	13	0.45	5/13 (38%)	8/13 (62%)	34	27
***2021**	28	0.41	6/28 (21%)	24/28 (86%)	31	206

***Years inserted from information taken from Leprosy Registers*

This data shows low total numbers of new cases and patients on treatment. However, the relatively high proportion of adult patients with multibacillary leprosy, i.e., highly infectious cases of leprosy and Grade 2 disability at diagnosis between 2008 and 2021, indicates delayed case detection. This rate tends to suggest that cases are not being detected in the early stages of clinical disease. Patients may not be seeking health care due to inadequate access to qualified diagnosticians, insufficient index of suspicion among primary health care workers, or patient concerns about stigma and confidentiality. Due to lack of diagnostic capacity, no accurate data exists on incidence, prevalence, distribution of leprosy in regions 1, 2, 7, 8 and 9.

Patient outcomes have improved significantly since the introduction of Multi Drug Therapy in 1981. Stigma and discrimination continue to prevail in Guyana against persons affected by Leprosy[18], representing a challenge to elimination.

The Leprosy Control Program has tried to integrate leprosy into the primary health care service in the regions, with the health care workers in the Skin Clinic functioning as consultants. However, regional health officers in all regions of Guyana have requested additional training on clinical diagnosis and treatment for primary care physicians and training on laboratory diagnosis for hospital laboratory staff. As all regions of Guyana report a high turnover of health care workers, especially doctors, refresher training should be conducted regularly, particularly in remote hinterland regions. It is recommended that integrated training on epidemiology, diagnosis and treatment for all five neglected infectious diseases be offered in the regions on a regular basis. The NID and Leprosy units should collaborate on curriculum development, training materials and roll out of a training plan in high priority regions.

[17] Source: Alexander, H. and Persaud, R. Leprosy in Guyana, 1990-95: Lepra Elective Study. Lepr. Rev (1997), 83-89.
Leprosy Control Programs Annual Reports (2018 to 2021)
[18] Briden A and Maguire E (2003). An assessment of knowledge and attitudes amongst leprosy/ Hansen's disease workers in Guyana. Leprosy Review 74:154-162.

All disease surveillance, including NID's, remains paper-based. The entire surveillance system would benefit from decentralisation and digitisation of data. However, a holistic assessment of the surveillance system should be done in order to identify gaps and bottlenecks as conversion to an electronic surveillance system will not resolve all the weaknesses. Integrated surveillance for multiple diseases is recommended wherever feasible and possible. This is particularly important for active surveillance programs.

4.5.8 Surgery

Special training is required for surgeons to do neurolysis, i.e., surgical decompression of nerves in predetermined Leprosy patients. For median nerve involvement in leprosy a recent study concluded that surgical along with medical treatment is a better choice in comparison with a solely medical or chemotherapeutic approach.[19]

4.5.9 Patient advocacy and support

Many countries have associations or support groups for persons affected by Leprosy. Such groups can advocate for the human rights of persons with Leprosy and provide psychological and emotional support to members. Guyana does not have Leprosy patient support groups. Some global Leprosy associations that could provide organisational, informational and financial support for a Leprosy support group in Guyana include:

- International Federation of Anti Leprosy Associations (ILEP): ilepfederation.org
- Leprosy Mission International: leprosymission.org

Persons affected by Leprosy would benefit from counselling and psychosocial support from social workers and other providers available through the public health system. Advice and information on vocational training programmes, microcredit and other means to improve their standard of living would also be helpful. Such information could be channeled through a social worker or patient support group.

4.5.10 Research

Armadillos are hunted and eaten in Guyana. Although Leprosy can be transmitted zoonotically from armadillos, the significance of zoonotic transmission has not been assessed in Guyana. There are research opportunities to study zoonotic transmission by nine-banded armadillos *(Dasypus novemcinctus).*
Research is also needed on the perception of leprosy among the Guyanese population, factors associated with treatment defaulting and adverse drug reactions (ADRs) in leprosy patients.

[19] Imran, S. A Mamta; N Etisha; M N Kameshwar, The carpal tunnel syndrome in leprosy: a long term follow up of steroids versus surgical decompression for median nerve neuritis in Leprosy; Lepr Rev Vol 92 Number 3, Sept 2021, 218-224)

5

Rehabilitation Services

Rehabilitation services are offered in 34 locations in the public health care system throughout Guyana. The rehabilitation services collaborated with the skin and NID clinics before COVID, but this should be re-established. The physiotherapists and occupational therapists are available to assist with care of Lymphedema and Leprosy patients, however they would require some specialised training from LF and Leprosy program staff, especially as many new therapists have recently been employed. The rehabilitation services need more referrals from doctors in order to be more involved in treating patients with LF and Leprosy. Such referrals should be included in treatment protocols.

Prosthetic and orthotic devices and special shoes are available at a cost to the patient; however, the National Insurance Service will cover up to 70% of the cost for employed persons.

6

Co-endemicity of Neglected Infectious Diseases

The following table on co-endemicity of Neglected Infectious Diseases by region was compiled from interviews with Regional Health Officers conducted in February 2022. LF data source is LF remapping survey in 2018 and 2019.

Table 10: Neglected Infectious Diseases reported by region

Region	Population[20]	LF	STH	Leprosy	Chagas	Leishmaniasis
1	27,643	+(P)	TBD	+	TBD	TBD
2	46,810	+	TBD	+	TBD	+
3	107,785	+	TBD	+	TBD	TBD
4	311,563	+	TBD	+	TBD	+
5	49,820	+	TBD	+	TBD	TBD
6	109,652	+	TBD	+	TBD	TBD
7	18,375	+(P)	TBD	+	TBD	+
8	11,077	-	TBD	TBD	+	+
9	24,328	-	TBD	TBD	+	+
10	39,992	+	TBD	+	TBD	+

[20] Bureau of Statistics, 2012 census

7

SWOT Analysis: Neglected Infectious Disease Program

Strengths	Weaknesses
• High political priority • Structured programs for LF and Leprosy • Very motivated and committed program leaders • LF approaching elimination • NID's included in national health plan and budget • Patients who receive treatment and care from NID clinics are generally satisfied • Good support from PAHO including NTD drug & diagnostic donations (ELF, Chagas) • National treatment guidelines for Leprosy • Blood transfusion services screen donated blood for Chagas antibodies • Rehabilitation services available throughout Guyana on referral including prosthetic devices, special shoes	• Highly centralized NID programs • Lack of structured national programs for Chagas, STH, Cutaneous Leishmaniasis • Program managers very stretched --- clinical diagnosis & treatment, surveillance, fieldwork, design and produce IEC materials, with very few human resources • Regional health services: staff shortages (doctors, pharmacists, lab staff, nurses, SCM) and high turnover especially in hinterland regions • Previous NID plan (2011) not operationalized or assessed • Previous NID plan (2011) was never costed to ascertain the true financial response • Lack of NID governance • Programs operating with inadequate HR, space, transportation, computers to achieve elimination • Challenges for NID program staff to visit regions (transportation) • Little capacity for NID diagnosis and treatment in some regions

Strengths	Weaknesses
	• Weak NID surveillance systems (passive surveillance, no ACD, paper-based records, no maps) especially for Leishmaniasis, Chagas, STH • No accurate data on incidence, prevalence, distribution of Chagas, Leishmaniasis, STH • No accurate data on incidence, prevalence, distribution of leprosy in Regions 1, 2, 7,8, and 9 • No national treatment guidelines for LF, Leishmaniasis, STH or Chagas • No established or documented method of diagnosis • No lab protocols for Leishmaniasis or Chagas. • No QA or QC program in Tropical Diseases Lab • No official lab protocol for the slit skin smear technique for Leprosy diagnosis • Loss to follow up for patients who have to come to central Georgetown (at personal expense) • Some communication gaps between central programs and regional health officers • Occasionally regional health clinical services order NID drugs that may be inappropriate or excess • Public especially in hinterland not sufficiently aware of NID's or their treatment. Often consult traditional healers before doctors • No PCR confirmatory test for Chagas in Guyana. There is ELISA of another generation that is used instead of PCR and can work depending on disease burden

Opportunities	Threats
• New Health 2030 plan includes NIDs • Health infrastructure throughout Guyana, with new hospitals being constructed • New Global NTD Roadmap 2030 • PAHO Elimination Initiative • Skin NTD approach: possibility for integration of Leprosy, CL, LF (joint training, surveillance, cross referrals) • Chemoprophylactic treatment for Leprosy contacts • Operational research on NIDs • Possibility of visits to countries with robust NID programs (Brazil, Argentina) • New national health information system to be developed – but when? • Referrals of patients for social support (housing, disability income) • Potential formation of patient support groups • Malaria program has QA dept. that could do QA for NID microscopy • Possibility of integration into malaria infrastructure: Vector Control Unit of MoPH and malaria supervisors in regions • Vector Control Unit willing to work on other vectors if trained • Opportunities for collaboration with Maternal and Child Health program, Guyana Food Safety Authority, Environmental Health Dept., rehabilitation services, Ministry of Amerindian Affairs	• COVID 19 has diverted health system – health care workers, lab, transportation, financial resources • Loss of momentum when political changes or change in technical leads • Stigma and discrimination against patients (Leprosy, LF, Leish) • High turnover of technical staff especially in hinterland (need for continuous training) • No public service commission currently in place so vacant confirmed/substantive posts cannot be filled (short term problem). Positions can be filled by two ways; contractual (gratuity paid) arrangements or through Public Service Commission (pensionable establishment) • Security risk for female staff when visit hinterland • Laboratories are not upgraded in diagnostic methods and technologies

8

Plan of Action

8.1 Vision

An NID free Guyana by 2030 through a quality patient-centered approach.

8.2 Mission

To provide a comprehensive integrated sustainable and effective NID programme that will achieve elimination at national and regional levels and reduce the socioeconomic burden.

8.3 Guiding principles

1. Safe, accessible, equitable, resilient and quality primary health services.
2. Evidence-based planning and decision making, monitoring and evaluation, and operational research.
3. Support for persons affected by NIDs, ending stigma and discrimination.
4. Advocacy and health promotion for all NIDs, responsible cooperation and active social participation.

8.4 Strategic Objectives

1. Strengthen NID and vector surveillance, monitoring and evaluation.
2. Mainstream NID case management into regional health services.
3. Strengthen clinical, public health and entomological lab capacity at all levels.
4. Improve NID management through integration, resource mobilisation, operational research, and development of policy guidance.
5. Increase knowledge and awareness of NIDs and end stigma and discrimination.

6. Collaboration with other programs and sectors, with clear roles and responsibilities.

8.5 Enabling Priorities

Enabling priorities are critical support mechanisms required for effective and efficient achievement of the objectives of the strategic plan.

1. *Governance, Advocacy and Leadership*

- At the central level, a High-Level Commission on Elimination of NIDS will provide a Country Coordinating Mechanism to coordinate interventions and subventions by governmental and non-governmental organisations as well as development partners.

- At the regional level, NID regional committees will be established that will have responsibility for implementation of the strategic plan for NIDs. These committees will lobby and coordinate public and private partners for holistic collaboration and execution of the NID strategic plan in each region.

2. *Communication between central NID programs and regional health services*

- In order to implement statutory transfer of financial and programmatic information between central and regional levels, M&E teams will be formed and dashboards created with comprehensive information including IEC, programmatic, logistics, finances, milestones, delays, to ensure two way-communication. Central and regional levels will have access to dashboards.

- Reciprocal data sharing between national and regional levels will be required.

3. *Other enabling priorities*

- Support of collaborating agencies in public and private sectors, NGOs, community groups, persons affected by NIDs in a society/group
- Collaboration with Brazil for information on NID patients treated there
- Proper budgeting and adequate continuous funding
- Risk mitigation plans for disease outbreaks and natural disasters

8.6 Expected Outcomes, Key Actions, Performance Indicators for NID Elimination 2022 – 2027

Strategic objectives	Expected Outcomes	Key Actions to be Taken	Timeframe for each action	Performance Indicators for Outcomes	Responsibility (Lead/Support)
1 Strengthen NID and vector surveillance	Robust active and passive form of NID Surveillance System. Reporting system for NID Vector Control surveillance (entomological). Integrated surveillance system	Increase in surveillance officers, at the regional level, to capture, collate and analyze NID data. Train existing officers on NID surveillance until new officers are in place. Make LF, Leishmaniasis, Chagas, and STH notifiable. Increase in entomology personnel (2 per region). Provide integrated support supervision Development of entomological and epidemiological training protocols to guide data collection. Capacity building training for personnel on entomological surveillance and health surveillance tools. Improve data management (software) and use to guide policies and implementation of management programs. Quarterly performance evaluation meeting for	About 6 – 12 months 3 months 3 months 6 months 6 months 6 months 8 months 3 months 3 months	Production of timely reports from all facilities for NIDs surveillance. Increased reporting of NID cases Quarterly epidemiological (incidence/prevalence/ morbidity/mortality) and entomological report on NIDs. Number of Regions implementing integrated disease surveillance system	Epidemiology and Surveillance Unit. Vector Control Unit: Medical Entomology and NIDs.

		NIDs surveillance and relevant stakeholders. Identification of key sentinel sites for NIDs.			
2. Mainstream NID diagnosis, care and case management into regional health services	All Level 2 and higher Health Facilities in the regions will have the capacity for diagnosis and management of NIDs. Region – specific treatment guidelines based on National Policy guidance. Sustainable and efficient supply chain. Improve patient satisfaction.	Training of a Regional Core Team. Regional rollout of training. Training includes clinical diagnosis and case management. Annual refresher training for regions. Training of key personnel for Logistics Management Information System (LMIS) for accurate forecasting and maintenance of 85% stock. Periodic M&E and SWOT analysis to determine compliance. Provide patients with psychosocial support as necessary. Patient Satisfaction survey.	2-3 months 5 days 3 to 6 months At 6- and 12-month intervals At 6 and 12 months Continuous	All centers must have one trained personnel in NID diagnosis and management. Number of referrals for Counselling or other support 80% of patients satisfied with services received.	RDC Nurses, social Workers in MOH. Ministry of Human Services for social services.
3. Strengthen laboratory capacity and quality					
3A. Strengthen laboratory capacity for both vector borne NIDs and other causes of NIDS (Tropical Disease	Defined physical entomology and Tropical Disease laboratory space, equipped with ALL the needed pieces of equipment and	New and modernized entomology and tropical disease laboratory, in a safe, environmentally adequate location, and good outline. Modernized laboratory equipment in entomology and	3-4 years	Number of laboratories offering entomology and Tropical Disease Lab services for the elimination of NIDs	MOH

Lab) within MOH and private sectors	environmental conditions conducive for staff to perform various activities. Defined package of a cadre of trained staff dedicated to work in the entomology and Tropical Disease laboratory All documented SOPs must be available Define the package of studies, sample collection, testing methods, and waste disposal. Define packages of trainings, with trainer of trainers from both public and private sectors Incorporate NIDs trainings into the existing Malaria training network of microscopy and RDTs	Tropical Disease conducive to performing testing methods. A cadre of trained staff and TOT, so that there is continuous capacity building to cater for the staff who may be leaving and new ones entering. Package of adequate remuneration and staff designation should be clearly articulated and that there is provision for promotion within the confines of the MOH All SOPs must be clearly documented and available for all staff to use Entomological studies should be clearly defined. Testing methods include microscopy, skin scrapings, skin slits, ELISA and PCR based technology and other new forms of testing Operational research and publication of scientific papers	1-2 years Contingent on infrastructure, equipment, trained staff Anytime	Number of trained staff by facility offering testing for entomology and Tropical Disease Lab services for the elimination of NIDs Number of staff confirmed in the designated position on the organizational structure Number of SOPs completed Number of new tests conducted Number of trained staff Number of TOT Number of malaria staff trained on NID diagnostic tests Number of research and publication papers	

	Research and development				
3B Sustainable QC & QA program for lab diagnosis of NIDs	Design, develop and document the QC and QA systems of both the vector borne and Tropical Disease labs. Intersectorial collaboration between public and private labs for exchanging inter country QC External QA as a method of verification of the labs above	Develop a QC & QA plan of action for entomology and Tropical Disease labs Design a SOP for the inter country and external QC and the external QA program	1-2 years contingent on the above	Number of tests with a pass rate of 85% performance Number of staff trained in QC with the public and private sector Number of staff trained in external QA Number of tests that passed the EQA assessment	MOH, Private sector and development partners
4. Improve NID program management integration and resources, and operational research.	Structured integrated central programme. Structured, integrated decentralized system. Easily accessible, adequate & sufficient resources. Strengthen advocacy & increase visibility of NIDs at all levels especially at the policy level. Increased expertise among programme managers and all staff within the NIDs.	Develop integrated NID unit of MoH with HR plan to address the needs of the NIDs elimination strategy. Support operational research for NIDs. Needs based NIDS capacity building for the relevant category of HR (programme heads, clinical staff, laboratory staff). Training of trainers for NIDs. Adequate space for NID case management. Establish integrated NIDs M&E system. Implement training manual for NIDs (electronic or printed) to help in capacity building in the difficult to reach areas. This	2022-2023 2022 - 2025 2022 - 2025 2022 – 2027 2022 – 2027 2022 – 2027 2022 - 2027	60% execution of the completed plan by 2024, 80% execution by 2025, 100 % execution by 2027). One operational study per NID at least every 3 years. Number of health facilities where at least one person is trained for NID. Number of persons trained Completed annual report submitted to programme heads.	MOH/VCS Focal points

		will be updated on a daily basis. Annual collaborative NID programme meetings.			
5. Increase knowledge and awareness of NIDs and reduce stigma and discrimination	Define and design awareness campaign program Design Stigma & Discrimination policies Availability of IEC materials (in the various dialects and foreign languages) in all Regions. Increased knowledge of the issues related to stigma & discrimination with respect to NIDs	Develop radio, TV programs, flyers, billboards, social media, sensitizations in schools, Governmental and Non-Governmental Organizations Capacity building sessions with community groups (schools, church, sports group, clinic sessions) Dissemination of NIDs IEC materials to the Regional Health Services and sister programmes. Incorporation of a document/plan focusing on stigma & discrimination of NIDs.	1 – 3 years 2022 – 2027 2022 – 2027 2022 - 2023	Knowledge, attitude & perception/practice (KAP) survey. Number of persons being screened or tested for NIDs Number of health centers with IEC materials available. NID patient survey on stigma and discrimination Number of health centers with trained & certified staff to tackle stigma & discrimination. Number of persons sensitized about S&D	MOH, private sector, regional health services and development partners
6. Collaboration with other sectors and programs					
6A To collaborate with WASH	To eliminate breeding sites for vectors To ensure universal access to at least basic sanitation and hygiene.	- Ramp up inspection & reporting - Advise NDC's and serve notices when necessary - Raise awareness in schools and communities - Identify high risk areas - Improve drainage	2023-2025	- Inspections - Reports done - Notices served % of population using safely managed sanitation services including	NID focal points Environmental health officers WASH

		Increase access to basic sanitation and hygiene		handwashing facility with soap and water.	
6B To collaborate with rehabilitation services	- Earlier referrals to prevent disability - Improved collaboration with Rehab & the Infectious Disease units - Address the needs of persons with disabilities caused by the NID's so as to improve their quality of life	- Build awareness with doctors for early referrals - Be include in treatment protocols - Form partnerships - Access to rehab services - Quality of life survey	2023-2026	- Early referrals - Improvements in the patient's quality of life	NID focal points Regional health services Rehabilitation services
6C: To collaborate with Ministry of Amerindian Affairs	- Raise awareness of the NID's in the Hinterland communities - Improved human resources - Improved access to medical supplies	- Convince communities leaders of the effectiveness of current medical practices - Medical outreaches (to be able to identify and treat the NID's) - Train Community Health Workers, Doctors and non-medical personnel (Community Service officers, Toshaos, welfare officers & Community Development Officers) to identify and use national treatment protocols	2023-2027	- Increased access to the NID services - Decreased belief in myths - Decreased prevalence of NIDs	Ministry of Amerindian Affairs Regional Health Services NID focal points

		- Hold information sessions with small groups - Have a session at the annual National Toshaos' conference - Place posters at strategic points - Distribute illustrated pamphlets (to cater for the dialect barriers)			
6D: To collaborate with Maternal and Child Health Program	Information on STH species prevalence and distribution by sex and age group STH elimination plan - Inclusion of Chagas screening in MCH antenatal program - Inclusion of Leprosy screening in MCH antenatal program	- Baseline survey of STH including map of deworming interventions by MCH and LF programs - Design and implementation of STH elimination program - Inclusion of Chagas interventions in antenatal program under EMTCT+ - Inclusion of leprosy interventions in antenatal program under EMTCT+	2022 2022-2023 2023-2024 2023-2025	STH survey report STH elimination plan & progress reports Inclusion of Chagas interventions in MCH perinatal strategy (EMTCT+) At least 2 MCH officers trained in the suspicion and diagnosis of leprosy	MCH & NID NID & MCH MCH & NID MCH & Leprosy

Appendix I: Disease Specific Approaches to Disease Control and Elimination

Disease Specific Approaches to Disease Control and Elimination

(incomplete – to be verified and expanded by NID specialists in PAHO HQ)

1. Leprosy[21]

Towards Zero Leprosy

Goal: Zero leprosy: zero infection and disease, zero disability, zero stigma and discrimination

Goal: Elimination of leprosy (defined as interruption of transmission)

Guyana's targets

- Zero new autochthonous cases- **by 2028**
- 70% reduction in annual number of new cases detected- **by 2026**
- 90% reduction in rate (per 10,000) of new cases with G2D- **by 2027**
- 90% reduction in rate (per 10,000) children of new child cases with Leprosy- **by 2026**

4 pillars with key components:

1.1 Implement integrated, country-owned zero leprosy roadmaps in all endemic countries

- Political commitment with adequate resources for leprosy in integrated context
- National partnerships for zero leprosy and zero leprosy roadmaps engaging all stakeholders-

[21] Source: Guyana Leprosy Control Program

- **by 2026**
- Capacity building in the healthcare system for quality services
- Effective surveillance and improved data management systems
- Monitoring of antimicrobial resistance (AMR) and adverse drug reactions by 2026

1.2 Scale up leprosy prevention alongside integrated active case detection

- Contact tracing for all new cases
- Preventive chemotherapy scaled up- **by 2024**
- Integrated active case-finding in targeted populations-**by 2024**

1.3. Manage leprosy and its complications and prevent new disability

- Early case detection, accurate diagnosis and prompt treatment
- Access to comprehensive, well-organised referral facilities
- Diagnosis and management of leprosy reactions, neuritis and disabilities
- Monitoring, support and training in self-care
- Mental well-being through psychological care and therapeutic counselling- **by 2024**

1.4. Combat stigma and ensure human rights are respected

- Adoption of the United Nations Principles and Guidelines for elimination of discrimination against persons affected by leprosy and their family members
- Inclusion of organisations and networks of persons affected by leprosy- **by 2026**
- Amendment of discriminatory laws- **no discriminatory laws by 2024**
- Interventions and processes to reduce and monitor leprosy-related stigma in communities- **by 2027**
- Access to social support and rehabilitation

2. Lymphatic Filariasis

2.1 MDA:

Guyana has conducted three rounds of LF MDA since 2016/2017. Following a survey conducted in 2018/2019, IDA (Ivermectin, DEC, Albendazole) was conducted in 8 endemic regions in 2021. Pre-TAS is ongoing. Impact Assessment Survey is planned for 4th quarter of 2022. Depending on results, IDA will probably be stopped in 2022. This will be followed by the post treatment surveillance phase, in order to document freedom from LF transmission.

2.2 Case management

MMDP on existing patients with lymphedema will be extended to all affected regions. Health Care Workers in these regions will be trained on MMDP and follow up. Patients will be referred for rehabilitation and psychosocial support as needed. LF patients with hydrocoele will be referred for surgery. Surgeons will be trained on hydrocoele surgery.

2.3 Post elimination surveillance

If results of IDA impact survey indicate that LF transmission has been stopped, there will be no need for further MDA. Post MDA surveillance will be conducted to verify that no further recrudescence or reintroduction. The LF Program will prepare and submit its dossier to document elimination.

3. Soil Transmitted Helminthiasis

As very little information is available on the prevalence, severity and distribution of STH in Guyana, a baseline survey will be required to design the STH elimination program.

The recent LF MDA rounds included distribution of Albendazole and Ivermectin, both of which will have reduced the prevalence of helminths. Also, the MCH program includes routine deworming of children between age 6 months and 5 years, as well as pregnant women. These deworming interventions should be mapped and analysed along with the baseline survey results, to identify any possible geographic or demographic gaps.

Step 1: Epidemiological situation analysis of STH. Conduct baseline studies on prevalence and intensity of STH. Map the existing deworming interventions, by target group, i.e. pre-SAC, SAC, Women of Reproductive Age, and region.

Step 2: Mount advocacy effort to obtain political buy in. Identify and establish partnerships for implementation. Possible partners for the NID program include MCH program, regional health services, Ministry of Amerindian Affairs, Environmental Health Dept, WASH services, and Ministry of Education.

Step 3: Design and implement integrated public health components and programs. Cost the STH plan and obtain budget.

Step 4: Monitoring and evaluation, and operational research.

4. Chagas Disease

WHO recommends the following approaches to prevention and control:

- Spraying of dwellings and surrounding areas with residual insecticides;
- House improvements and house cleanliness to prevent vector infestation;
- Personal preventive measures such as bednets, good hygiene practices in food preparation, transportation, storage and consumption;
- Development of contextualized information, education and communication activities for different actors and scenarios about preventative measures and surveillance tools;

- Screening of blood donors;
- Testing of organ, tissue or cell donors and receivers;
- Access to diagnosis and treatment of people with medical indication or recommendation to do antiparasitic treatment, especially children and women of child-bearing age before pregnancy; a
- Screening of newborns and other children of infected mothers without previous antiparasitic treatment to do early diagnosis and provide treatment.

Chagas: Elimination of Mother to Child Transmission, through EMTCT+

Goals:

- Entire country or subdivision has domestic infestation index of less than 1%
- Entire country has achieved goal of elimination of Chagas and instituted measures to prevent disease resurgency or introduction

Targets:

- 90% of children cured of Chagas infection with post treatment negative serology
- 90% of pregnant women are tested for Chagas (in endemic areas)
- 90% of neonates with seropositive mothers are tested for Chagas
- 90% of seropositive mothers are treated for Chagas

EMTCT+ Lines of Action Related to Chagas

1. Integrate Chagas interventions within sexual and reproductive health, antenatal care, maternal and child health, family and community health policies, programs and services. This includes screening of pregnant women for Chagas in endemic areas and appropriate care, referral, and follow-up of pregnant women who test positive.

2. Intensify strategic information on Chagas in Maternal and Child Health services. Define national baselines and targets. Review and update national surveillance protocols and tools to ensure essential data is collected. Ensure adequate systems for timely collection, collation, analysis and dissemination of local, regional and national levels and use of information for strategic planning.

3. Improve the laboratory network and quality and supply chain management. Ensure availability and quality of tests. This includes adherence to SOP's, internal and external quality assurance and proficiency testing, as well as effective supply chain management.

4. Ensure human rights, gender equality and community engagement.

5. Cutaneous and Mucocutaneous Leishmaniasis

Goals:

- To reduce disabilities and fatalities due to Leishmaniasis by strengthening diagnosis, treatment, rehabilitation, surveillance and control
- To reduce CL proportion in children under age 10 by 50% (by 2022)

Targets for Leishmaniasis:

- To reduce deaths from CL & ML by 90% by 2027 (Guyana has no baseline data for this indicator)
- To reduce the CL proportion in children under 10 years by 50% by 2030. According to SISLeish reporting 2012 to 2015, Guyana's baseline was 13.66%. Therefore, target is 50% reduction to 6.83

Strategies

1. Strengthen surveillance systems and maintain information for decision making.

2. Strengthen outbreak investigation.

3. Improve access to diagnosis, treatment, rehabilitation, nutritional support and follow up of Leishmaniasis cases.

4. Identify, monitor and report adverse reactions to treatment in a timely manner. As Guyana does not currently have a national pharmacovigilance system, ADR to Leishmaniasis medications should be reported to the Food and Drugs department.

5. Reduce vector transmission through entomological surveillance and integrated vector management. Strengthen entomological capacity to guide surveillance, prevention and control actions for CL and ML.

6. Health education, health promotion, social mobilization in areas of transmission.

7. Strengthen laboratory diagnosis. The national laboratory should participate in Regional Program for Direct External Evaluation of Performance (PEED).

8. CL epidemiological classification and risk stratification of areas: See PAHO Plan of Action to strengthen surveillance and control of Leishmaniasis in the Americas for risk stratification.
    - 8.1 Map areas with transmission and categorise as low, moderate or high/intense/very intense.
    - 8.2 Categorise areas without transmission as vulnerable or non-vulnerable. PAHO Plan of action recommends CL interventions for each type of area.

Appendix II: Milestone Plan

STRATEGIC OBJECTIVE	MILESTONE	2022				2023				2024				2025				2026				2027			
		Q 1	Q 2	Q 3	Q 4	Q 1	Q 2	Q 3	Q 4	Q 1	Q 2	Q 3	Q 4	Q 1	Q 2	Q 3	Q 4	Q 1	Q 2	Q 3	Q 4	Q 1	Q 2	Q 3	Q 4
1 Improve NID Governance (enabling priority)	High level NID Commission/ Country Coordinating Mechanism constituted and holding quarterly meetings to evaluate NID program performance.																								
	NID coordinating committees established in each region, and holding quarterly meetings.																								
2 Strengthen NID and vector surveillance	Development of entomological and epidemiological surveillance protocols.																								
	Each region has surveillance officer, trained and conducting NID surveillance.																								
	LF, Leishmaniasis, Chagas and STH made notifiable diseases.																								
	Each region has 2 entomology personnel, trained and conducting NID vector surveillance and integrated vector management.																								

STRATEGIC OBJECTIVE	MILESTONE	2022				2023				2024				2025				2026				2027			
		Q 1	Q 2	Q 3	Q 4	Q 1	Q 2	Q 3	Q 4	Q 1	Q 2	Q 3	Q 4	Q 1	Q 2	Q 3	Q 4	Q 1	Q 2	Q 3	Q 4	Q 1	Q 2	Q 3	Q 4
	Quarterly NID surveillance meetings to discuss progress and evaluate performance.																								
3 Mainstream case management into central and regional health services	Region – specific NID treatment guidelines based on National Policy guidance.																								
	All Level 2 and higher Health Facilities in the regions will have the capacity for diagnosis and management of NIDs.																								
	NID program managers and all regional health services receive training in Logistics Management Information System.																								
	NID patients received psychosocial support through internal (MoH) and external referrals.																								
4 Strengthen laboratory testing capacity for NID's and vectors	Document describing NID and entomology package of studies, sample collection, testing methods and waste disposal. To include microscopy, skin scrapings, skin slit smears, ELISA and PCR based technology and other new																								

STRATEGIC OBJECTIVE	MILESTONE	2022				2023				2024				2025				2026				2027			
		Q 1	Q 2	Q 3	Q 4	Q 1	Q 2	Q 3	Q 4	Q 1	Q 2	Q 3	Q 4	Q 1	Q 2	Q 3	Q 4	Q 1	Q 2	Q 3	Q 4	Q 1	Q 2	Q 3	Q 4
	forms of testing.																								
	Training plan for laboratory staff, centrally and regionally, including public and private labs, existing malaria microscopists in regions, and annual refresher trainings. TOT approach. To include long term training needs in light of staff turnover.																								
	Lab SOP's documented.																								
	Training plan implemented centrally and regionally, in public and private sector labs.																								
	Design for Vector and Tropical Disease Lab including specific location, infrastructure, equipment, HR, start-up costs and annual																								

STRATEGIC OBJECTIVE	MILESTONE	2022				2023				2024				2025				2026				2027			
		Q 1	Q 2	Q 3	Q 4	Q 1	Q 2	Q 3	Q 4	Q 1	Q 2	Q 3	Q 4	Q 1	Q 2	Q 3	Q 4	Q 1	Q 2	Q 3	Q 4	Q 1	Q 2	Q 3	Q 4
	operating budget.																								
	Modern Vector and Tropical Disease Laboratory operational with all necessary equipment, SOP's, reagents, trained staff and appropriate biosecurity and biosafety measures in place for NID and entomological diagnostics.																								
5 Improve program management	HR plan for NID elimination submitted, costed and approved. To include package of adequate remuneration and staff designation with provision for promotion within the confines of the MOH.																								
	Additional staff employed to implement HR plan.																								

STRATEGIC OBJECTIVE	MILESTONE	2022				2023				2024				2025				2026				2027			
		Q 1	Q 2	Q 3	Q 4	Q 1	Q 2	Q 3	Q 4	Q 1	Q 2	Q 3	Q 4	Q 1	Q 2	Q 3	Q 4	Q 1	Q 2	Q 3	Q 4	Q 1	Q 2	Q 3	Q 4
	Training manual developed for clinical and lab staff.																								
	Capacity building for program leaders, clinical and lab staff. TOT approach with regular refresher training due to high staff turnover.																								
	NID operational research supported.																								
	NID clinic established with adequate space and facilities.																								
	NID M&E system.																								
	Annual collaborative NID program management meetings.																								
6 Increase knowledge and awareness of NIDs, reduce stigma & discrimination	Multimedia public awareness and communication 5 year plan developed, costed and approved.																								
	Stigma and discrimination policies and plan developed and approved.																								

STRATEGIC OBJECTIVE	MILESTONE	2022				2023				2024				2025				2026				2027			
		Q 1	Q 2	Q 3	Q 4	Q 1	Q 2	Q 3	Q 4	Q 1	Q 2	Q 3	Q 4	Q 1	Q 2	Q 3	Q 4	Q 1	Q 2	Q 3	Q 4	Q 1	Q 2	Q 3	Q 4
	IEC materials produced and distributed to all regions.																								
	Capacity building and sensitization of community groups on NID including stigma & discrimination.																								
7 Collaboration with partners and other agencies	Joint action plan with WASH to reduce vector breeding sites and provide safe water to high risk communities.																								
	Joint action plan with WASH implemented.																								
	Collaboration/ referrals with rehab services to address the needs of persons with disabilities and improve quality of life.																								
	Joint outreach and community mobilisation activities with Ministry of Amerindian Affairs.																								
	Baseline survey of STH in Guyana, including map of deworming interventions by MCH.																								
	STH Elimination Plan based on survey results.																								

STRATEGIC OBJECTIVE	MILESTONE	2022				2023				2024				2025				2026				2027			
		Q 1	Q 2	Q 3	Q 4	Q 1	Q 2	Q 3	Q 4	Q 1	Q 2	Q 3	Q 4	Q 1	Q 2	Q 3	Q 4	Q 1	Q 2	Q 3	Q 4	Q 1	Q 2	Q 3	Q 4
	MCH antenatal program to include Chagas interventions under EMTCT+.																								

Appendix III: Monitoring & Evaluation

Monitoring is the systematic process of collecting, analyzing and using information to track a program's progress toward reaching its objectives and to guide management decisions. Monitoring usually focuses on processes, such as when and where activities occur, who delivers them and how many people or entities they reach.

Evaluation is the systematic assessment of a program's performance. Evaluation focuses on expected and achieved accomplishments, examining the results chain (inputs, activities, outputs, outcomes and impacts), processes, contextual factors and causality, in order to understand achievements or the lack of achievements. Evaluation aims at determining the relevance, impact, effectiveness, efficiency and sustainability of interventions and the contributions of the intervention to the results achieved.

Impact and process indicators are included in the activity plan in Section 8.2. The NID Program will develop an M&E system, with indicators that address global and national goals and targets. This will require consultation with disease specialists in PAHO/WHO. Some **suggested** disease indicators follow but more work needs to be done to develop the NID M&E plan. Periodic independent program assessments by external experts are a best practice for evaluation.

1. Leprosy Indicators

Monitoring and evaluation of interventions implemented against leprosy focuses on three groups of indicators: elimination indicators, patient care indicators and managerial indicators. Detailed recommendations are included in the WHO publication entitled *How to monitor leprosy elimination in your working area* (WHO, 2001).

Elimination indicators

- Prevalence: the number of cases registered for MDT treatment at a given point of time (usually, for reporting purposes, the 31st of December)

- Prevalence rate: the number of cases registered for treatment at a given point of time per 10,000 population

$$\text{Prevalence rate} = \frac{\text{Prevalence}}{\text{Population in the given area}} \times 10{,}000$$

- Detection: the number of cases newly detected and never treated before, during a given year (1st of January to 31st of December)

- Detection rate: the number of cases newly detected during a given year per 100,000 population

$$\text{Detection rate} = \frac{\text{Detection}}{\text{Population in the given area}} \times 100{,}000$$

- Proportion of children under 15 years old among newly detected cases, expressed as a percentage

$$\text{Proportion under 15} = \frac{\text{Number of patients aged 0-14 years detected during one year}}{\text{Total number of patients detected during one year}} \times 100$$

- Proportion of cases with grade 2 disability among newly detected cases

$$\text{Proportion G2D} = \frac{\text{Number of patients newly diagnosed with grade 2 disability}}{\text{Number of newly detected patients for whom the disability status has been recorded}} \times 100$$

Patient care indicators

- Cure rate: the number of patients cured divided by the number of patients supposed to have been cured in the same cohort, expressed as a percentage

$$\text{Cure rate (MB)} = \frac{\text{Number of patients who have taken 12 blister packs of MDT}}{\text{Number of MB patients who started MB-MDT 18 months before the date of the study}} \times 100$$

$$\text{Cure rate (PB)} = \frac{\text{Number of patients who have taken 6 blister packs of MDT}}{\text{Number of PB patients who started PB-MDT 12 months before the date of the study}} \times 100$$

- Defaulter rate: the number of patients who have not taken treatment for 12 consecutive months divided by the number of patients supposed to have been cured in the same cohort, expressed as a percentage

Number of patients who have not taken blister packs of MDT
for 12 consecutive months
Defaulter rate (MB) = ---------- x 100
Number of MB patients who started MB-MDT
18 months before the date of the study

Number of patients who have not taken blister packs of MDT
for 12 consecutive months
Defaulter rate (PB) = ---------- x 100
Number of PB patients who started PB-MDT
12 months before the date of the study

- Proportion of patients still on treatment after having completed standard MDT regimen: the number of patients who are taking MDT after having completed standard MDT regimen divided by the number of patients supposed to have been cured and stopped taking MDT in the same cohort, expressed as a percentage.

Number of patients who are still on treatment after having
completed 12 MDT blister packs
- Proportion of patients = ---------- x 100

still on treatment (MB) Number of MB patients who started MB-MDT
18 months before the date of the study

Number of patients who are still on treatment after having
Completed 6 MDT blister packs
Proportion of patients = ---------- x 100
still on treatment (PB) Number of PB patients who started PB-MDT
12 months before the date of the study

Managerial indicator

Proportion of health facilities providing MDT: the proportion of health facilities providing MDT blister packs among all existing health facilities

Number of health facilities visited
having at least one MDT blister pack
Proportion of health facilities = ---------- x 100
providing MDT Number of health facilities visited

2. Lymphatic Filariasis Indicators

- Number of persons who require LF preventive chemotherapy

- Epidemiological Drug Coverage (EDC), the reported proportion (percentage) of the total population living in an LF IU that received the PC medication. Target ≥ 65%

- Program Drug Coverage (PDC): the reported proportion (percentage) of the target population living in the IU that actually ingested the medicines.

Reported coverage should be verified through a coverage survey at least in a subsample of the IU's, using a population-based survey cluster method. This should be carried out by an independent team from outside of the IU.

- Number of persons receiving MMDP for LF

- Geographic coverage of MMDP: % of LF IU's where MMDP is provided

- Post IDA Impact Assessment: WHO HQ is currently developing a methodology to evaluate impact of IDA. Some potential indicators will be:

Number of EU's eligible for Impact Assessment Survey
Number of EU's that have cleared pre-TAS
Number of EU's that have cleared Impact Assessment Survey

3. Soil Transmitted Helminthiasis indicators

Global targets for preventive chemotherapy[22]

75% of preschool (pre-SAC) and school-age children (SAC) in need of treatment are regularly treated.

75% coverage with preventive chemotherapy (PC) is achieved in pre-SAC and SAC.

2030 STH objectives with targets and indicators:

1. Achieve and maintain elimination of STH morbidity in pre-SAC and SAC by 2030
Indicator: Number of countries with prevalence in pre-SAC and SAC with STH infections of moderate and heavy intensity (MHI) < 2%.

[22] WHO, 2030 Targets for Soil Transmitted Helminthiasis Control Programmes (2030).

Indicator calculation = $\frac{\text{Number of children with M\&HI}}{\text{Total number of children examined}}$

2. Reduce the number of tablets needed in PC for STH by 50% (by 2030)

ndicator calculation = $\frac{\text{Number of pre-SAC at risk x annual PC frequency}}{\text{Number of SAC at risk x annual PC frequency}}$

3. Increase domestic financial support to PC for STH.

Indicators:

a) % of endemic countries that after elimination of STH morbidity, fully finance the maintenance phase of control activities.

(b) Number of at-risk children covered by endemic countries fully financing PC for STH

Establish an efficient STH control program for adolescent, pregnant and lactating Women of Reproductive Age (WRA)

Indicator: Deworming coverage in adolescent, pregnant, lactating and other WRA in endemic areas (where SAC are in need of treatment). (Data should be disaggregated by WRA subgroup.)

Indicator calculation:

$$\frac{\text{Number of adolescent, pregnant and lactating WRA receiving deworming}}{\text{Total number of adolescent, pregnant and lactating WRA}}$$

Establish efficient Strongyloidiasis control program in SAC

Indicator: Coverage with Ivermectin of SAC at risk of morbidity due to Strongyloidiasis

Calculation = $\frac{\text{Number of at-risk SAC receiving Ivermectin and a benzimidazole}}{\text{Total number of at risk SAC}}$

Basic parasitological indicators (to be collected at each site and at each visit)

- Prevalence and intensity of infection with *A. lumbricoides*;
- Prevalence and intensity of infection with *T. trichiura*;
- Prevalence and intensity of infection with hookworms (*A. duodenale* and *N. americanus*);
- Prevalence of infection with any of the three STH species (cumulative prevalence of infection);
- Prevalence of high-intensity infections with any of the three STH species (see Table 10 for classes of intensity).

Table 11: Classes of intensity for soil-transmitted helminth infections (WHO, 2002)

Organism	Light-intensity (epg)	Moderate-intensity (epg)	Heavy-intensity (epg)
A. lumbricoides	1-4,999	5,000-49,999	≥ 50,000
T. trichiura	1-999	1,000-9,999	≥ 10,000
Hookworms	1-1,999	2,000-3,999	≥ 4,000
epg: eggs per gram of feces			

Examination techniques:

For parasitological indicators: a stool sample should be collected from each individual and should be analyzed by the Kato-Katz thick smear technique, for eggs of STHs.

4. Leishmaniasis indicators[23]

Impact

- Number of cases of CL and ML reported in a year in country, region and subregion (NDC). Cases confirmed by PAHO/WHO standard case definition[24].
- Incidence rate of CL/ML = Total number of new cases during year/Total population at risk in country, region and subregion (NDC) x 100,000 population
- Density rate of CL/ML = Total number of new CL or ML cases during year/ transmission area in square km in country, region, subregion (NDC) --- in limited geographical area.

Surveillance

- Country reports annually to SisLeish on CL/ML data and annual population at subregional (NDC) level.
- Country applies CL/ML risk stratification to guide Leish surveillance and control. ** *For instructions on CL/ML risk stratification, See PAHO Plan of Action to Strengthen Surveillance and Control of Leishmaniasis in the Americas.*
- CL outbreaks are investigated and reported.

Laboratory

- At least 80% of CL/ML cases are diagnosed or confirmed by laboratory exam.

[23] PAHO/WHO Plan of Action to Strengthen the Surveillance and Control of Leishmaniasis in the Americas 2017-2022. https://www.paho.org/en/documents/plan-action-strengthen-surveillance-and-control-leishmaniasis-americas-2017-2022
[24] Ibid.

- Laboratory participates in direct external performance evaluation (PEED) for microscopic examination of Leishmania.
- At least 90% of laboratory network is performing microscopic diagnosis of CL/ML and internal quality evaluation of diagnosis.
- At least 95% of CL/ML diagnosed cases are treated.
- At least 80% of total treated CL/ML cases are cured.
- Leishmaniasis medication is available in the country throughout the year.
- CL/ML cases with disabilities are officially included in the national rehabilitation program.
- Severe adverse drug reactions for CL/ML medications are investigated and reported.

Chagas Disease Indicators

- Antiparasitic treatment coverage of eligible population. Target is 75%.
- Interruption of transmission through 4 transmission routes, i.e. vectoral, transfusion, transplantation and congenital.

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