The Impact of Universal Health Coverage and National Health Expenditure on the Main Health Determinants on Central America Countries and the Caribbean

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ABSTRACT

Introduction: Health is considered as a sensitive marker of the sustainable development of a population. In Central America and Caribbean (CAC) region, the majority of countries are considered middle-income economies with significant inequalities mainly between the different types of health coverage and health expenditure.

Objectives: The main objective of the dissertation is to identify a possible relationship between universal health coverage and health investment in the main health and some sociodemographic determinants defined by the WHO/PAHO from 2009 to 2018. Additional characterizations of current types of health coverage, investment in health and the main health and socio-demographic indicators of the region were made.

Method: The research corresponds to an ecological study where information on maternal, infant, neonatal, under five, general and communicable diseases mortality rates, as well as life expectancy and Gini coefficient index were extracted from the PAHO/WHO and the World Bank Development Indicators reports dated from 2009 to 2018. The data obtained was analysed to evaluate the correlation between the coverage indicators and GDP percentage spent on health with the results variables.

Results: It was determined that the GDP % invested in health had a greater impact on life expectancy than the way in which the health system was organized in a particular country ($p = 0.018$). GDP % invested in health and the type of coverage showed an inverse correlation with maternal mortality ($p = 0.004$). Likewise, for each additional factor added to health coverage (whether single, dual or tripartite), maternal mortality also decreased. GDP % invested in health also had a significant impact on neonatal mortality ($p = 0.000$); however, the nature of the health system had no influence on neonatal mortality. Infant mortality was reduced ($p = 0.001$) for each additional point of GDP investment in health, and both investment in health ($p = 0.001$) and type of health coverage ($p = 0.022$) directly affected mortality in children under 5 years of age. Finally, percentage of GDP spend on health had no direct impact on general mortality ($p = 0.820$) or mortality from communicable diseases ($p = 0.085$).

Conclusion: Differences in the main health determinants reflect the gap in health spending between different governments. The analysis confirms that there is a relationship mainly between health investment and the main health determinants. It also demonstrated that each additional point of the GDP invested in health might reflect an improvement in the number of

years that an individual can live and a significant decrease in the different mortality rates studied. At the same time, this analysis was able to correlate the type of health coverage with significant differences in maternal mortality and under five mortality rates.

Recommendations: It is important to conduct similar studies prospectively in order to allow governments to exercise an evidence-driven decision-making process in CAC.

KEY WORDS

Universal coverage, health investment, indicators, Central America, Caribbean, mortality, morbidity
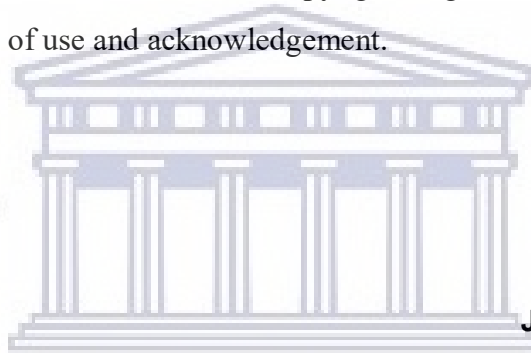
DECLARATION

I declare that this thesis that I now submit for assessment on the programme of study leading to the degree Master of Science in Pharmacy Administration and Policy Regulation has not been submitted for the purpose of a degree at this or any other higher education institution. It is entirely my own work and has not been taken from the work of others save to the extent that such work has been cited and acknowledged within the text of this work.

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Lopez, A   **January 16th, 2020**

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ACKNOWLEDGEMENTS

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LIST OF ABBREVIATIONS AND ACRONYMS

CAC: Central America and Caribbean

CCSS: Caja Costarricense de Seguro Social

CI: Confidence Interval

GDP: Gross Domestic Product

GNI: Gross National Income

GMR: General mortality rate

IMR: infant mortality rate

L5MR: Under five mortality rate

LB: Live Births

MCD: Mortality of communicable disease

MDGs: Millennium Development Goals

MMR: Maternal mortality ratio

MoH: Ministry of Health

NHS: National Health System

NMR: Neonatal mortality Rate

PAHO: Pan American Health Organization

Pop: population

SEM: Sickness and Maternity Insurance

SIVM: Disability, Old Age and Death Insurance

Std: Standard

SUS: Single Universal Health System

UHC: Universal Health Coverage

USAID: United States Agency for International Development

WB: World Bank

WHO: World Health Organization

CHAPTER ONE
INTRODUCTION

1.1 INTRODUCTION

This chapter will develop on basic definitions and concepts related to the universality of healthcare as a human right and its main objectives. It will also describe the demographic characteristics and the different income levels of the countries of the Central America and Caribbean (CAC) region through the Gross National Income (GNI) per capita and the World Bank Income Classification. Finally, it will define the different health status indicators according to international entities, such as the Pan American Health Organization (PAHO) and the World Health Organization (WHO), and describe their relevance to this research project.

1.2 DEFINITIONS AND CONCEPTS

The rational of the universality of health care lies in a document written 70 years ago, the Universal Declaration of Human Rights (1948). The declaration laid the foundation for equity and gives an international consensus to guide the conduct of governments on medicines, public health, and the strengthening of health systems; aiming to establish the highest attainable standard of health. According to the Pan American Health Organization (PAHO), Sustainable Health Agenda for the Americas 2018-2030 (2017)

> "enjoyment of the highest attainable standard of health is one of the fundamental rights of every human being without distinction of race, religion, political belief, economic or social condition".

This same document defines a series of values that are fundamental when reflecting on this subject; equity, universality and social inclusion. The Agenda reflects on the constant search for equity in

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health, as a pillar to eliminate all health inequalities that are not only avoidable, but are unjust, and remediable among populations. It has previously been stated by the WHO (2015) that;

> "a human rights-based approach to health provides strategies and solutions to address and rectify inequalities, discriminatory practices and unjust power relations, which are often at the heart of inequitable health outcomes".

The main goal of this approach is to align all health strategies and programs with the objective of improving the access of all people to the right to health (PAHO, 2017). The Agenda also remembers that human rights, such as access to the highest standard of health, are universal and inalienable and that no individual, or country, should be excluded based on race, colour, sex, language, religion, political, national or social origin, place of birth, or other status. Regarding social inclusion, the Agenda encourages social participation in defining, implementing and assessing the outcomes of health policies. It also encourages policy-makers and service providers to make health systems more responsive to the people they serve (PAHO, 2017). This document mainly represents the health sectors response to the commitments adopted by the countries in the 2030 Agenda for Sustainable Development and unfinished business from the Millennium Development Goals (MDGs) and the Health Agenda for the Americas 2008-2017.

It has also previously been highlighted by authors like Backman *et al* (2008) that the right to health for the most vulnerable individuals in society (the economically disadvantaged and particularly those living in poverty) has been of particular concern. Nowadays health is considered as a sensitive marker of the sustainable development of a population, since a healthy population has been directly related to higher labour productivity and economic benefits, creating opportunities for greater inclusion (de Andrade *et al.*, 2015).

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1.3 CENTRAL AMERICA AND CARIBBEAN (CAC) COUNTRIES DEMOGRAPHICS AND INCOME LEVELS

Latin America generally refers to those countries in the Americas where the Spanish, Portuguese or French languages predominate. Specifically, Central America is made up of seven countries (Panamá, Costa Rica, Nicaragua, Honduras, El Salvador, Belize and Guatemala), with a population estimated to be 48,857,000 in 2018. The Latin Caribbean is comprised of seven islands (Cuba, Dominican Republic, French Guiana, Guadeloupe, Haiti, Martinique and Puerto Rico) with an estimated population of 38,268,000 habitants (PAHO & WHO, 2018). Of the above-mentioned countries, only Guadeloupe and Martinique are not considered member states of the PAHO and do not have economic data incorporated into the World Bank classification.

Gross Domestic Product (GDP) is a widely used indicator that refers to the total gross value added by all resident producers in the economy (Rahman *et al.,* 2019). GDP per capita is the GDP of the country divided by its midyear population. Usually the growth in a country's economy is measured by the change in GDP at constant price (Rahman *et al.,* 2019). Gross National Income (GNI) per capita measures income in US dollars, converted from the local currency using the World Bank Atlas method and is broadly used in assessing a country's wealth and capacity to provide for its people. GNI is defined as the sum of total domestic and foreign value added claimed by the residents of a particular country, divided by the total population. It is used to classify economies into the four main income groups: low-income, lower-middle-income, upper-middle-income, and high-income. Estimates of GNI are obtained from economists in World Bank country units, and the size of the population is estimated by World Bank demographers from a variety of sources (World Bank, 2019). According to the World Bank, high-income countries are considered those that generate a Gross National Income (GNI) per capita of more than US $ 12,375. In the region of Central America and the Latin Caribbean, only Panama is considered, according to the World Bank, as a high-income country. Countries such as Costa Rica, Dominican Republic, Guatemala and Belize are considered medium-high income countries, with per capita income of US $ 3,996 to US $ 12,375. Nicaragua, El Salvador and Honduras are considered middle-low income countries, with per capita income between US $ 1,026 and US $ 3,995. Only Haiti in the region is classified as a low-income country, with less than US $ 1025 per capita (World Bank, 2019). It is

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important to highlight that the WHO Public Spending on Health Report (2018) showed that in 2016 the median per capita health spending was over US$ 2,000 in high-income countries but just a fifth of that (US$ 400) in upper-middle income and one-twentieth of that (US$ 100) in low and lower-middle income countries. This report also reveals that only 20% of the world's population live in high-income countries, and yet these countries account for close to 80% of global health spending; proving that there is currently a gap in health spending between rich and poor countries that must be addressed by governments.

1.4 PAN AMERICAN HEALTH ORGANIZATION (PAHO) AND WORLD HEALTH ORGANIZATION (WHO) CORE HEALTH AND DEMOGRAPHIC STATUS INDICATORS

Just as classification of countries by income levels is important for grouping and comparing different economies and the variations by geographic region, global health indicators are of vital importance for monitoring changes in the health of different populations and for collecting evidence to inform adequate decision making. These indicators can be divided into those that directly measure health phenomena such as disease and death, and the indirect measures of health such as education and poverty indicators. The global health indicators used in developing countries usually address morbidity and mortality, and important precursors of both (Larson & Mercer, 2004). For the purposes of this study, the focus was on the direct health status indicators reported in the published PAHO and the WHO reports on health situation in the Americas from 2009 to 2018 (PAHO /WHO, 2009-2018). In cases where data was not available in PAHO/WHO reports; or that they are more complete on the World Bank database, this last source was used in order to avail the largest amount of data for the analysis (World Bank, 2019). The 2018 edition includes the latest information on key indicators for the Region of the Americas; including Central American Isthmus and the Latin Caribbean. The data on the 82 core health indicators was grouped into five categories: demographic-socioeconomic, health status, risk factors, service coverage, and health systems. The main health status indicators determined by these two international organizations that were selected for this mini-thesis analysis were life expectancy, maternal

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mortality ratio, neonatal mortality rate, infant mortality rate, under five mortality rate, general mortality rate, and mortality of communicable diseases rate.

Mortality data represents not only an essential source of cause of death data, but also a source of demographic and geographic information. Mortality data is generally used to quantify health problems, as well as to determine or monitor health priorities or goals. It has certain advantages over morbidity indicators, since death is a unique, easily identifiable event that reflects the occurrence and severity of a disease. Furthermore, the registration of mortality data is mandatory in all the countries of the Region of the Americas. On the other hand, it was decided not to use morbidity indicators since to calculate the different morbidity rates it is necessary to draw upon direct observation with surveys and other investigations, the notification of events in the surveillance systems and disease notification in the ambulatory settings, hospital or specific records. Moreover, there are several factors that can affect the accuracy of the measurement of these events, such as: quality of the data, validity of the measurement instruments, severity of the disease, different cultural norms, confidentiality and health information systems. Additional to the main health status indicators, life expectancy at birth is a demographic and socio-economic indicator that becomes relevant to this review as it reflects the overall mortality level of a population; summarizing the mortality pattern that prevails across all age groups in a given year (PAHO, 2018).

According to the Global Reference List of 100 Core Health Indicators (WHO, 2015), life expectancy at birth refers to the average number of years that a newborn could expect to live if he or she were to pass through life exposed to the sex- and age-specific death rates prevailing at the time of his or her birth, for a specific year, in a given country, territory or geographical area. Maternal mortality ratio (MMR) refers to the annual number of female deaths from any cause related to or aggravated by pregnancy or its management (excluding accidental or incidental causes) during pregnancy and childbirth or within 42 days of the termination of pregnancy, irrespective of the duration and site of the pregnancy. It is expressed per 100 000 live births (LB), for a specified time period. The numerator includes all maternal deaths occurring in a period and the denominator includes the total number of live births occurring in the same period. Infant mortality rate refers to the probability that a child born in a specific year or period will die before

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reaching the age of 1 year. The infant mortality rate (IMR) is, strictly speaking, not a rate but a probability that indicates the chance of dying between birth and age of 1 year per 1000 live births. The numerator includes the number of children who died before their first birthday (0−11 months of age) and the denominator includes the number of live births (years of exposure). Under five mortality rate (L5MR), similar to infant mortality rate, is not a rate but the probability of a child born in a specific year or period dying before reaching the age of 5 years. It is expressed as a rate per 1000 live births. The numerator includes the number of deaths among children aged 0–4 years (0–59 months of age), broken down by age groups, and the denominator includes the number of live births (person-years of exposure). The general mortality rate (GMR) refers to the estimated total number of deaths in a population of a given sex and/or age, divided by the total number of this population, expressed per 100,000 population, for a given year, in a given country, territory, or geographic area. Mortality of communicable disease (MCD) rate refers to the estimated total number of deaths from communicable diseases in a population of a given sex divided by the corresponding total number of this population, after removing the effect of differences in the age distribution. It is expressed per 100,000 population for a given year, in a given country, territory, or geographic area (WHO, 2015). Communicable diseases refer specifically to HIV/AIDS, sexually transmitted infections (STIs), tuberculosis (TB), malaria, neglected tropical diseases, outbreaks and epidemic diseases. The total current expenditure on health is expressed as a percentage of gross domestic product (% GDP) and it is considered an indicator of resources and access to health systems rather than an indicator of population health. The numerator corresponds to the sum of all current expenditure on health (12-month period) and the denominator corresponds to the gross domestic product. This includes all current expenditure, regardless of the source, domestic and donor funding (PAHO & WHO, 2018). Finally, the Gini coefficient is a socioeconomic determinant that is used to measure differences in the distribution of wealth within a country. (World Bank, 2019). This index measures inequality based on two absolute variables (population and health variables) represented in a diagonal line. The greater the distance from the diagonal line, the greater the inequality. Thus, a Gini index of 0 represents perfect equity, while an index of 100 represents perfect inequality. It is important to note that having a high GDP does not necessarily correlate directly with equality, since there are cases of countries with high GDP that report high levels of inequality, such as Panama with a Gini index of 50.4. (World Bank, 2019).

The Gini coefficient is based on a cumulative frequency curve (Lorenz curve) that compares the distribution of a proportion of the population on the X axis and the cumulative proportion of the health variable on the Y axis. In this curve the equality distribution is represented by a diagonal line, and the greater the deviation of the Lorenz curve from this line, the greater the inequality. The Gini coefficient is zero if everyone had the same income and is 100 if a single person had all the income (PAHO, 2018).

It is important to highlight that few developing countries are able to maintain death, birth or disease registries due mainly to budget constraints and limited logistics (Larson & Mercer, 2004). Nevertheless, with ongoing technology advances, data collection has become more accessible at the global, regional, sub regional and national levels according to PAHO (2018).

1.5 BACKGROUND AND RATIONALE FOR THE STUDY

Most of the countries of the Central America and Latin Caribbean region are considered middle-income economies; with significant inequalities between countries like Panama and Haiti. Similarly, the levels of literacy in this region differ greatly between them; which has led to significant differences in the level of employment rates and economic income in the population of each country. Additionally, throughout history there have been inequities between the different types of health coverage in the region that remain in force until today. With the diverse levels of health coverage in CAC and the varying levels of expenditure on health, a study to determine the impact that both variables have on health outcomes is desirable. It is important to determine if there is a relationship between these economic and social inequalities with the main health and demographic results in the region.

1.6 OBJECTIVES OF THE STUDY

The objectives of the study were as follows:

The overarching objective of the study was to determine if there is a relationship between universal health coverage and health investment, defined as a percentage of GDP, in each of the countries of Central America and the Latin Caribbean and the main health determinants and some sociodemographic determinants as defined by the WHO and PAHO in the period 2009-2018

Specific Objectives:

Describe the different types of health coverage in the Central America and Latin Caribbean region.

Determine the investment in health of Central America and the Latin Caribbean countries of the last 10 years.

Characterize the main health and socio-demographic indicators of the countries of Central America and Latin Caribbean of WHO and PAHO individually and as a whole in the period 2009-2018.

Determine any relationships between the nature of health coverage and the investment in health with the main health and socio-demographic indicators.

1.7 IMPORTANCE OF THE STUDY

As far as it is known, there have been no similar analyses to the current dissertation in the region of Central America and Latin Caribbean specifically. The data collected in this work will help to determine whether the type of health coverage or the investment of this region in health are correlated with the main health and / or social determinants used worldwide to measure the wellbeing of a population.

1.8 OUTLINE OF THE DISSERTATION

Chapter one will cover a brief introduction of main concepts and definitions health´s universality and the main health and socio demographic health determinants, as well as the demographics and income levels of the Central American and Latin Caribbean Region. It will also develop on the background and rationale for the study and the main objectives that will be developed through the dissertation. Chapter two will cover the main health coverage systems background and the current CAC health coverage and national health expenditure. Chapter three will develop on the methodology used to identify possible associations between the deployment of a unified public health coverage and the level of health investment in each of the Central America and the Latin Caribbean countries and selected health and demographic determinants, as well as the study design and data collection and analysis. Chapter four will describe in detail the collected data and results of the previously selected health and sociodemographic determinants, and investment in healthcare between 2009 and 2018 in the Central America and Latin Caribbean region. Finally, chapter five will discuss the main results of the analysis, its limitations and relevance of the obtained data, it will also dive into the main conclusions and recommendations for future reviews.
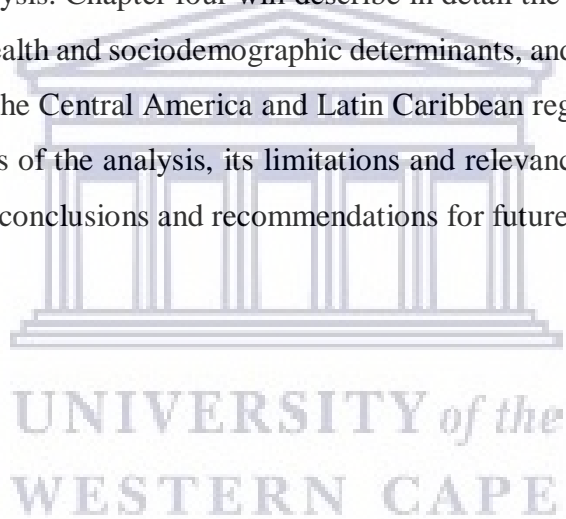
CHAPTER TWO
LITERATURE REVIEW

2.1 INTRODUCTION

In this chapter, the literature will describe the different types of health coverage in the Central American and Caribbean region, as well as the historical background that led them to evolve into the current health system. Additionally, the investment in health, as a percentage of GDP, of the main countries of the region and their evolution over time will be described.

2.2 HEALTH COVERAGE SYSTEMS REVIEW AND CAC HEALTH SYSTEMS BACKGROUND

According to Vega & Frenz (2014), in universal health coverage systems there is a gap between what is medically possible and what is financially feasible. Therefore, rationing is unavoidable in many societies with the Central America and Caribbean countries being no exceptions. Moreover, countries in Latin America, more than any other region of the world, have introduced a prioritysetting model to define their health benefit plans, resulting in severe inequities because of a process which is contentious, politically charged, and technically challenging. (Vega & Frenz, 2014).

In the Resolution of the General Assembly of the United Nations "The future we want" (2012) it was affirmed by the participants that "universal health coverage is a key instrument to improve health, social cohesion and sustainable human and economic development". According to the PAHO "Sustainable Health Agenda for the Americas 2018-2030" report (2017), countries should focus on improving access to a timely, available, and affordable health care, of appropriate quality, as well as improving the social determinants of health, such as adequate standards of living and healthy food. In the Lancets series of articles on Universal Health Coverage (UHC) in Latin America, Frenk, Cotlear & de Andrade (2015) highlighted the current efforts made by these countries to move from a segmented health system to a universal health coverage in order to overcome social segregation and promote parity of opportunities and the right to adequate health

care. These Lancet´s series of articles intended to describe the multiple political, economic, and social forces that shape health policy making in these countries. Central American and the Caribbean (CAC) have a wide variety of ethnic, social and economic inequalities that affect access to a universal health system. Some of these determinants include high unemployment rates, an ageing population and a rapid shift from acute to chronic diseases (Frenk, 2015). In the last decade, it has been reported that the economic growth in the Americas has not been uniform across diverse social groups, resulting directly in poor household quality of life and low availability of health and education. Unfortunately, this situation is reflected in major variations in the health indicators, both between and within countries in the region. A clear example of these variations is infant mortality rate (IMR), which in 2013 was 4.5 times higher in the lowest income countries compared to the countries with the highest income levels (PAHO, 2017).De Andrade *et al* (2015) described the current social situation of Latin American countries as the result of multiple determining factors including adverse colonial legacies, tremendous social injustice, enormous socioeconomic disparities and great inequities in health. From the 1980s to the 2000s, poverty and inequality worsened substantially, although some social indicators, such as the decrease in the inequality in labour income and the wage differences between employees, have improved since the beginning of the 2000s. In addition, some strategies, such as social assistance programs, have improved the income levels of poor families, reduced school dropout rates and increased the demand for health prevention and promotion services (de Andrade *et al.*, 2015). However, there are still some issues, common to Latin American countries, that continue to negatively impact on economic development, social equity and health indicators such as population growth, the continuously aging trend of the population, the increase in poverty and the propensity to suffer more chronic than acute illnesses, as a consequence of unhealthy lifestyles.

In the previous century health systems in Latin America were mainly organized by population segments into the working class and the unemployed; promoting segregation in different institutions including Social Security and Health (Frenk *et al.,* 2015). Under this model, organized workers in formal employment were covered by social security, which comprised of health insurance financed by employer-employee-State contributions, while the rest of the population received limited medical assistance provided by the Ministries of Health. The role of the Ministries

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of Health was generally threefold; the legal authority in charge of regulating the whole health system, the responsible authority for public health actions and the provider of limited, free or lowcost medical assistance to those excluded from social security (Laurell & Giovanella, 2018). There was also a private health sector that varied from country to country depending on how social insurance was organized. Although this segregated model has already proven to be inequitable, inefficient, and unresponsive (Frenk *et al*., 2015), and despite the fact that its multiple problems were the strongest arguments for reform, Laurell & Giovanella (2018) report that this three-tier (tripartite) system tends to persist, with national specificities.

Because of the deleterious results of segregation, some health systems in Latin America reverted to two basic alternative models in order to transform the health system. First, a unique and unified public model (single public), in which the state finances and provides health services to all the population, and a second model, referred to the private system, which is characterized by complete dependence on out-of-pocket expenses of patients or private health insurance. Due to the high costs associated with the private model, none of the Latin American CAC countries follows this model, with Chile being the exception in adopting a similar model. The main challenge presented by the private system is the dependence on the individual's ability to pay and therefore restricting access to health services (Frenk *et al*., 2015).

Many Latin American countries have implemented changes in their public policies that involve actions not only in the health sector, but also in the social and economic sector. Some of them have sought to stimulate the creation of health systems with universal coverage to improve both health indicators and equity among the population (de Andrade *et al*., 2015). Cotlear *et al* (2015) identified four distinctive phases in the transformation process of health systems in Latin America: the first two phases (pre-national health institutions and the creation of modern national health institutions) took place in the inequity era, as healthcare services were delivered under a predefined institutional segmentation depending on the social class and employment status of the population. The third phase of transformation involved the increased access to health benefits for the poor and unemployed, via the expansion of health-care services. However at the same time policies that widened the inequality gap and promoted segmentation between the two public health sector blocks were implemented. The public health systems were then divided into the social security

system for the working class and their families, and the Ministries of Health services for the unemployed population. Finally, Cotlear *et al*., (2015) describes the fourth phase as the quest for equity. The equity phase was defined by an attempt to address the inequity in benefits, quality of the services, and financial protection across all population groups, thus encouraging the attainment of universality. This last phase of the transformation of health systems started at very different periods in each country. It began in 1952 in Chile, in 1960 in Cuba, in 1973 in Costa Rica, in 1989 in Brazil, in 1993 in Colombia, and in 2004 in Mexico. Other countries like Guatemala, Panamá, El Salvador and Honduras, among others, are yet to transition to this final phase. It is important to highlight that each country has transitioned at its own pace, and this is one of the main reasons why there are still substantial differences between the various country´s health systems.

More recently Laurell & Giovanella (2018) described that, from the early 1990s, health policy in Latin America has focused on a common objective to increase access, decrease inequity, and provide financial protection. Fundamentally, two different models of reform persist: The Universal Health Coverage (UHC) model and the Single Universal Health System (SUS) model. The main characteristic of the UHC is that medical care is made a commodity by the introduction of competition facilitated by a payer/provider split, free choice, and pre-priced health service plans. On the other hand, the principles of social justice and egalitarian, universal social rights inspire the SUS model. The main characteristics are that funding relies on tax revenues, the State is responsible for the provision of health services to the whole population as a universal citizens' entitlement that is independent of individual's ability to pay or prior contributions (Laurell & Giovanella, 2018). Therefore, everyone is entitled to free care financed by the State. Even though, currently these are the two basic models, there are considerable differences in implementation from one country to another. It is important to highlight that almost all Latin American countries have undergone a period of neoclassic/neoliberal health reform as a result of the structural adjustment programs directed by the World Bank under the guidelines of the Washington Consensus (Laurell & Giovanella, 2018).

2.3 CURRENT CAC AND LATIN CARIBBEAN HEALTH COVERAGE AND NATIONAL HEALTH EXPENDITURE

Govindaraj *et al* (1997) described that it was until recently, in the 1990s, that the attempts to organize data collection on health expenditures at a national level were successful in Latin America and the Caribbean. In the past efforts made by international entities like WHO, PAHO and United States Agency for International Development (USAID) were ineffective. It was until the World Bank developed in 1993 the World Development Report, where the first comprehensive attempt to document and analyse health expenditures in developing countries happened. By that time on average, the Latin American and Caribbean countries spent around 6.2% of their GDP on health, with the expenditures divided, in general, equally between the public and private sectors. Nevertheless, there were considerable variations in the public/private distribution in some countries, while the public sector accounted for 81.7% of total health expenditures in Costa Rica and only 25.1% in Paraguay.

Through history, Cuba and Costa Rica were the only two countries from CAC which were able to establish an integrated pubic healthcare in a unique institution trough the unification of funds and finance services of the Ministry of Health and Social Security into a unique public payer. Both countries share the common objective of reducing the health imbalances despite their different populations, ethnic characteristics and social behaviours. The one public payer path has been acknowledged by financial and health specialists as the most effective path to establish the undeniable right to health care for all citizens through the provision of universal coverage and the elimination of social exclusion. However, at the same time the model has challenges such as quality gaps between urban and rural sectors, the monopoly created in those systems that might lead to inefficiency, explosive cost increases, and unresponsiveness to the needs of users (Cotlear *et al.*, 2015).

The first country to integrate into a single universal health system (entirely public) in the CAC was Cuba. The transformation from a mostly private to a single universal health system (SUS) occurred with the creation of the Cuban National Health System (NHS) in the 1960s following the 1959 Cuban revolution (Cotelar *et al.*, 2015). This single universal health system (SUS) was written into

the constitution in 1976, and codified in the Public Health Law of 1983 (Keck & Reed, 2012). In Cuba, health spending is almost exclusively public, representing 96% of total health spending, and health facilities are public and staffed by civil servants. The SUS guarantees care at all levels, from primary to tertiary care, in an integrated, territorially organized system. In the mid-1990s, Cuba went through a severe economic depression, which had secondary effects on the health system like infrastructure deterioration and scarcity of materials, medicines, and medical equipment. At the same time, waiting times increased resulting in discontent among both users and health personnel. Keck & Reed (2012) also described long waiting times to see physicians and very short consultation time as an access barrier; with improvement in services only occurring in the mid2000s (Laurell & Giovanella, 2018). Nevertheless, with the deficiencies in the system, Cuba's health indicators have transitioned from those typical of a developing country to those more typical of the developed world. Consequently, major attainments in health were reached in a short period of time, to the point that the Cuban experience has been distinguished as one of the best examples of achieving good health care at a low cost (Cotelar *et al*., 2015).

Costa Rica was able to unify public healthcare into one system, but still maintains a small private sector resulting in a dual healthcare system. The General Health Law (1973) defined health as a good of public interest and stated that it is an essential function of the State to ensure the health of Costa Ricans by guaranteeing the right to health benefits for all the inhabitants of the country. At the same time, the Political Constitution of Costa Rica (1949) declared as inalienable the right of workers to protection against risks of illness through social insurance. Currently the Caja Costarricense de Seguro Social (CCSS) leads the public sector, as the main provider of health services, while the Ministry of Health (MoH) acts mainly as a governing body of the health system (Sáenz *et al*., 2011). The CCSS was created in 1941 with the intention of covering the health services of the working class, and over the years, through the transformation process of health systems previously mentioned, it was extended to new beneficiaries. Presently users are classified according to different types of insurance as; direct insured, indirect insured (family and dependent individuals) and uninsured. The CCSS currently administers three main regimes: Sickness and Maternity Insurance (SEM); Disability, Old Age and Death Insurance (SIVM); and the noncontributory regime. Contributions from employers, employees and the State are the main

source of financing for the institution. The contribution quota amounts to 22.91% of the salary payroll; of which the employer contributes 14.16% and the employee contributes with 8.25%; finally, the State contributes 0.50%. The voluntary and independent insured contribute according to their declared income and the non-contributory regimes are financed by the State through the Fund for Social Development and Family Allowances, as well as with taxes on the lottery and the sale of cigarettes and liquors (Sáenz *et al*., 2011).

Other CAC countries, like Dominican Republic, also made attempts at unifying of their social security and public institutions, but ended up with a tripartite health system where the Ministry of Health, the social security and the private sector play a role. Some other countries like Nicaragua established a free choice of the financing body (Cotlear *et al*., 2015).

Nowadays, the Latin American region is considered one of the most unequal regions in the world and many health systems are still underfunded (Laurell & Giovanella, 2018) with enormous barriers to achieving health equity (Rodríguez et al, 2019). Most of the countries, with the exception of Cuba and Costa Rica, have traditionally offered access to public health systems through social security only to the working class; leaving the informal, non-working and poor class with access to a system dependent on the Ministries of Health (tripartite systems). The economic circumstances of the previously mentioned system are often deplorable, with very basic health services available and limited therapeutic options.

2.4 SUMMARY

This chapter described the main health coverage systems background and the current CAC health coverage and national health expenditure of each country. Chapter three will develop on the methodology used to identify possible associations between the deployment of a unified public health coverage and the level of health investment in each of the Central America and the Latin Caribbean countries and selected health and demographic determinants. It will also develop on the study design, data collection and analysis.

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CHAPTER THREE
METHODOLOGY

3.1 INTRODUCTION

This chapter presents the methods used to identify if a relationship existed between the deployment of a unified public health coverage (Single Public and Dual coverage) and the level of health investment in each of the Central America and the Latin Caribbean countries and selected health and demographic determinants in those countries. Published data for these indicators over a period of 10 years (2009 – 2018) were retrospectively analysed to determine if there was a trend and to compare it among countries based on the following questions;

· Does the national health plan include a unified public health system to provide access to health services?

· What is the total government spending on health as a percentage of the national GDP spent in healthcare?

3.2 STUDY DESIGN

The research was carried out as an ecological study where data on the core health indicators was extracted from previously published databases. The PAHO/WHO publications and reports on national, regional and worldwide health indicators, such as the World Bank World Development indicators, were prioritized over online databases as sources of data. It was required that all reports regarding international and national health determinants were open access and should have been published no more than 10 years ago. If a report provided year ranges instead of a singular year for a specific indicator, the review did not attempt to identify a specific year from the original data source and therefore excluded the data from the statistical analysis.

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3.3 DATA COLLECTION

Eight indicators from PAHO & WHO (2009-2018) and the World Bank Development Indicators (2009-2018) reports were extracted using a structured template in Microsoft excel (appendix I). Maternal mortality ratio, infant mortality rate, neonatal mortality rate, under five mortality rate, general mortality rate, communicable diseases mortality rate, life expectancy and Gini coefficient index from 2009 to 2018 were extracted from the reports into an excel data collection sheet; which served as a source document for subsequent statistical analysis. The most recent status indicators were reviewed in each country and compared with the median value established in the PAHO and World Bank website. Additionally, when possible, the different health systems were classified into three main coverage categories: single public, dual or tripartite healthcare; as well as classified into the four main income groups: low-income, lower-middle-income, upper-middle-income, and high-income for final discussion and conclusions.

3.4 DATA ANALISYS

The data obtained was analysed to determine the causal explanations of the different results and main differences of the health systems (Lawrence & Tar, 2013). For the analysis of the information, descriptive statistics, measures of central tendency and dispersion were used for the quantitative variables, while frequency distributions were used for the qualitative variables. The comparison of the quantitative variables was made by means of the Student's t tests and analysis of variance. Additionally, linear regressions were carried out to evaluate the correlation between the coverage indicators (Single Public, Dual, Tripartite) and % of GDP spent on health with the results variables (maternal mortality ratio, infant mortality rate, neonatal mortality rate, under five mortality, general mortality rate, communicable mortality rate, life expectancy and Gini index). The level of significance was set at $p < 0.05$, and all analysis was done using Microsoft Excel and SPSS version 23 software.

3.5 DATA COLLECTION INSTRUMENTS

A Microsoft Excel Data Sheet was used to extract the information regarding the eight core health indicators from PAHO & WHO (2009-2018) and the World Bank Development Indicators (20092018)

3.6 SUMMARY

Chapter three deep dived into the methodology used in the dissertation, emphasizing the methods used to identify associations between the deployment of a unified public health coverage and the level of health investment in CAC and preselected health and socio-demographic determinants. It also developed further into the study design, data collection and data analysis process. Chapter four will focus in describing the results obtained from the data extraction sheet regarding health investment, Gini coefficient, type of health coverage and the preselected health determinants between 2009 and 2018 in CAC.

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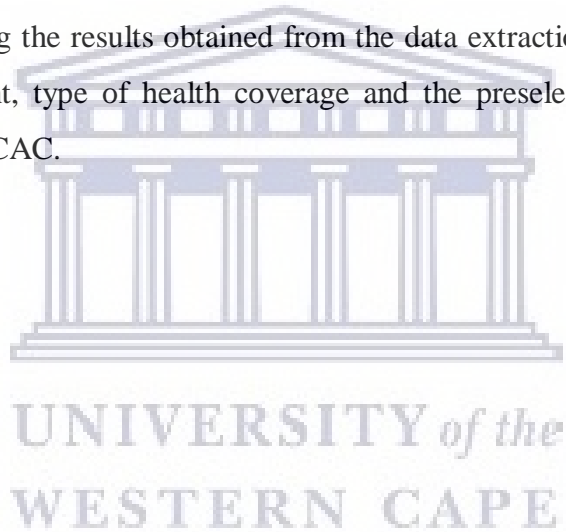
CHAPTER FOUR
RESULTS

4.1 INTRODUCTION

Selected health and sociodemographic determinants, and investment in healthcare between 2009 and 2018, in the various countries making up the Central America and Caribbean (CAC) region, were evaluated to identify any correlations with the type of health coverage in the country. The results of these are presented below.

4.2 HEALTH INVESTMENT AS A PERCENTAGE OF GDP

Table 4.1 presents the distribution by country of investment in health as a percentage (%) of GDP for the various countries in the CAC region for the years 2007 to 2016. The median value for health investment as a percentage of GDP in the region was 8.0% (IC95 %, 7.7; 8.4) during the studied period. Cuba (11.7%) and Honduras (8.4%) were the only countries with health investments above the median, while the investment value for Costa Rica (7.8%) was slightly lower than the median of the region. Belize had the lowest investment in health, with 5.7% of GDP invested in health for the period, while no data was available for French Guyana, Martinique and Puerto Rico.

Table 4.1. Investment in health as a percentage of GDP for countries in the Central American and Caribbean Region, 2009-2016.

Country	Median	IC95%	
Central America Region			
Belize	5,7	5,4	5,9
Costa Rica	7,8	7,7	8,0
El Salvador	6,9	6,8	7,0
Guatemala	5,9	5,7	6,1
Honduras	8,4	8,1	8,7
Nicaragua	7,5	6,9	8,1
Panamá	6,7	6,5	7,0
Caribbean Region			
Cuba	11,7	10,4	13,0
Dominican Republic	5,8	5,5	6,1
Guadaloupe	6,1	-11,0	23,1
Haiti	7,5	6,0	9,0
Latin America & Caribbean (WB)	**8,0**	**7,7**	**8,4**

GDP % invested in health in CAC countries was categorized into five groups viz: Group 1 (>7.83%); group 2 (7.5% - 7.83%); group 3 (6.74% - 7.5%); group 4 (5.77% - 6.74%) and group 5 (< 5.77%). Cuba and Honduras were the only countries in the highest health expenditure as a percentage of GDP category (>7.83%), while Costa Rica was the only country in the second category (7.5% - 7.83%). In the third category (6.74% - 7.5%) were Nicaragua, Haiti and El Salvador, while Panama, Guatemala, Dominican Republic and Guadalupe had health spend as a percentage of GDP that fell into the fourth category (5.77% - 6.74%). Belize occupied the fifth category with less than 5.55% of GDP invested in health (**figure 4.1**).
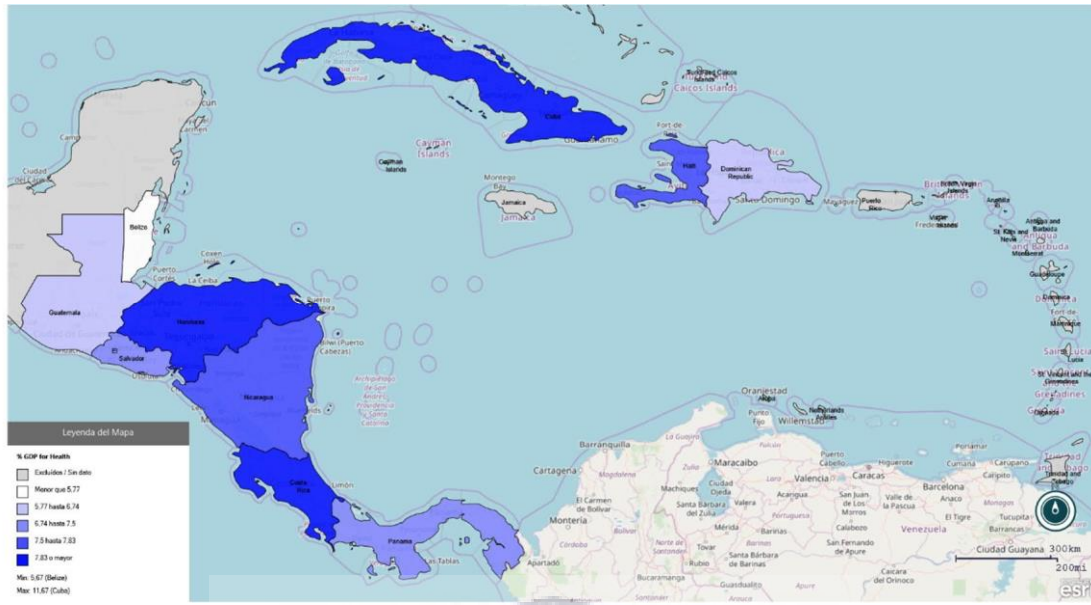
Figure 4.1. Average value per country of GDP % allocated to health in the Central American and Caribbean Region, 2009-2016.

Figure 4.2 shows the distribution by country and year of the health expenditure in the region. Some of the countries including Honduras, Costa Rica, Panama, El Salvador, Guatemala, Belize and the Dominican Republic had a constant trend in investment in health over time, while on the other hand, Haiti had an irregular health expenditure pattern, with significant variations in health investment over the period studied. In 2011 and 2012 Haiti's investment in health was close to 10% of GDP, however, from 2013 onwards, a downward trend in the investment was seen reaching the most conservative values reported in the region with 5.38 % in 2016. In the case of Cuba, there were only six values recorded over time, however a significant reduction in health investment can be seen between 2009 and 2011, with increases recorded between 2013 and 2015.

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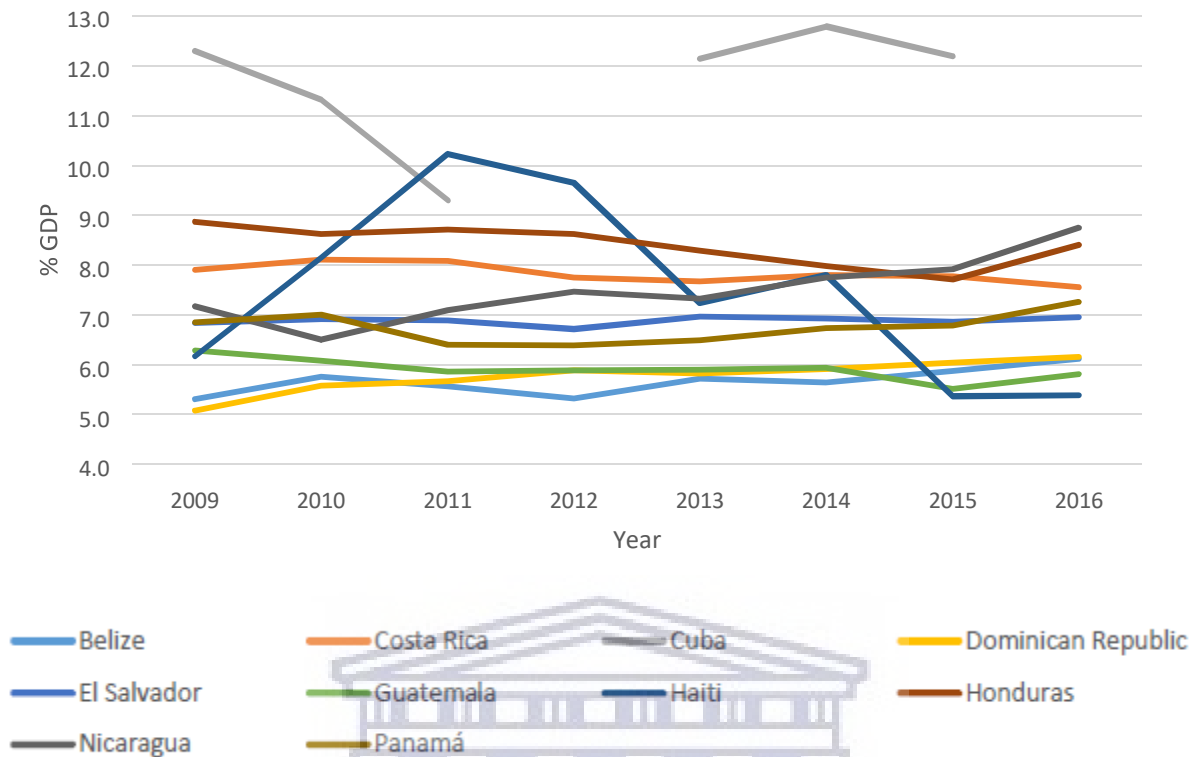
Figure 4.2. Distribution by country and year of health expenditure as a percentage of GDP in the Central American and Caribbean Region, 2009-2016.

4.3 GINI COEFFICIENT FOR COUNTRIES IN THE CENTRAL AMERICAN AND CARIBBEAN REGION

Table 4.2 presents the distribution by country of the Gini coefficient for the various countries in the CAC region for the years 2009 to 2017. Some countries such as Belize, French Guyana, Guadeloupe, Martinique and Puerto Rico did not have such data reported (N=0), while others, including Nicaragua (N=2), Cuba (N=1) and Haiti (N=1) had less than four values reported in the period studied. The small number of values reported for some of the countries may constitute a limitation to the interpretation of these results, since the trend seen in the region can be significantly modified by the weight of unique values over time. The median value for Gini coefficient in the

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region was 48.2 (IC 95%, 44.3; 52.2) during the studied period. Cuba (78.4), Panamá (51.1) and Honduras (52.2) were the only countries with Gini coefficients above the median, while the coefficient for Guatemala and Costa Rica was slightly lower with coefficients of 49.3 and 48.8 respectively. Haiti had the lowest reported Gini coefficient with a mean of 41.1, while no data was available for Belize, French Guyana, Guadaloupe, Martinique and Puerto Rico.

Table 4.2. Gini coefficient for countries in the Central American and Caribbean Region, 20092017.

Country	N	Mean	IC95%	
Central America Region				
Belize	0			
Costa Rica	9	48,8	48,3	49,4
El Salvador	9	41,9	40,2	43,6
Guatemala	4	49,3	46,1	52,6
Honduras	9	52,2	50,3	54,1
Nicaragua	2	46,0	42,8	49,1
Panamá	9	51,1	50,5	51,6
Central America Region (PAHO)		**48,2**	**44,3**	**52,2**
Caribbean Region				
Cuba	1	78,4		
Dominican Republic	9	46,5	45,3	47,6
French Guiana	0			
Guadaloupe	0			
Haiti	1	41,1		
Martinique	0			
Puerto Rico	0			

Figure 4.3 presents a geographical representation of the CAC countries classified by intervals of the average reported Gini coefficient by country. In the upper range (greater than 51.63) was Cuba with a Gini coefficient of 78.4 (only reported value) and Honduras with a coefficient of 52.2 (95%

CI; 50.3, 54.1). In the range of 49.08 to 51.63 was Panama with a coefficient of 51.1 (95% CI; 50.5, 51.6) and Guatemala with 49.3 (95% CI; 46.1, 52.6). In the range of 46.21 to 49.08 was Costa Rica with a coefficient of 48.8 (95% CI; 48.3, 49.4) and the Dominican Republic with a coefficient of 46.5 (95% CI; 45.3, 47.6). In the range of 41.5 to 46.21 Nicaragua and El Salvador are located with coefficients of 46.0 (95% CI; 42.8, 49.1) and 41.9 (95% CI; 40.2, 43.6) respectively. Finally, in the lowest interval with less than 41.5 was Haiti with a single reported value of 41.1.
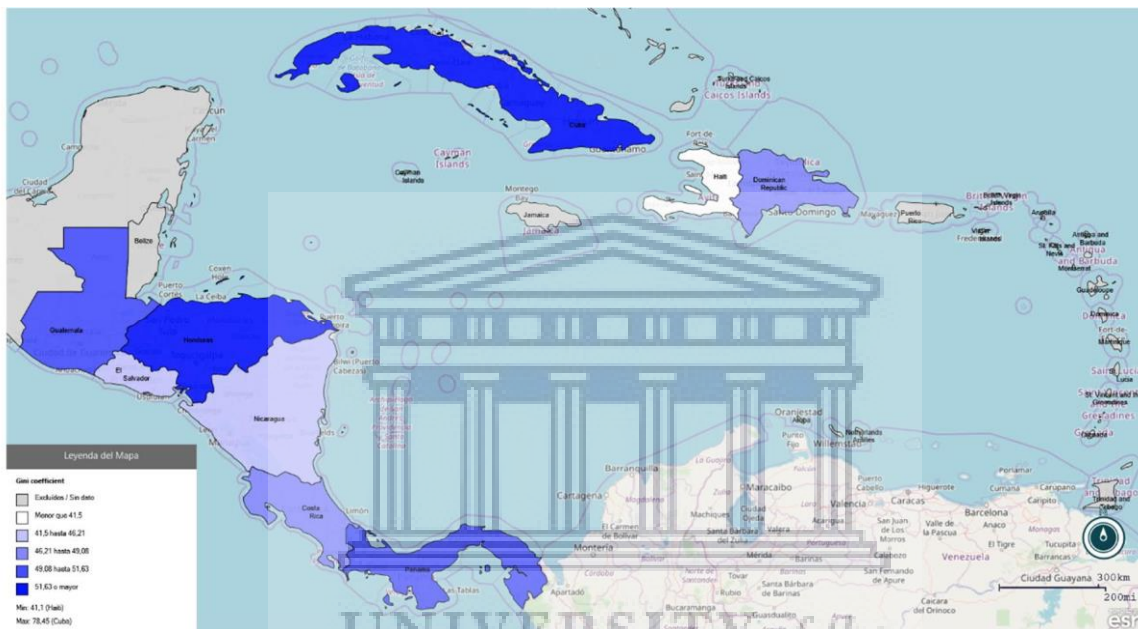
Figure 4.3. Average value per country of the Gini coefficient in the Central American and Caribbean Region, 2009-2017

For the countries with multi-year data for Gini coefficient, very little changes in Gini coefficient occurred from year to year. The largest variation was observed with Honduras, while El Salvador recorded a gradual decline in Gini coefficient over the years (figure 4.4).

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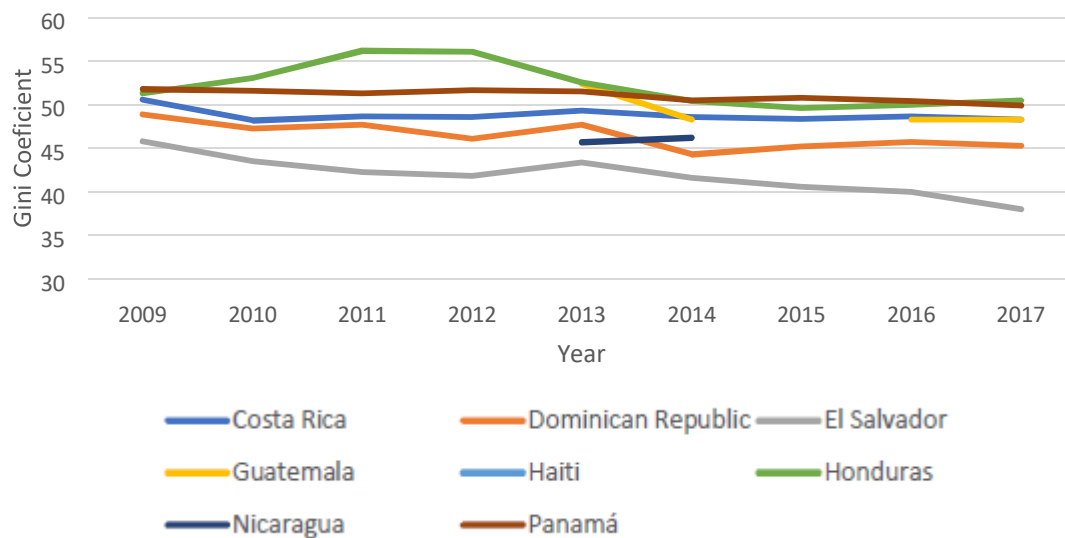
Figure 4.4. Gini coefficient by country and year of the countries in the Central American and Caribbean Region, 2009-2017.

4.4 LIFE EXPECTANCY FOR COUNTRIES IN THE CENTRAL AMERICAN AND CARIBBEAN REGION

With respect to the WHO and PAHO main determinants of health previously described, the average life expectancy of the Latin American and Caribbean region between 2009 and 2018 was 74.0 years (95% CI; 73.4, 74.5). Life expectancy in years was higher in countries like Martinique with 81.2 years (95% CI; 80.5, 81.9), Guadalupe with 80.7 years (IC95 %; 80.0, 81.4), and Puerto Rico with 79.4 years (95% CI; 79.0, 79.8). Costa Rica with 79.3 years (CI; 79.0, 79.7) and Cuba with 78.6 years on average (95% CI, 78.3; 79.0) had the next highest tier of life expectancy. Life expectancy in Panama and Honduras was slightly above the regional average with 77.5 (95% CI, 77.1; 77.9) and 74.0 (95% CI, 73.6; 74.4) respectively. Countries with life expectancy below the regional average were Nicaragua, Belize, Dominican Republic, Guadeloupe, El Salvador and Haiti (table 4.3; figure 4.5).

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Table 4.3. Life expectancy in the Central American and Caribbean Region, 2009-2018.

Country	Mean	IC95%	
Central America Region			
Belize	73,2	72,5	74,0
Costa Rica	79,3	79,0	79,7
El Salvador	72,1	71,5	72,8
Guatemala	72,7	72,0	73,4
Honduras	74,0	73,6	74,4
Nicaragua	73,4	72,7	74,2
Panamá	77,5	77,1	77,9
Caribbean Region			
Cuba	78,6	78,3	79,0
Dominican Republic	72,9	72,4	73,4
French Guiana	77,8	76,6	79,0
Guadaloupe	80,7	80,0	81,4
Haiti	61,9	61,0	62,8
Martinique	81,2	80,5	81,9
Puerto Rico	79,4	79,0	79,8
Latin America & Caribbean (WB)	**74,0**	**73,4**	**74,5**

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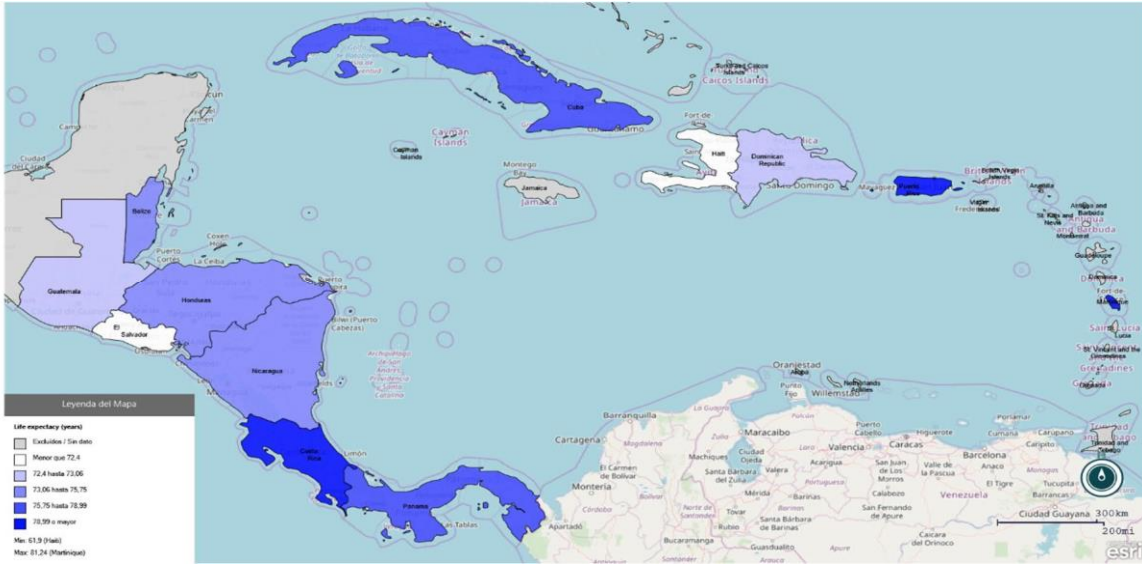
Figure 4.5. Average life expectancy for countries in the Central American and Caribbean Region, 2009-2018

There was very little change to life expectancy in the countries in the region from year to year. In general, the trend was towards an increase in life expectancy over time in the entire region. The country that constantly reported the lowest life expectancy in the period studied was Haiti, with Martinique and Guadaloupe reporting figures not much higher than those reported for Haiti (figure 4.6).

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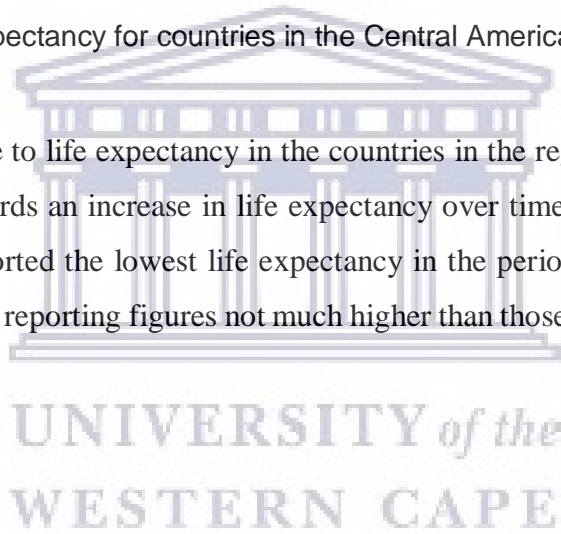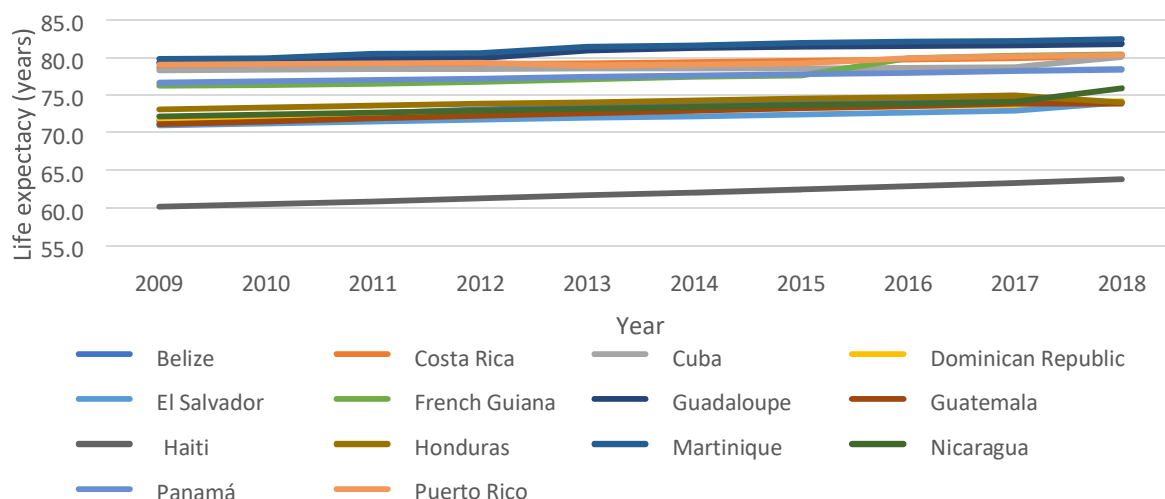
Figure 4.6. Life expectancy by country and year of in the Central American and Caribbean Region, 2009-2018.

4.5 MATERNAL MORTALITY FOR COUNTRIES IN THE CENTRAL AMERICAN AND CARIBBEAN REGION

The Latin American and Caribbean region reported an average of 79.8 deaths per 100,000 live births (95% CI, 76.5; 83.0) during the study period. Puerto Rico, French Guyana and Martinique reported the lowest maternal mortality rates during this period of 20.8 (95% CI; 19.9, 21.7), 21.2 (95% CI; 6.6, 35.8) and 21.9 (95% CI; 11.1, 32.6) deaths per 100,000 live births respectively. Costa Rica and Cuba reported 29.0 (95% CI 27.9, 301) and 33.8 (95% CI, 23.2; 44.5) deaths per 100,000 live births respectively, while Haiti, Guatemala and Nicaragua report the highest maternal mortality rates of 492.3 (95% CI; 486.1, 498.6), 112.9 (95% CI; 102.8, 123.0) and 105.6 (95% CI; 101.4, 109.8) deaths per 100,000 live births respectively (table 4.4ͺfigure 4.7).

Table 4.4. Maternal mortality rate of countries in the Central American and Caribbean Region, 2009-2018.

Country	Mean	IC95%	
Central America Region			
Belize	47,2	41,9	52,6
Costa Rica	29,0	27,9	30,1
El Salvador	50,7	47,9	53,4
Guatemala	112,9	102,8	123,0
Honduras	69,4	66,6	72,2
Nicaragua	105,6	101,4	109,8
Panamá	66,9	58,3	75,5
Caribbean Region			
Cuba	33,8	23,2	44,5
Dominican Republic	94,6	94,0	95,1
French Guiana	21,2	6,6	35,8
Guadaloupe	17,3	17,3	17,3
Haiti	492,3	486,1	498,6
Martinique	21,9	11,1	32,6
Puerto Rico	20,8	19,9	21,7
Latin America & Caribbean (WB)	**79,8**	**76,5**	**83,0**

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Figure 4.7. Maternal mortality rates for countries in the Central American and Caribbean Region, 2009-2018.

Figure 4.8 shows the distribution by country and year of maternal mortality rates in the region. Some of the countries such as Guatemala, Nicaragua, Dominican Republic, Panamá, Honduras, El Salvador and Belize show a constant maternal mortality rate with a discrete downward trend over time. On the other hand, countries like Costa Rica and Puerto Rico show a consistent maternal mortality rate, without any significant changes over time, but always low compared to other countries in the region. Cuba, on the other hand, shows an irregular pattern to maternal mortality over time, with significant changes in maternal mortality rates over the period studied. It is observed that in 2012 there was a significant reduction in the maternal mortality rate in Cuba, however, the following year it increased again until reaching values similar to those reported between 2009 and 2011. In the case of Haiti, maternal mortality rates were consistently above the regional average, with a maternal mortality rate up to five times higher than the rest of the region. Martinique, French Guyana and Guadaloupe had few reported values in the period studied.

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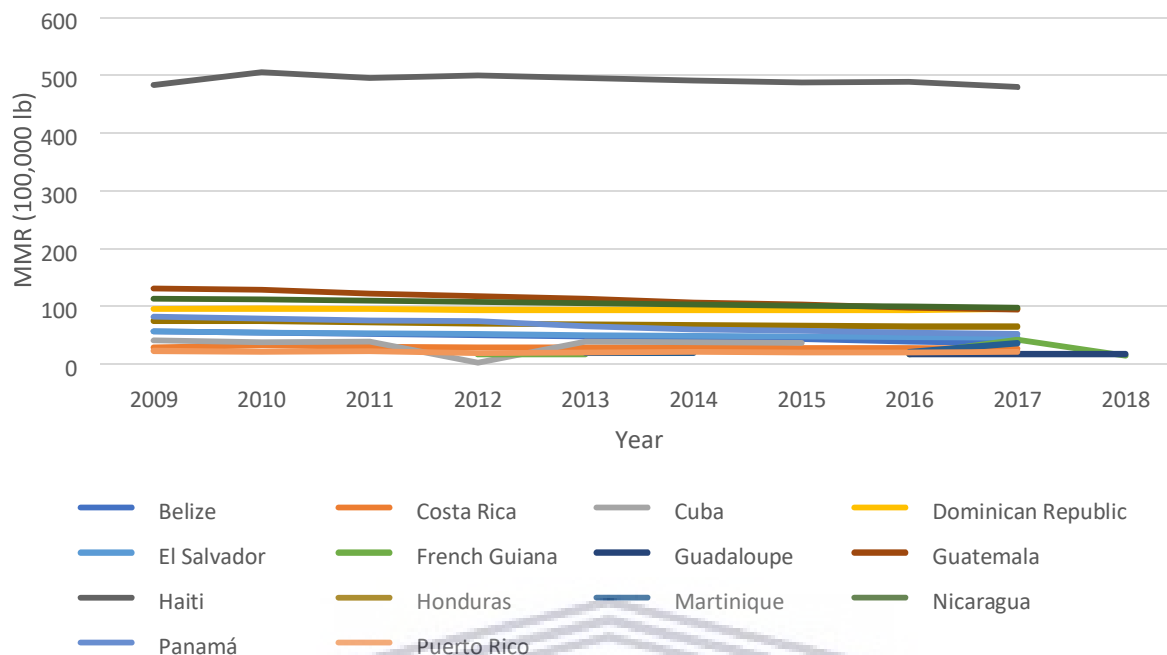
Figure 4.8. Maternal mortality rate by country and year of in the Central American and Caribbean Region, 2009-2018.

.4.6 NEONATAL MORTALITY FOR COUNTRIES IN THE CENTRAL AMERICAN AND CARIBBEAN REGION

The distribution by country of neonatal mortality in CAC from 2009 to 2018 is shown in **table 4.5**. In general, the Latin American and Caribbean region reported an average of 10.1 deaths per 1,000 live births (95% CI, 9.6; 10.6). Haiti, Dominican Republic and Guatemala reported the highest neonatal mortality rates in the region with 27.9 (95% CI; 27.0, 28.9), 21.6 (95% CI; 20.7, 22.5) and 14.4 (95% CI; 14.4, 13.3) deaths per 1,000 live births respectively. On the contrary, Cuba and Costa Rica represent the lowest neonatal mortality rates with 2.6 (95% CI; 2.1, 3.1) and 6.3 (95% CI; 6.1, 6.5) deaths per 1,000 live births respectively.

Table 4.5. Neonatal mortality in the Central American and Caribbean Region, 2009-2018.

Country	Mean	IC95%	
Central America Region			
Belize	9,6	9,2	10,1
Costa Rica	6,3	6,1	6,5
El Salvador	8,1	7,3	8,8
Guatemala	14,4	13,3	15,5
Honduras	11,4	10,5	12,3
Nicaragua	9,6	9,4	9,7
Panamá	9,9	9,2	10,6
Caribbean Region			
Cuba	2,6	2,1	3,1
Dominican Republic	21,6	20,7	22,5
Haiti	27,9	27,0	28,9
Latin America & Caribbean (WB)	**10,1**	**9,6**	**10,6**

Neonatal mortality rates in CAC countries were categorized into five groups viz: Group 1 (>14.43 deaths per 1,000 live births); group 2 (9.91 – 14.43 deaths per 1,000 live births); group 3 (9.59 – 9.91 deaths per 1,000 live births); group 4 (6.29 – 9.59 deaths per 1,000 live births) and group 5 (< 6.29 deaths per 1,000 live births). Haiti, Dominican Republic and Guatemala were the countries with the highest mortality rates (>14.43 deaths per 1,000 live births), while Honduras and Panamá were the only countries in the second category (9.91 – 14.43 deaths per 1,000 live births). In the third group (9.59 – 9.91 deaths per 1,000 live births) were Nicaragua and Belize, while Costa Rica and El Salvador had a mortality rate that fell into the fourth category (6.29 – 9.59 deaths per 1,000 live births). Cuba was the only country that occupied the fifth category with less than 6.29 deaths per 1,000 live births (figure 4.9).

Figure 4.9. Neonatal mortality rates for countries in the Central American and Caribbean Region, 2009-2018

Figure 4.10 shows the distribution by country and year of neonatal mortality rates in the region. In general terms, a downward trend of neonatal mortality rates was observed with all the countries studied over time. Once again, Haiti significantly deviated from the overall trend in the region, followed in this case by the Dominican Republic and Guatemala. Honduras, Panama, Nicaragua, Belize and El Salvador had neonatal mortality rates ranging between 9.6 and 6.7 deaths per 1000 live births in 2019, while Costa Rica had very stable neonatal mortality rates over the ten years. Cuba presented consistently with the lowest rates of neonatal mortality in the region throughout the study period, and had the lowest reported rate of 2.1 deaths per 1000 live births in 2018.

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Figure 4.10. Neonatal mortality rate by country and year of in the Central American and Caribbean Region, 2009-2018.

4.7 INFANT MORTALITY FOR COUNTRIES IN THE CENTRAL AMERICAN AND CARIBBEAN REGION

The Latin American and Caribbean region reported an infant mortality average of 16.1 deaths per 1,000 live births (95% CI, 15.0; 17.2) during the study period. Below the median were Cuba, Costa Rica, Guadeloupe, Martinique, French Guyana, Belize, El Salvador and Panama who accounted for the lowest infant mortality rates during the studied period with 4.3 (95% CI; 3.9, 4.8), 8.1 (95% CI; 7.8, 8.5), 8.1 (95% CI; 7.4, 8.7), 8.4 (95% CI; 7.7, 9.1), 9.6 (95% CI; 8.4, 10.7), 14.1 (95% CI; 12.7, 15.4), 14.2 (95% CI; 12.9, 15.6) and 15.3 (95% CI; 14.2, 16.3) deaths per 1,000 live births respectively. On the contrary, the highest infant mortality rates were reported in Nicaragua, Honduras, Guatemala, Dominican Republic and Haiti with 16.6 (95% CI; 16.0, 17.1), 17.7(95%CI; 16.4, 19.1), 25.7 (95% CI;23.8, 27.5), 26.6 (95% CI; 25.5, 27.7) and 57.6 (95% CI;

50.2, 65.0) deaths per 1,000 live births respectively (table 4.6¸figure 4.11).

Table 4.6. Infant mortality in the Central American and Caribbean Region, 2009-2018**.**

Country	Mean	IC95%	
Central America Region			
Belize	14,1	12,7	15,4
Costa Rica	8,1	7,8	8,5
El Salvador	14,2	12,9	15,6
Guatemala	25,7	23,8	27,5
Honduras	17,7	16,4	19,1
Nicaragua	16,6	16,0	17,1
Panamá	15,3	14,2	16,3
Caribbean Region			
Cuba	4,3	3,9	4,8
Dominican Republic	26,6	25,5	27,7
French Guiana	9,6	8,4	10,7
Guadaloupe	8,1	7,4	8,7
Haiti	57,6	50,2	65,0
Martinique	8,4	7,7	9,1
Latin America & Caribbean (WB)	**16,1**	**15,0**	**17,2**

Figure 4.11. Infant mortality rates for countries in the Central American and Caribbean Region, 2009-2018

Figure 4.12 shows the distribution by country and year of infant mortality rates in the region. Most of the countries including Dominican Republic, Guatemala, Honduras, Nicaragua, Panamá, Belize, El Salvador and French Guyana had a constant infant mortality rate with a slight downward trend over time. Costa Rica and Martinique on the other hand had a fairly constant infant mortality rates over the period, without any significant changes over time, and were always amongst the lowest compared to other countries in the region. Cuba had the lowest mortality rates of the region, nevertheless with a peak in 2012 of 5.7 deaths per 1,000 live births. Haiti on the other hand had infant mortality rates consistently above the regional average. A spike in infant mortality rate of 85.6 deaths per 1,000 live births occurred in 2010, but following this, Haiti showed a steady decline in infant mortality. It however remained the country with the highest infant mortality in the region.

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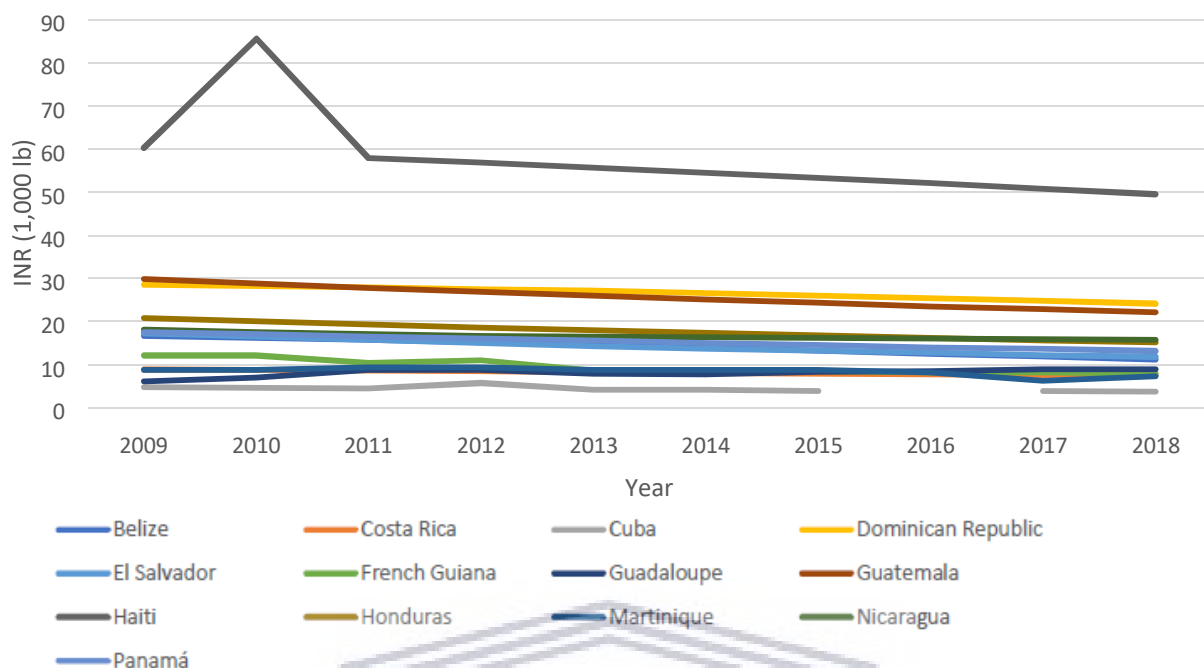
Figure 4.12. Infant mortality rate by country and year of in the Central American and Caribbean Region, 2009-2018.

4.8 CHILDREN UNDER FIVE MORTALITY FOR COUNTRIES IN THE CENTRAL AMERICAN AND CARIBBEAN REGION

The distribution by country of mortality in children under five years in CAC from 2009 to 2018 is shown in table 4.7. In general, the Latin American and Caribbean region reported an average of 19.2 deaths per 1,000 live births (95% CI, 17.5; 20.9). Above the regional average, Haiti reported 67.4 (95% CI; 55.2, 79.7) deaths per 1,000 live births, followed by the Dominican Republic, Guatemala, Honduras and Nicaragua with 32.1 (95% CI; 30.7, 33.5), 30.9 (95% CI; 28.5, 33.4), 20.8 (95% CI; 19.1, 22.5) and 19.3 (95% CI; 18.7, 20.0) respectively. Conversely, Cuba and Puerto Rico presented with the lowest mortality in children under five (< 8.93 deaths per 1,000 live births) with 5.8 (95% CI; 5.1, 6.4) and 8.7 (95% CI; 8.0, 9.4) deaths per 1,000 live births respectively. Martinique, Costa Rica, Guadeloupe and French Guyana reported 9.2 (95% CI; 8.9, 9.4), 9.4 (95% CI; 9.1, 9.8), 9.9 (IC95 %; 8.4, 11.5) and 12.1 (95% CI; 10.0, 14.2) deaths per 1,000 live births respectively (figure 4.13).

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Table 4.7. Mortality of children under 5 in the Central American and Caribbean Region, 2009-2018.

Country	Mean	IC95%	
Central America Region			
Belize	16,4	14,8	18,0
Costa Rica	9,4	9,1	9,8
El Salvador	16,6	15,0	18,1
Guatemala	30,9	28,5	33,4
Honduras	20,8	19,1	22,5
Nicaragua	19,3	18,7	20,0
Panamá	17,8	16,6	19,1
Caribbean Region			
Cuba	5,8	5,1	6,4
Dominican Republic	32,1	30,7	33,5
French Guiana	12,1	10,0	14,2
Guadaloupe	9,9	8,4	11,5
Haiti	67,4	55,2	79,7
Martinique	9,2	8,9	9,4
Puerto Rico	8,7	8,0	9,4
Latin America & Caribbean (WB)	**19,2**	**17,5**	**20,9**
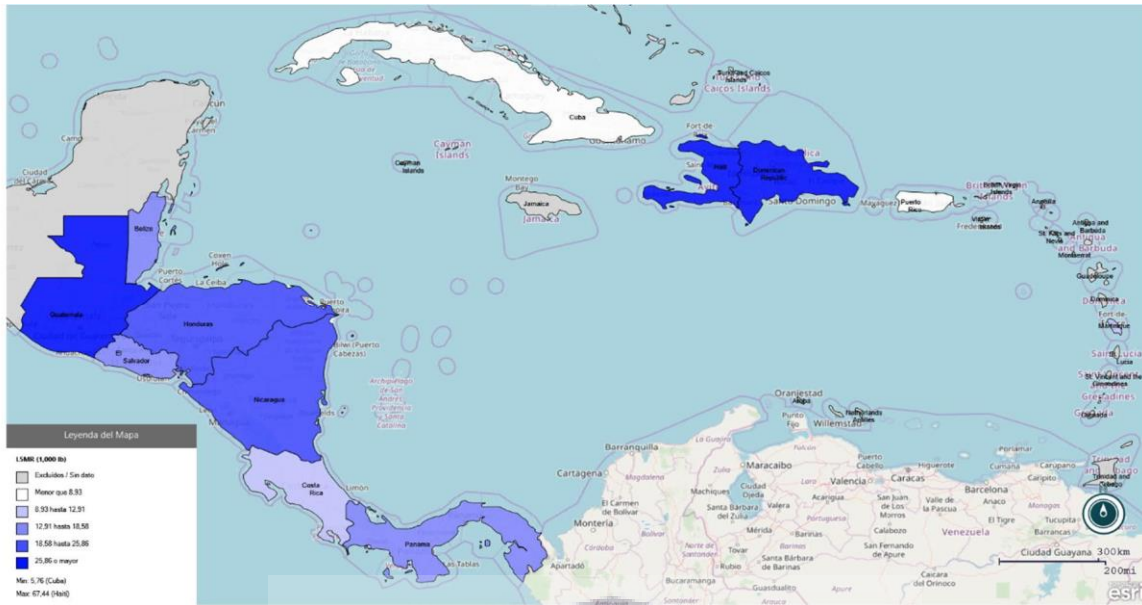
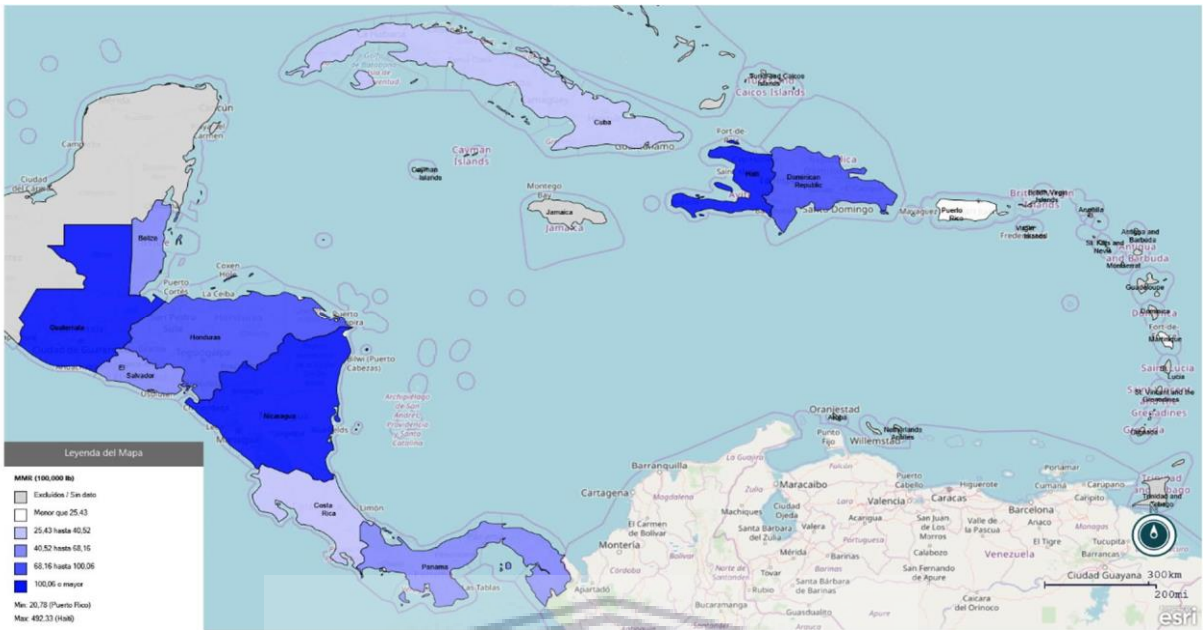**Figure 4.13.** Under 5 mortality rates for countries in the Central American and Caribbean Region, 2009-2018

Figure 4.14 shows the distribution by country and year of children under five mortality rates in the region. Apart from Haiti, a downward trend in under five mortality rates was observed in the region over time. With Haiti, a sharp reduction was observed in 2010, however this rebounded the following and gradually declined in the following years. Costa Rica reported a low and more consistent trend in under five mortality rates ranging from 10.2 in 2009 to 8.8 in 2018. Finally, Cuba presented the lowest rates of under five mortality in the region with a slight increase in 2012, but by 2018 it reported a rate of 5.0 deaths per 1000 live births. Countries like Puerto Rico and French Guiana had data reported from 2012 onward, while Guadaloupe and Martinique had limited reported information for the analysis.

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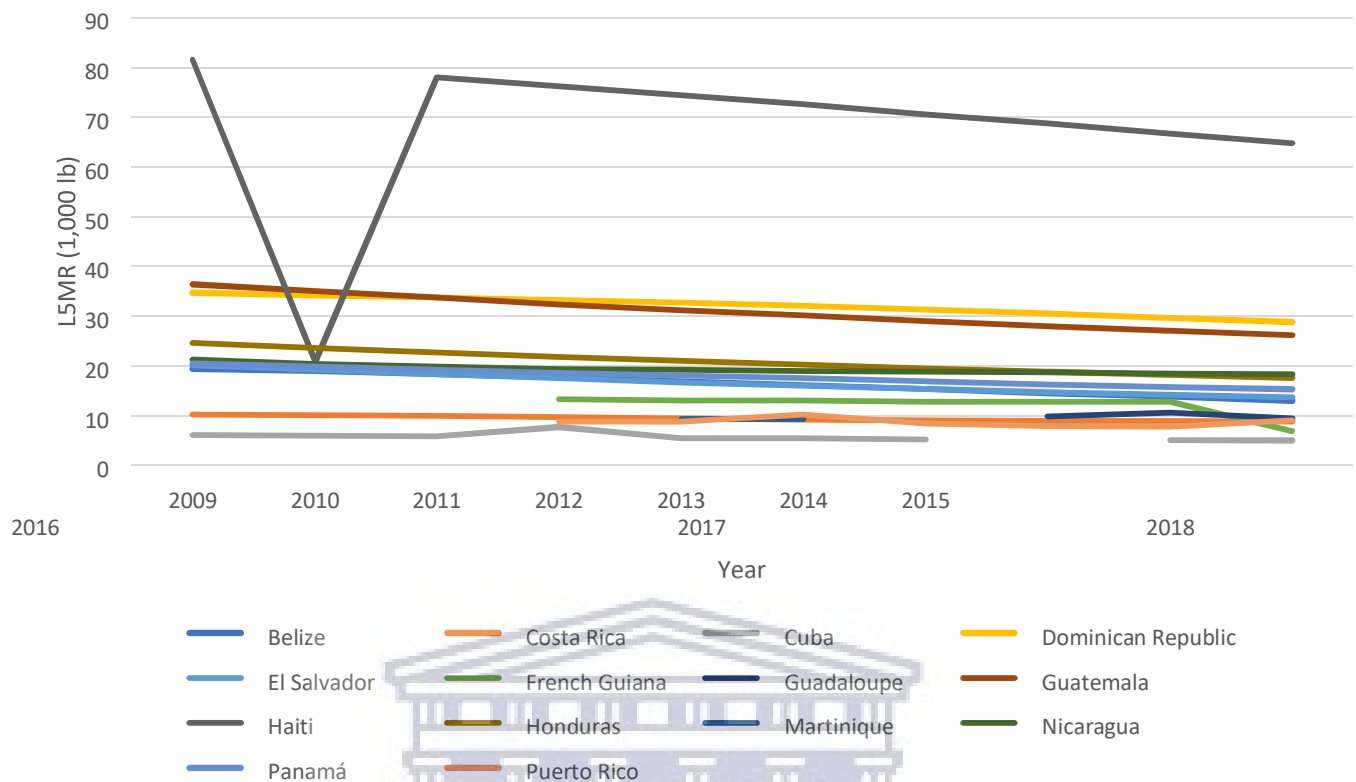
Figure 4.14 Under five mortality rate by country and year of in the Central American and Caribbean Region, 2009-2018**.**

4.9 GENERAL MORTALITY FOR COUNTRIES IN THE CENTRAL AMERICAN AND CARIBBEAN REGION

Table 4.8 shows the distribution by country of general mortality rates in CAC from 2009 to 2018. The Central American region reported an average of 5.7 deaths per 100,000 inhabitants (IC95 %, 5.1; 6.3) and the Latin Caribbean region reported an average of 6.8 deaths per 100,000 inhabitants (95% CI, 6.2; 7.4). Costa Rica, Nicaragua, Panama and Honduras reported the lowest general mortality rates below the region´s average with 3.9 (95% CI; 3.7, 4.2), 5.2 (95% CI; 4.7, 5.7), 5.2 (95% CI; 5.1, 5.4) and 5.5 (95% CI; 3.8, 7.1) deaths per 100,000 inhabitants respectively. On the

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contrary, the countries that reported highest general mortality in Central America were Belize, Guatemala and El Salvador with 6.0 (95% CI; 4.3, 7.7), 6.1 (95% CI; 5.5, 6.7) and 6.7 (95% CI; 6.3, 7.0) deaths per 100,000 inhabitants respectively. In the case of the Latin Caribbean region, Haiti was the only country with an overall mortality above the average reported for this region, with a value of 9.6 deaths (only value reported) per 100,000 inhabitants.

Table 4.8. General mortality in the Central American and Caribbean Region, 2009-2018.

Country	Mean	IC95%	
Central America Region			
Belize	6,0	4,3	7,7
Costa Rica	3,9	3,7	4,2
El Salvador	6,7	6,3	7,0
Guatemala	6,1	5,5	6,7
Honduras	5,5	3,8	7,1
Nicaragua	5,2	4,7	5,7
Panamá	5,2	5,1	5,4
Caribbean Region			
Cuba	6,5	5,4	7,5
Dominican Republic	6,2	5,8	6,6
French Guiana	3,5	3,0	4,0
Guadaloupe	5,3	4,3	6,2
Haiti	9.6		
Martinique	5,6	4,4	6,7
Puerto Rico	6,7	5,7	7,7
Central America Region (PAHO)	**5,7**	**5,1**	**6,3**
Latin Caribbean Region (PAHO)	**6,8**	**6,2**	**7,4**

General mortality in CAC countries was categorized into five groups viz: Group 1 (> 6.57 deaths per 100,000 inhabitants); group 2 (6.16 – 6.57 deaths per 100,000 inhabitants); group 3 (5.52 – 6.16 deaths per 100,000 inhabitants); group 4 (5.22 – 5.52 deaths per 100,000 inhabitants) and group 5 (< 5.22 deaths per 100,000 inhabitants). Costa Rica, Nicaragua and French Guiana were the only countries with the lowest reported general mortality rates, followed by Panamá, Honduras and Guadaloupe, then by Belize, Guatemala and Martinique in the third category. Cuba and Dominican Republic were classified in the second category, while in the first and highest category (> 6.57 deaths per 100,000 inhabitants) were El Salvador, Haiti and Puerto Rico.
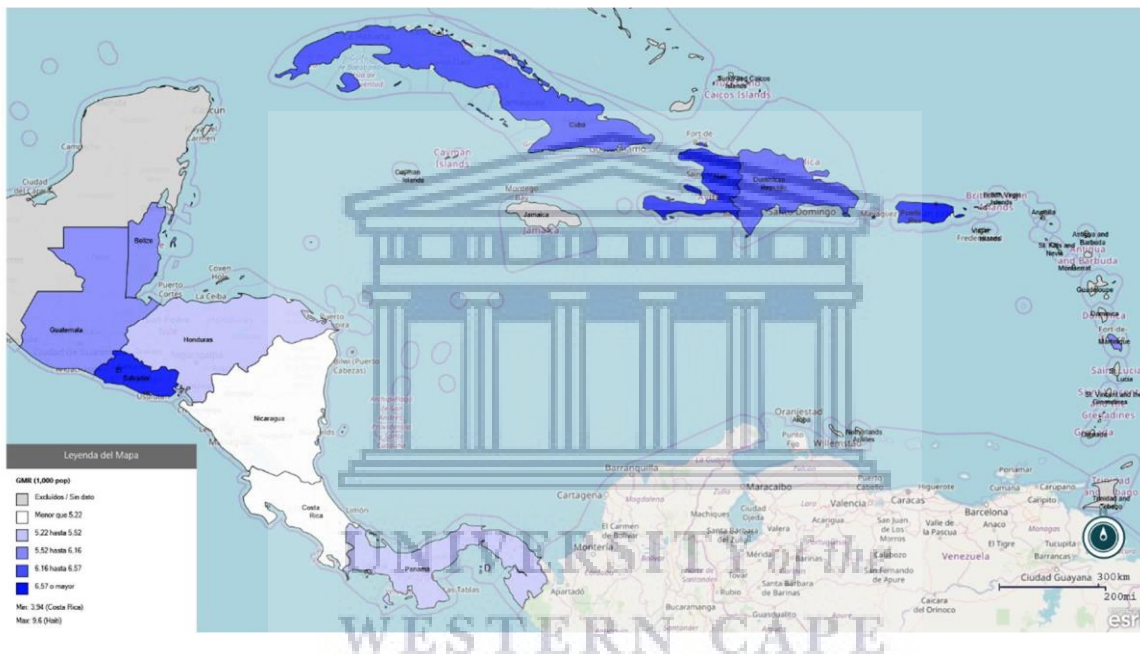
Figure 4.15. General mortality rates for countries in the Central American and Caribbean Region, 2009-2018

Figure 4.16 shows the distribution by country and year of general mortality rates in the region, evidencing a chaotic distribution of the general mortality during the studied period, with no clear upward or downward trend established. Costa Rica was the country with the most consistent distribution of general mortality over time with values reported in 2009 of 4.1 deaths per 100,000 inhabitants and 4.5 deaths per 100,000 inhabitants in 2017. Similarly, Panama presented with a

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consistent general mortality rate until 2016 where a sharp drop occurred that persisted till the end of the period studied. Cuba, Martinique, Puerto Rico and Guadaloupe reported drops in overall mortality between 2014 and 2015 that remained until the end of the period studied. On the contrary, Belize, Guatemala, Dominican Republic, Nicaragua and French Guiana reported significant increases in overall mortality in 2016. Finally, El Salvador reported a gradual but steady increase in general mortality rate over time, reporting values of 5.9 deaths per 100,000 inhabitants in 2009 and 6.9 deaths per 100,000 inhabitants in 2018.
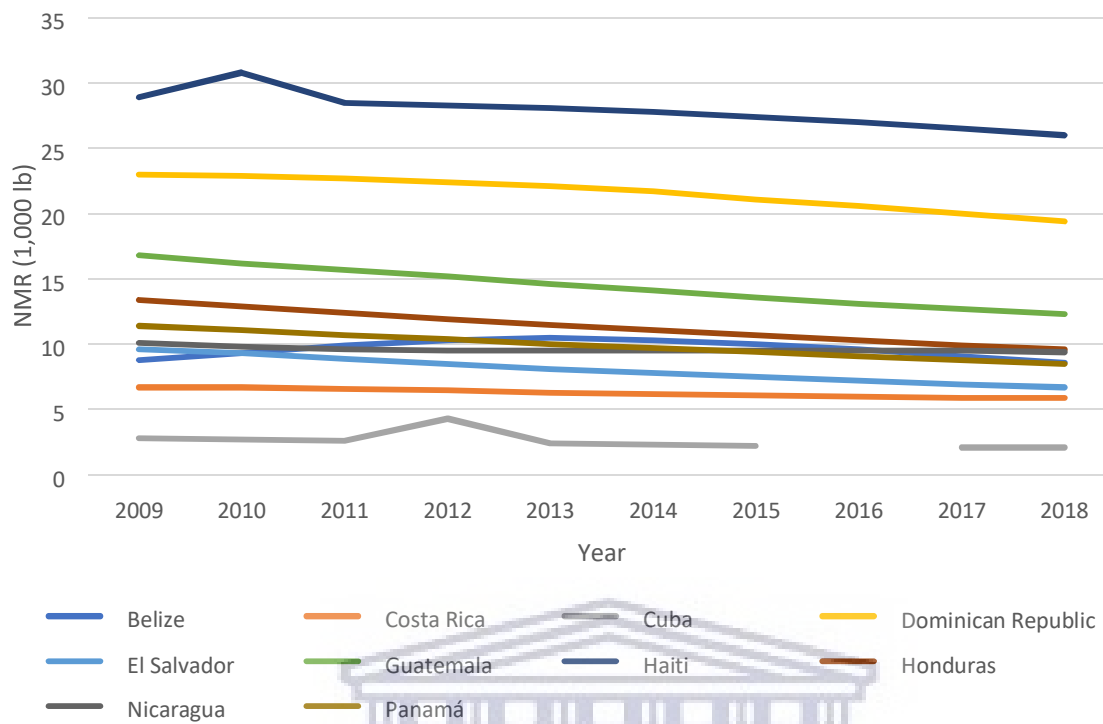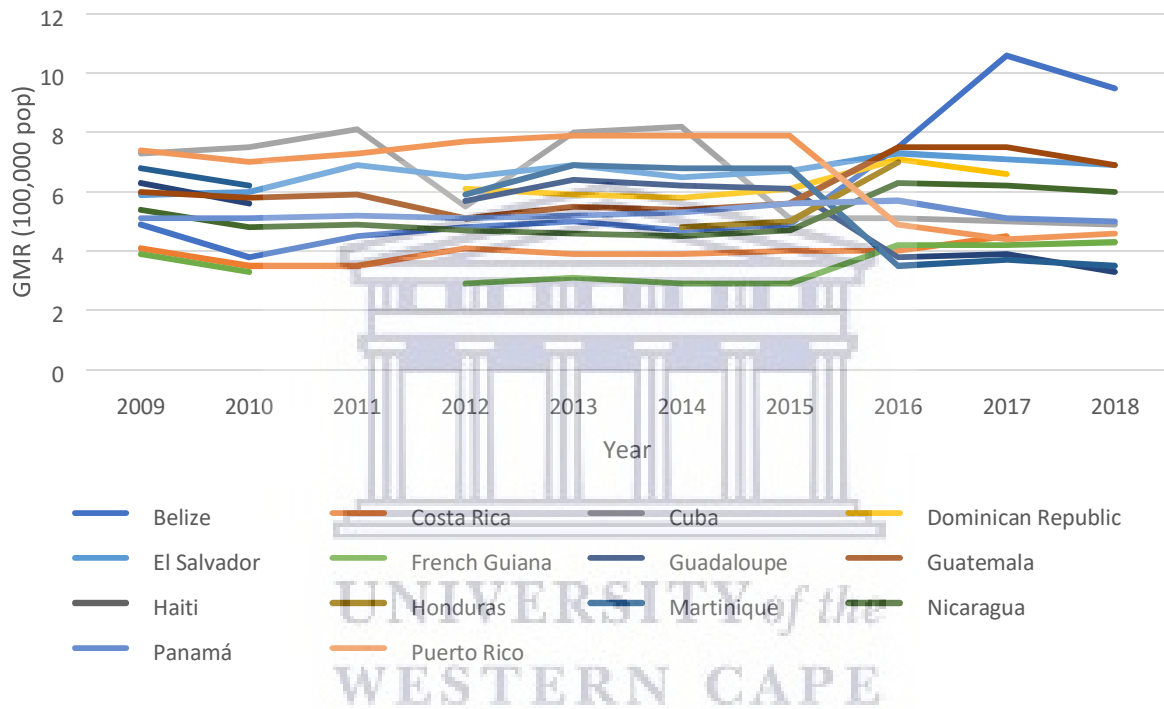

Figure 4.16. General mortality rate by country and year of in the Central American and Caribbean Region, 2009-2018

4.10 MORTALITY OF COMMUNICABLE DISEASES FOR COUNTRIES IN THE CENTRAL AMERICAN AND CARIBBEAN REGION

Table 4.9 shows the distribution by country of communicable diseases mortality rate in CAC from 2009 to 2018. The Central American region reported an average of 85.2 deaths per 100,000 inhabitants (IC95 %, 69.8; 100.2) and the Latin Caribbean region reported an average of 59.3 deaths per 100,000 inhabitants (95% CI, 55.5; 63.2). The countries of Central America that reported the lowest mortality, below the average, from communicable diseases were Costa Rica, Nicaragua, Panama and El Salvador with 20.9 (95% CI; 16.7, 25.1), 46.2 (95% CI; 36.8, 55.7), 66.9 (95% CI; 60.8, 72.9) and 82.1 (95% CI; 67.9, 96.2) deaths per 100,000 inhabitants respectively. On the contrary, the countries that reported mortality rates from communicable diseases higher than the Central American average were Guatemala, Honduras and Belize with 123,0 (95%CI; 105.4, 140.5), 93.9 (95% CI; -8.6, 196.3) and 92.7 (95% CI; 65.4, 120.1) deaths per 100,000 inhabitants respectively. In the case of the Latin Caribbean region, Dominican Republic reported communicable diseases mortality rate above the average of 69.8 (95% CI; 50.9, 88.6) deaths per 100,000 inhabitants. Haiti did not report values over time period studied.
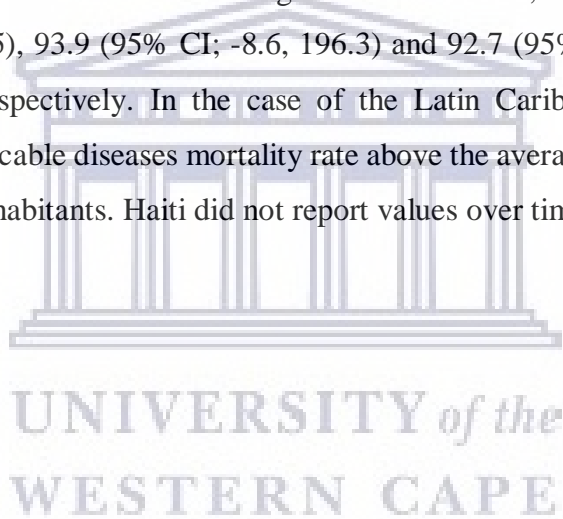
Table 4.9. Mortality of communicable diseases in the Central American and Caribbean Regions, 2009-2018.

Country	Mean	IC95%	
Central America Region			
Belize	92,7	65,4	120,1
Costa Rica	20,9	16,7	25,1
El Salvador	82,1	67,9	96,2
Guatemala	123,0	105,4	140,5
Honduras	93,9	-8,6	196,3
Nicaragua	46,2	36,8	55,7
Panamá	66,9	60,8	72,9
Caribbean Region			
Cuba	49,3	43,5	55,1
Dominican Republic	69,8	50,9	88,6
French Guiana	35,8	28,6	43,0
Guadaloupe	35,6	31,8	39,5
Haiti			
Martinique	36,0	31,3	40,7
Puerto Rico	56,6	49,0	64,3
Central America Region (PAHO)	**85,2**	**69,8**	**100,2**
Latin Caribbean Region (PAHO)	**59,3**	**55,5**	**63,2**

CAC countries were grouped into intervals in **Figure 4.17.** The only country that fell within the group with the lowest mortality due to communicable diseases (< 41.11 deaths per 100,000 inhabitants) was Costa Rica with 20.9 (95% CI; 16.7, 25.1) deaths per 100,000 inhabitants. In the case of the Latin Caribbean Guadeloupe, French Guiana and Martinique were classified in the lowest mortality group with 35.6 (95% CI; 31.8, 39.5), 35.8 (95% CI; 28.6, 43.0) and 36.0 (95% CI; 31.3, 40.7) deaths per 100,000 inhabitants respectively. On the contrary, within the countries that reported the highest mortality rates from communicable diseases (> 87.4 deaths per 100,000

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inhabitants) were Guatemala, Honduras and Belize with 123.0 (95% CI; 105.4, 140.5), 93.9 (95% CI; -8.6 , 196.3) and 92.7 (95% CI; 65.4, 120.1) deaths per 100,000 inhabitants respectively.

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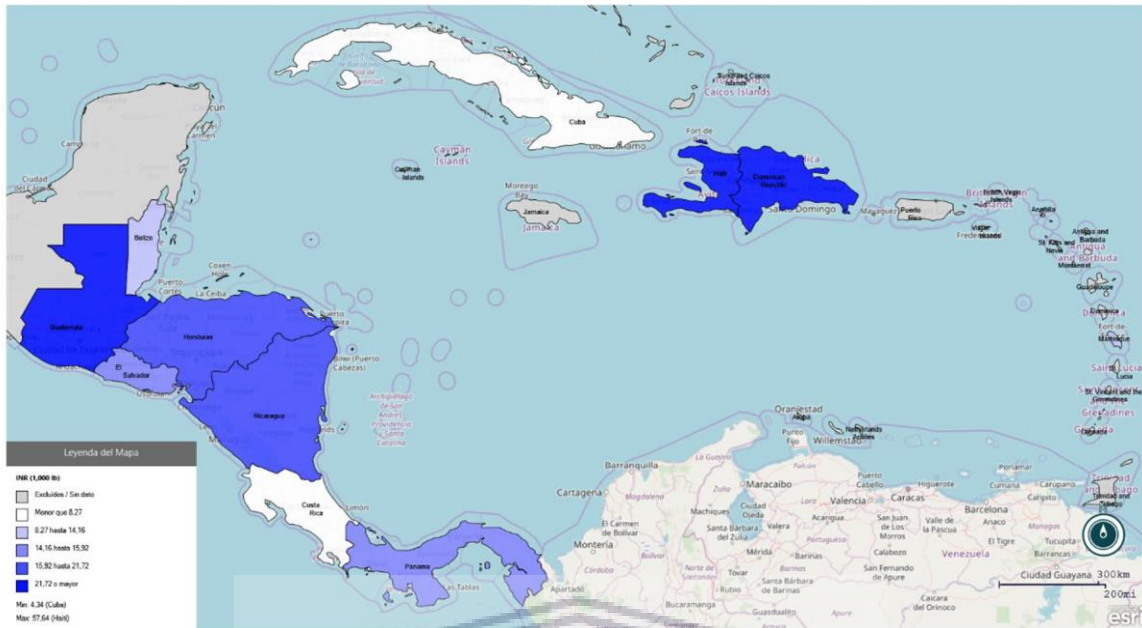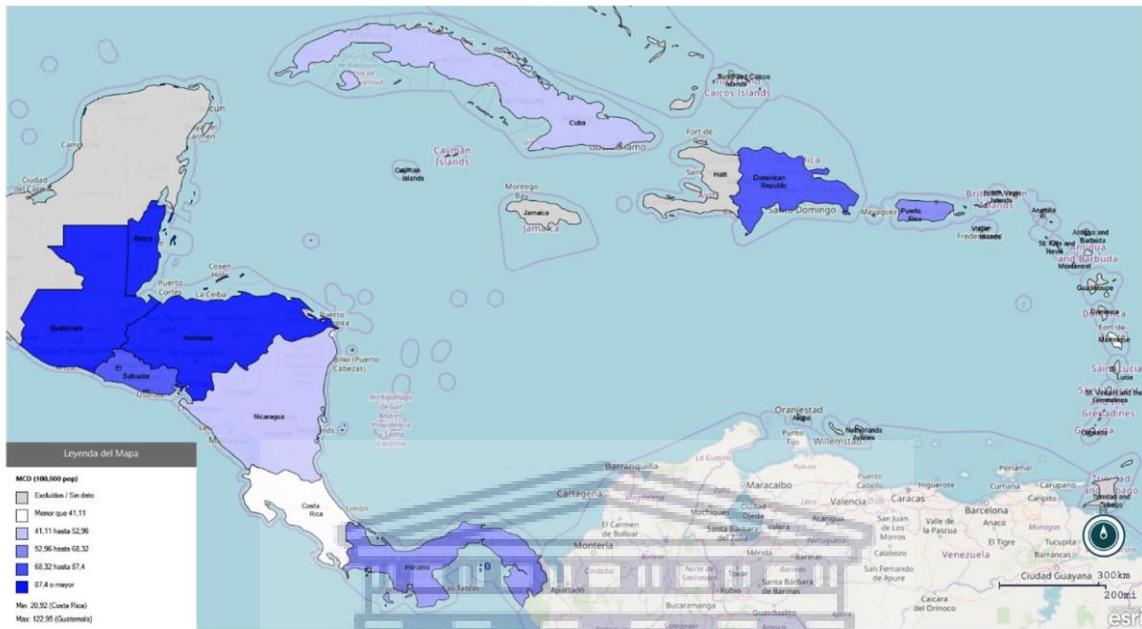**Figure 4.17.** Mortality of communicable diseases for countries in the Central American and Caribbean Region, 2009-2018

Figure 4.18 shows the distribution by country and year of communicable diseases mortality rates in the region, indicating a heterogeneous distribution of the mortality rates during the studied period, where a clear upward or downward trend could not be established. Despite this, there was an increase in mortality from communicable causes between 2014 and 2015 in several countries of the region, including Guatemala, Honduras, Belize, El Salvador, Puerto Rico, Nicaragua, Costa Rica, Panama and French Guiana. On the contrary, Cuba reported a reduction in mortality due to communicable causes in 2014, which was maintained until the end of the period studied. Similarly, Puerto Rico, Guadaloupe and Martinique also reported a fall in mortality from communicable causes in 2015 that remained until the end of the period studied.

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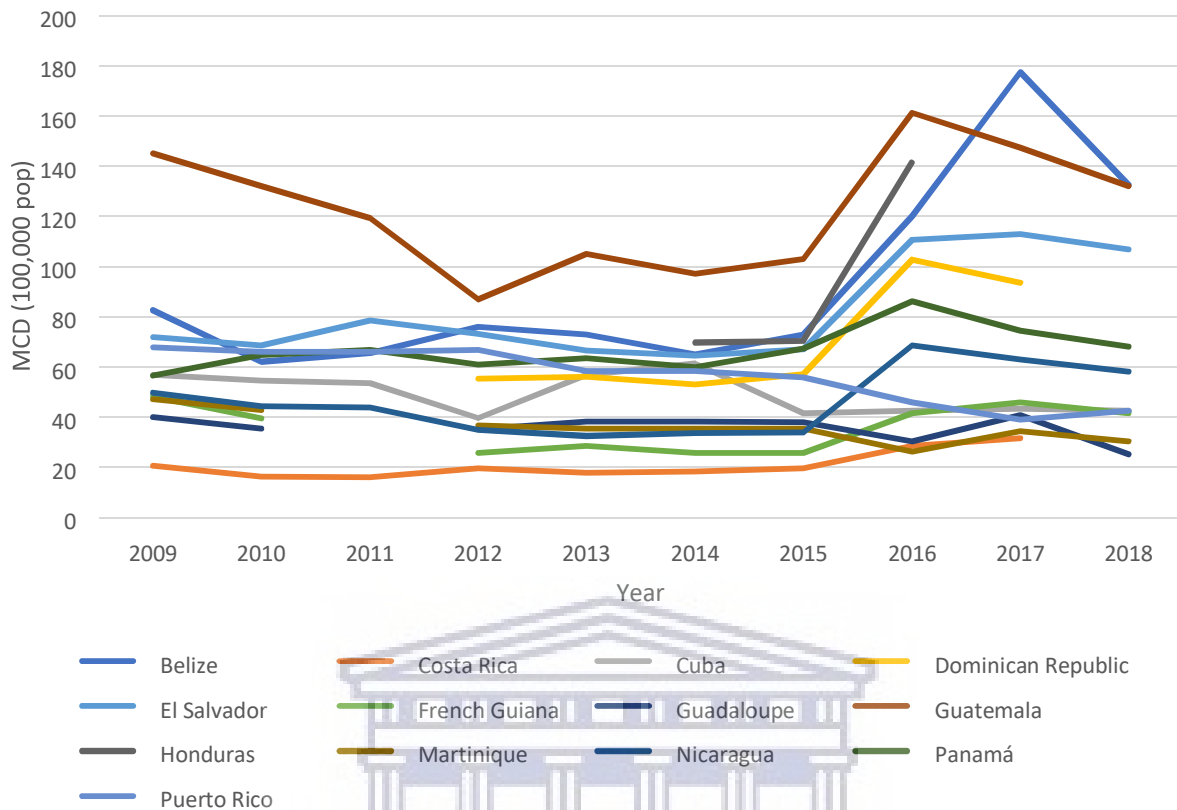
Figure 4.18. Mortality of communicable diseases rate by country and year of in the Central American and Caribbean Region, 2009-2018

4.11 TYPE OF HEALTH COVERAGE IN THE CENTRAL AMERICAN AND CARIBBEAN REGION

Figure 4.19 shows the geographical distribution of the type of health coverage in the CAC region. In this case, only Cuba depends on a unique public health system, which is the Ministry of Health. Costa Rica and Haiti are classified as dual health systems; where health care is distributed between the Social Security and Private sector. Finally, Guatemala, El Salvador, Honduras, Nicaragua, Panama and Dominican Republic are classified as tripartite health systems; where health care is distributed among the public (Ministry of Health), Social Security and Private sectors.

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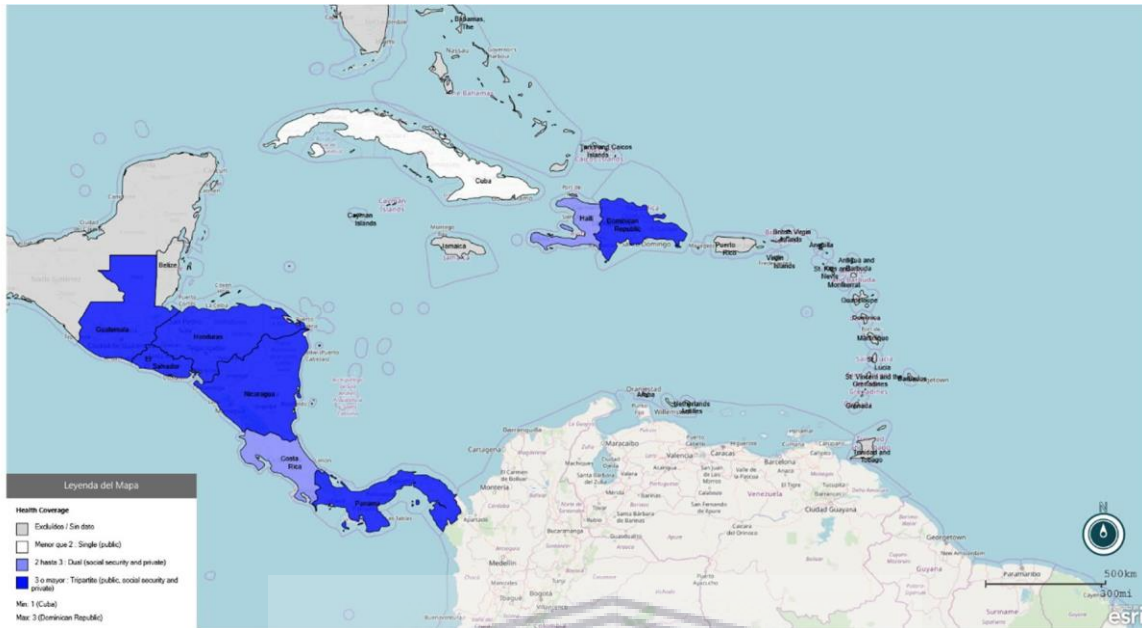
Figure 4.19. Type of health coverage by country in the Central American and Caribbean Region, 2009-2018

4.12 CORRELATION BETWEEN HEALTH INDICATORS AND HEALTH INVESTMENT AND TYPE OF HEALTH COVERAGE IN THE COUNTRIES OF THE CENTRAL AMERICAN AND CARIBBEAN REGION.

Table 4.10 shows the relationship between the different health indicators and the investment in health, represented as a percentage of the GDP allocated to health, and the type of health coverage of the CAC countries between the years 2009 and 2018. The GDP % invested in health had a greater impact on life expectancy than the way in which the health system was organized in the particular country (p = 0.018), with life expectancy in years increasing by 1.18 years for each additional percentage point of GDP invested in health (table 4.10). GDP % invested in health and the type of coverage had an inverse correlation with maternal mortality, with each additional percentage point of the GDP invested in health reducing maternal mortality by 38.67 maternal

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deaths per 100,000 live births (p = 0.004). In the same way, for each additional factor added to health coverage (whether single, dual or tripartite), maternal mortality decreased by 115.82 maternal deaths per 100,000 live births (p = 0.001) (table 4.10). GDP percent invested in health also had a significant impact on neonatal mortality, with each additional percentage point of GDP investment in health reducing neonatal mortality by 2.89 cases per 100,000 (p = 0.000). The nature of the health system had no influence however on neonatal mortality (table 4.10). Infant mortality was reduced by 5.01 cases per 100,000 (p = 0.001) for each additional percentage point of GDP investment in health (table 4.10). Both investment in health and type of health coverage directly influenced mortality in children under 5 years of age. Each additional percentage point of GDP invested in health reduced mortality in children under 5 years by 6.27 cases (p = 0.001), while each additional factor added to health coverage (single, dual or tripartite) decreased mortality in children under 5 years by 10.71 cases in total (p = 0.022) (table 4.10). Finally, the percentage of GDP spend on health had no direct impact on general mortality (p = 0.820) or mortality from communicable diseases (p = 0.085).
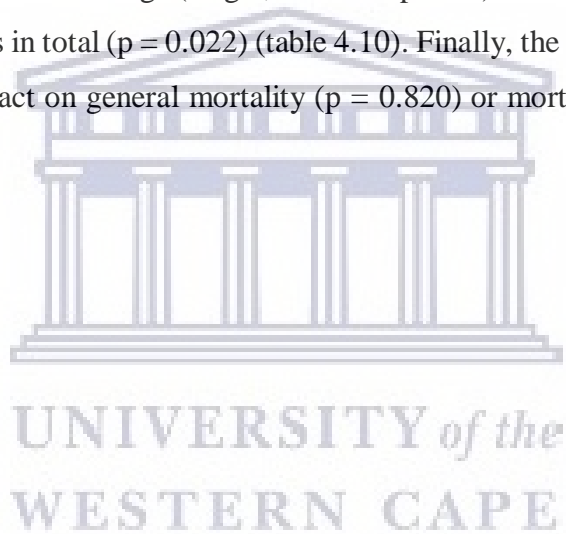
Table 4.10. Relationship between health indicators and the GDP % allocated to health and the type of health coverage, in the countries of the Central American and Caribbean Region, 20092018.

Independent variables	Coefficient	Std. Error	t	P
Life expectancy (years)				
% GDP	1,18	0,49	2,42	0,018
Health Coverage	1,58	1,28	1,23	0,223
Maternal Mortality Rate [MMR] (100,000 lb)				
% GDP	-38,67	12,92	-2,99	0,004
Health Coverage	-115,82	34,11	-3,40	0,001
Neonatal Mortality Rate [NMR] (1,000 lb)				
% GDP	-2,89	0,67	-4,30	0,000
Health Coverage	-3,42	1,77	-1,93	0,058
Infant Mortality Rate [IMR] (1,000 lb)				
% GDP	-5,01	1,47	-3,41	0,001
Health Coverage	-8,72	3,88	-2,25	0,028
Under 5 Mortality Rate [L5MR] (1,000 lb)				
% GDP	-6,27	1,72	-3,64	0,001
Health Coverage	-10,71	4,55	-2,36	0,022
General Mortality Rate [GMR] (100,000 pop)				
% GDP	0,07	0,17	0,41	0,685
Health Coverage	-0,22	0,45	-0,48	0,630
Mortality of Communicable Disease [MCD] (100,000 pop)				
% GDP	1,10	4,83	0,23	0,820
Health Coverage	21,90	12,48	1,75	0,085

4.13 SUMMARY

Chapter four described the main results obtained from 2009 to 2018 regarding the previously preselected health and sociodemographic determinants in the Central America and Latin Caribbean region. A discussion of the results will be offered in chapter five; as well as the dissertation´s limitations, relevance of the obtained data and the main conclusions and recommendations for future reviews.

CHAPTER FIVE
DISCUSSION, CONCLUSION AND RECOMMENDATIONS

5.1 DISCUSSION

As previously discussed, in the Central America and Latin Caribbean (CAC) region there have been important differences in economies throughout history, despite the common origins and the small territory it comprises. According to the World Bank (2019) Analytical Classifications of the GNI per capita, most countries in the region are classified as upper-middle income economies, and these include Belize, Costa Rica, Guatemala, Cuba, Dominican Republic, and French Guiana. Less common, but still present, are countries classified as low-middle income economies such as El Salvador, Honduras and Nicaragua. The main contrast within the region with respect to the GNI is present between countries classified as high-income economies including Panama and Puerto Rico, and Haiti, the only low-income economy in the region. Consistent with the inequities of income levels in the region, are the differences in the type of health coverage and expenditure in health, resulting in important differences in access to health services among the populations in the region. It is for this reason that this review intended to determine the impact of these economic and social inequalities on the main health and demographic outcomes in the region.

It is important to remember that only Cuba is considered to have a single public health system (Figure 4.19), while Costa Rica and Haiti are classified as dual health systems where a single public health system coexists with private healthcare. Guatemala, El Salvador, Honduras, Nicaragua, Panama and Dominican Republic are classified as having tripartite health coverage systems, where public health care is distributed between two main institutions. Interestingly Panama, which is considered internationally as a high-income economy, reported a lower investment in health than countries such as Honduras, El Salvador and Nicaragua, which are considered low-middle income economies (Table 4.1). Even Haiti, the only low-income country in the region, reported investments in health higher than that reported by Panamá. Nevertheless, it is important to highlight the heterogeneous reported health expenditure in Haiti during the study period; where health policy is probably not the only factor that should be taken into consideration for resources

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distribution. The World Bank´s report on Haiti´s Health Financing stated, that primary health care needs to be prioritized, and that there are current financial and geographical barriers that need to be broken in order to access a quality healthcare. In Haiti it is imperative to increase the public spending for health and to optimize of existing resources (Cavagnero et al, 2017). Additionaly, these results should however take into account that the investment in health by each of the countries studied had not changed considerably in the last 10 years, maintaining the inequities in health in the region during the period studied.

Contrary to the hypothesized association, the results indicate that the only health indicators that correlate directly with the type of health coverage adopted by the country are maternal mortality and under five mortality rates. No relationship with other parameters like life expectancy, neonatal mortality, infant mortality, global mortality rates and mortality due to communicable diseases were reported. Previous research on the main health determinants has focused on the entire Latin America and Caribbean Region, with Barreto *et al* (2012) reporting that from 1960 to 2008 the Latin America and Caribbean region faced noteworthy demographic changes, with a substantial decline of GMR and an increase in life expectancy. This research results build and complement on the existing evidence demonstrating that from 2009 to 2018, GMR in CAC region dropped from 7.0 to 6.5 per 100,000 people, IMR also fell from 18.3 to 14.0 per 1000 live births and L5MR dropped from 21.6 to 16.4 per 1000 live births. Additionally, Life Expectancy increased a little over 2 years from 72.9 years in 2009 to 75 years in 2018 **(Appendix 1).**

Similarly, previous research on health expenditure has mainly focused on the Latin American and Caribbean region as a whole. This may be justified by the absence of standardized approaches to estimate national health expenditure, as health care is usually financed by different sources such as government, parastatals, and social security institutions (Govindaraj *et al*, 1997). This fact makes it difficult to track the overall health spending of each county and the region as a whole. In line with the hypothesis, there seems to be a greater weight of the resources invested in health, since the different mortality rates inversely correlate with the government´s investment in health, with the exception of general mortality rate and mortality from communicable diseases.

The lack of association between the GMR and the investment in health can be justified by the fact that the GMR summarizes the risk of death in the general population, without differentiating by other important variables such as sex, age, education level or cause of death. Furthermore, by not differentiating by age, it is influenced by the age distribution of the population, something that should be considered when comparing general mortality rates of the populations involved (PAHO, 2018). This review took into account the total age-adjusted GMR, without sex differentiation.

Nevertheless, other social factors out of the scope of this review, such as infrastructure and security, could significantly influence GMR as they vary between countries. On the other hand, age and sex also influence MCD mainly because the phenomena related to health occur differently in certain population groups due to the ways in which these two variables interact. For example, some diseases are more lethal during the first year of life, while others more commonly affect the elderly. Furthermore, low mortality levels are generally associated with older populations with greater average longevity and a relatively lower burden of communicable diseases (PAHO, 2018). Therefore, with the exception of GMR and MCD, these results reinforce the recommendations of the Primary health care on the road to universal health coverage: 2019 monitoring report (WHO, 2019), which highlights that most countries could achieve health goals by increasing national resources to increase public spending in health. This report suggests that at least an additional 1% of GDP should be immediately allocated or reallocated to primary health care; however for the poorest countries this may not be feasible or sufficient. It is for this reason that it is imperative to strengthen health systems, as well as long-term technical assistance, focused on low-income countries. This same report issues some recommendations for countries similar to those of the CAC region. For high and upper middle-income countries, like Panama, Belize, Costa Rica, Guatemala, Cuba, Dominican Republic and French Guiana, where there is a high service coverage and low financial hardship, the major challenge is to continue to make efficiency, quality and equity gains. For lower middle-income countries, like El Salvador, Honduras and Nicaragua, where there is a high service coverage but high levels of financial hardship, ensuring inclusive, universal mechanisms to protect against high out-of-pocket spending will be the key challenge. Finally, for countries with low service coverage and high financial hardship, like Haiti, there is a need to reform

their service delivery and health financing arrangements, giving priority to addressing inequities (WHO, 2019).

It is important to highlight that in Costa Rica and Cuba, the reported mortality rates tend to be the lowest in the region, suggesting that public spending in health may have an important role in the main health determinants, regardless of whether it is a single or dual health system. However, this breakdown is beyond the scope of this analysis. This research provides a new insight into the importance of the global goal of attaining universal health coverage and allocating public funds to expand health services. This transformation happened after the international community adopted the Sustainable Development Goals in 2015; but some low-income countries, such as Haiti, El Salvador, Honduras and Nicaragua, are lagging behind while a large gap persists between rich and poor countries (WHO, 2018).

The obtained data contributes a clearer understanding of the need to invest more in primary health care, with emphasis on health promotion and disease prevention, as no country can afford to rely on curative care (WHO, 2019). It also stresses a clear call to action for all people to receive the quality health services they need without financial difficulties and an intention to achieve universal health coverage (PAHO, 2017).

5.2 CONCLUSION

Over the years, efforts made to understand the determinants of health expenditure and its impact in the main health determinants have mainly focused on the Latin American and Caribbean region as a whole, without showing a particular interest in the developing countries of Central America and Caribbean. It is important to recognize the limitations of this type of retrospective review of data sources with incomplete information. However, although multiple data sources had to be consulted, and the uniformity of the information was not guaranteed, there was sufficient and reasonable data on the main sociodemographic and health determinants for most countries during the period from 2009-2018 to perform the analysis. While firm conclusions cannot be drawn regarding the correlation between the public health investment and the type of health coverage with the main determinants in the region, some general trends can be concluded from the analysis.

The results of this research are to some extent consistent with the existing literature, since the differences in the main health determinants reflect the gap in health spending between different governments. This analysis confirms that there is a relationship mainly between health investment, determined as the percentage of the GDP, and the main WHO/PAHO and World Bank health determinants. It also demonstrated that each additional point of the GDP invested in health might reflect an improvement in the number of years that an individual can live and a significant decrease in the different mortality rates studied. At the same time, this analysis was able to correlate the type of health coverage with significant differences in maternal mortality and under five mortality rates.

Based on the disaggregated data available it would be appropriate to consider the PAHO recommendation of investing at least an additional 1% of GDP into primary health care, even though this might not be feasible for every country. It would also be advisable to move from segmented public coverage to a unified public system in order to try to overcome social disparities and provide similar opportunities and adequate medical care to the population. These conclusions arise from the fact that in spite of the efforts made in the region to prioritize in terms of investment in health plans, there are still large inequities dragged from the past reflected in the results of this review.

5.3 RECOMMENDATIONS

From what is known, few authors have completed the task of reviewing the possible correlations between the investment in health and the type of health coverage with the main social and health determinants of the Central American and the Latin Caribbean region; however, other regions of the world have this type of analysis available for the general population, health care providers, decision makers and payers. It is recommended to carry out additional studies and follow-up on this type of data in CAC in order to be able to allow governments to exercise evidence-driven decision making process, which will permit to migrate towards health system models that optimize resources and obtain better results for their population. Future work could be proposed prospectively, so as to overcome the barrier of the limitation of available data and the heterogeneous data sources used for retrospective reviews; consequently, the information collected

can be more homogeneous and complete. Future studies should take into account other health indicators such as non-communicable diseases, which at this time could not be analysed due to a significant data limitation.

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APPENDICES

Appendix 1: Data Extraction Sheet

COUNTRY	Income Level	Single (public)	Dual (social security and private)	Tripartite (public, social security and private)	2009												2010											
					% GDP	Gini coefficient	Life expectacy (years)	MMR (100,000 lb)	NMR (1,000 lb)	INR (1,000 lb)	L5MR (1,000 lb)	GMR (1,000 pop) corrected	GMR (1,000 pop) adjusted	MCD (100,000 pop) corrected	MCD (100,000 pop) adjusted	MNCD (100,000 pop) corrected	% GDP	Gini coefficient	Life expectacy	MMR (100,000 lb)	NMR (1,000 lb)	INR (1,000 lb)	L5MR (1,000 lb)	GMR (1,000 pop) corrected	GMR (1,000 pop) adjusted	MCD (100,000 pop) corrected	MCD (100,000 pop) adjusted	MNCD (100,000 pop)
Latin America & Caribbean (BM)					7.417	n/a	72.9	87	11.2	18.3	21.6						7.868	n/a	73.1	85.0	11	18.3	24.4					
Central America Region (PAHO)												5.5	7.0	89.8	104.8	n/a								5.3	6.5	83.3	94.1	n/a
Belize	UM UM LM				5.311	n/a	71.541	57	8.8	16.6	19.4	4.9	7	82.7	109.6	n/a	5.765	n/a	72.057	54	9.3	16.2	18.9	3.8	5.5	62.1	84.2	n/a
Costa Rica			X		7.907	50.6	78.626	29	6.7	8.8	10.2	4.1	4.7	20.7	23.5	n/a	8.113	48.2	78.769	32	6.7	8.7	10.1	3.5	3.9	16.2	18	n/a
El Salvador				X	6.839	45.8	70.978	57	9.6	17.3	20.2	5.9	7.1	71.9	92.9	n/a	6.915	43.5	71.21	54	9.3	16.5	19.2	6	6.5	68.6	73.9	n/a
Guatemala	UM LM LM		X		6.285	n/a	71.108	131	16.8	29.8	36.4	6	7.8	145	162	n/a	6.077	n/a	71.481	129	16.2	28.8	35	5.8	7.4	132.1	149.2	n/a
Honduras			X		8.87	51.3	73.061	75	13.4	20.8	24.6	5.1	6.9			n/a	8.628	53.1	73.317	74	12.9	20	23.6	n/a	n/a	n/a	n/a	n/a
Nicaragua			X		7.178	n/a	72.167	113	10.1	18.1	21.3	5.4	7.7	49.6	68.2	n/a	6.502	n/a	72.428	112	9.8	17.5	20.4	4.8	6.7	44.3	55	n/a
Panamá	H			X	6.852	51.8	76.6	82	11.4	17.5	20.5	5.1	5.8	56.5	61.9	n/a	7.003	51.6	76.792	79	11.1	17	19.9	5.1 7.1	5.6 4.9	64.7 57.9	70 40.2	n/a n/a
Latin Caribbean Region (PAHO)												7.5	7.6	64.9	56.9													
Cuba	UM UM UM	X			12.29	n/a	78.256	41	2.8	4.7	6.1	7.3	5.1	56.9	39.3	n/a	11.313	n/a	78.338	38	2.7	4.6	6	7.5	5.7	54.5	41.3	n/a
Dominican Republic			X		5.087	48.9	71.806	95	23	28.5	34.7	5.9	6.9	70.6	77.6	n/a	5.582	47.3	72.046	96	22.9	28.2	34.2	n/a	n/a	n/a	n/a	n/a
French Guiana					n/a	n/a	76.2	n/a	n/a	12.1	n/a	3.9	5.3	48.3	60.3	n/a			76.3	n/a	n/a	12.1	n/a	3.3	4.6	39.5	49.6	n/a
Guadaloupe	X				14	n/a	79.3	n/a		6.1	n/a	6.3	4.9	39.9	31.5	n/a	2.1	n/a	79.4	n/a		6.9	n/a	5.6	3.9	35.3	25.2	n/a
Haiti	L		X		6.169	n/a	60.148	484	28.9	60.2	81.5	9.6	12.1	47.1	30.4	n/a	8.146	n/a	60.511	506	30.8	85.6	208.6	n/a	n/a	n/a	n/a	n/a
Martinique	X		X		n/a	n/a	79.8	12.8	n/a	8.8	n/a	6.8	4.4			n/a	n/a	n/a	79.9	n/a	n/a	8.8	n/a	6.2	3.9	42.7	27	n/a
Puerto Rico	H					n/a	n/a	79	23	n/a	n/a	n/a	7.4	5.1	67.8	48.3	n/a		n/a	79.1	21	n/a	n/a	n/a	7	4.6	65.9	45.4	n/a

COUNTRY	Income Level	Single (public)	Dual (social security and private)	Tripartite (public, social security and private)	2011												2012										2013										
					% GDP	Gini coefficient	Life expectacy	MMR (100,000 lb)	NMR (1,000 lb)	INR (1,000 lb)	L5MR (1,000 lb)	GMR (1,000 pop) correct ed	GMR (1,000 pop) adjuste d	MCD (100,000 pop) correct ed	MCD (100,000 pop) adjuste d	MNCD (100,000 pop)	% GDP	Gini coefficient	Life expectacy	MMR (100,000 lb)	NMR (1,000 lb)	INR (1,000 lb)	L5MR (1,000 lb)	GMR (1,000 pop) correct ed	GMR (1,000 pop) adjuste d	MCD (100,000 pop)	MNCD (100,000 pop)	% GDP	Gini coefficient	Life expectacy	MMR (100,000 lb)	NMR (1,000 lb)	INR (1,000 lb)	L5MR (1,000 lb)	GMR (1,000 pop) correct ed	GMR (1,000 pop) correct ed	MCD (100,000 pop) correct ed	MCD (100,000 pop) adjuste d	MNCD (100,000 pop)
Latin America & Caribbean (BM)					7.915	n/a	73.5	82	10.6	17.1	20.2						7.887	n/a	73.7	80.0	10.4	16.6	19.5					7.988	n/a	74.2	79	10.1	16.1	18.9					

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Country	Income Level	Single (public)	Dual	Tripartite	% GDP	Gini coefficient	Life expectancy	MMR	NMR	INR	U5MR	GMR corrected	GMR adjusted	MCD corrected	MCD corrected	MNCD	% GDP	Gini	Life expectancy	MMR	NMR	INR	U5MR	GMR corr	GMR adj	MCD corr	MCD corr	MNCD	% GDP	Life exp	MMR	NMR	INR	U5MR	GMR	MCD	MNCD
Central America Region (PAHO)												n/a	7.1	80.1	93.7	n/a								5.1	6.9	64.3	n/a						5.3	6.9	70.3	82.0	n/a
Belize	UM		x		5.575	n/a	72.57	52	9.9	15.7	18.3	4.5	7	65.4	94.1	n/a	5.323	n/a	73.044	50	10.3	15.2	17.7	4.8	7.4	76	n/a	5.727	...	73.452	48	10.5	14.5	16.9	5	8.1	72.9	108.3	n/a
Costa Rica	UM				8.087	48.7	78.919	30	6.6	8.6	9.9	3.5	4.3	16	18.9	n/a	7.751	48.6	79.074	29	6.5	8.4	9.7	4.1	4.9	19.7	n/a	7.678	49.3	79.234	29	6.3	8.2	9.5	3.9	4.5	17.7	20.2	n/a
El Salvador	LM		x		6.897	42.3	71.449	53	8.9	15.7	18.3	6.9	7.9	78.4	87.5	n/a	6.719	41.8	71.692	52	8.5	15	17.5	6.5	7.4	73.2	n/a	6.97	43.4	71.935	50	8.1	14.3	16.7	6.9	7.5	66.6	70.8	n/a
Guatemala	UM		x		5.86	n/a	71.861	122	15.7	27.8	33.7	5.9	8	119.3	140.7	n/a	5.885	n/a	72.236	118	15.2	26.8	32.4	5.1	7.6	86.9	n/a	5.903	52.4	72.596	113	14.6	25.9	31.2	5.5	7.7	105	125.5	n/a
Honduras	LM		x		8.71	56.2	73.569	72	12.4	19.3	22.7	...	...	...	...	n/a	8.619	56.1	73.814	70	11.9	18.6	21.8	...	...	...	n/a	8.292	52.6	74.051	69	11.5	17.9	21	...	...	32.5	39.2	n/a
Nicaragua	LM		x		7.092	n/a	72.692	110	9.6	17	19.8	4.9	7	43.8	54	n/a	7.466	n/a	72.951	108	9.5	16.6	19.4	4.7	6.6	34.9	n/a	7.325	45.7	73.197	105	9.5	16.4	19.2	4.6	6.5	32.5	39.2	n/a
Panamá	H		x		6.405	51.3	76.989	76	10.7	16.5	19.2	5.2	6.1	66.9	74.3	n/a	6.389	51.7	77.188	74	10.4	16	18.6	5.1	6	60.8	n/a	6.491	51.5	77.386	66	10	15.5	18.1	5.2	5.9	63.5	69.4	n/a
Latin Caribbean Region (PAHO)												n/a	n/a	n/a	n/a	n/a								7.1	6	55.3	n/a								7.0	6.1	55.3	49.1	n/a
Cuba	UM UM UM	x			9.299	n/a	78.4	39	2.6	4.4	5.8	8.1	5.5	53.6	n/a	10.431	n/a	78.446	78.446	2.5	4.3	5.7	7.7	5.5	55.5	39.6	n/a	12.141	n/a	78.485	39	2.4	4.1	5.5	8	5.3	56.9	37.5	n/a
Dominican Republic			x		5.671	47.7	72.284	95	22.7	27.9	33.8	...	...	...	...	n/a	5.889	46.1	72.523	94	22.4	27.5	33.3	6.1	7	55.4	n/a	5.829	47.7	72.763	94	22.1	27.1	32.7	5.9	7.1	56.1	63.5	n/a
French Guiana					n/a	n/a	76.5	na	n/a	10.4	n/a	...	...	...	...	n/a	n/a	n/a	76.7	16.4	n/a	10.9	13.3	2.9	4.4	25.7	n/a	n/a	n/a	77.1	16.4	n/a	8.6	13	3.1	4.4	28.4	52.1	n/a
Guadaloupe	x				2.1		79.8	na	n/a	8.7	n/a	...	...	...	...	n/a	n/a	n/a	79.9	n/a	n/a	8.7	n/a	5.7	3.7	35.1	n/a	n/a	n/a	80.9	n/a	n/a	7.9	n/a	6.4	4.8	38.2	29.3	n/a
Haiti	L		x		10.231	n/a	60.879	496	28.5	57.9	78	...	...	...	...	n/a	9.649	41.1	61.26	500	28.3	56.8	76.2	...	...	...	n/a	7.238	n/a	61.658	496	28.1	55.7	74.4	...	...	...	...	n/a
Martinique	x		x		n/a	n/a	80.5	na	n/a	9.3	n/a	...	...	...	...	n/a	n/a	n/a	80.6	n/a	n/a	9.3	n/a	5.9	3.2	36.6	n/a	n/a	n/a	81.4	19.3	n/a	8.7	9.3	6.9	4.4	35.5	24.6	n/a
Puerto Rico	H				n/a	n/a	79.2	22	n/a	n/a	n/a	7.3	5.4	65.9	49.9	n/a	n/a	n/a	79.3	19	n/a	n/a	8.8	7.7	5.2	66.8	n/a	n/a	n/a	78.9	20	n/a	n/a	8.8	7.9	5.6	58.4	42.6	n/a

COUNTRY		Health Coverage			2014												2015												2016									
	Income Level	Single (public)	Dual (social security and private)	Tripartite (public, social security and private)	% GDP	Gini coefficient	Life expectancy	MMR (100,000 lb)	NMR (1,000 lb)	INR (1,000 lb)	U5MR (1,000 lb)	GMR (1,000 pop) corrected	GMR (1,000 pop) adjusted	MCD (100,000 pop) corrected	MCD (100,000 pop) corrected	MNCD (100,000 pop)	% GDP	Gini coefficient	Life expectancy	MMR (100,000 lb)	NMR (1,000 lb)	INR (1,000 lb)	U5MR (1,000 lb)	GMR (1,000 pop) corrected	GMR (1,000 pop) adjusted	MCD (100,000 pop) corrected	MCD (100,000 pop) adjusted	MNCD (100,000 pop)	% GDP	Gini coefficient	Life expectancy	MMR (100,000 lb)	NMR (1,000 lb)	INR (1,000 lb)	U5MR (1,000 lb)	GMR (1,000 pop)	MCD (100,000 pop)	MNCD (100,000 pop)
Latin America & Caribbean (BM)							76.5												76.4												74.4							
Central America Region (PAHO)					8.171	n/a		78	9.9	15.6	18.4	5.1	6.8	67.2	80.6		8.558	n/a		77.0	9.8	15.2	17.9	5.3	6.8	70.8	82.2	n/a	8.56			76.0	9.7	15.2	17.9	6.7	118.1	467.4
Belize	UM UM LM				5.652	...	73.782	46	10.3	13.9	16.1	4.7	7.5	64.9	97.4		5.884	n/a	74.034	43	10	13.2	15.3	4.9	7.4	72.9	105.2	n/a	6.121	n/a	74.219	39	9.6	12.5	14.5	7.5	120.2	523.9
Costa Rica			x		7.803	48.6	79.398	29	6.2	8	9.2	3.9	4.4	18.3	20		7.78	48.4	79.565	28	6.1	7.8	9.1	4	4.2	19.7	20.1	n/a	7.556	48.7	79.738	28	6	7.7	8.9	4	28.4	320
El Salvador				x	6.925	41.6	72.175	49	7.8	13.7	16	6.5	7.3	64.4	70.4		6.864	40.6	72.412	48	7.5	13.2	15.3	6.7	7.3	67.1	70.4	n/a	6.958	40	72.644	47	7.2	12.7	14.7	7.3	110.6	507.4
Guatemala	UM		x		5.938	48.3	72.935	107	14.1	25.1	30.1	5.4	7.7	97.1	117.7		5.516	n/a	73.25	103	13.6	24.3	29	5.6	7.7	103.1	121.6	n/a	5.82	48.3	73.541	98	13.1	23.5	28	7.5	161.3	478.5
Honduras	LM		x		7.988	50.4	74.278	68	11.1	17.3	20.2	4.8	6.9	69.7	90		7.714	49.8	74.495	67	10.7	16.7	19.5	5	6.9	70.4	88.4	n/a	8.402	50	74.701	65	10.3	16.1	18.8	7	141.5	492
Nicaragua	LM		x		7.747	46.2	73.429	103	9.5	16.3	19	4.5	6.5	33.6	41.4		7.916	n/a	73.649	101	9.5	16.1	18.8	4.7	6.5	34	40.5	n/a	8.746	n/a	73.86	100	9.5	16	18.7	6.3	68.6	501.3
Panamá	H			x	6.734	50.5	77.583	60	9.7	15	17.5	5.3	5.8	60	63.9		6.795	50.8	77.776	58	9.4	14.5	16.9	5.6	5.8	67.4	68.4	n/a	7.261	50.4	77.964	55	9.1	14	16.3	5.7	86.2	431.2
Latin Caribbean Region (PAHO)								7.0	5.5	54.6	46.3					n/a				7.2	5.8	57.7	46.9					n/a						5.8	66.4	449.3
Cuba	UM UM UM	x			12.785	n/a	78.521	38	2.3	4.1	5.4	8.2	5.1	61.3	37.5	n/a	12.19	n/a	78.561	37	2.2	3.9	5.2	5.1	42.5	416.2	n/a	78.607		78.607					5.1	42.5	416.2

Dominican Republic			X	5.922	44.3	73.003	94	21.7	26.6	32.1	5.8	7	53	60.4	n/a	6.044	45.2	73.241	94	21.1	26	31.3	6.1	7	57.1	63	n/a	6.161	45.7	73.471	94	20.6	25.4	30.6	7.1	102.8	524.6
French Guiana				n/a	n/a	77.4	n/a	n/a	8.6	13	2.9	4.6	25.8	42.5	n/a	n/a	77.6	n/a	n/a	8.5	12.8	2.9	4.4	25.7	40.3	n/a	n/a	79.9	16.4	n/a	8.2	12.8	4.2	41.6	262
Guadaloupe	X			n/a	n/a	81.2	n/a	n/a	7.7	n/a	6.2	4.1	38.1	24.2	n/a	n/a	81.4	n/a	n/a	8.3	n/a	6.1	3.9	38	23.1	n/a	n/a	81.5	17.3	n/a	8.4	9.8	3.8	30.2	261.4
Haiti Martinique	L	X		7.798 n/a	n/a n/a	62.069 81.6	492 19.3	27.8 n/a	54.5 8.7	72.6 9.3	... 6.8	... 3.8	... 35.5	n/a 18.6	5.372 n/a	n/a n/a	62.485 81.9	488 n/a	27.4 n/a	53.3 8.7	70.6 n/a	... 6.8	... 3.6	... 35.4	n/a 17.8	5.386 n/a	n/a n/a	62.896 82.1	489 21.7	27 n/a	52.1 8.2	68.7 9	... 3.5	... 26.3	267.1
	X																																			
Puerto Rico	H			n/a	n/a	79	21	n/a	n/a	10.2	7.9	5.1	58.4	39	n/a	n/a	n/a	79.2	20	n/a	n/a	8.4	7.9	4.9	55.9	35.6	n/a	n/a	79.9	20	n/a	n/a	7.9	4.9	45.8	391.4