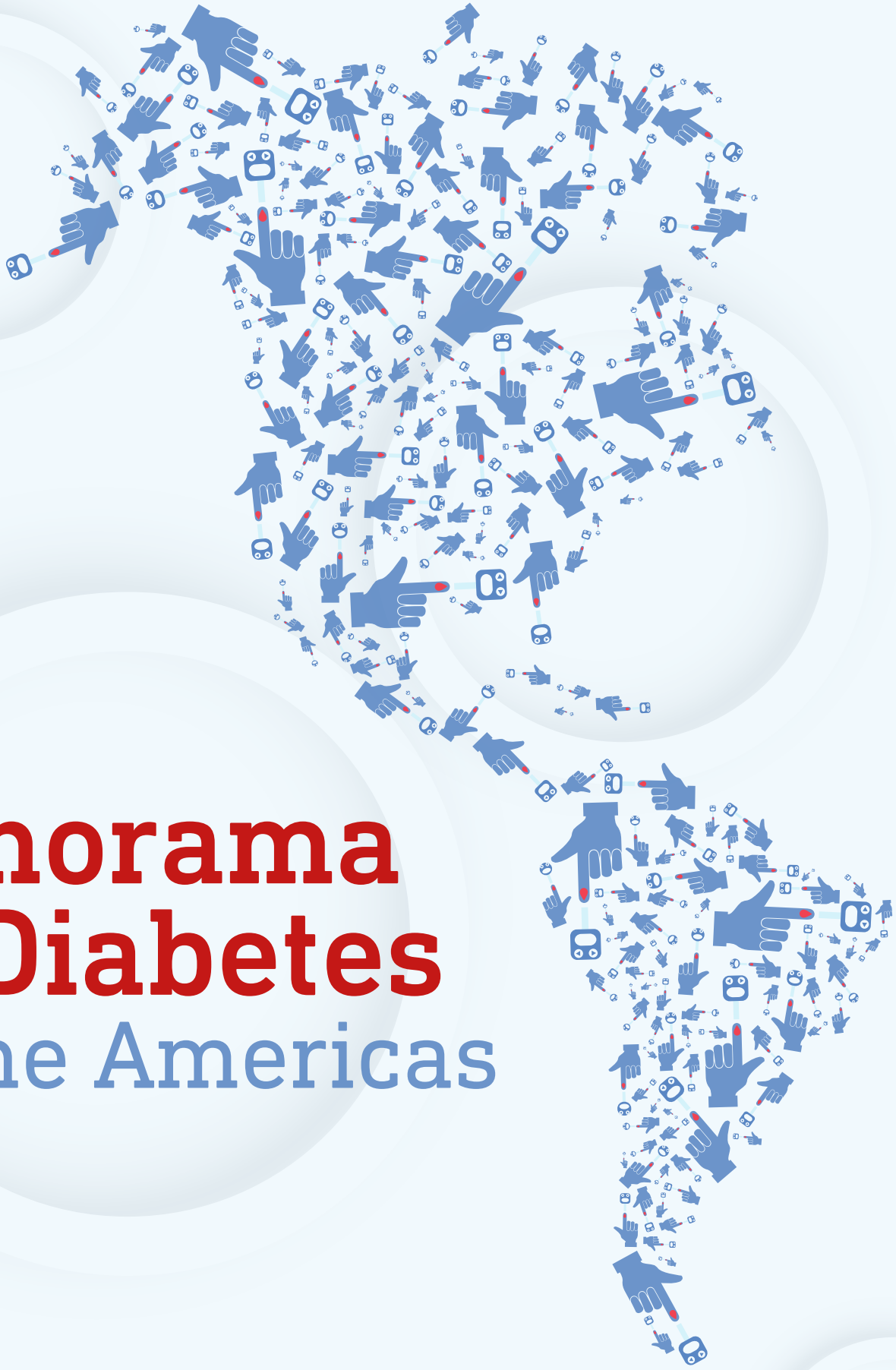

Panorama of Diabetes in the Americas

PAHO
Pan American Health Organization
World Health Organization
REGIONAL OFFICE FOR THE Americas

Panorama of Diabetes in the Americas

Washington D.C., 2022

PAHO Pan American Health Organization World Health Organization Regional Office for the Americas

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NMH/NV/2022

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ACKNOWLEDGMENTS

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ABBREVIATIONS AND ACRONYMS

ARDS	acute respiratory distress syndrome
ASDR	age-standardized DALY rate
ASMR	age-standardized mortality rate
ASYDR	age-standardized YLD rate
ASYLR	age-standardized YLL rate
BMI	body mass index
CCS	country capacity survey
DALYs	disability-adjusted life-years
GDP	gross domestic product
GHE	global health estimates
GMF	Global Monitoring Framework
HbA1c	glycosylated hemoglobin
NCDs	noncommunicable diseases
NMH	Department of Noncommunicable Diseases and Mental Health
PAHO	Pan American Health Organization
PEN	Essential Noncommunicable Disease Interventions for Primary Care
SDG	Sustainable Development Goals
USRDS	United States Renal Data System
WHO	World Health Organization
YLD	years of healthy life lost due to disability
YLL	years of life lost due to premature mortality

EXECUTIVE SUMMARY

Diabetes is a chronic, metabolic disease with multifactorial causes, characterized by elevated levels of blood glucose. Type 2 diabetes is the most common type, usually occurring in adults, when the body becomes resistant to insulin or does not produce enough. Type 1 diabetes, a less common type, occurs when the pancreas produces little or no insulin by itself. Worldwide, more than 420 million adults are living with diabetes, and in the Region of the Americas an estimated 62 million people are living with the disease. It is the second leading cause of disability-adjusted life-years (DALYs) in the Region, and estimates indicate that the burden will continue increasing exponentially in the years to come.

The burden of diabetes in the Americas

Globally, diabetes mortality has increased 70% since 2000, ranking among the 10 leading causes of death worldwide. In the Americas, 284 049 people died due to diabetes in 2019, with an age-standardized mortality rate of 20.9 per 100 000 population. DALYs due to diabetes and the two components of this indicator, years of life lost due to premature mortality (YLLs) and years of healthy life lost due to disability (YLDs), increased markedly in the Region between 2000 and 2019. These changes positioned diabetes as the second leading cause of both DALYs and YLDs in 2019 and the seventh leading cause of YLLs.

The prevalence of diabetes and its risk factors

Globally, the age-standardized prevalence of raised fasting glucose/diabetes doubled in the past 30 years, reaching 8.5% in 2014 (the latest year available for comparable estimates of diabetes prevalence). In the Americas, the age-standardized prevalence was 8.3%. All of the countries in the Region showed an increase in diabetes prevalence between 2000 and 2014, and the projections for each country show that the prevalence will continue to increase until at least 2025.

As with other noncommunicable diseases (NCDs), overweight/obesity and physical inactivity are major risk factors for type 2 diabetes. The prevalence of overweight and obesity has increased in the past decades in almost all countries worldwide, including countries in the Americas. Between 2000 and 2016 (the latest year available for comparable estimates of overweight/obesity prevalence), the age-standardized prevalence of overweight/obesity in adults increased by 17.3% in the Americas. Among adolescents, the situation is alarming, as obesity prevalence increased 60% between 2000 and 2016 and the prevalence of overweight in the Americas was almost double that observed worldwide.

Insufficient physical activity is another important risk factor. Almost 40% of the population in the Americas is insufficiently physically active, with women having a higher age-standardized prevalence (45.2%) than men. Among adolescents in the Americas, 80.7% are insufficiently active, with a prevalence almost unchanged between 2001 and 2016 in most countries.

Raised blood pressure often occurs alongside type 2 diabetes. In the Americas, the age-standardized prevalence of raised blood pressure among adults was 17.6% in 2015 (the latest available year for comparable estimates of raised blood pressure prevalence), and it was higher in men (20.3%) than in women (14.8%).

Tobacco use is another risk factor for noncommunicable diseases, including diabetes. In the Americas, the percentage of the population aged 15 years and over currently using any tobacco product (smoked and/or smokeless tobacco) daily or non-daily varies by country from 5.7% to 44.7%. In adolescents, the rates vary across countries from 6.9% to 25.3%.

Complications from diabetes

When the hyperglycemic state that characterizes diabetes is sustained over time, long-term vascular complications can arise, which increase the burden associated with this disease and dramatically worsen the quality of life of people with diabetes. Complications from diabetes include diabetic retinopathy, diabetic nephropathy, diabetic neuropathy, coronary heart disease, peripheral arterial disease, and stroke.

Diabetes and comorbidities

Cardiovascular diseases are major comorbidities of diabetes and are the leading cause of morbidity and mortality in people with diabetes.

Diabetes is a risk factor for various diseases, including tuberculosis. However, the relationship with tuberculosis is characteristically bidirectional and complex, and it threatens to increase the burden of both diabetes and tuberculosis.

Recently, a new relationship has emerged that could grow the burden associated with diabetes and deepen the challenges associated with its prevention and control. International evidence shows that people with diabetes have twice the odds of developing severe COVID-19 disease. At present, diabetes is considered both a risk factor for and a condition made worse by SARS-CoV-2 infection. The COVID-19 pandemic also has had a huge impact in terms of the continuity of essential health services for NCDs.

National capacity for diabetes prevention and control: current status

Successfully addressing the enormous and growing burden of NCDs and their risk factors requires implementing and evaluating evidence-based national multisectoral policies, programs, and plans. Diabetes plans are in place in most countries in the Americas, and services for diagnosis, treatment, and patient follow-up are reported as being generally available in all countries in the Americas. However, despite the existence of these plans and services, major gaps in access and utilization lead to generally high rates of undiagnosed diabetes, poor control, and complications.

Diabetes in indigenous populations

Diabetes is a significant global health challenge, and this challenge is more evident in indigenous populations. International evidence shows high variability in the prevalence of diabetes in indigenous peoples depending on the country and the ethnic group evaluated. This variability is related to individual, structural risk factors, biological and environmental changes, and adoption of unhealthy lifestyles.

The century of insulin

Diabetes is characterized by a total or relative deficit of insulin, a hormone that regulates blood glucose levels. When people living with diabetes do not have good metabolic control, they can develop health-threatening complications. These complications significantly increase the mortality, costs, and poor quality of life associated with diabetes. Contradicting the vital importance of insulin to those living with diabetes, access is still limited for many people.

Final considerations

This report on diabetes in the Americas highlights the significance of diabetes as a cause of death and disability in the Region and shows that, despite national efforts, the prevalence of the disease continues to increase in all countries. Considering that the Americas has the highest prevalence of overweight, obesity, and physical inactivity globally—all risk factors closely related to diabetes—it is foreseeable that the increasing trend in diabetes prevalence will continue for several years. Countries are making efforts to halt the rise in diabetes by strengthening diagnosis and treatment services and promoting primary prevention policies, but much more is needed in terms of prevention policies and diabetes services to sufficiently address the diabetes problem.


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INTRODUCTION

Diabetes is a metabolic disease of multifactorial etiology in which genetic, sociodemographic, and environmental elements interact, together with risk factors such as obesity, physical inactivity, and unhealthy diets. It is characterized by a state of hyperglycemia caused by a total or relative insulin deficiency requiring continuous medical care and multidisciplinary strategies to prevent the development of acute and long-term complications that include cardiovascular disease, neuropathy, retinopathy, nephropathy, amputations, and reduced life expectancy (*1–3*). There are three main types of diabetes: type 1 diabetes, type 2 diabetes, and gestational diabetes. Type 2 is the most common, accounting for approximately 90% of cases globally. Today, more than 420 million adults are living with diabetes worldwide. Sixty-two million (14.7%) people live with diabetes in the Americas (*2*).

In recent decades, the burden of diabetes has increased exponentially, especially in low- and middle-income countries. Currently, diabetes is the second leading cause of disability-adjusted life-years (DALY)s in the Americas, preceded only by ischemic heart disease. This position places the Americas as the region with the highest number of years of healthy life lost (through either disability or premature death) due to diabetes worldwide. In the rest of the World Health Organization (WHO) Regions, diabetes ranges from fourth (EURO Region) to 14th (AFRO Region) as a cause of DALYs (*4*).

In addition to the burden of disease, diabetes and its complications can seriously affect the quality of life of people living with diabetes, their families, and society in general, along with causing an overload for health systems. The high costs associated with its treatment produce a heavy economic burden for individuals and threaten to hinder nations' social and economic development. According to estimates, direct medical and indirect costs of diabetes will translate into estimated losses in gross domestic product (GDP) worldwide of US$ 1.7 trillion between 2011 and 2030 (*5*). Under a conservative assumption that the evolution of diabetes prevalence is determined only by changes in demography and urbanization, the direct and indirect predicted cost of diabetes would reach US$ 2.25 trillion in 2030, equivalent to 1.9% of the global GDP.

However, if estimated mean annual change rates in age- and sex-specific prevalence of and mortality from diabetes between 1990 and 2015 are considered, the total cost rises to US$ 2.48 trillion (2.2% of the global GDP) (*6*). In Latin America and the Caribbean, the estimated total cost in 2015 fluctuated between US$ 103 billion and US$ 124 billion, representing a six- to seven-fold increase in the total cost from 2000. The highest estimated cost was for Brazil (US$ 37 billion to US$ 43 billion), while the lowest estimated cost was for Grenada (US$ 39 million to US$ 42 million). According to these estimates, the average annual cost of treating one case of diabetes ranged from US$ 540 in Guyana to US$ 4979 in Puerto Rico (*7*).

Since 2011, the world has come together to tackle noncommunicable diseases (NCDs) including diabetes, as evidenced by the various political declarations and initiatives. In the Political Declarations of the High-Level Meetings of the United Nations General Assembly on

Prevention and Control of Non-communicable Diseases, held initially in 2011 and with follow-up meetings in 2014 and 2018 (*8–10*), Member States pledged to establish and strengthen national multisectoral actions for prevention and control of NCDs. The WHO Global Action Plan for the prevention and control of NCDs provides a roadmap for countries to respond to the burden of NCDs (*11*). Its actualization was discussed more recently in response to the mid-term evaluation, designing the roadmap 2023–2030 for the Global Action Plan for the prevention and control of NCDs 2013-2030.

The Action Plan of the Pan American Health Organization (PAHO) proposes regional and local actions to address this group of diseases by strengthening the achievements and existing capacities in the Region along four strategic lines: policies and multisectoral alliances for the prevention and control of NCDs, risk factors and protective factors for NCDs, the response of health systems to NCDs and their risk factors, and surveillance and investigation of NCDs (*12*). More recently, in the 2030 Agenda for Sustainable Development, Member States set a target to reduce by one-third premature mortality from NCDs – including diabetes – through prevention and treatment and to promote mental health and well-being (*13*).

Despite these political commitments and the global target to halt the rise of diabetes and obesity, interventions addressing diabetes through effective healthy lifestyle policies; access to quality health care, essential medicines, and technologies; and self-management support have been insufficient. Considering the aging population and the prevalence of unhealthy lifestyles, it is more urgent now than ever to halt the rise in diabetes by strengthening country responses.

This report provides a panorama of the diabetes situation in the Americas region. It presents data from various sources on key indicators including diabetes mortality, prevalence, and national responses to diabetes and highlights critical issues of our time such as diabetes and COVID-19, diabetes in indigenous populations, and access to insulin 100 years after its discovery. To ensure the comparability of the data included in this report, they are mainly based on WHO's Global Health Estimates (GHE 2000–2019) and the NCD Country Capacity Survey (NCD CCS) (*14–16*).

This report is organized into eight parts. Part one covers the burden of diabetes and includes mortality, premature mortality, years of life lost prematurely, years of life lived with disability, and disability-adjusted life years. Part two provides data on the prevalence of high blood glucose/diabetes levels and related risk factors (overweight, obesity, insufficient physical activity, high blood pressure, tobacco). Part three is dedicated to data on complications of diabetes (retinopathy, chronic kidney disease, and diabetic foot disease). Part four contains information on comorbidities of diabetes (cardiovascular disease, tuberculosis, and COVID-19). Part five includes information on countries' responses with respect to diabetes prevention and control, including national policies and plans for diabetes and NCDs, the availability and use of national guidelines and protocols for diabetes, the availability of essential drugs and basic technologies for treatment and diagnosis of diabetes, and national capacities in terms of surveillance and monitoring of diabetes. Part six focuses on diabetes in indigenous populations; part seven covers aspects of the centenary since the discovery of insulin; and part eight offers final reflections.

THE BURDEN OF DIABETES IN THE AMERICAS

Diabetes mortality

Globally, NCDs are the leading causes of death, accounting for 73.6% of deaths worldwide in 2019. Mortality from diabetes has increased by 70.0% since 2000, ranking among the 10 leading causes of death worldwide. Increases have been higher in men (80%) and in lower- and middle-income countries, in which diabetes moved from the 15th to the ninth leading cause of death (*17*).

In the Region of the Americas, NCDs – principally cardiovascular diseases, cancer, diabetes, and chronic respiratory diseases – are responsible for 81.3% of all deaths. In 2019, diabetes was the underlying cause of 284 049 deaths, equivalent to 4% of total deaths (male: 3.7%; female: 4.3%) (*18*). In addition, diabetes was a related cause of deaths due to other diseases associated with raised blood glucose levels, notably cardiovascular diseases, chronic kidney disease, and tuberculosis (*2*).

In 2019, the age-standardized mortality rate (ASMR) from diabetes (excluding chronic kidney disease due to diabetes) in the Americas reached 20.9 per 100 000 population (male: 23.1 per 100 000 population; female: 18.9 per 100 000 population). An analysis of the ASMR by country reveals notable differences. The highest ASMRs are seen in Guyana (82.6 per 100 000 population), Mexico (71.8 per 100 000 population), and Trinidad and Tobago (69.6 per 100 000 population). As a counterpart, the lowest ASMRs are observed in Colombia (9.1 per 100 000 population), Cuba (8.5 per 100 000 population), and Canada (7.2 per 100 000 population).

In men, the countries with extreme ASMRs are Trinidad and Tobago (84.8 per 100 000 population), Guyana (78.3 per 100 000 population), and Mexico (77.9 per 100 000 population) at the upper end and Colombia (9.1 per 100 000 population), Cuba (8.5 per 100 000 population), and Canada (7.2 per 100 000 population) at the lower end. In women, Haiti (91.7 per 100 000 population), Guyana (86.0 per 100 000 population), and Jamaica (71.2 per 100 000 population) have the highest ASMRs, while Argentina (8.9 per 100 000 population), the United States of America (7.9 per 100 000 population), and Canada (5.0 per 100 000 population) have the lowest ASMRs (*19*).

The relative variation of the ASMR from diabetes between 2000 and 2019 also shows notable differences across countries (Figure 1). Costa Rica exhibits the highest difference between the two years, reaching 70.5% in the male ASMR (2000: 8.4 per 100 000 population; 2019: 14.4 per 100 000 population) and 52.1% in the female ASMR (2000: 9.9 per 100 000 population; 2019: 15.1 per 100 000 population), followed by Honduras and Suriname in the male ASMR (30.4% and 29.9%, respectively) , and by Venezuela (Bolivarian Republic of) and Suriname in the female ASMR (21.7% and 21.6%, respectively) (*19*).

Figure 1. Age-standardized diabetes mellitus death rate trend by sex and country. Region of the Americas, 2010–2019.

Source: World Health Organization. WHO Global Health Observatory. Available from: https://www.who.int/data/gho

When observing the countries with the highest rates during the last decade, it can be seen that they remain practically unchanged. In the case of the male ASMR, the top positions are occupied by Trinidad and Tobago, Guyana, Mexico, Grenada, and Saint Vincent and the Grenadines. In the case of the female ASMR, these positions are occupied by Haiti, Guyana, Jamaica, Guatemala, Saint Vincent and the Grenadines, and Grenada (Figure 2) (*19*).

Figure 2. Top 10 countries with the highest age-standardized diabetes mellitus death rates by year. Region of the Americas, 2010–2019.

MALE

2019	2018	2017	2016	2015	2014	2013	2012	2011	2010
Trinidad and Tobago	Trinidad and Tobago	Trinidad and Tobago	Trinidad and Tobago	Trinidad and Tobago	Trinidad and Tobago	Trinidad and Tobago	Trinidad and Tobago	Trinidad and Tobago	Trinidad and Tobago
Guyana	Guyana	Guyana	Guyana	Guyana	Guyana	Guyana	Guyana	Guyana	Grenada
Mexico	Mexico	Mexico	Mexico	Mexico	Mexico	Saint Vincent and the Grenadines	Saint Vincent and the Grenadines	Grenada	Guyana
Grenada	Grenada	Grenada	Grenada	Grenada	Saint Vincent and the Grenadines	Mexico	Mexico	Mexico	Mexico
Suriname	Saint Lucia	Saint Lucia	Guatemala	Guatemala	Guatemala	Guatemala	Guatemala	Saint Vincent and the Grenadines	Guatemala
Saint Lucia	Suriname	Guatemala	Saint Lucia	Saint Lucia	Grenada	Saint Lucia	Grenada	Jamaica	Saint Lucia
Guatemala	Guatemala	Suriname	Suriname	Jamaica	Saint Lucia	Grenada	Saint Lucia	Guatemala	Jamaica
Jamaica	Jamaica	Jamaica	Jamaica	Suriname	Jamaica	Suriname	Jamaica	Saint Lucia	Belize
Belize	Belize	Antigua and Barbuda	Belize	Saint Vincent and the Grenadines	Suriname	Jamaica	Suriname	Suriname	Antigua and Barbuda
Antigua and Barbuda	Venezuela (Bolivarian Republic of)	Belize	Venezuela (Bolivarian Republic of)	Belize	Belize	Belize	Belize	Antigua and Barbuda	Saint Vincent and the Grenadines

FEMALE

2019	2018	2017	2016	2015	2014	2013	2012	2011	2010
Haiti	Haiti	Haiti	Haiti	Haiti	Haiti	Haiti	Haiti	Haiti	Haiti
Guyana	Guyana	Guyana	Guyana	Guyana	Guyana	Guyana	Guyana	Guyana	Guyana
Jamaica	Jamaica	Guatemala	Guatemala	Guatemala	Guatemala	Saint Vincent and the Grenadines	Saint Vincent and the Grenadines	Grenada	Grenada
Guatemala	Guatemala	Jamaica	Jamaica	Jamaica	Saint Vincent and the Grenadines	Grenada	Grenada	Saint Vincent and the Grenadines	Trinidad and Tobago
Mexico	Mexico	Mexico	Mexico	Trinidad and Tobago	Grenada	Guatemala	Trinidad and Tobago	Trinidad and Tobago	Guatemala
Grenada	Grenada	Antigua and Barbuda	Trinidad and Tobago	Mexico	Jamaica	Trinidad and Tobago	Guatemala	Guatemala	Belize
Belize	Trinidad and Tobago	Grenada	Grenada	Grenada	Trinidad and Tobago	Belize	Belize	Belize	Saint Vincent and the Grenadines
Saint Lucia	Belize	Trinidad and Tobago	Antigua and Barbuda	Saint Vincent and the Grenadines	Mexico	Mexico	Jamaica	Jamaica	Mexico
Trinidad and Tobago	Saint Lucia	Belize	Belize	Belize	Belize	Jamaica	Mexico	Mexico	Jamaica
Bolivia (Plurinational State of)	Antigua and Barbuda	Saint Lucia	Bolivia (Plurinational State of)	Bolivia (Plurinational State of)	Bolivia (Plurinational State of)	Bolivia (Plurinational State of)	Antigua and Barbuda	Antigua and Barbuda	Antigua and Barbuda

Source: Pan American Health Organization. Monitoring the level and trends of the burden of diabetes mellitus in the Region of the Americas, 2000–2019. Washington, DC: PAHO; 2021.

Premature mortality from noncommunicable diseases

Premature deaths due to noncommunicable diseases

Each year, NCDs are among the leading causes of death in people aged below 70 years worldwide. In 2019, 41.8% of all NCD deaths were premature deaths. In men, this proportion rises to 47.2%. In the Americas, the situation is similar: 36.5% of all NCD deaths occur before people's 70th birthday (male: 41.4%; female: 31.3%), with differences across countries. Thirty countries exceed the regional value, with Haiti (56.9%), The Bahamas (54.9%), and Guatemala (53.1%) showing the highest proportions, and Barbados (27.7%), Uruguay (26.7%), and Canada (26%) the lowest. In 2000, only 25 countries had a proportion higher than the regional figure (*19, 20*).

In 2019, more than half of all NCD deaths among men in seven countries (Haiti, The Bahamas, Guatemala, Guyana, Suriname, Belize, and Paraguay) occurred before the age of 70 years. In contrast, only three countries exceed this value for women (Haiti, The Bahamas, and Guatemala) (Figure 3) (*19, 21*).

Unconditional probability of dying from noncommunicable diseases

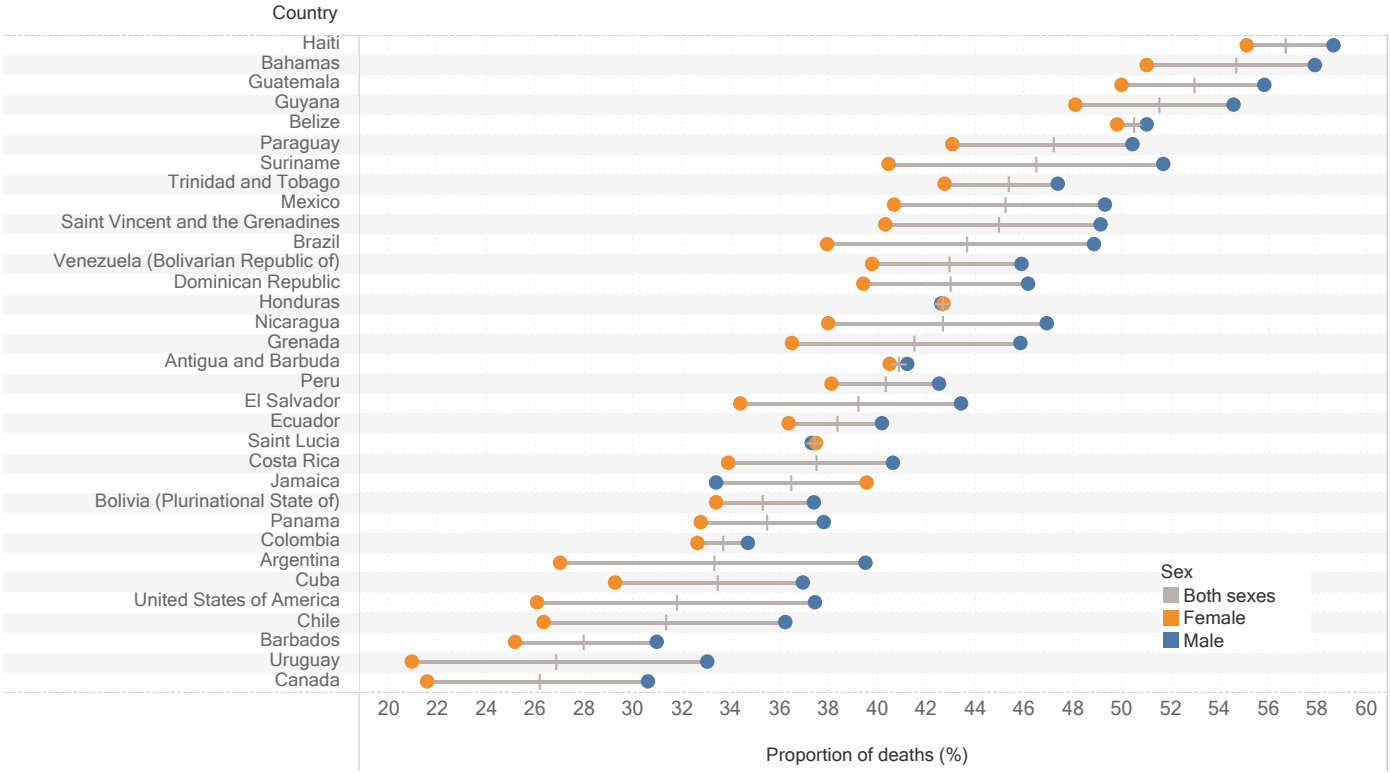
The unconditional probability of dying between the ages of 30 and 70 years is the indicator established in the Global Monitoring Framework (GMF) and the Indicator Framework for the Sustainable Development Goals (SDGs) to assess premature mortality from the four primary NCDs (*21*). This indicator quantifies the risk of a person dying between the age of 30 to 70 years from the main NCDs (cardiovascular diseases, cancer, diabetes, and chronic respiratory diseases).

Globally, the estimated unconditional probability of dying in 2000 was 22.9%, with a marked difference by sex (male: 27.5%; female: 18.3%). In 2019, the probabilities decreased in both sexes, but the risk of dying from the four main NCDs was still approximately 50% higher in men than women (male: 21.4%; female: 14.2%) (*20*).

The same scenario can be observed in the Americas. In 2019, a 30-year-old man had a 16.4% chance of dying from any of the four major NCDs before reaching his 70th birthday, a probability 22.9% lower than in 2000 (21.3%). The chance decreased by 22.8% among women, from 15.3% in 2000 to 11.8% in 2019. However, in both years, the risk of dying prematurely was 40% higher in men than women (*19*).

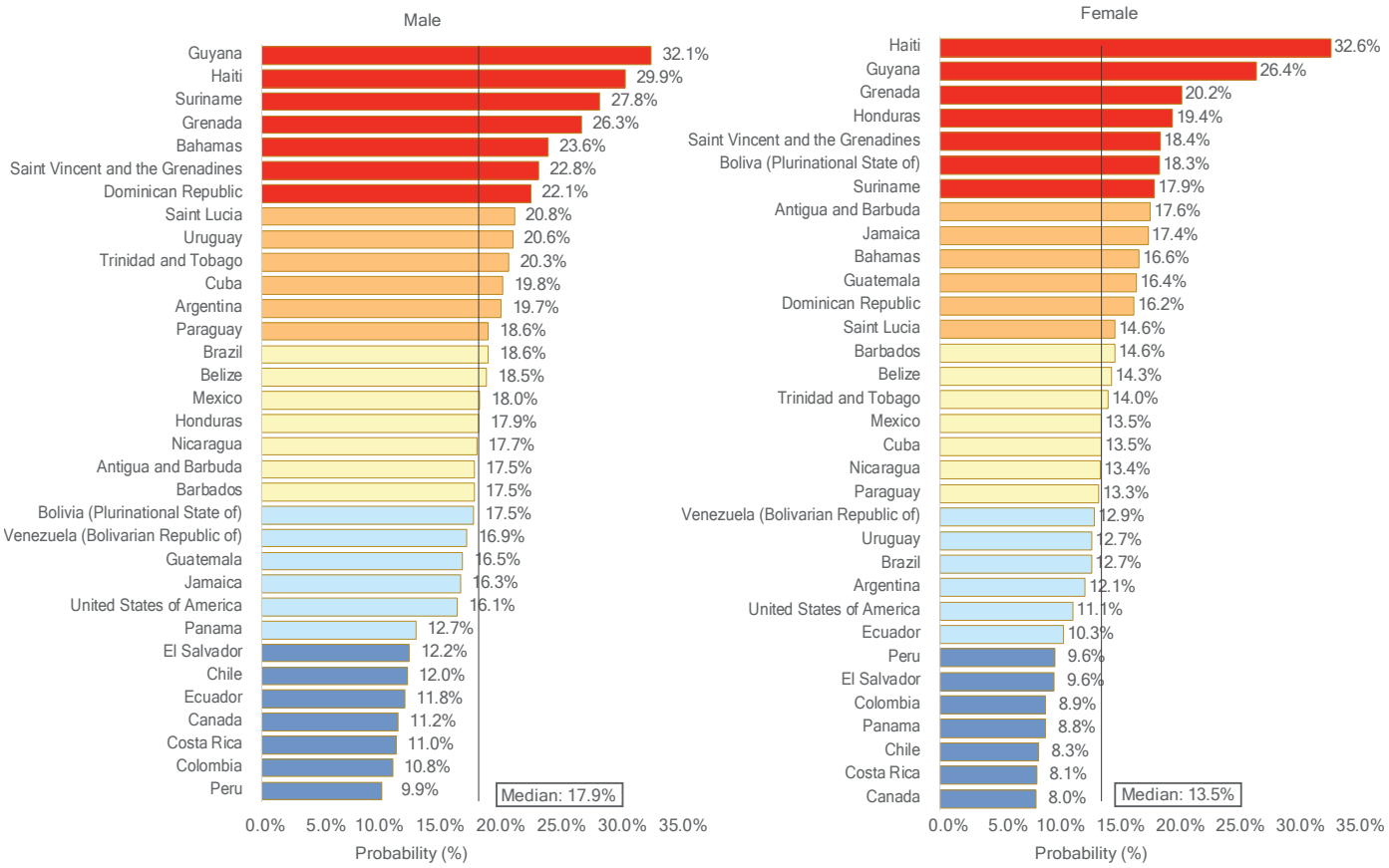
At the country level, 24 countries exhibit a risk of premature death higher than the regional value (14%) among both men and women, with an unconditional probability of dying ranging from 9.9% in Peru to 32.1% in Guyana among men, and from 8% in Canada to 32.6% in Haiti among women. In 2000, only 14 countries exceeded the regional risk value in men and 17 in women (Figure 4).

Figure 3. Premature deaths due to noncommunicable diseases (NCDs) as a proportion of all NCD deaths by sex and country. Region of the Americas, 2019.



Source: World Health Organization. WHO Global Health Observatory. Available from: https://www.who.int/data/gho

Figure 4. Unconditional probability of dying from the four major noncommunicable diseases (cardiovascular diseases, cancer, diabetes mellitus, and chronic respiratory diseases) by sex and country. Region of the Americas, 2019.



Source: Pan American Health Organization. Monitoring the premature mortality from the four major noncommunicable diseases (cardiovascular diseases, cancer, diabetes mellitus, and chronic respiratory diseases) in the Region of the Americas, 2000–2019. Washington, DC: PAHO; 2021.

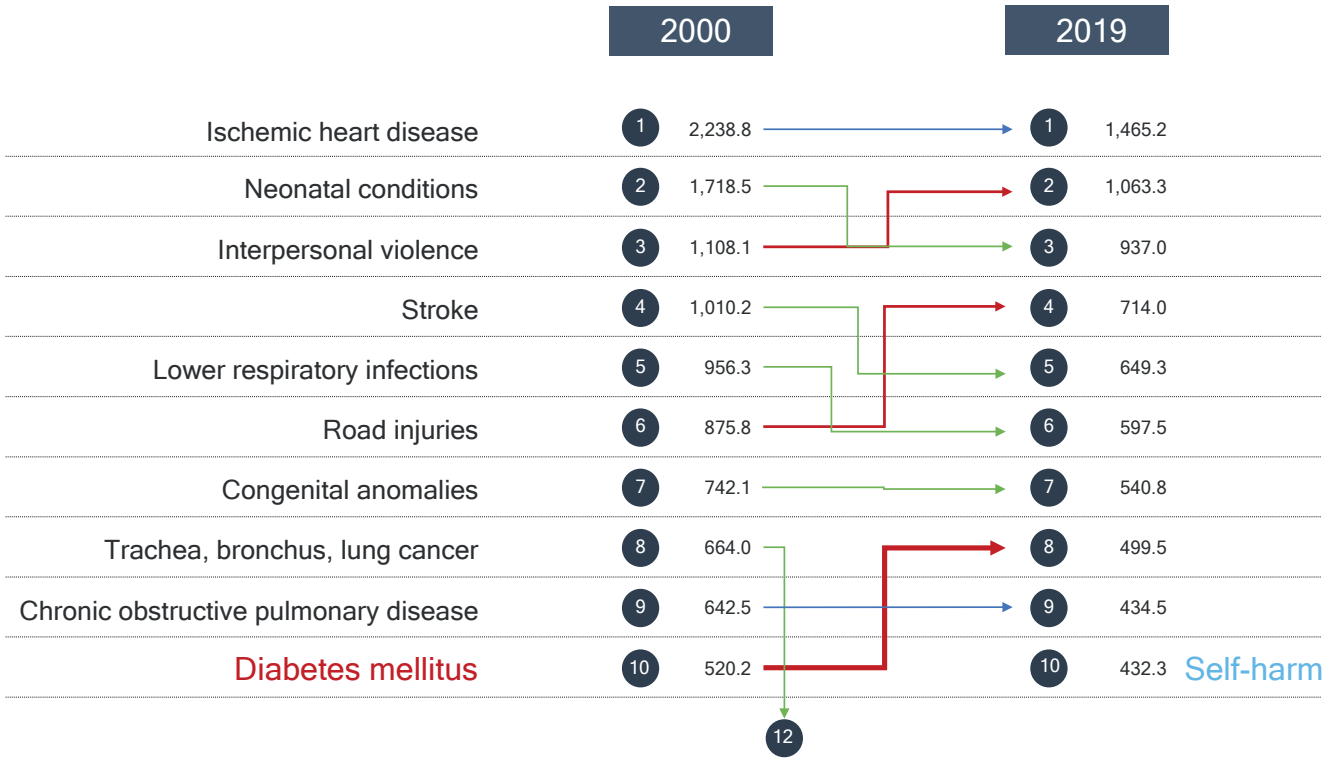
Years of life lost (YLLs) due to diabetes

Another valuable measure to assess the impact of NCDs (and other diseases) on mortality in a population is years of life lost prematurely (YLLs). Its calculation method combines the frequency of deaths and the age at which they occur. Years of life lost prematurely due to NCDs are a proportion of the total YLLs lost in the population due to premature mortality (*22*).

Globally, the absolute number of YLLs due to NCDs has increased in the last two decades, from 790 853 YLLs (38.2% of total YLLs) in 2000 to 923 598 YLLs (54.1% of total YLLs) in 2019. Diabetes exhibits a similar pattern. Diabetes was responsible for 21 457 664 YLLs (1.0% of total YLLs) in 2000, rising to 34 171 016 YLLs (2.0% of total YLLs) in 2019. This increase moved diabetes to the 13th leading cause of YLLs; in 2000, diabetes was not among the top 20 causes (*4*).

In the Americas, the 2019 age-standardized YLL rate (ASYLR) due to diabetes (excluding chronic kidney disease due to diabetes) was 4% lower than the equivalent in 2000 (2019: 499.5 per 100 000 population; 2000: 520.2 per 100 000 population). Despite this decrease, ASYLR from diabetes positioned as the eighth highest in 2019, whereas it was in the tenth position in 2000 (Figure 5). In women, the difference between the two years reached 13.0% (2000: 509.4 per 100 000 population; 2019: 443.1 per 100 000 population). However, the ASYLR in men increased 5.6% from 532.6 per 100 000 population in 2000 to 561.5 per 100 000 population in 2019. Central America, Mexico, and the Latin Caribbean displayed the highest increase in the male ASYLR: 33.2% (2000: 1040.9 per 100 000 population; 2019: 1386.1 per 100 000 population) (*19*).

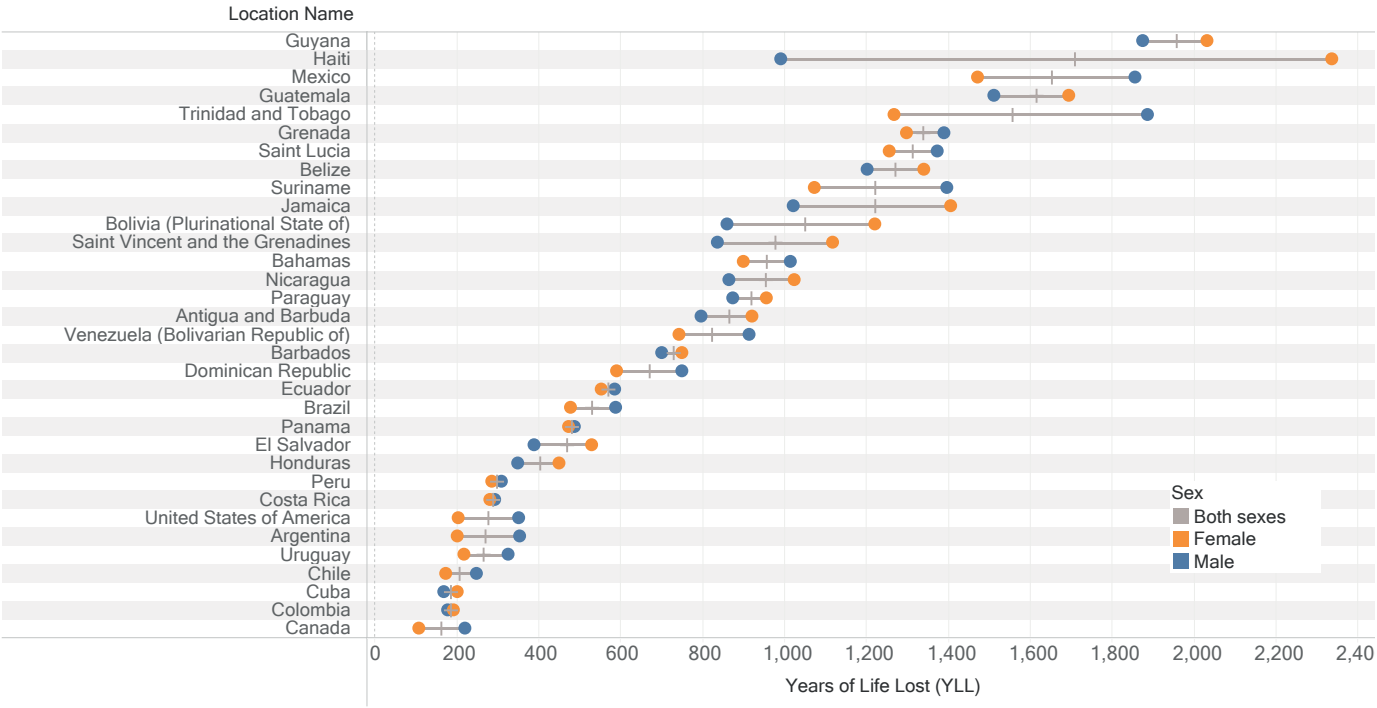
Figure 5. Age-standardized years of life lost (YLLs) rate (rates per 100 000 population). Region of the Americas, 2000-2019.



Source: Pan American Health Organization. Burden of Diabetes Mellitus. Available from: https://www.paho.org/en/enlace/burden-diabetes-mellitus

The countries with the highest ASYLR in 2019 were Guyana (1957.3 per 100 000 population), Haiti (1710.0 per 100 000 population), and Mexico (1652.7 per 100 000 population). In line with a longer life expectancy at birth and lower mortality from diabetes, the ASYLR was higher in women. Haiti (2337.4 per 100 000 population), Guyana (2032.3 per 100 000 population), and Guatemala (1696.1 per 100 000 population) had the highest female ASYLR from diabetes in 2019. In the case of the male ASYLR, Trinidad and Tobago (1886.6 per 100 000 population), Guyana (1874.5 per 100 000 population), and Mexico (1857.6 per 100 000 population) exhibited the highest rates (Figure 6) (*19*).

Figure 6. Age-standardized years of life lost (YLLs) rate due to diabetes by sex and country. Region of the Americas, 2019.



Source: World Health Organization. WHO Global Health Observatory. Available from: https://www.who.int/data/gho

Years lived with disability (YLDs)

As with YLLs, years lived with disability (YLDs) are a valuable measure for quantifying the impact of NCDs on a population. One YLD represents the equivalent of one full year of healthy life lost due to disability or poor health, in this case caused by diabetes. Its calculation method combines the prevalence of the non-fatal condition and the weight of the disability that this condition generates (*22*).

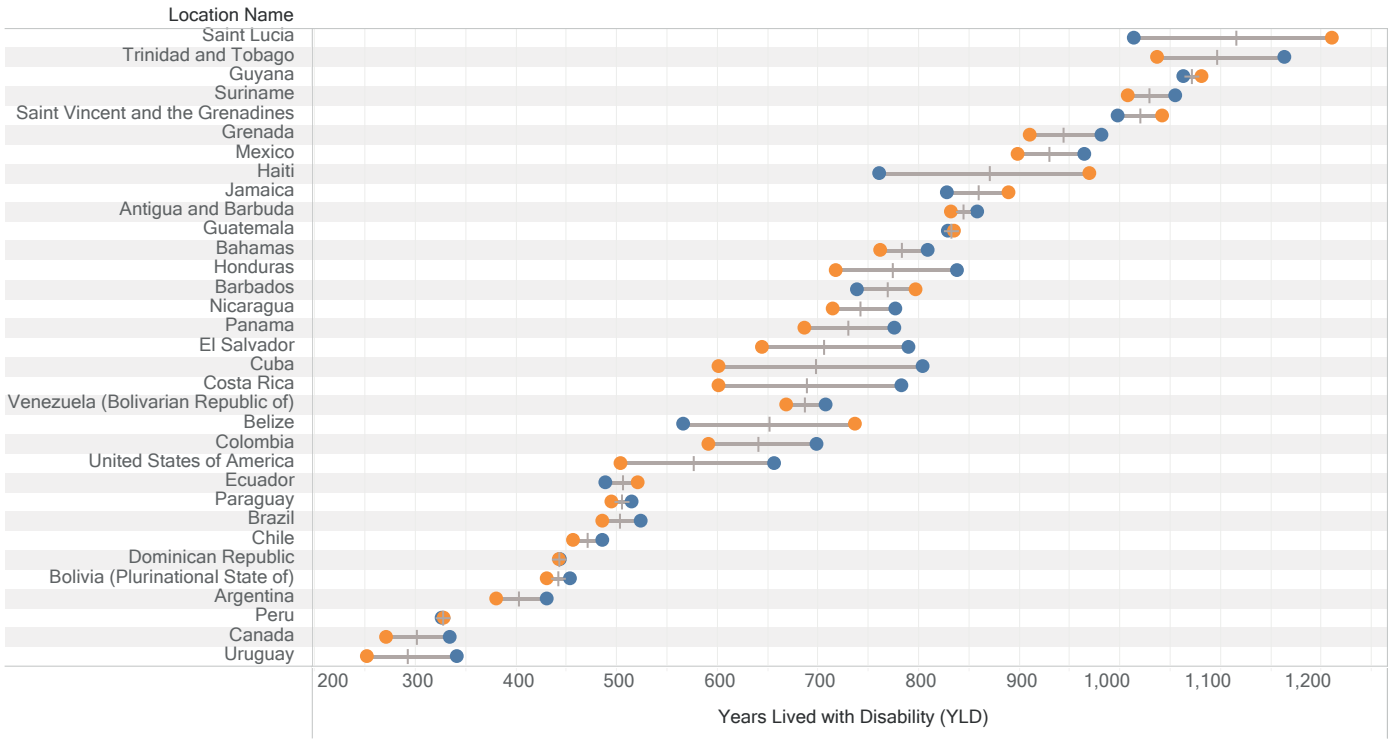
According to WHO estimates, the absolute numbers of YLDs due to diabetes (excluding chronic kidney disease) doubled worldwide in the last two decades, from 17 024 YLDs (2.8% of total YLDs) in 2000 to 36 240 YLDs (4.4% of total YLDs) in 2019. This increase moved diabetes from the ninth leading cause of YLDs in 2000 to the fourth leading cause in 2019 (according to WHO data). The Americas follows the same pattern. In 2000, diabetes was responsible for 3123 YLDs (3.5% of total YLDs), ranking as the fifth leading cause of YLDs. In 2019, YLDs reached 7188 (5.8% of total YLDs), positioning diabetes as the second leading cause in the Region, preceded only by back and neck pain (*4*).

Regionally, the 2019 age-standardized YLD rate (ASYDR) due to diabetes was 44% higher than the rate in 2000 (2000: 404.2 per 100 000 population; 2019: 582.2 per 100 000 population). The difference in the male rate between these two years reaches 47.8% (2000: 425.8 per 100 000 population; 2019: 630.6 per 100 000 population). The difference in the female rate is 40.1% (2000: 386.4 per 100 000 population; 2019: 540.3 per 100 000 population) (*19*).

The ASYDR due to diabetes shows notable differences across countries. In 2019, the highest male rates were in Trinidad and Tobago (1163.8 per 100 000 population), Guyana (1063.5 per 100 000 population), and Suriname (1055.8 per 100 000 population), while the highest female rates were in Saint Lucia (1210.9 per 100 000 population), Guyana (1081.3 per 100 000 population), and Saint Vincent and the Grenadines (1042.3 per 100 000 population).

By contrast, Peru (male: 326.4 per 100 000 population; female: 329.1 per 100 000 population), Canada (male: 334.3 per 100 000 population; female: 271.1 per 100 000 population), and Uruguay (male: 341.3 per 100 000 population; female: 252.6 per 100 000 population) had the lowest rates in both men and women. An analysis of the relative difference between the 2000 and 2019 rates reveals worrying results. Uruguay, the United States of America, and the Dominican Republic exhibit the largest differences in men and women, with increases reaching 189.5%, 68.1%, and 66.2% in men and 92.4%, 69.4%, and 60.3% in women, respectively (Figure 7) (*19*).

Figure 7. Age-standardized years lived with disability (YLDs) rate by sex and country. Region of the Americas, 2019.



Source: World Health Organization. WHO Global Health Observatory. Available from: https://www.who.int/data/gho

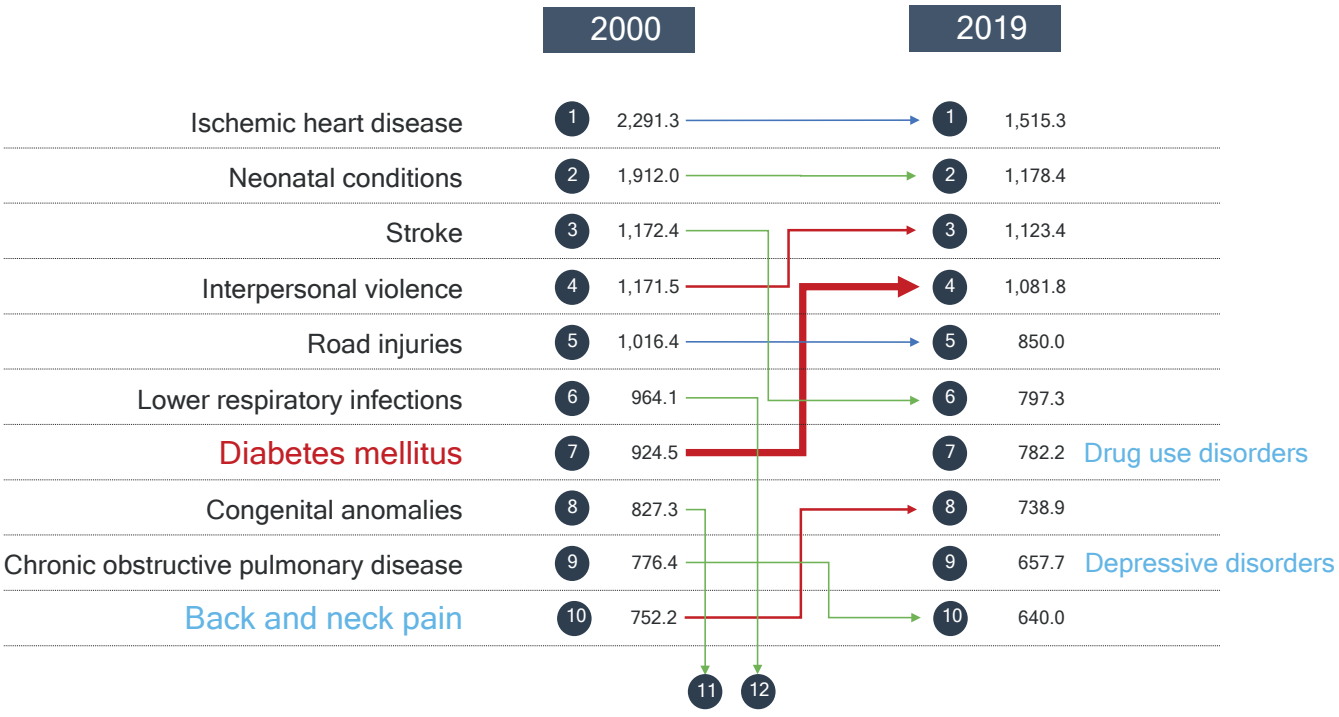
Disability-adjusted life-years (DALYs)

Disability-adjusted life-years (DALYs) is a time-based measure of the burden of disease on a specific population and reflects its health status. It combines years of life lost due to premature mortality (YLLs) and years of life lost due to time lived in states of less than full health, or years of healthy life lost due to disability (YLDs) (22). Globally, the number of DALYs due to diabetes (excluding chronic kidney disease due to diabetes) increased by 82.9% between 2000 and 2019, from 38.5 million to 70.4 million. In the Americas, the increase in the number of DALYs was 87.5% (2000: 7.2 million; 2019: 13.4 million), reaching 96.5% in men (4).

The age-standardized DALY rate (ASDR) shows a sustained rise over the same period, from 924.5 per 100 000 population in 2000 to 1081.8 per 100 000 population in 2019. This change positioned diabetes as the fourth leading cause of DALYs in 2019, whereas it was in seventh position in 2000 (Figure 8). The three countries with the highest ASDR due to diabetes in 2019 were Guyana (3029.1 per 100 000 population), Trinidad and Tobago (2654.5 per 100 000 population), and Mexico (2582.2 per 100 000 population) (*19*).

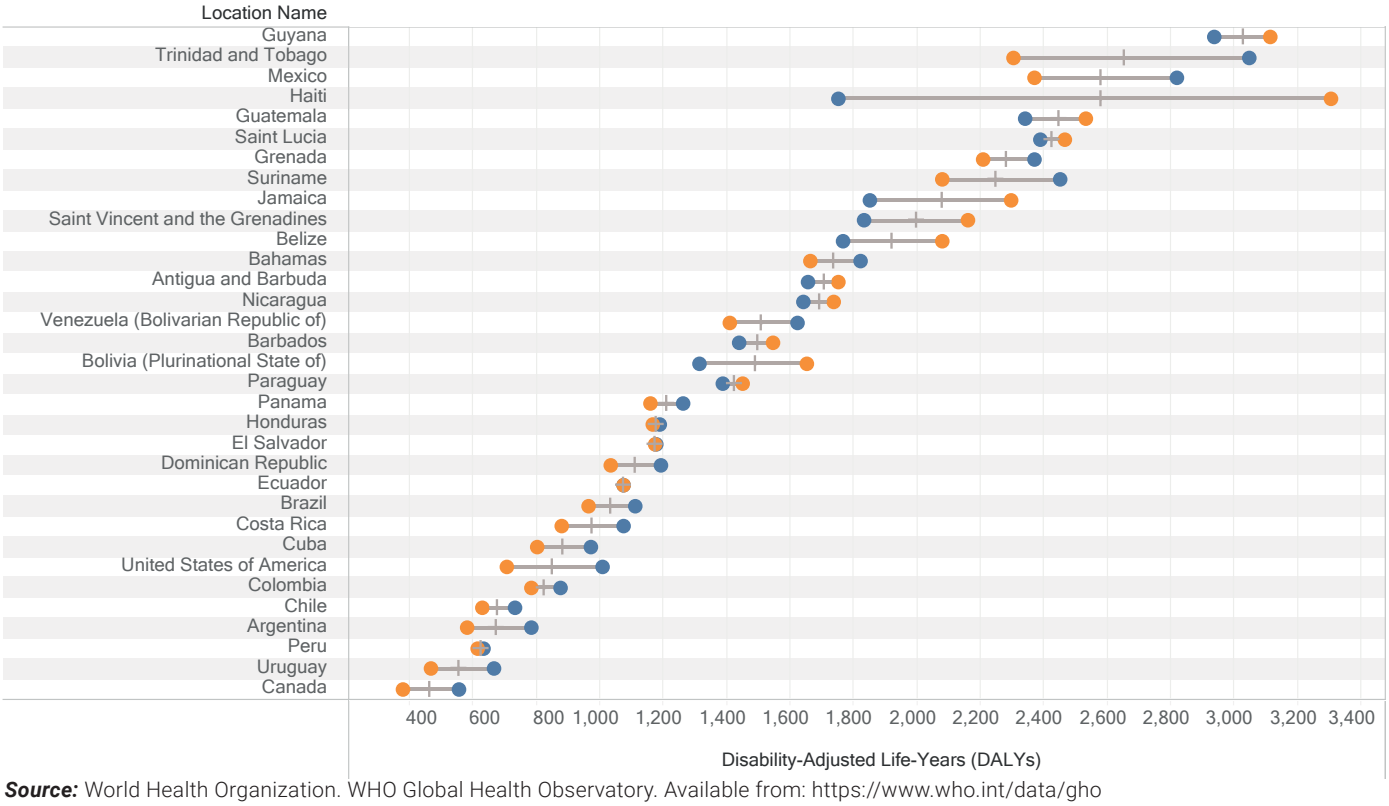
In line with a longer life expectancy at birth and lower direct mortality from diabetes, the ASDR is higher in women, with maximum values of 3307.8 per 100 000 population in Haiti, 3113.5 per 100 000 population in Guyana, and 2532.0 per 100 000 population in Guatemala. Although the male ASDR is lower than the female ASDR, the increase between 2000 and 2019 was more pronounced in men, with a relative difference of 24.5% between the extreme years of the period (2000: 957.4 per 100 000 population; 2019: 1192.1 per 100 000 population). In women, this difference was only 9.8% (2000: 895.8 per 100 000 population; 2019: 983.4 per 100 000 population) (Figure 9) (*19*).

Figure 8. Age-standardized disability-adjusted life-years (DALYs) rate (rates per 100 000 population). Region of the Americas, 2000 and 2019.



Source: Pan American Health Organization. Leading causes of death, and disability. Available from: https://www.paho.org/en/enlace/leading-causes-death-and-disability

Figure 9. Age-standardized disability-adjusted life-years (DALYs) rate due to diabetes by sex and country. Region of the Americas, 2019.



Source: World Health Organization. WHO Global Health Observatory. Available from: https://www.who.int/data/gho

THE PREVALENCE OF DIABETES AND RISK FACTORS

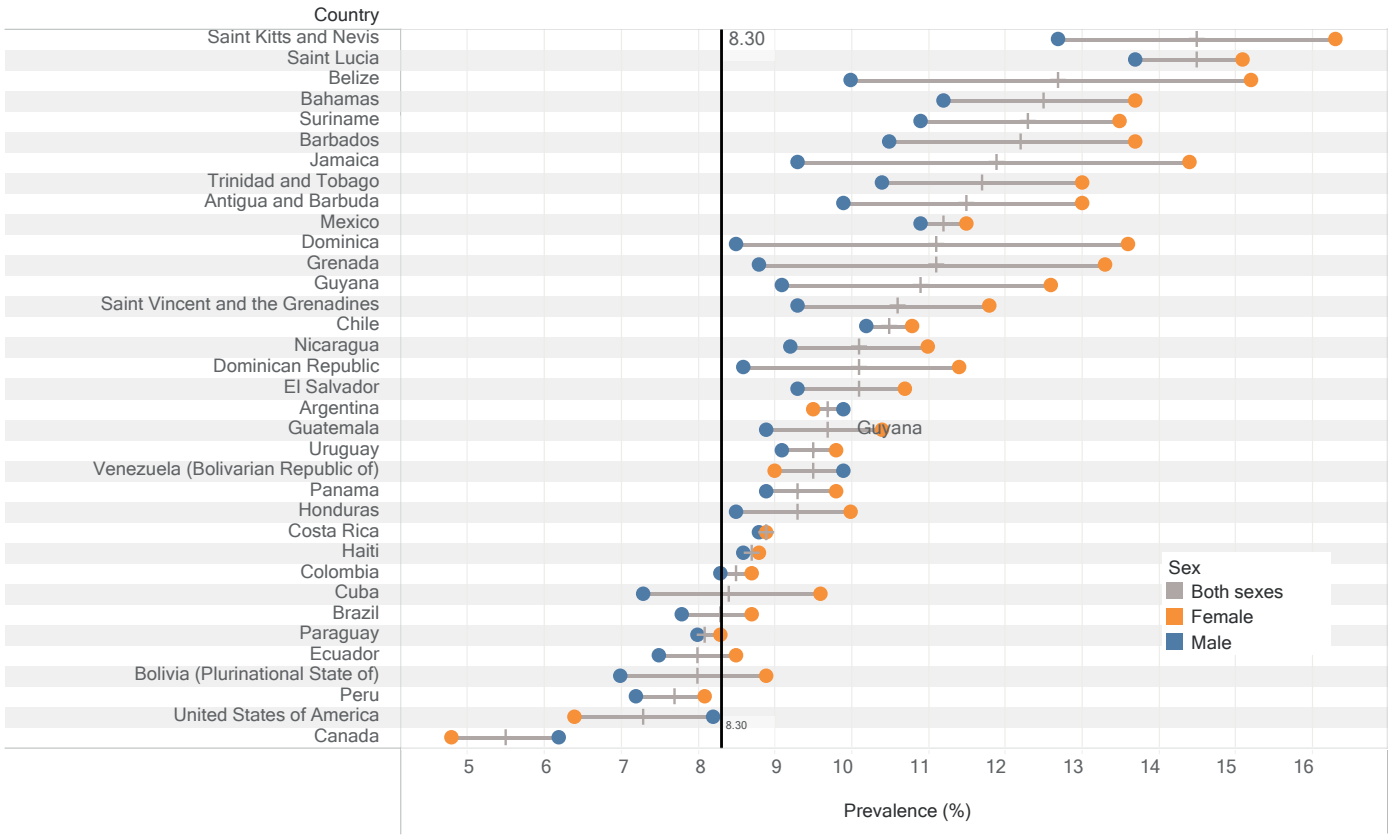
Raised blood glucose/diabetes prevalence

The prevalence of raised blood glucose/diabetes in adults is the percentage of the population aged 18 years and older who have a fasting plasma glucose level of 7.0 mmol/L or higher, a history of a diabetes diagnosis, or a history of use of insulin or oral hypoglycemic drugs. These data are derived from population-based health examination surveys and provided by countries to WHO or obtained through reviews of published and unpublished literature (*21*). The latest available year for comparable estimates of diabetes prevalence is 2014; although countries may have more recent data available, the comparable estimates are used for the purposes of this regional report and to compare countries.

Globally, the age-standardized prevalence of raised fasting glucose/diabetes nearly doubled over 30 years, from 4.7% in 1980 to 8.5% in 2014, which reflects an increase in the number of people living with diabetes from 108 million to 422 million (*2*). In the Americas, the age-standardized prevalence of raised fasting blood glucose (≥7.0 mmol/L) is estimated as 8.3%, with only a small difference between men (8.5%) and women (8.1%). Saint Kitts and Nevis and Saint Lucia show the highest age-standardized prevalence in the Region (14.5% in both countries), followed by Belize (12.5%). In contrast, the countries with the lowest prevalence are Canada (5.5%), the United States of America (7.3%), and Peru (7.7%) (Figure 10). In 20 countries of the Region, the prevalence of diabetes in women is greater than 10%, with a difference of 11.5 percentage points between the countries with the highest and lowest prevalence (Saint Kitts and Nevis: 16.3%; Canada: 4.8%). Only eight countries have a prevalence above 10% among men; the difference between the countries with extreme values is smaller as well (Saint Lucia: 13.7%; Canada: 6.2%) (*19*).

All of the countries in the Region showed an increase in the standardized prevalence of diabetes between 2000 and 2014 (Annex 1), and the projections for each country indicate that this increase will continue until at least 2025. The largest increases have been observed in Saint Lucia (90.3%), Trinidad and Tobago (73.3%), and Antigua and Barbuda (52.3%) in men and Saint Lucia (65.9%), Trinidad and Tobago (60.5%), and Haiti (54.4%) in women (*19*).

Figure 10. Prevalence of raised fasting blood glucose/diabetes among adults 18+ years, age-standardized, by sex and country. Region of the Americas, 2014

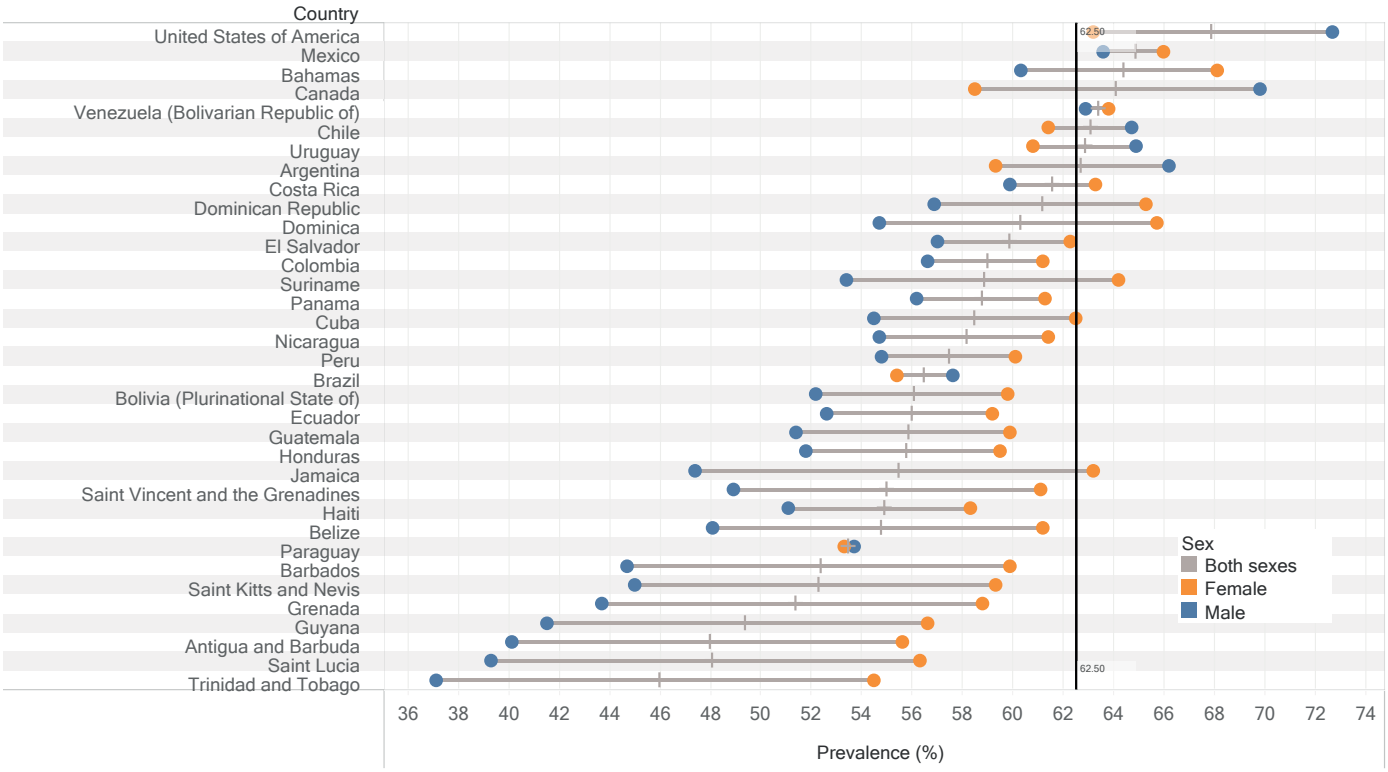


Source: World Health Organization. WHO Global Health Observatory. Available from: https://www.who.int/data/gho

Risk factor prevalence

The burden associated with diabetes is closely related to the prevalence of risk factors related to this disease. Overweight, defined as a body mass index (BMI) between 25 kg/m^2 and 29.9 kg/m^2, and obesity, defined as a BMI above 30 kg/m^2 (*21*), are the main risk factors for Type 2 diabetes. Overweight and obesity prevalence has been increasing in almost all countries worldwide. In the Americas, the age-standardized prevalence of overweight and obesity has increased by 17.3%, from 53.3% in 2000 to 62.5% in 2016. The regional overweight and obesity prevalence is higher among men (64.1%) than women (60.9%). However, women have a higher prevalence of overweight and obesity in almost all countries, with men having a higher prevalence in only five countries. The high proportion of overweight and obesity in the Region, along with the increase in the prevalence of raised blood glucose/diabetes in adults, calls attention to the urgent need to focus public health interventions on diabetes prevention (*19*).

Figure 11. Prevalence of overweight and obesity (BMI > 25) among adults 18+ years, age-standardized estimates. Region of the Americas, 2016.

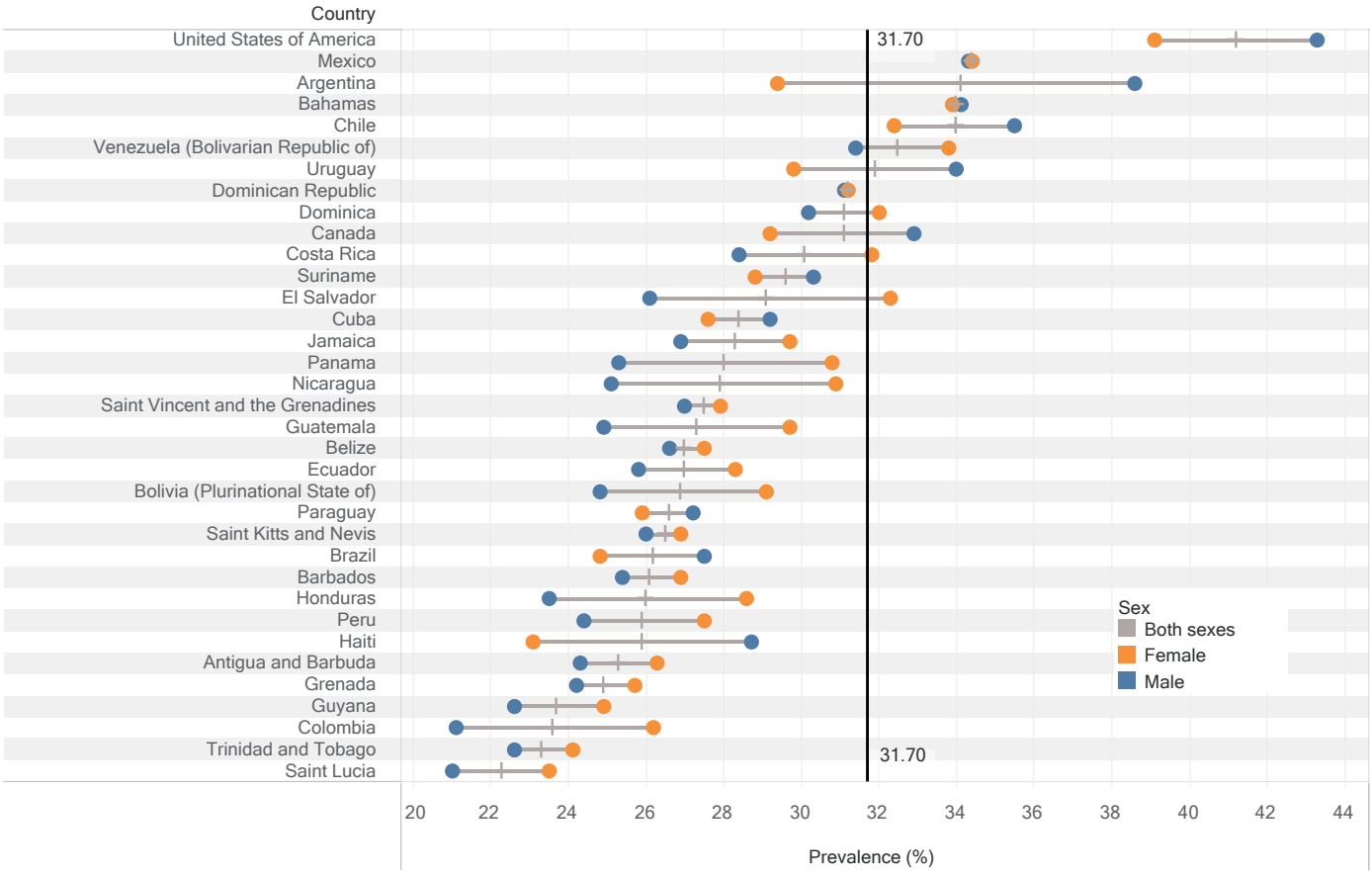


Source: World Health Organization. WHO Global Health Observatory. Available from: https://www.who.int/data/gho

The prevalence of overweight and obesity among children and adolescents aged 10 to 19 years is alarming. In 2016, 17.3% of 10 to 19-year-olds worldwide were overweight, defined as a BMI more than one standard deviation above the median for their age and sex. This is an increase of 74.7% since 2000 (9.9%). There was a substantial increase of 82.7% among boys/men between 2000 (9.8%) and 2016 (17.9%); among girls/women, the increase was 66% between 2000 (10%) and 2016 (16.6%) (*23*).

In the Americas, the situation is more serious than at the global level. In 2016, the prevalence of overweight in adolescents of both sexes reached 31.7%, almost double that observed worldwide, increasing 32.1% relative to 2000 (24.0%). By sex, the regional rate shows little difference in both 2000 (male rate: 23.5%; female rate: 24.5%) and 2016 (male rate: 32.3%; female rate: 31%); however, the increase between 2000 and 2016 is notably higher in men (men: 37.4%; women: 26.5%). The United States of America has the highest prevalence of overweight in both years at the country level, both in men (2016: 43.3%, 2000: 35.8%) and in women (2016: 39.1%, 2000: 34.3%). Argentina has the second-highest rate in the male population (2016: 38.6%, 2000: 28.0%), Chile (35.5%) and Canada (27.6%) have the third position in 2016 and 2000, respectively. In women, Mexico shows the second highest rate in 2016 (34.4%), followed by Bahamas (33.9%) (Figure 12) (*19*).

Figure 12. Prevalence of overweight and obesity among adolescents aged 10–19 years, BMI > +1 standard deviation above the median (crude estimate) (%). Region of the Americas, 2016.

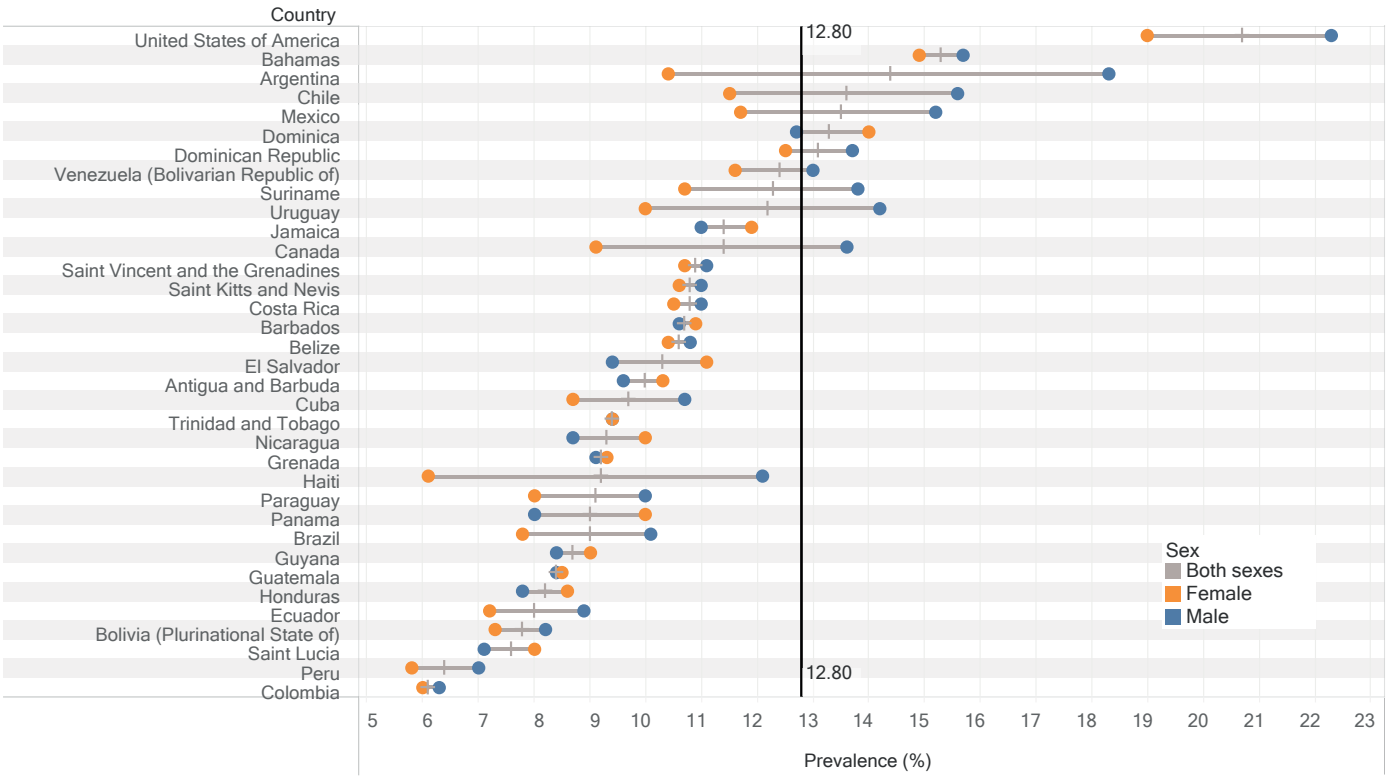


Source: World Health Organization. WHO Global Health Observatory. Available from: https://www.who.int/data/gho

The situation regarding obesity among adolescents (defined as a BMI more than two standard deviations above the age and sex median) is worrisome (21). Globally, the prevalence in 2016 (5.6%) was 133.3% higher than that observed in 2000 (2.4%). This difference reaches 140.7% in men (2000: 2.7%; 2016: 6.5%) and 123.8% in women (2000: 2.1%; 2016: 4.7%) (*23*). In the Americas, the increase between 2000 and 2016 (60%) is less pronounced. However, regional rates of obesity in adolescents are between two and two and a half times higher than rates worldwide, reaching 14% in 2016 in men and 11.5% in women (*19, 24*).

The highest obesity prevalence in men is observed in the United States of America (22.3%), Argentina (18.3%), and The Bahamas (15.7%) in 2016, as was the case in 2000 (United States of America: 16.7%; Argentina: 11.2%; The Bahamas: 9.4%). Among women, the highest obesity prevalence is in the United States of America (19%), with a rate that is almost four times higher than the world obesity prevalence in females. This is followed by The Bahamas (14.9%), where the female obesity prevalence is almost three times the world rate (5.6%) (Figure 13) (*19*).

Figure 13. Prevalence of obesity among adolescents aged 10–19 years, BMI > +2 standard deviations above the median (crude estimate) (%). Region of the Americas, 2016.

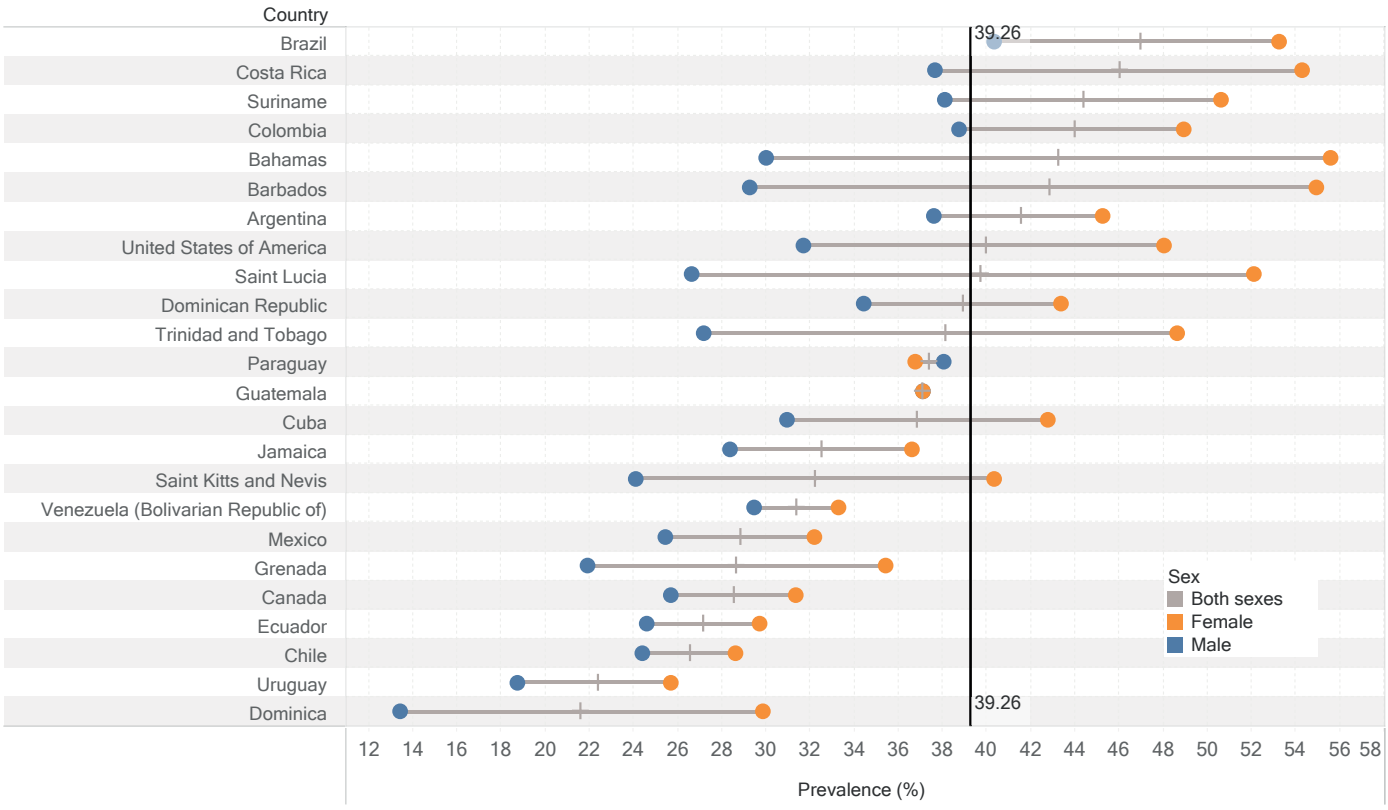


Source: World Health Organization. WHO Global Health Observatory. Available from: https://www.who.int/data/gho

Insufficient physical activity is another risk factor related to diabetes and other NCDs. According to 2016 estimates, almost 40% of the population in the Americas is insufficiently physically active, a rate considerably higher than that observed worldwide (27.5%); women, in whom the age-standardized prevalence reaches 45.2%, are more likely than men to be insufficiently active. Brazil (47%), Costa Rica (46.1%), and Suriname (44.4%) are the countries in which physical inactivity is most prevalent, while Chile (26.6%), Uruguay (22.4%), and Dominica (21.7%) have the lowest prevalence of physical inactivity (Figure 14) (*19*).

Among adolescents in the Americas, 80.7% are insufficiently physically active, with a prevalence almost unchanged between 2001 and 2016 in most countries. Countries with the highest rates among women, and with rates almost unchanged between 2001 and 2016, include Venezuela (Bolivarian Republic of) (2001: 92.6%; 2016: 92.9%), Chile (2001: 90.9%; 2016: 91.2%), Ecuador (2001: 89.6%; 2016: 90.0%), and Argentina (2001: 89.7%; 2016: 89.6%). In men, the highest rates are observed in Venezuela (Bolivarian Republic of) (2001: 83.9%; 2016: 84.8%), Guatemala (2001: 83.9%; 2016: 84.5%), and Chile (2001: 83.9%; 2016: 84.2%) (*19*).

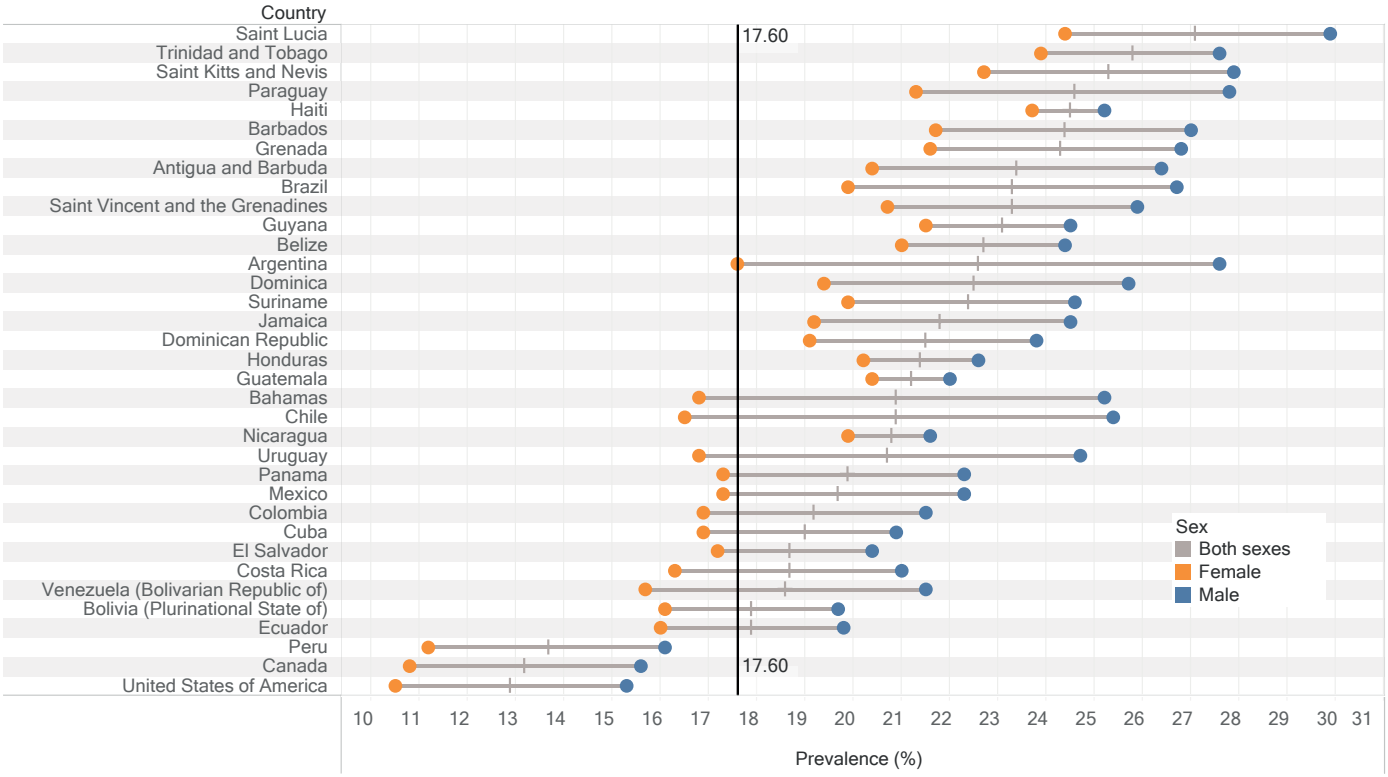
Figure 14. Prevalence of insufficient physical activity among adults aged 18+ years, age-standardized estimates. Region of the Americas, 2016.



Source: World Health Organization. WHO Global Health Observatory. Available from: https://www.who.int/data/gho

In 2015, the age-standardized prevalence of raised blood pressure in adults (defined as systolic blood pressure [SBP] and/or diastolic blood pressure [DBP] ≥ 140/90 mmHg) (*21*) was estimated as 22.1% worldwide, with a higher prevalence in men (24.1%) than in women (20.1%) (*23*). In the Americas, the prevalence was 17.6%, and as observed worldwide raised blood pressure was more prevalent in men (20.3%) than in women (14.8%). The countries with the extreme prevalence values were Saint Lucia (27.1%), Trinidad and Tobago (25.8%), and Saint Kitts and Nevis (25.3%) at the upper end and Peru (13.7%), Canada (13.2%), and the United States of America (12.9%) at the lower end. With respect to prevalence according to sex, the highest values for men were in Saint Lucia (29.9%), Saint Kitts and Nevis (27.9%), and Paraguay (27.8%), while the highest values for women were in Saint Lucia (24.4%), Trinidad and Tobago (23.9%), and Haiti (23.7%) (Figure 15) (*19*).

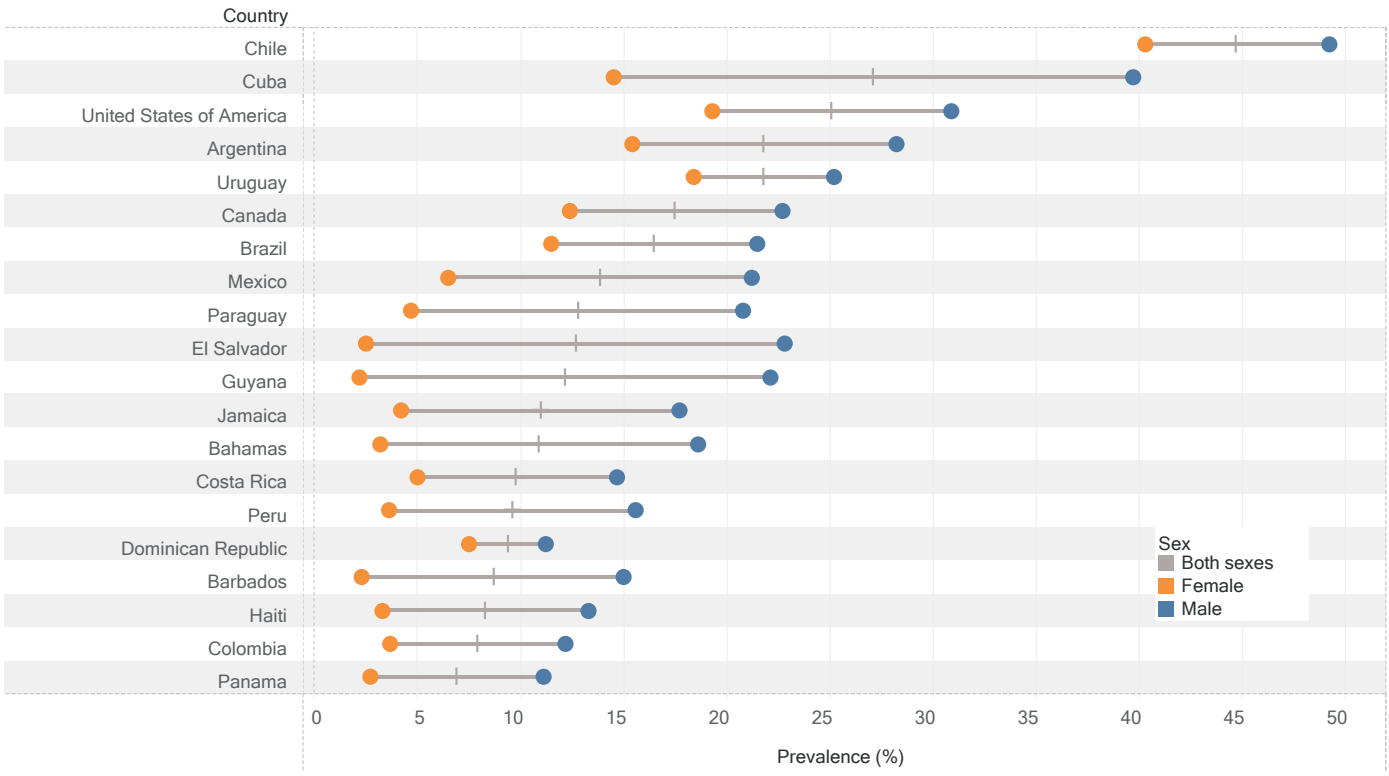
Figure 15. Prevalence of raised blood pressure/hypertension (SBP ≥ 140 or DBP ≥ 90) among adults aged 18+ years, age-standardized estimates. Region of the Americas, 2015



Source: World Health Organization. WHO Global Health Observatory. Available from: https://www.who.int/data/gho

Tobacco use is an important risk factor for NCDs, including diabetes, and is responsible for more than 8 million deaths globally (*25*). The percentage of the population aged 15 years and over currently using any tobacco product (smoked and/or smokeless tobacco) daily or non-daily varies greatly by country and by sex in the Americas, with no improvement since 2007 (*26*). Chile and Cuba had the highest age-standardized tobacco use prevalence in both 2007 (49.6% and 37.8%, respectively) and 2018 (44.7% and 27.1%, respectively). Argentina, the country with the third-highest prevalence (34.1%) in 2007, fell to the fourth position (21.8%) in 2018, behind the United States of America (25.1%). Chile had the highest male and female prevalence, with values markedly higher than in the other countries evaluated. The Chilean female prevalence of current tobacco use was 45.6% in 2007 and 40.3% in 2018. The country with the second-highest female prevalence was Argentina (26.9%) in 2007 and the United States of America (19.3%) in 2018. The Chilean male prevalence of current tobacco use reached 53.5% in 2007 and 49.2% in 2018. Cuba also had a high prevalence of male tobacco use (2007: 51.4%; 2018: 39.7%) (Figure 16) (*19, 26*).

Figure 16. Prevalence of current tobacco use among persons aged 15 years and older, age-standardized estimates. Region of the Americas, 2018.

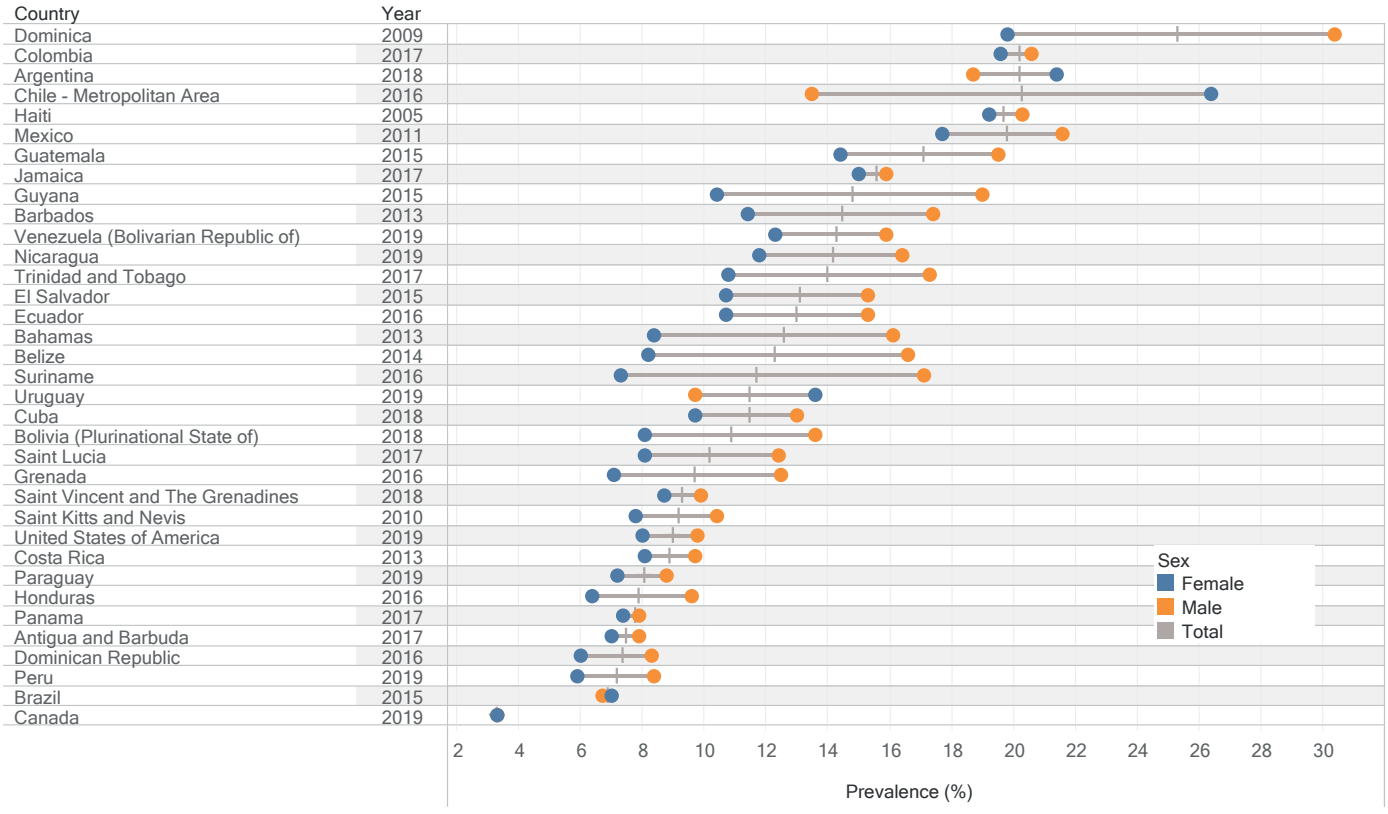


Source: World Health Organization. WHO Global Health Observatory. Available from: https://www.who.int/data/gho

Tobacco prevalence rates in youth 13–15 years of age can be used to estimate future trends in tobacco use globally and nationally. Reports from surveys among adolescents from 177 countries in the 2008–2018 decade (Global Youth Smoking Survey, Global School-Based Student Health Survey, and School-Age Health Behavior Survey) reveal that at least 43.8 million adolescents between 13 and 15 years of age worldwide consume some form of tobacco; this is equivalent to an average tobacco consumption rate of approximately 12%, reaching 16% in boys and 8% in girls (*26*).

In the Americas, the difference between boys and girls is smaller; 13.4% of boys and 11.7% of girls use tobacco. These results position the Americas, together with Europe, within the regions that have the highest average rates. In the 2008–2018 period, 22 (65.6%) of 32 countries in the Region had a prevalence of tobacco use in adolescents higher than 10%. When rates are analyzed at the country level, the results are alarming. Dominica (25.3%), Argentina, and Colombia (20.2% in both countries) have the highest average rates, while the Dominican Republic (7.4%), Peru (7.2%), and Brazil (6.9%) have the lowest. When analyzed by sex, the rates in boys increase to 30.4% in Dominica and 21.6% in Mexico. In girls, the rates reach 21.4% in Argentina and 19.8% in Dominica (Figure 17) (*19*).

Figure 17. Prevalence of current tobacco use among persons aged 13–15 years and older. Region of the Americas.



Source: World Health Organization. WHO Global Health Observatory. Available from: https://www.who.int/data/gho

COMPLICATIONS OF DIABETES

When the hyperglycemic state that characterizes diabetes is sustained over time, long-term vascular complications can occur, which increase the burden associated with the disease and dramatically worsen the quality of life of people with diabetes. In general terms, diabetes complications can be classified as microvascular complications (when the vascular damage is in the small blood vessels) and macrovascular complications (when the damage is in the arteries). Diabetic retinopathy, diabetic nephropathy, and diabetic neuropathy are the main microvascular complications, while coronary heart disease, peripheral artery disease, and stroke are the primary macrovascular complications (*2, 27*).

Data on the prevalence and incidence of complications associated with diabetes are scarce. Where studies have been published, results show high variability between countries, highlighting the need to strengthen surveillance and promote research on diabetes complications (*2, 11, 12, 28*).

Diabetic retinopathy

Diabetic retinopathy is a specific and common microvascular complication of diabetes and the leading cause of acquired blindness among people aged 20 to 74 years (*29, 30*). Risk factors include diabetes duration, chronic hyperglycemia, nephropathy, hypertension, and dyslipidemia. In addition, several studies suggest that pregnancy may aggravate retinopathy in women with type 1 diabetes, especially when glycemic control is deficient at the time of conception (*30*). Higher retinopathy rates have been reported in the Caucasian population, among people with type 1 diabetes, and possibly among people in lower socioeconomic groups (*2*).

The prevalence of blindness due to diabetic retinopathy was 2.6% globally in 2010. However, an analysis of 35 population-based studies in 2016 showed that the overall age-standardized prevalence of any retinopathy in individuals with diabetes was 34.6%, while the prevalence values for the particularly severe disease stages that threaten vision, proliferative retinopathy, and diabetic macular edema, were 6.96% and 6.81%, respectively. This led to the estimation that 92.6 million adults had any diabetic retinopathy (*2, 31*).

The prevalence of diabetic retinopathy shows varied results across ethnic groups and countries. A population-based study of 4774 Mexican Americans with diabetes revealed a prevalence of diabetic retinopathy of 48% and a prevalence of moderate to severe non-proliferative and proliferative retinopathy of 32%. This contrasts with the prevalence of diabetic retinopathy of 35% in a Caucasian cohort from the United States of America (*31, 32*).

Despite the dramatic consequences of diabetic retinopathy, early treatment can reduce an individual's risk of severe visual loss by 57%. Unfortunately, early screening and prompt treatment services are largely unavailable, especially in middle- and low-income countries.

Considering the expected rise in diabetes in the coming years, it is necessary to ensure access to health services for adequate diabetes management, including prevention and management of diabetes complications (*29*).

Chronic kidney disease

Chronic kidney disease is one of the principal complications of diabetes worldwide, affecting between 12% and 55% of people with this condition, with an incidence up to 10 times as high as among those without diabetes. It may be present at the diagnosis of type 2 diabetes or until 10 years post-diagnosis in type 1 diabetes, and, similar to other microvascular complications of diabetes, it is heavily associated with blood glucose control and can progress to end-stage renal disease requiring dialysis or kidney transplantation (*2, 27, 30*). According to the United States Renal Data System (USRDS), the prevalence of chronic kidney disease in the United States of America in adults with diabetes was 36.9% in 2018. The incidence of treated end-stage renal disease reached 395 per million population (according to the USRDS). Also, it was reported that glycemic control worsened among people with diabetes and chronic kidney disease from 2003–2006 to 2015–2018 (*33*).

Access to dialysis and renal replacement therapy can influence the prevalence of end-stage renal disease. Unfortunately, such access is highly variable between and within countries in the Americas (*2*).

Diabetic foot disease

Diabetic foot disease is a late and frequent complication of diabetes, secondary to diabetic neuropathy and peripheral arterial occlusive disease. It is one of the major causes of morbidity and mortality in people with diabetes. The condition is characterized by foot ulcers with various degrees of destruction of deep tissues and greater susceptibility to infections resulting in soft tissue sepsis. It is the leading cause of lower extremity amputations, and people with diabetes have a 10 to 20 times higher risk of amputation than nondiabetic populations (*2, 27, 30, 34*). The economic burden of diabetic foot disease is significant, with an estimated cost of approximately US$ 17 500 (in 1998 dollars) to treat a single ulcer and an estimated cost of US$ 30 000 to US$ 33 500 for a lower extremity amputation (*35*).

According to the Latin American Diabetes Association, 58.2% of people with diabetes in Brazil have diabetic foot complications, while in Chile 13% require amputations due to foot injuries. Between 2004 and 2005, hospital discharges for diabetic foot and lower extremity amputations increased markedly in Mexico. In Costa Rica, an investigation of a cohort of 572 adults with diabetes with seven years of follow-up revealed that the incidence rate of lower extremity amputations was 6.02 per 1000 person-years (*36*). In the Caribbean, hospital-based studies have shown diabetic foot disease to be an important issue (*37*).

DIABETES AND COMORBIDITIES

Cardiovascular diseases and diabetes

Diabetes is often comorbid with a variety of other diseases and conditions, notably cardiovascular diseases. Cardiovascular diseases are the leading cause of morbidity and mortality in people with diabetes (*38, 39*).

The interaction between certain risk factors, such as hypertension, dyslipidemia, and tobacco consumption, dramatically increases cardiovascular disease risk, especially the risk of ischemic heart disease (*38, 40*). However, diabetes itself confers an independent risk that grows continuously with increasing fasting plasma glucose levels, even before levels sufficient for a diagnosis of diabetes are reached. People living with diabetes have a two to five times higher rate of cardiovascular disease (*2, 38, 39*), and people in lower- and middle-income countries are affected to a greater extent (*41*).

In the United States of America, the rate of cardiovascular disease mortality (largely stroke and myocardial infarction) is 1.7 times higher in people living with diabetes than in people without diabetes, with a relative risk of morbidity and mortality between one and three in men and two and five in women (*39*). In Mexico City, a large cohort study in people aged 35 years and older showed that previously diagnosed diabetes at baseline was associated with about four times the death rate from cardiovascular disease relative to adults without diabetes (*41*). These results were ratified in a resurvey assessment of this cohort carried out between 2015 and 2019 that concluded that the excess mortality associated with high systolic blood pressure was substantially greater among individuals with diabetes, especially those with poorly controlled diabetes (*42*).

In Cuba, another large prospective study in a population aged 30 years and older revealed that individuals with previously diagnosed diabetes at baseline had approximately twice the risk of cardiovascular mortality relative to those without diabetes. Cardiovascular mortality showed a strong positive association with systolic blood pressure and body mass index (*43*). These findings are in line with what was reported in the INTERHEART study. This international case-control study enrolled participants from 52 countries, including six from Latin America (Argentina, Brazil, Chile, Colombia, Guatemala, and Mexico); the results revealed that the population attributable risk of acute myocardial infarction due to diabetes ranged from 7.4 in Colombia to 17 in Brazil (*44*).

The demographic and epidemiological transition experienced by the Americas in past decades has brought about a change in the patterns and trends of the main cardiometabolic risk factors and diseases observed in the population. As reported by the NCD Risk Factor Collaboration, the Americas has an obesity crisis accompanied by heterogeneous patterns of diabetes and high blood pressure (*45*).

Given the associations of diabetes and cardiovascular diseases, it is important to implement integrated strategies for diabetes management that also address obesity, hypertension, dyslipidemia, physical inactivity, and tobacco use. Tools available from WHO/PAHO such as the Package of Essential Noncommunicable Disease Interventions for Primary Care (PEN), the HEARTS Technical Package, and HEARTS D: Diagnosis and Management of Type 2 Diabetes offer practical resources to achieve this aim (*46–48*).

Tuberculosis and diabetes

Diabetes is a risk factor for various diseases including tuberculosis. However, the relationship with tuberculosis is characteristically bidirectional and complex. Both pathologies increase the risk of the other as well as impair their response to treatment. On the one hand, diabetes increases the susceptibility to infection by Mycobacterium tuberculosis, the bacterium that causes tuberculosis, and the risk of latent infection, relapse, or death. In addition, it reduces the probability of a favorable treatment outcome, including the potential for drug-resistant and multi-resistant tuberculosis. On the other hand, tuberculosis can trigger the onset of diabetes, deteriorate glycemic control in existing diabetes, and interfere with diabetes treatment through drug interactions (*49–52*).

According to WHO estimates, the five principal health-related risk factors for tuberculosis are diabetes together with malnutrition, alcohol dependency, human immunodeficiency virus (HIV) co-infection, and tobacco use (*51, 52*). The contribution of each of these risk factors varies substantially by country.

Globally, 350 000 incident tuberculosis cases were attributable to diabetes in 2019 (*51*). In the Americas, 46% of new (estimated) tuberculosis cases were attributable to one or more of these risk factors in 2018, and 11 000 (4%) were associated with diabetes (*53*). In the same year, 28 countries reported that 21 135 (10.1%) of the total notified incident tuberculosis cases involved comorbid diabetes, ranging from 2.6% in Panama to 40% in Puerto Rico (*53*).

The two-way relationship between these diseases of epidemic magnitudes threatens to increase the burden of both diabetes and tuberculosis, especially in low- and middle-income countries, and highlights the need to design comprehensive, innovative, and multisectoral strategies for treatment and prevention (*49–52*). WHO's Collaborative Framework for Care and Control of Tuberculosis and Diabetes provides useful guidance. With the purpose of assisting policymakers, public health practitioners, and clinicians in understanding how to decrease the joint burden of diabetes and tuberculosis, the framework establishes recommendations to guide national programs, clinicians, and others engaged in care of patients and prevention and control of diabetes and tuberculosis (*52, 53*).

COVID-19 and diabetes

People living with diabetes and other underlying chronic conditions such as hypertension, obesity, and cardiovascular disease have a higher risk of COVID-19 (*54, 55*). They are twice as likely to develop severe forms of COVID-19, including acute respiratory distress syndrome (ARDS), and to require intensive care and use of ventilators; they are also twice as likely to die from COVID-19 (*34, 56, 57*). This increased risk persists even in the absence of other comorbidities and would decline with well-controlled blood glucose levels (*56, 58*). Diabetes is considered both a risk factor for and a condition made worse by SARS-CoV-2 infection (*54*).

People with diabetes require continuous care; however, the COVID-19 pandemic has at times seriously disrupted access to essential health services, including diabetes services. According to a global WHO survey on health service disruptions conducted in 2020 (round 1) and 2021 (round 2), decreased outpatient volume due to patients not presenting, decreased inpatient volume due to cancellation of elective care, and insufficient staff availability (due to deployment to provide COVID-19 relief or other factors) are the most frequent reasons for disruptions in health services (*59*).

In the Region of the Americas, 52% of countries (28 of 54) responded to the second round of the survey. Service disruptions were reported in 46% of the evaluated services; 23% of disruptions were described as mild, 14% as moderate, and 9% as severe. Noncommunicable disease services were disrupted in more than 40% of countries, including services for management of diabetes and related complications.

Despite the association of diabetes and COVID-19 and the need for continuous, uninterrupted care for people with diabetes, COVID-19 preparedness and response plans do not include diabetes services (*60*). Integrating diabetes as part of health emergency preparedness and response needs to be considered.

NATIONAL CAPACITY FOR DIABETES PREVENTION AND CONTROL: CURRENT STATUS

Successfully addressing the enormous and growing burden of NCDs and their risk factors requires implementing and evaluating evidence-based national multisectoral policies, programs, services, and plans. A fundamental part of NCD surveillance is monitoring the progress made in this area. In the last 20 years, WHO/PAHO has periodically conducted a country capacity survey on NCDs to assess national-level responses to NCDs. The NCD Country Capacity Survey (NCD CCS) has been carried out in the Americas region in 2001, 2005, 2010, 2013, 2015, 2017, 2019, and 2021. The survey collects information from ministry of health NCD program managers across four main areas: 1) public health infrastructure, partnerships, and multisectoral collaboration; 2) policies, strategies, and action plans; 3) health information systems, monitoring, surveillance, and surveys; and 4) health system capacity for detection, treatment, and care (*15*).

The information presented below is a summary of the diabetes-related results from the 2021 NCD CCS, in which 35 countries responded (*16*).

National policies and plans for diabetes and NCDs

A national NCD policy/strategy/action plan is recommended, and for diabetes it should be included in the overall NCD policy/strategy/action plan or as a specific diabetes plan for the country to facilitate a coordinated, multisectoral response. In the past NCD CCS, 33 out of 35 countries of the Region reported having an integrated national NCD policy, strategy, or action plan that includes diabetes; however, only 19 countries (54%) reported having an operational NCD plan. Seven (20%) countries reported having a specific national operational policy, plan, or strategy for diabetes (Argentina, Brazil, Cuba, Ecuador, Mexico, Peru, and the United States of America) (Table 1) (*16*).

Table 1. Examples of diabetes policies, strategies, or operational plans in countries of the Region of the Americas, 2021

Country	Document title	Electronic reference
Argentina	(a) National Law 23.753/89.	(a) https://bancos.salud.gob.ar/sites/default/files/2018-10/0000000386cnt-2014-02_ley-nacional-diabetes-23753.pdf
	(b) Resolution 301/99. National Diabetes Program (PRONADIA) and standards for the provision of medicines and supplies [in Spanish].	(b) http://servicios.infoleg.gob.ar/infolegInternet/anexos/55000-59999/57326/norma.htm -:~:text=La Ley Nacional Nº 23.753,Areas técnicas de su dependencia
Brazil	Law 13.895 Establishes the National Policy for Diabetes Prevention and Comprehensive Assistance to Diabetic Persons. [in Portuguese].	http://www.planalto.gov.br/ccivil_03/_ato2019-2022/2019/lei/L13895.htm
Cuba	National Diabetes Program [in Spanish].	https://extranet.who.int/ncdccs/Data/CUB_B6_Programa%20Nacional%20de%20Diabetes%20Cuba..pdf
Ecuador	Law 32 for the prevention, protection and comprehensive care of people suffering from diabetes [Spanish]	https://www.salud.gob.ec/wp-content/uploads/downloads/2014/09/Normativa-Ley-de-Prevenci%C3%B3n-Protecci%C3%B3n-y-Atenci%C3%B3n-de-la-Diabetes.pdf
Mexico	Official Mexican STANDARD NOM-015-SSA2-2010, For the prevention, treatment and control of diabetes mellitus. [in Spanish].	http://www.dof.gob.mx/normasOficiales/4215/salud/salud.htm
Peru	(a) Law 28553. General law for the protection of people with diabetes [in Spanish]	(a) https://docs.peru.justia.com/federales/leyes/28553-jun-17-2005.pdf
	(b) Decree 009-2008-SA. Regulation of the general law for the protection of people with diabetes [in Spanis]	(b) https://www.gob.pe/institucion/minsa/normas-legales/248268-009-2008-sa
United States of America	Healthy People 2030: Diabetes.	https://health.gov/healthypeople/objectives-and-data/browse-objectives/diabetes

National indicators to monitor NCD progress, including for diabetes, are recommended. Twenty-four countries (69%) of the Region reported having a set of national NCD indicators, although only 14 countries noted that diabetes indicators were included. Other than North America and the Southern Cone, which had the highest proportion overall, the proportion of countries that reported establishing NCD indicators was highest in Central America, the Latin Caribbean, and Mexico (67%) followed by, Non-Latin Caribbean region (43%), and Andean Area (40%) (*16*)

In the case of diabetes risk factor policies/strategies/action plans, 21 (60%) countries reported having policies, strategies, or action plans for overweight and obesity; 14 (40%) had the same resources for reducing physical inactivity and/or promoting physical activity; 17 (49%) had national guidelines recommending levels of physical activity; and 26 (74%) had a policy, strategy, or action plan to decrease tobacco use (*16*).

National guidelines and protocols

Guidelines for diabetes management are key to improving quality of care. Almost all countries in the Americas (34 of 35; 97%) reported the availability of evidence-based national guidelines, protocols, or standards for the management of diabetes that are either fully or partially implemented. However, only 26 countries (26 of 34, 74%) reported the use of guidelines in more than 50% of their health facilities.

Availability of essential drugs and basic technologies

Insulin, metformin, and sulfonylureas are the main essential medicines for diabetes treatment. These medicines were generally available in almost all countries of the Region in 50% or more of public sector pharmacies; 35 countries (100%) reported having metformin generally available, 34 (97%) reported having sulfonylureas available, and 32 (91%) reported having insulin available (*16*).

Six basic technologies are recommended for diabetes management and monitoring: equipment for measuring blood glucose, oral glucose tolerance tests, tests to measure glycosylated hemoglobin (HbA1c), fundus examinations, tuning fork tests to diagnose diabetic foot disease, and urine test strips for glucose and ketone analysis. In the 2021 NCD CCS, only 12 countries (34%) reported having these six basic technologies available in 50% or more of their public health facilities (*16*).

Also in public health facilities, thirty-three (94%) out of 35 countries reported having blood glucose measurement equipment, and 24 countries (69%) reported having oral glucose tolerance testing, and 20 countries (57%) reported having urine test strips for measuring glucose and ketones. Furthermore, 19 countries (54%) reported the availability of tests for measuring HbA1c. However, only 18 countries (51%) reported having tuning forks to measure sensitivity for diagnosing diabetic foot disease, and ophthalmoscopy equipment and mydriatic drops to perform fundus exams (*16*).

Surveillance and monitoring

Population-based surveys are one of the primary resources for surveillance. Ideally, these surveys should be nationally representative, should be carried out at least every three to five years, and should include physical measurements for biological risk factors such as blood glucose, cholesterol, weight, height, and salt/sodium intake. Regular application of national population surveys with blood glucose measurements allows countries to assess trends and the impact of interventions aimed at preventing and controlling this disease.

Only thirteen out of 35 countries (37%) of the Region reported conducting a national population-based survey involving blood glucose measurement in adults within the last five years (2016 or later) (Argentina, The Bahamas, Canada, Chile, Costa Rica, Dominican Republic, Ecuador, Guyana, Jamaica, Mexico, Panama, Saint Lucia, and the United States of America). (*16*).

Another essential resource for public health surveillance is disease registries. The information derived from diabetes registries can be applied to improve treatment compliance, prevent complications, and assess the clinical outcomes of management. However, only 16 countries (46%) reported having a diabetes registry, of which only five countries were population-based (*16*).

DIABETES IN INDIGENOUS POPULATIONS

The Americas is a multicultural and multiethnic region. The wealth delivered by the more than 600 ethnic groups that live in the Region contrasts with the inequalities to which these populations are exposed and that impede, among other aspects, adequate access to health services and affect the quality of care they receive, impacting their living conditions in general (*61, 62*).

Diabetes is a significant global health challenge, and this challenge is more evident in indigenous populations (*63*). International evidence shows high variability in the prevalence of diabetes in indigenous peoples depending on the country and ethnic group evaluated. In North America, approximately 50% of adults 30–64 years of age who belong to the Pima Indian tribe in Arizona, United States of America, have type 2 diabetes, positioning it as a population with one of the highest rates of diabetes in the world. In addition, the prevalence of diabetes in the indigenous peoples of Canada is between three and five times higher than in the general population, and diabetes is one of the fastest-growing diseases among these individuals. In Latin America, the reported prevalence range is between 3% and 36.5% (*63, 64*).

The variability observed in the prevalence of diabetes in indigenous populations is related to individual risk factors, such as age, family history, sex, and genetics, and structural risk factors such as health systems and poverty. These risk factors must be added to biological and environmental changes and the adoption of unhealthy lifestyles such as smoking, physical inactivity, and unhealthy eating habits characterized by non-traditional indigenous diets rich in sugar, fat, and ultra-processed foods. These factors can also cause complications secondary to diabetes at an earlier age than in the non-indigenous population. In groups that have maintained traditional lifestyles, a lower prevalence is observed than in other indigenous peoples; an example is the Aymaras and Mapuches in Chile, with an age-adjusted prevalence between 1% and 4% (*63, 64*).

The burden of diabetes in indigenous populations highlights the urgent need to improve health and health equity in these groups. The 2030 Agenda for Sustainable Development aims to ensure that no one is left behind (*13*). However, the inequalities faced by indigenous peoples threaten the achievement of this goal. In recent years, PAHO Member States have implemented policies, plans, and programs to reduce inequities, promote social justice, and eliminate barriers to health services these groups face (*62*).

For example, the Strategy for Universal Access to Health and Universal Health Coverage, approved in 2014, seeks to guarantee that all peoples and communities have access, without any discrimination, to comprehensive, adequate, timely, and quality health services (*65*). The commitments of this strategy are reinforced in the Policy on ethnicity and health, approved at the 29th Pan American Sanitary Conference, 69th session of the WHO Regional Committee for the Americas, in 2017, in which the Member States agreed to guarantee an intercultural approach to health and the equitable treatment of indigenous peoples, Afro-descendants, Roma individuals, and members of other ethnic groups (*61, 66*).

THE CENTURY OF INSULIN

The year 2021 marked 100 years since the discovery of insulin, signifying a milestone for humanity and a change for the lives of thousands of people who, until then, were destined for imminent death, preceded by severe complications (*5*).

Diabetes is characterized by a total or relative deficit of insulin, a hormone that regulates blood glucose levels. When people living with diabetes do not have good metabolic control, they can develop health-threatening complications. These complications significantly increase the mortality, costs, and poor quality of life associated with diabetes (*2, 67*).

Unfortunately, access is still limited for many people in the world, even though insulin has been on WHO's List of Essential Medicines since it was first published in 1977. Unstable supplies and unaffordable out-of-pocket payments are the main barriers to its use, translating into rationing and use in inappropriate doses that generate complications and premature death (*5*). Between 2013 and 2021, there was a decrease in the number of countries in the Americas reporting that insulin is generally available. In the 2013 NCD CCS, 31 out of 32 countries (97%) reported having general availability of insulin in the public sector. In 2021, only 32 out of 35 countries (91%) reported availability of insulin.

One hundred years after the discovery of insulin, there is still much to do. Improving access to insulin requires reinforcing national efforts and engaging in collaborations with the pharmaceutical, health technology product, and related private sector industries (*5*). The WHO Global Diabetes Compact proposes ways that pharmaceutical industries can help, for example by increasing transparency, guaranteeing uninterrupted supplies of human insulin for lower-income countries and humanitarian settings, participating in future procurement mechanisms, and engaging in WHO's prequalification program for insulin (*5*). A key strategy to increase insulin access is to utilize the PAHO Strategic Fund for Essential Medicines, which offers diabetes medicines, including insulin, for one specified price regardless of purchase size and with assured quality to Member States.

SUMMARY

The data displayed in this report shows that diabetes represents a genuine health emergency for the Region of the Americas. Although mortality shows a slight increase between 2000 and 2019 at the regional level, there are profound differences between countries. Two aspects need to be highlighted. First, in some countries such as Costa Rica, Honduras, Suriname, and Venezuela, the 2019 ASMR from diabetes shows an accentuated increase concerning 2000. Second, the countries with the highest mortality rates from diabetes remain practically unchanged during the last decade, highlighting Grenada, Guyana, Guatemala, Haiti, Jamaica, Mexico, Trinidad and Tobago, and Saint Vincent and the Grenadines.

The increase in the burden of diabetes in the Americas positions it as the eighth leading cause of YLLs, the second leading cause of YLDs, and the fourth leading cause of DALYs in 2019. As with mortality, these three metrics show considerable differences across countries, with the highest rates concentrates in Trinidad and Tobago, Guyana, Suriname, Saint Lucia, Mexico, and Saint Vincent and the Grenadines. On the other hand, Uruguay, the United States of America, and the Dominican Republic display the largest differences in the ASYDR between 2000 and 2019.

From 2000 to 2014, all the countries in the Region increased the age-standardized prevalence of raised fasting blood glucose, with the largest increments seen in Antigua and Barbuda, Haiti, Saint Lucia, and Trinidad and Tobago. In line with the marked increase in the prevalence of overweight and obesity, along with the high prevalence of insufficient physical activity in women, the female age-standardized prevalence of raised fasting blood glucose exceeds 10% in more than half of the countries in the Region.

The prevalence of hypertension and tobacco consumption, other major risk factors for diabetes, is high. Because of the close relationship between diabetes and cardiovascular disease -the leading cause of death of people living with diabetes- these results are alarming and suggest that both mortality and disability related to diabetes will continue to increase.

In recent decades, countries have made efforts to halt the rise in diabetes, but the data presented in this report indicate they are still insufficient. The last CCS shows a dramatically low availability of the six basic technologies recommended for diabetes management and monitoring in public health facilities. Three pillars must be strengthened. First, it is imperative to improve the capacity for an early diagnosis of diabetes and diabetes-related complications in the Region. Second, it is urgent to increase the availability and adequate access of the population to quality health care for diabetes, including insulin, other medicines, blood glucose monitoring devices, counseling, and coordinated management of high-risk people.

Primary health care has a fundamental role in meeting these objectives. Solid and timely policies, along with a close intersectoral work represent the third pillar. The countries need to build policies/strategies to enhance healthy lifestyles and nutrition in the population, along with strengthening health education on diabetes prevention and control. A common agenda based on collaborative work between governments, civil society, and people living with diabetes need to be prioritized.

FINAL CONSIDERATIONS

This panorama on diabetes in the Americas presents the status of diabetes in countries in the Region. It highlights the importance of diabetes as a cause of death and disability and illustrates the increasing prevalence of diabetes and related risk factors across the Region. The report notes the extent to which countries in the Region are putting in place national interventions through diabetes policies/strategies/plans, diabetes targets, access to diabetes medicines and technologies, and surveillance. Nonetheless, there is an urgent need to scale up these interventions and improve diabetes prevention, diagnosis, treatment, and surveillance.

The Global Diabetes Compact, launched by WHO in April 2021 and implemented in the Americas by PAHO, provides a framework to address primary prevention, improve the quality of diabetes care, and strengthen monitoring. The ultimate goal is to reduce the risk of diabetes and ensure that all people diagnosed with diabetes have access to quality care and treatment that are equitable, comprehensive, and affordable (*5, 68*).

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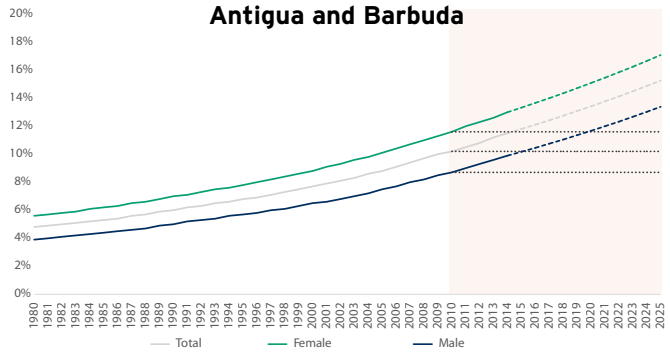
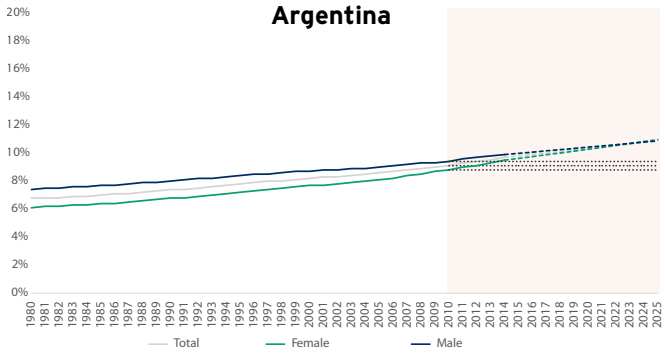
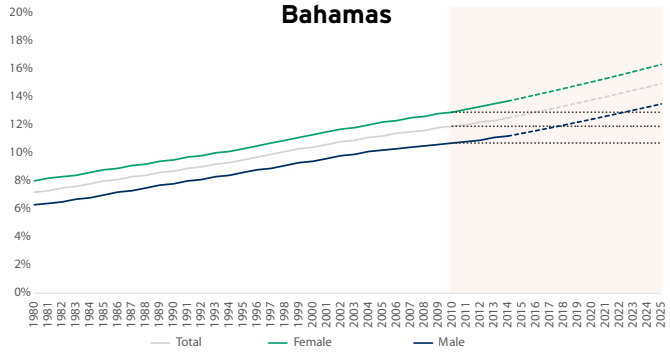
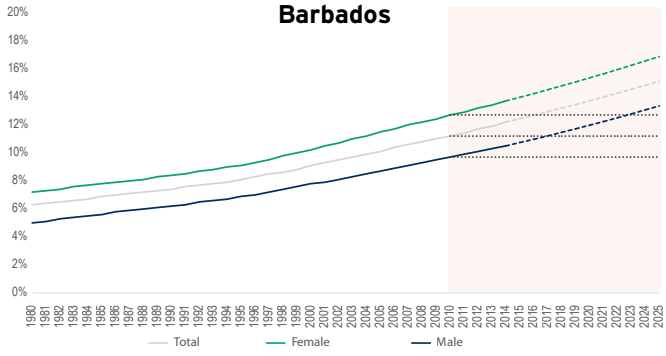
ANNEXES

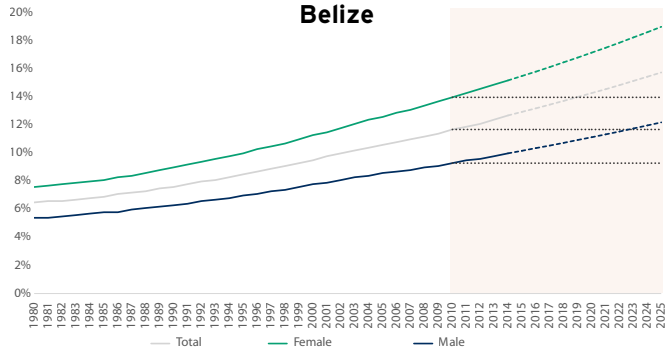
Annex 1. Prevalence of raised fasting blood glucose/diabetes among adults 18+ years, age-standardized, by sex. Trends 1980–2025. Region of the Americas.

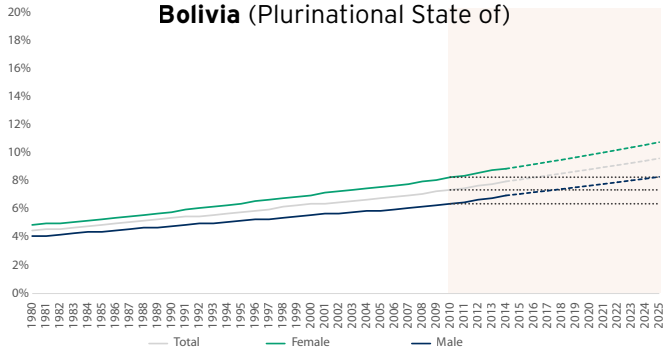


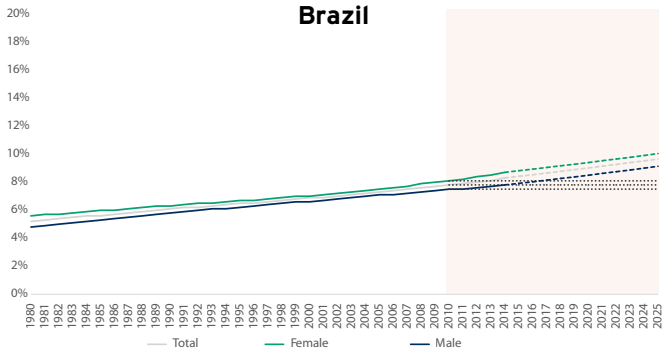








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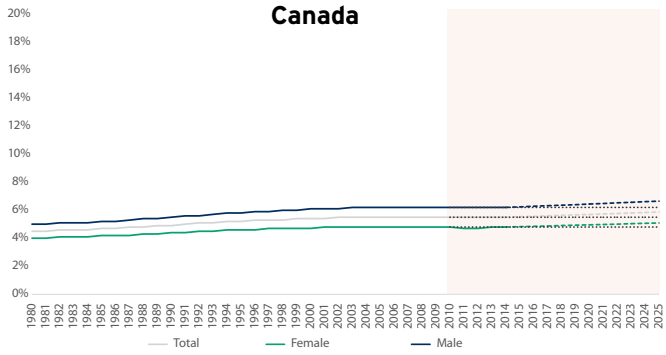
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Female
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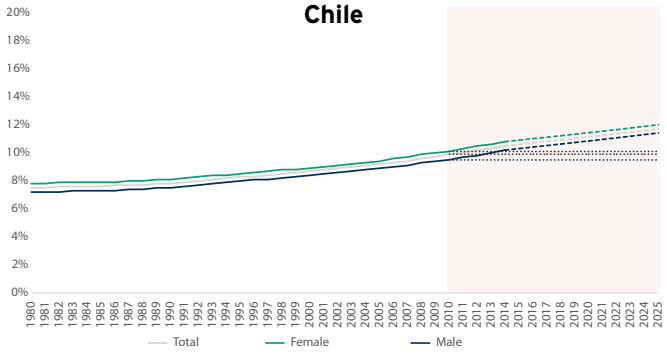
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Total
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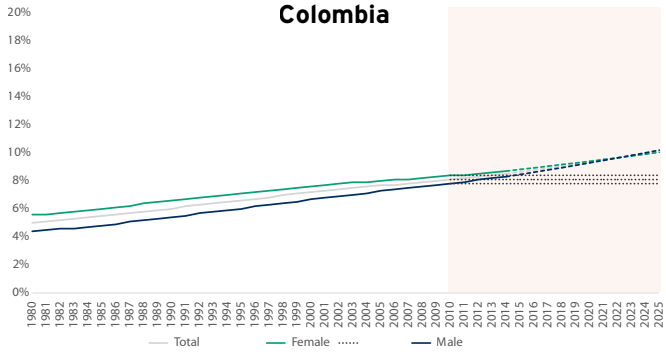
Male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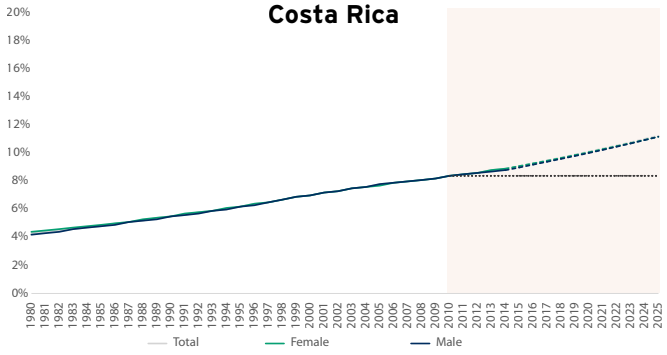
Total
Female
Male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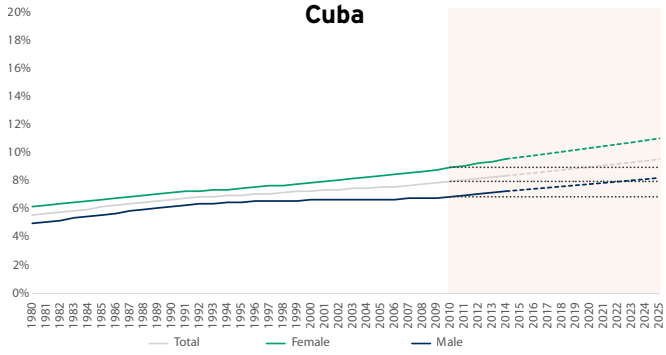
Male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Total
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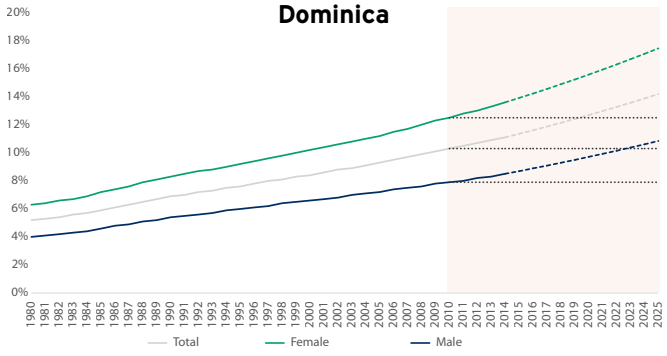
Male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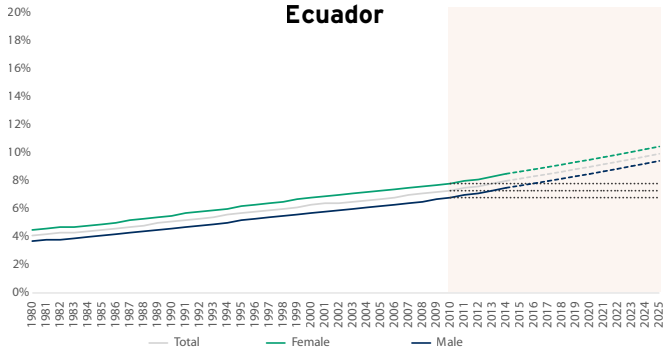
Male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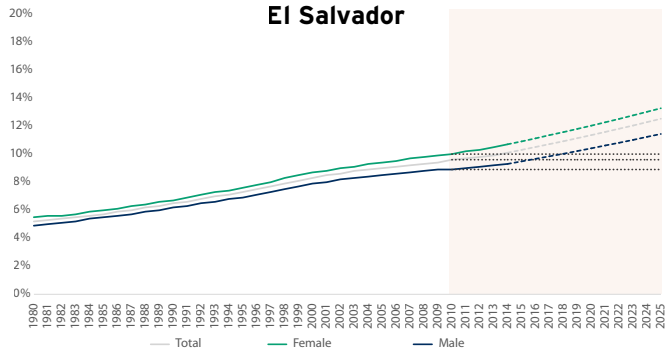
El Salvador
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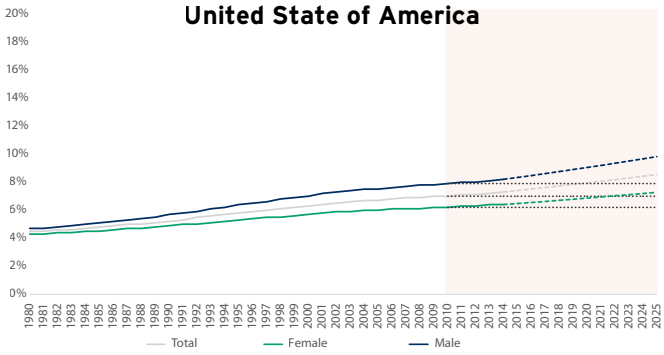
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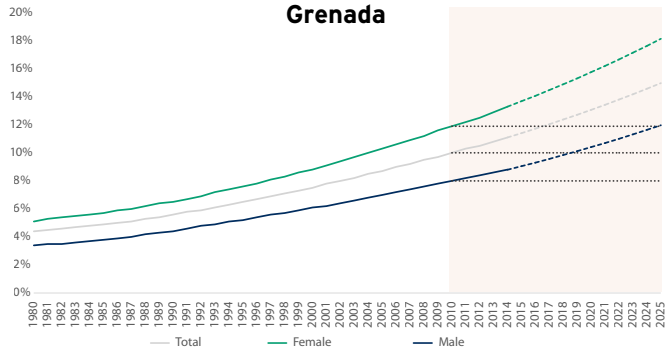
Total
Female
Male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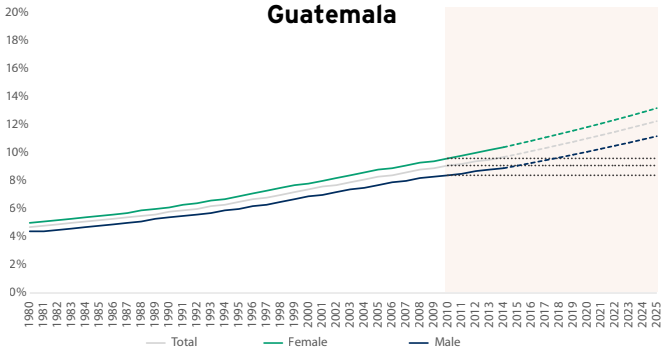
Male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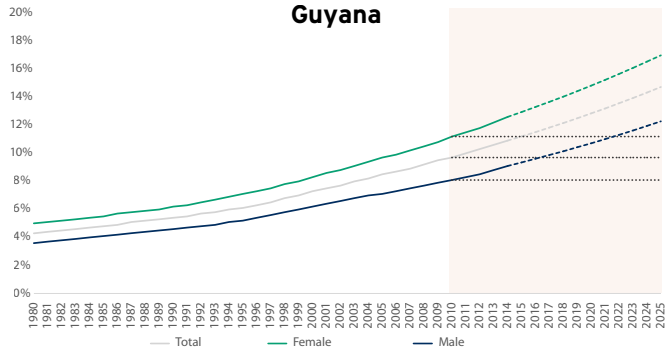
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Total
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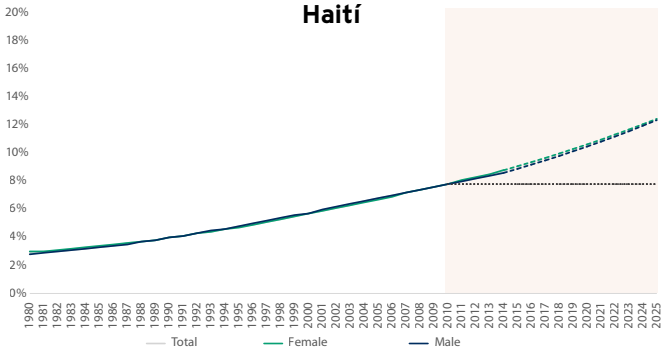
Haití
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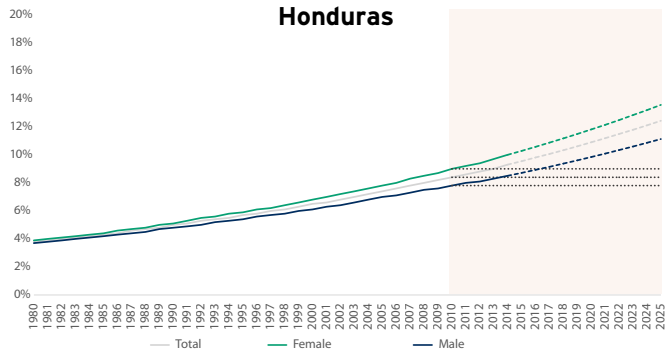
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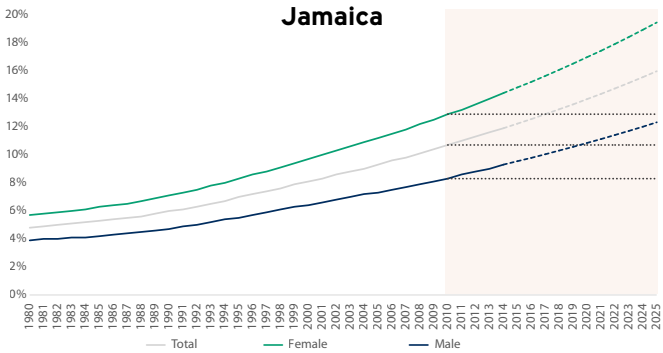
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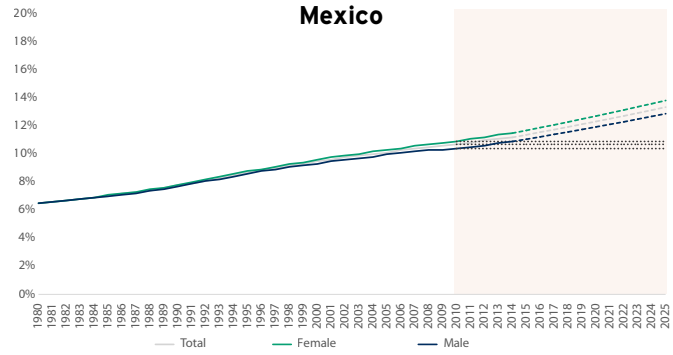
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1980 1981 1982 1983 1984 1985 1986 1987 1988 1989 1990 1991 1992 1993 1994 1995 1996 1997 1998 1999 2000 2001 2002 2003 2004 2005 2006 2007 2008 2009 2010 2011 2012 2013 2014 2015 2016 2017 2018 2019 2020 2021 2022 2023 2024 2025
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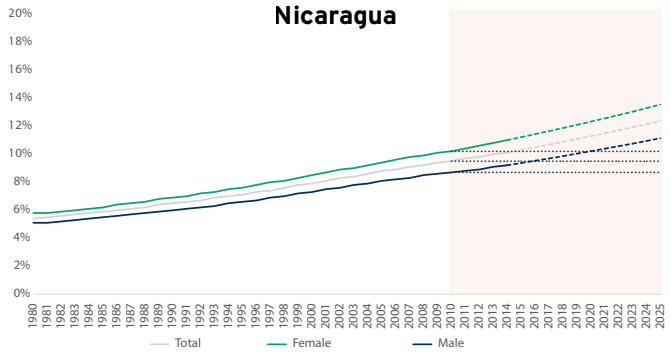
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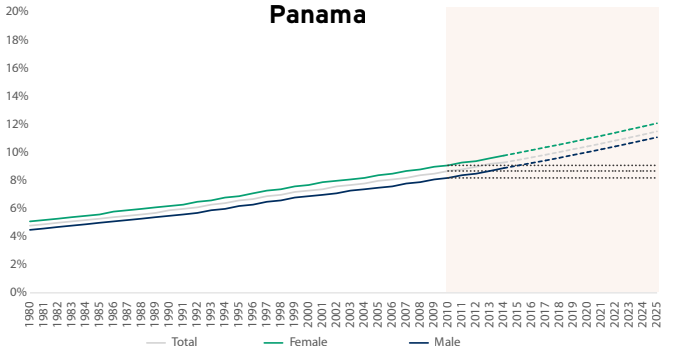
Male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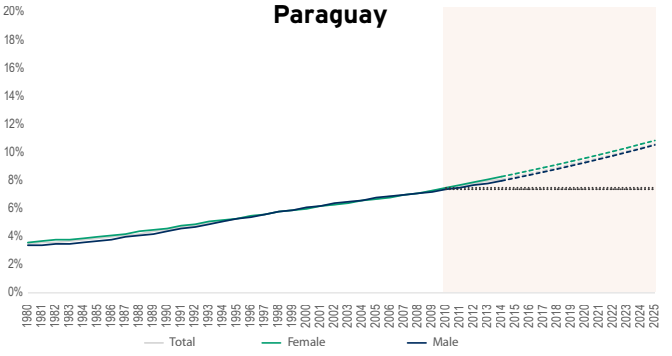
Male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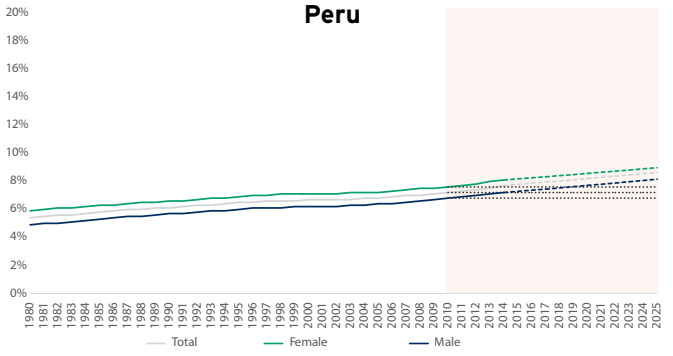
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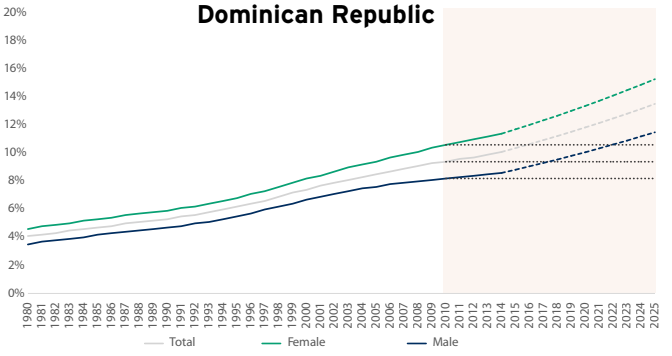
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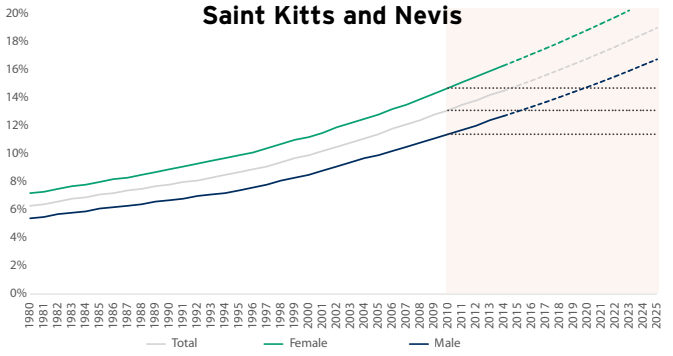
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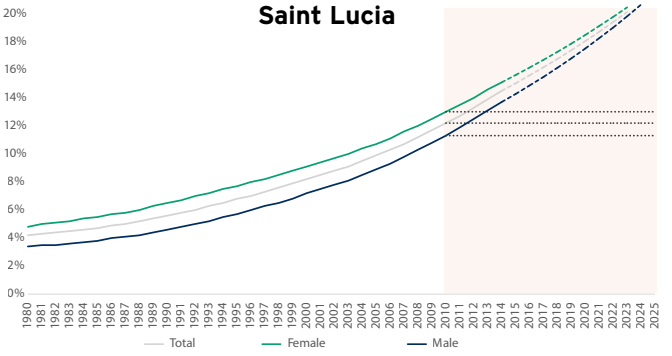
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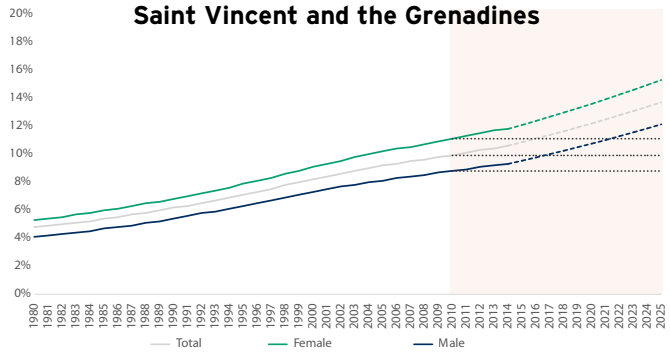

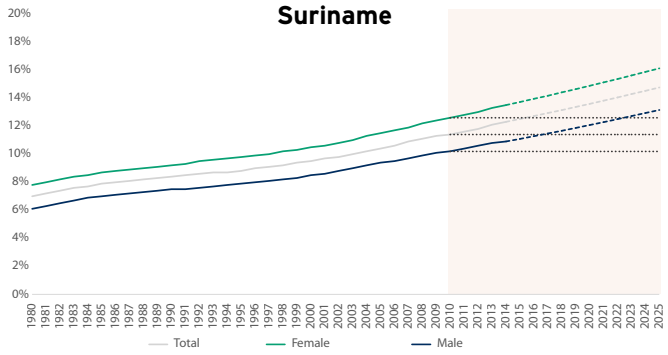

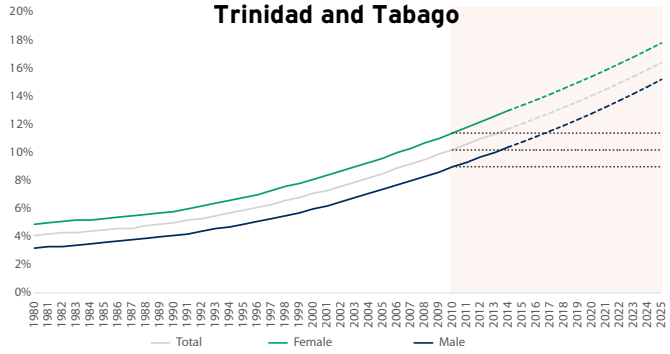

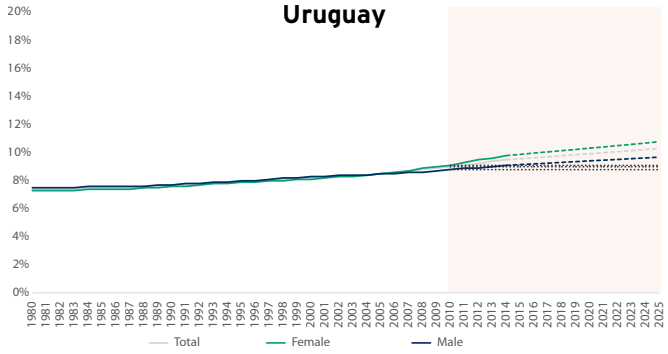

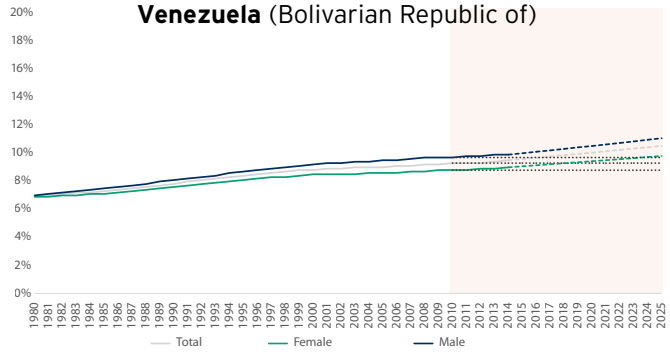

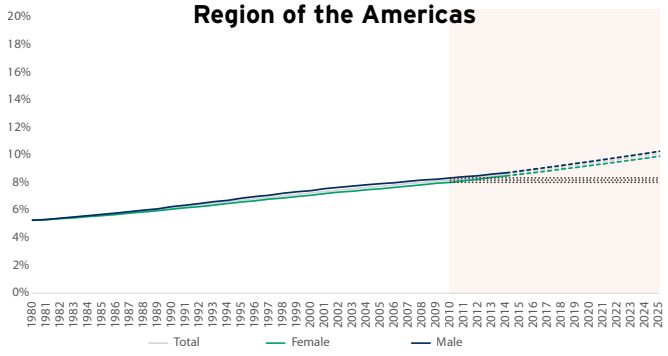

Note: The 2014–2025 projections were calculated using exponential regression, with United Nations population projections for adults aged 20 years and over.

Source: World Health Organization. WHO Global Health Observatory. Available from: https://www.who.int/data/gho

The burden of diabetes is enormous, positioning it as one of the main challenges facing public health today. Currently, it is estimated that 62 million people are living with diabetes in the Region of the Americas and projections show its prevalence will continue rising over the following years. The Region shows the highest number of years of healthy life lost (through either disability or premature death) due to diabetes worldwide. The high costs associated with its treatment produce a heavy economic burden. Its complications can seriously affect the quality of life of people living with diabetes, their families, and society and overload health systems.

This report shows the latest internationally comparable data on diabetes and its main risk factors by year, country, and sex. It also includes a summary of the countries health systems' response to diabetes, including national plans, targets, surveillance, guidelines, and access to essential drugs and technologies, and synthesizes information about diabetes-related complications and the close relationship between diabetes and other pathologies, such as cardiovascular diseases, tuberculosis, and COVID-19. The data presented here reveal that, despite advances in national responses, diabetes continues to expand, and our response remains insufficient. This report aims to draw attention to the urgent need to strengthen efforts to prevent, diagnose, and control diabetes in the Region of the Americas.

PAHO
Pan American Health Organization
World Health Organization
REGIONAL OFFICE FOR THE Americas

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