International Diabetes Federation

75 YEARS 1950 - 2025

11th Edition | 2025

Diabetes Atlas

IDF Diabetes Atlas

11th edition | 2025

International Diabetes Federation

75 YEARS 1950 - 2025

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Online version of the IDF Diabetes Atlas available at **diabetesatlas.org**

Data

The list of studies on which estimates in the IDF Diabetes Atlas are based can be found at **diabetesatlas.org**

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This edition of the IDF Diabetes Atlas is dedicated to Professor Akhtar Hussain, who served as President of the International Diabetes Federation from 2022–2024 and untimely passed away on 1 July 2024.

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Foreword by the IDF President

This edition of the IDF Diabetes Atlas was launched at our World Diabetes Congress 2025 in Bangkok. The launch coincides with the 75th anniversary of the year we were officially founded and 25 years since we introduced the Diabetes Atlas in 2000. In 1950, diabetes representative organisations from 16 countries came together to share experiences and collaborate to create strategies that would support the response to a condition already identified as a growing, but at that time much-hidden, threat to global health. Since then, our federation of national and transnational members has grown to include, at the time of writing, more than 240 diabetes-focussed organisations in 161 countries and territories.

From the outset, we looked to embrace the complete spectrum of the diabetes community: the researchers pushing the envelope of science to advance diabetes care, the medical doctors and allied healthcare professionals who provide the care, and, of course, the people with diabetes at the very heart of care.

From our genesis, we sought to listen to and voice the concerns of the entire community and improve diabetes care worldwide, not just in high-income economies but also (indeed, particularly) in those countries where resources are limited and health inequities high. Our first President back in 1950 was Dr R D Lawrence, a British diabetologist and one of the co-founders of our organisation. He was a researcher famed for his role in advancing diabetes care and advocacy worldwide, and he was a person living with type 1 diabetes.

Lawrence was extremely fortunate to have been one of the first recipients of therapeutic insulin shortly after it was first discovered in 1921 at the University of Toronto, Canada by Dr. Frederick Banting and Charles Best, with the assistance of James Collip and under the supervision of Dr. John Macleod. It saved Lawrence's life. He would have been keenly aware of the huge inequities in access to diabetes care that existed between individuals, countries and regions.

One wonders what these diabetes luminaries might think to see that disparities in access to diabetes care and prevention remain deeply unequal, with many still facing significant barriers to diagnosis, treatment, and management. Today, despite being a global health crisis and despite the greater attention the condition receives, we must acknowledge that for many, diabetes care remains a privilege rather than a right.

Three-quarters of a century after our foundation, we must, perhaps more than ever, be united in our global endeavour to transform access to care for people affected by diabetes and its complications, and drive awareness of the serious risk posed to individuals, communities and economies. The IDF Diabetes Atlas remains a highly valuable tool to support our advocacy to demand policy change. I encourage you all to take advantage of the resources we have made available online at diabetesatlas.org and use the content to support your efforts and campaigns.

Much has been achieved thanks to the tireless enthusiasm and commitment of volunteers and professionals across the world in service of a common mission – to improve the lives of people with diabetes and prevent diabetes in those at risk. Much, however, remains to be done to tackle the systemic inequities that disproportionately affect communities because of socioeconomic status, race, ethnicity, geography, gender, disability, and other social determinants of health. The Diabetes Atlas helps provide the context and the evidence to drive change.

We are living a defining decade for diabetes. At the beginning of the decade, the centenary of the discovery of insulin in 2021, was a catalytic moment that saw the launch of the World Health Organization's Global Diabetes Compact - a unique global initiative aimed at ensuring access to equitable, comprehensive, affordable and quality care for everyone living with diabetes and addressing risk factors to reduce the growing cases of type 2 diabetes - and a Resolution on strengthening the prevention and control of diabetes, which places the condition at the core of the NCD response. In 2022, Member States agreed on a set of diabetes coverage targets, aiming to reduce the risk of diabetes and moving towards a world where everyone diagnosed with

diabetes has access to the care they need. We are only five years away from 2030, the deadline to meet the targets. Unfortunately, we appear woefully off-track to achieve them. The time is now to take advantage of the context, join forces and request governments to honour their commitments and invest in diabetes prevention and care.

My sincere hope is that this 11th edition of the IDF Diabetes Atlas will help the global diabetes community advocate for intensified action to diagnose diabetes early and provide access to quality care to delay or prevent complications, to improve care for all people living with diabetes and to delay or prevent type 2 diabetes in people at risk.

Every edition of the Diabetes Atlas includes more quality data from more countries, thereby providing an increasingly accurate description of the global diabetes landscape. I give my sincere gratitude to the many international experts who have contributed to the production of this edition and to the Co-Chairs, Professors Dianna J Magliano and Edward J Boyko, for their leadership.

Regretfully, I must end on a sad note: Had it not been for his untimely death while on active duty for the Federation in July 2024, my predecessor, Professor Aktar Hussain, would have written this foreword. A friend, inspiration and mentor, Professor Hussain was a passionate advocate for people living with diabetes, particularly those in low and middle-income countries. On behalf of the International Diabetes Federation, I dedicate this 11th Edition of the IDF Diabetes Atlas to his memory. We can honour him by using this publication to drive change.

Professor Peter Schwarz
President 2024–2027
International Diabetes Federation

Foreword by the IDF Diabetes Atlas Chairs

It gives us great pleasure to present to you the 11th Edition of the IDF Diabetes Atlas.

The IDF Atlas has now been in production for over two decades and delivers valuable and realistic summary data on the state of diabetes for each nation and the world population. Initially designed as a data resource for individual countries and to advance the interests of global health, it has since evolved and demonstrated itself to be a valuable advocacy tool as well.

Our new data confirm that diabetes prevalence is still increasing globally and provide strong evidence that should promote action and initiatives to improve the lives of people with diabetes.

This is our second edition as co-chairs and this experience has instilled in us a deep knowledge of the issues and challenges of estimating the impact of diabetes in every country and some populous territories. As with any project intent on utilising available data to make scientific estimates, a methodology must be selected to achieve the objectives. Choices must be made regarding what type of data to include, for example, clinic-based versus community/population-based. The time period over which the data were collected must be specified. Another consideration is whether to include all available data meeting eligibility criteria or only data of the highest quality. An important consideration is the definition of diabetes, whether it is based on self-reported diagnosis or laboratory testing, and if by laboratory testing, which test or tests should be used-plasma or capillary fasting glucose, Haemoglobin A1c, 1 hour or 2 hour oral glucose tolerance tests. Given the many choices, it is not surprising that the other groups who have published on global diabetes prevalence – the Global Burden of Disease (GBD) and the NCD-RisC Collaboration – have used different methods, resulting in a considerable span for the estimate of numbers of persons globally with diabetes, ranging from approximately 500 to 800 million in 2021-2024. Along this range, the GBD and IDF estimates fall close to 500 million, while the NCD-RisC estimate is at the upper end of the range. A critical examination of differing methodologies is needed to better inform healthcare planning regarding the magnitude of the diabetes problem.

In this edition, 62 out of 215 countries or territories (29%) lack in-country data. While this is an improvement on previous editions, it is still grossly inadequate, and data from Africa is still worryingly sparse. It should be noted that many older studies cannot be used to predict diabetes prevalence given that the epidemic has continued to rise since the first edition of the IDF Diabetes Atlas, such that older research will almost certainly underestimate current conditions. We have, therefore, elected not to use studies conducted before 2005 in the estimations. We have also instituted some new aspects of data inclusion and have elected to exclusively use regular national surveys, like the National Health and Nutrition Examination Survey (NHANES) and the Korean National Health and Nutrition Examination Survey (KHANES) in the countries where these were conducted. Further, technological advances now allow access to the whole-of-population data of diabetes prevalence by way of national registries and administrative sources. National compulsory health insurance organisations also provide excellent unbiased estimates. Notably, these sources only capture known diabetes, but estimates are corrected with recent estimates of undiagnosed diabetes to derive a credible unbiased estimate of total diabetes prevalence for those nations. We can expect that the future expansion of diabetes registry data will enhance national estimates. WHO STEPS studies still have a strong place in the Atlas. This year, we have included over 60 WHO STEPS surveys in our estimates.

It has been the practice for the Atlas team to review the methodology for each edition to identify opportunities to reduce bias and increase precision. In this edition we enlisted statistical experts to scrutinise our methods and assumptions and recommend improvements where needed. Therefore, we caution readers to take care when comparing our new estimates to older editions, as differences between editions may represent actual changes or an alteration in methodology. In particular, we have taken a new approach to the estimation of deaths attributed to diabetes by taking into account the lower risk of dying due to diabetes among those with undiagnosed diabetes. We were unable to disentangle mortality in the diagnosed and undiagnosed in the past, but the availability of new data from our collaborators and from recently completed larger studies have allowed us to do this in a more credible and accurate way. We have also used updated urbanisation ratios from WHO and applied a new method to generate confidence intervals around our diabetes estimates. We are excited about these improvements.

As in previous editions, we have presented forecasts of diabetes prevalence. In this edition, we present forecasts to the year 2050. Projection of future diabetes prevalence is always challenging, and it is important to note that we only take into account changes in age and sex and urban to rural distribution. We deliberately do not consider any other changes which would increase or decrease diabetes incidence because we believe this guesswork would likely be inaccurate.

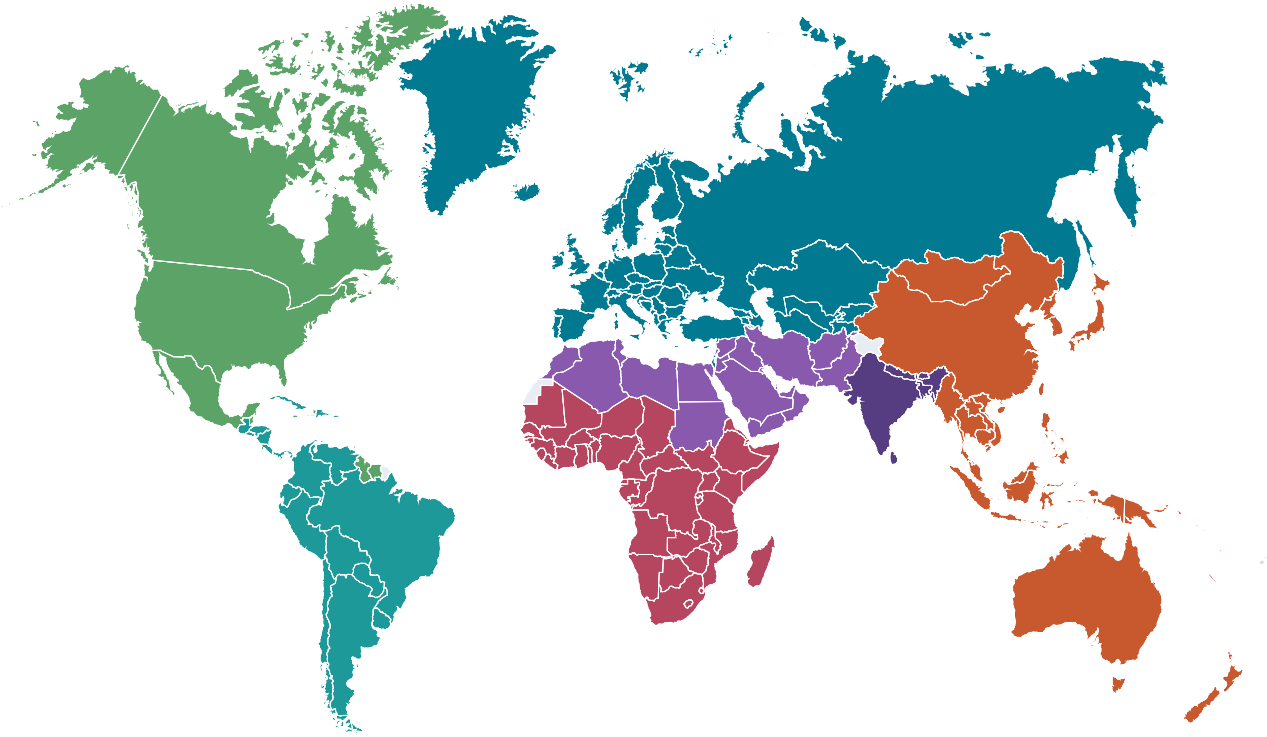
Lastly, we want to stress the importance of continued surveillance of diabetes prevalence and encourage well-designed and carefully conducted national diabetes prevalence (and incidence) studies to permit better monitoring of the impact of diabetes presently and allow a better foundation from which to make forecasts. We also want to reiterate the importance of continued diabetes awareness and prevention activities to help stem the rising tide of diabetes. Controlling diabetes is indeed a team sport. Addressing the rising trend will require a concerted effort from people with diabetes, governments, non-government organisations focused on diabetes, and the medical community. We hope this Edition of the Atlas will support this endeavour.

Professor Dianna Magliano
Chair, IDF Diabetes Atlas Committee

Professor Edward Boyko
Chair, IDF Diabetes Atlas Committee

Summary

Map 1 Number of people with diabetes worldwide and per IDF Region, in 2024–2050 (20–79 years)



World

2050	852.5 Million
2024	588.7 Million

45% increase

Africa (AFR)

2050	59.5 Million
2024	24.6 Million

142% increase

Europe (EUR)

2050	72.4 Million
2024	65.6 Million

10% increase

Middle-East and North Africa (MENA)

2050	162.6 Million
2024	84.7 Million

92% increase

North America and Caribbean (NAC)

2050	68.1 Million
2024	56.2 Million

21% increase

South and Central America (SACA)

2050	51.5 Million
2024	35.4 Million

45% increase

South-East Asia (SEA)

2050	184.5 Million
2024	106.9 Million

73% increase

Western Pacific (WP)

2050	253.8 Million
2024	215.4 Million

18% increase

The IDF Diabetes Atlas is an authoritative source of evidence and a valuable advocacy tool on the prevalence of diabetes, related morbidity and mortality, as well as diabetes-related health expenditures at global, regional and national levels. The IDF Diabetes Atlas also introduces readers to the pathophysiology of diabetes, its classification and its diagnostic criteria. It presents the global picture of diabetes for different types of diabetes and populations and provides information on specific actions that can be taken, such as proven measures to prevent type 2 diabetes and the best management of all forms of diabetes to avoid subsequent complications.

The credibility of diabetes estimates relies on the rigorous methods used for the selection and analysis of high-quality data sources. For every edition, the IDF Diabetes Atlas Committee – composed of thematic experts from each of the seven IDF Regions – reviews the methods underlying the IDF Diabetes Atlas estimates and projections and available data sources. The methods have been explained in detail by Guariguata *et al*.[1] The majority of the data sources used are population-based studies that have been published in peer-reviewed journals. In this edition, we have also included data from national diabetes registries. With the establishment of electronic records and national registries becoming more common, we anticipate more data like these will be featured in the future. Furthermore, information from national health surveys, including some of the World Health Organization's (WHO) STEPwise approach to NCD risk factor Surveillance (STEPS), are used where they meet inclusion criteria.

Findings of the current 11th edition confirm that diabetes is one of the fastest-growing global health challenges of the 21st century (see Map 1). In 2024, it is estimated that 589 million adults aged 20-79 were living with diabetes. Over 9.5 million people had type 1 diabetes in 2024, of whom 1.9 million children and adolescents under the age of 20. The total number of people living with diabetes is projected to reach 853 million by 2050.

There is a large and growing population at high risk of developing diabetes. In 2024, 635 million people were estimated to have impaired glucose tolerance and 488 million were estimated to have impaired fasting glucose. It was also estimated that over 3.4 million people aged 20–79 died from diabetes-related causes in 2024. Direct health expenditures due to diabetes surpassed one trillion USD for the first time and will continue to rise over the coming years.

This IDF Diabetes Atlas 11th edition also shows that hyperglycaemia in pregnancy (HIP) affects approximately one in five pregnancies. Another cause for alarm is the consistently high percentage (43%) of people with undiagnosed diabetes, which is overwhelmingly type 2. This highlights the urgent need to improve the ability to diagnose people with diabetes, many of whom are unaware they have the condition, and provide appropriate and care as early as possible.

Diabetes is a major health issue that has reached alarming levels. The 11th edition confirms that **diabetes is one of the fastest-growing global health emergencies of the 21st century.**

Tinotenda Dzikiti, Zimbabwe - Living with type 1 diabetes

Key messages:

- The IDF Diabetes Atlas is a valuable research and advocacy tool that provides essential information on the estimated and projected global prevalence of diabetes.
- The IDF Diabetes Atlas draws attention to the growing impact of diabetes in all countries and regions.
- The estimates presented in the IDF Diabetes Atlas are based on the best quality data available at the time of analysis.

Introduction

Since its first edition, published in 2000, the IDF Diabetes Atlas has provided robust estimates of the prevalence of diabetes by country, IDF Region and globally. Since its second edition, published in 2003, it has also projected these estimates into the future. In doing so, it has served as an advocacy tool, not only for the quantification of the impact of diabetes worldwide, but also for reducing that impact through measures aimed at improving the long-term consequences of all types of diabetes, as well as the primary prevention of type 2 diabetes.

In 2014, the WHO/NCD-RisC estimate of 422 million people with diabetes[3], was very close to the IDF estimate of 415 million people with diabetes in 2015[4]. However, the recent WHO/NCD-RisC publication estimated that 828 million people aged 18 years or older had diabetes in 2022[5], considerably more than estimates provided in this IDF Diabetes Atlas (589 million) for 2024 and the Global Burden of Diseases Study (GBD) figure of 485 million for ages 20-79 in 2021[6]. As mentioned above, multiple decisions are required to estimate worldwide diabetes prevalence, including a selection of representative studies, the diabetes case definition, and the means of generating estimates for countries lacking data. We wish to highlight two decisions that may have falsely elevated the WHO/NCD-RisC 2022 estimate. NCD-RisC defines diabetes based on fasting plasma glucose (FPG)≥7mmol/l, HbA1c ≥6.5%, or use of medication to help regulate blood glucose. First, IDF does not widely use HbA1c due to its limited global availability and its spuriously high readings with concomitant iron deficiency,[2] common in many lower-income countries. Second, this elevation in cases may result from another WHO/NCD-RisC estimation method, which scales up diabetes prevalence for countries with FPG but lacking HbA1c in their surveys.[7,8]

The diabetes impact is steadily growing to alarming levels. The IDF Diabetes Atlas, under the guidance of a committee of experts from all IDF regions, remains dedicated to providing the most accurate possible data based on the available epidemiological sources and methods of analysis.

Our vision for the IDF Diabetes Atlas 11th edition

The 11th edition of the IDF Diabetes Atlas has interrelated objectives:

- Describe the current diabetes landscape and deliver the latest diabetes impact data.
- Support global advocacy to improve the lives of people with diabetes and those at risk.
- Encourage discussions on the latest methodology to monitor the diabetes pandemic.

Multiple changes have been made to the epidemiological methods used in preparing the 11th edition of the IDF Diabetes Atlas. These are summarised in Chapter 2. New data has been accessed, and some topics have been introduced for the first time (see 'What's new in the 11th edition?' below). However, the basis on which estimates and projections have been calculated in this edition remain essentially the same as those used in the previous edition. Thus, continuity has been maintained and, with certain caveats, conclusions about time trends in the global progress of diabetes can be made with reasonable confidence except where otherwise indicated.

What's new in the 11th edition?

A whole chapter is dedicated to up-to-date epidemiological data on the most common diabetes-related complications (see Chapter 5).

The impact of diabetes in older adults (>65 years old) has also been included in this edition (see Chapter 3).

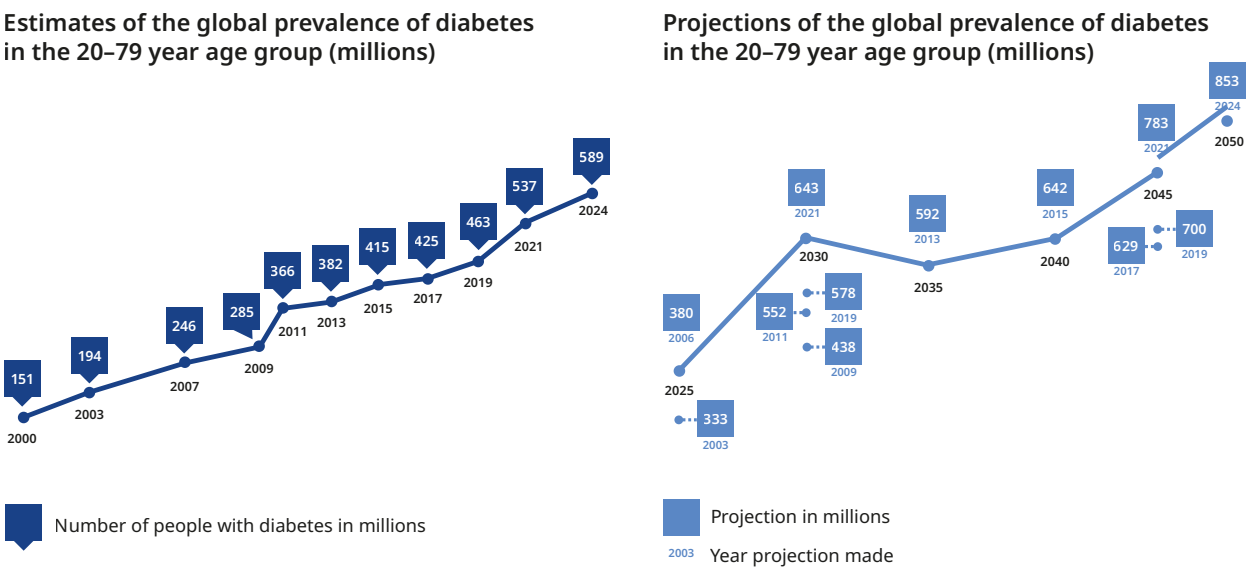
The current Diabetes Atlas presents projections for 2050 compared to the projections for 2030 and 2045 presented in previous editions. This change provides a better description of the impact of diabetes by mid-century.

For the first time, diabetes-related mortality is presented separately for people with diagnosed and undiagnosed diabetes (see Chapter 3).

Increased recognition of prediabetes has allowed us to report recent data on its prevalence. To better describe the total impact of the intermediate states of hyperglycaemia, prediabetes based on HbA1c-defined American Diabetes Association (ADA) criteria (HbA1c 5.7-6.4%) is included, along with the impaired glucose tolerance and impaired fasting glucose (see Chapter 3).

The importance of the advocacy objective of the IDF Diabetes Atlas and related materials is given attention. For this purpose, a new user-friendly data portal has been developed and launched on the **Diabetes Atlas website**. This ensures easy access, downloadable files, and ability to stratify all the Atlas data per indicator, per region and per country. The website also provides downloadable resources such as global and regional fact sheets and a slide presentation.

Figure 1 Estimates and projections of the global prevalence of diabetes in the 20–79 year age group in millions (IDF Diabetes Atlas editions 1st to 11th).



How to read this edition of the IDF Diabetes Atlas

Although it might be tempting to focus solely on the figures for a given country or IDF Region, other factors should be considered when interpreting the IDF Diabetes Atlas estimates and any differences from those given in the previous edition. Possible reasons to account for significant differences between the 10th edition (2021) and 11th edition (2024) figures are:

- The inclusion of new studies for some countries.
- The inclusion of national diabetes registry data with modification. Data on diagnosed diabetes from these sources were adjusted to include both diagnosed and an estimate of undiagnosed diabetes.
- The exclusion of specific WHO STEPS surveys included in the previous edition, as a result of concerns about their validity (see Chapter 2).
- While we may include several studies which all met inclusion criteria for one country, in cases where multiple serial surveys were available, only the latest survey was included.
- The exclusion of studies conducted before 2005. Since older studies probably report a lower prevalence, the exclusion of these studies may result in a higher estimate of prevalence than in previous editions.
- Updating data sources with better quality studies may result in a lower prevalence than reports from previous years with less robust methodology. Any change in prevalence within individual countries could be due, in part, to these methodological changes.

Limitations

- The definition of diabetes used in the IDF Diabetes Atlas is based on an epidemiological definition which requires abnormal blood glucose levels to be detected in only one test compared to a clinical diagnosis of diabetes, which requires abnormal blood glucose levels to be detected on two separate tests in someone with diabetes symptoms such as excessive thirst (polydipsia) or urination (polyuria).
- While we attempted to include only population-based representative studies, all studies have limitations and biases which require careful interpretation. In some countries and territories where territory-wide or population-based registers were included, the estimate of prevalence was adjusted, taking into consideration the proportion of people with undiagnosed diabetes in that country or territory.
- When a country lacked any internal data, diabetes prevalence was extrapolated from a country with similar economy, language and demography. Such extrapolations may represent a source of error.
- The urban and rural classifications are based on how the individual data sources defined urban and rural, rather than defined by the IDF analysis team.

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Robin Fein, USA - Living with type 2 diabetes

1

What is diabetes?

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17 1.2 Type 2 diabetes
18 1.3 Impaired glucose tolerance and impaired fasting glucose
18 1.4 Diagnostic criteria for diabetes
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Key messages:

- Diabetes is a serious, chronic condition that occurs when the body cannot produce enough insulin or cannot effectively use the insulin it does produce, leading to high levels of glucose (hyperglycaemia).

- Type 1 diabetes is the major type of diabetes in children and young adults but can occur at any age. People with type 1 diabetes require insulin to survive.

- Type 2 diabetes accounts for the vast majority (over 90%) of diabetes cases worldwide.

- Type 2 diabetes can be prevented or delayed, and there is accumulating evidence that remission of type 2 diabetes may be possible in the early stages of the condition.

- 'Prediabetes' or 'Intermediate Hyperglycaemia' are terms used to describe impaired glucose tolerance and/or impaired fasting glucose. People with prediabetes are at higher risk of developing type 2 diabetes, cardiovascular disease and stroke.

- Women with gestational diabetes (GDM) are at increased risk of birth complications. Regular prenatal care is essential to monitor and address potential complications promptly.

Diabetes is a serious, long-term (or 'chronic") condition that occurs when glucose levels in a person's blood rise because the body cannot produce enough or any insulin or cannot effectively use the insulin it produces.

Insulin allows glucose from the bloodstream to enter the body's cells, where it is converted into energy or stored. Insulin is also essential for the metabolism of protein and fat. A lack of insulin, or the inability of cells to respond to it, leads to high levels of blood glucose (hyperglycaemia), which is the clinical indicator of diabetes. Another important measurement of blood glucose (glycaemia) is Haemoglobin A1c (HbA1c), which gives an indication of glucose concentration in the blood over a period of 90 days prior to the blood test. Both direct measurement of glucose concentration in plasma or HbA1c may be used to diagnose diabetes. The threshold glycaemia levels for the diagnosis of diabetes can be found in Figure 1.1.

A high blood glucose if left untreated over the long term, can cause damage to many of the body's organs, leading to disabling and life-threatening health complications such as cardiovascular diseases (CVD), nerve damage (neuropathy), kidney damage (nephropathy), lower-limb amputation, and eye disease mainly affecting the retina (retinopathy), resulting in loss of vision and even blindness. There is also increased recognition of other complications associated with diabetes such as cognitive decline, liver disease, cancer and frailty. If near-normal levels of blood glucose can be maintained, these serious complications can be delayed or prevented.

Figure 1.1 Diagnostic criteria for diabetes.[1]

Note: Fasting is defined as no caloric intake for at least eight hours.

The HbA1c test should be performed in a laboratory using a method that is National Glycohaemoglobin Certification Program (NGSP) certified and standardised to the Diabetes Control and Complications Trial assay.

The two-hour postprandial plasma glucose test should be performed using a glucose load containing the equivalent of 75-g anhydrous glucose dissolved in water.

In the absence of symptoms of hyperglycaemia, two abnormal tests are required for the diagnosis of diabetes.

The American Diabetes Association (ADA) (2) recommends diagnosing "prediabetes" with a fasting plasma glucose between 5.6 and 6.9 mmol/L (100mg/dL to 125mg/dL: impaired fasting glucose), a 2-h plasma glucose ≥7.8 and <11.1 mmol/L (140–200 mg/dl: impaired glucose tolerance) or HbA1c values between 39 and 47 mmol/mol (5.7–6.4%).[2]

1.1 Type 1 diabetes

Type 1 diabetes is caused by an autoimmune process in which the body's immune system attacks the insulin-producing beta-cells of the pancreas, resulting in insulin deficiency.[3] Although the cause(s) of type 1 diabetes remains unknown, it is thought to be the result of a complex interplay between multiple genetic and environmental factors.[2] Stages are now recognised in the onset of type 1 diabetes: Stage 1 represents autoimmunity with normoglycaemia, stage 2 reflects progression to asymptomatic dysglycaemia, and stage 3 is a clinically overt disease requiring initiation of insulin treatment.[4] The condition can develop at any age, although the onset of stage 3 is most frequent in children and young adults. Type 1 diabetes is one of the most common chronic diseases in childhood but can happen at any age.

The incidence of type 1 diabetes varies around the world, with some regions having much higher incidences than others.[5–8] Incidence has been increasing in the great majority of countries studied, although there is evidence that this increase is stable or tailing off in some high-income countries. The reasons for this are unclear but the rapid increase over time is most likely due to environmental changes.[5–8]

Clinical (stage 3) type 1 diabetes is diagnosed by an elevated blood glucose concentration (Figure 1.1) in the presence of some or, rarely, all the symptoms listed in Figure 1.2. However, diagnosing the type of diabetes is sometimes difficult, and additional testing may be required to distinguish between type 1, type 2, and rarer forms of monogenic diabetes.[9,10]

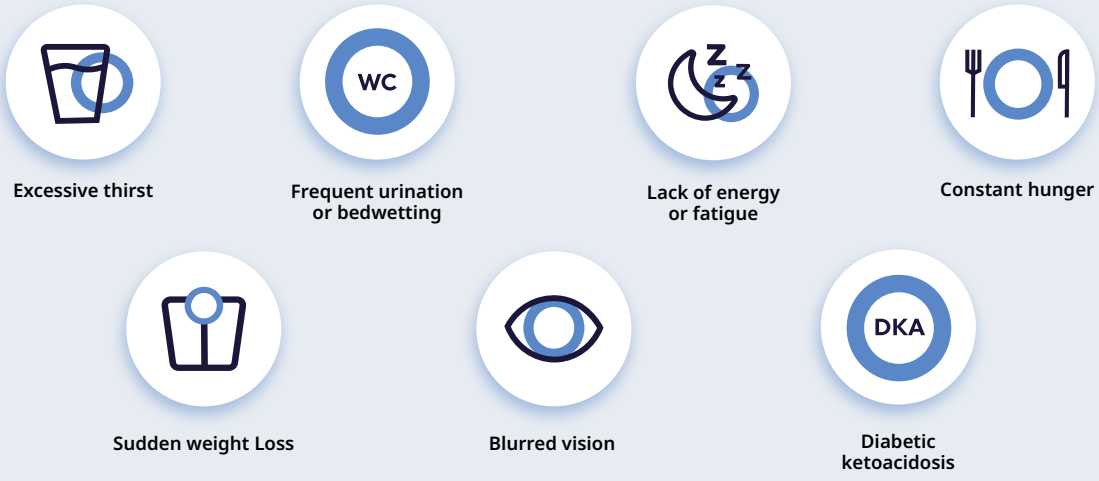
The typical symptoms of type 1 diabetes are listed in Figure 1.2. The classic clinical picture of excessive thirst (polydipsia), frequent urination (polyuria) and weight loss may, however, not be present and the diagnosis delayed or even missed entirely.

Even in countries with universal health coverage (UHC), diagnosis of type 1 diabetes may be delayed until the first hospital admission for diabetic ketoacidosis (DKA), sometimes with fatal results.

A recent study of DKA rates at diagnosis of type 1 diabetes in 13 high-income countries showed a pooled rate for 2006–2016 of 29.9%.[11] Prevalence of DKA at diagnosis of type 1 diabetes, ranged from 19.5% to 43.8%, and increased over time in three countries and decreased in one. This situation has prompted campaigns to increase awareness of type 1 diabetes among parents, school teachers and healthcare professionals.[12] The latter includes advocacy of 'on-the-spot' blood glucose measurement in an unwell child with no obvious diagnosis. In less-resourced countries, the frequency of misdiagnosis and consequent death from DKA at the onset of type 1 diabetes is not known, but is likely to be very substantial.[13]

Following clinical diagnosis, people with type 1 diabetes need daily insulin injections to keep their blood glucose level within an appropriate range. Without insulin replacement therapy, they would not survive. However, with daily insulin treatment, regular blood or interstitial fluid glucose monitoring, education and support, they can live healthy lives and delay or prevent many of the complications associated with diabetes.

Figure 1.2 The typical symptoms of type 1 diabetes



Living with type 1 diabetes remains a challenge for a child and the whole family, even in countries with access to multiple daily injections or an insulin pump, glucose monitoring, structured diabetes education (including insulin adjustments, physical activity and a healthy diet) and expert medical care. Besides the acute complications of hypoglycaemia (abnormally low blood glucose) and DKA, suboptimal glycaemic control may lead to poor growth and the early onset of circulatory (or 'vascular') complications.[14] Optimal care is now recognised to be the use of an automated insulin delivery system that combines an insulin pump and a continuous glucose monitor, but this is an expensive approach which, as yet, is only widely available in some high-income countries.

In many countries, especially in economically disadvantaged families, access to insulin and self-care tools, including structured diabetes education, can be limited.[15] This may lead to serious acute and chronic complications which can result in early death or severe disability.[16]

1.2 Type 2 diabetes

Type 2 diabetes is the most common type of diabetes, accounting for over 90% of all diabetes worldwide. It is currently the 8th leading cause of disease burden[17] globally and estimated to become the second leading cause by 2050.[18] In type 2 diabetes, the inability of the body's cells to respond fully to insulin is termed insulin resistance. The presence of insulin resistance prompts an increase in insulin production, which, over time, may result in inadequate insulin production as pancreatic beta cells fail to keep up with demand.

Type 2 diabetes may have symptoms similar to those of type 1 diabetes, but the onset is typically much less dramatic and often completely asymptomatic. The lack of symptoms makes the exact time of the onset of type 2 diabetes difficult or impossible to determine. As a result, there is often a long period before the diabetes is diagnosed. At any given time, as many as one-third to one-half of people with type 2 diabetes in the population may be undiagnosed. If the diagnosis is delayed for a prolonged time, complications may develop.[19,20] Many are diagnosed because they already have one or more of the complications associated with the condition.

The causes of type 2 diabetes are not completely understood, but there is a strong link with excess body weight, higher age, ethnicity and a family history of diabetes. Contributors to type 2 diabetes risk are thought to include multi-gene predisposition and environmental triggers.

The cornerstone of type 2 diabetes management is promoting a lifestyle that includes a healthy diet, regular physical activity, smoking cessation and maintenance of healthy body weight. If changes to lifestyle are not sufficient to control blood glucose levels, oral medication is usually initiated, with metformin as the first-line medication.

If treatment with a single medication is not sufficient, a range of combination therapy options are also available. These include sulphonylureas, alpha glucosidase inhibitors, thiazolidinediones, dipeptidyl peptidase 4 (DPP-4) inhibitors, glucagon-like peptide 1 receptor (GLP-1R) gastric inhibitory peptide (GIP) agonists, and sodium-glucose co-transporter 2 inhibitors.

Heather Koga, Zimbabwe - Living with type 2 diabetes

Type 2 diabetes is the most common type of diabetes, accounting **for over 90% of all diabetes worldwide.**

Insulin injections may be necessary to control hyperglycaemia to recommended levels if non-insulin medications do not help people with type 2 diabetes to achieve glycaemic control.

Beyond controlling blood glucose levels, it is critically important to manage blood pressure (BP) and blood cholesterol (LDL-c) levels and assess control of these risk factors on a regular basis (at least annually). Regular screening for the development of early diabetes-related complications, such as kidney disease, retinopathy, neuropathy, peripheral artery disease and foot ulceration, helps prevent the development and progression of these complications. With regular check-ups and effective lifestyle management – along with medication as needed and support in the form of diabetes education – people with type 2 diabetes can lead long and healthy lives.

Globally, the prevalence of type 2 diabetes is high and rising across all regions. This rise is driven by population ageing, economic development and increasing urbanisation – leading to greater exposure to type 2 diabetes risk factors including more sedentary lifestyles, greater consumption of sugar-sweetened beverages, processed and red meat, unrefined grains, and other unhealthy foods linked to obesity, and greater exposure to air pollution.[21] However, the beneficial results of early detection and more effective treatment are helping people with type 2 diabetes to live longer, which also contributes to the rise in prevalence.

The prevalence of type 2 diabetes has increased notably in adults under 40[22] and has also become a concern in children and young people due to the increasing prevalence of obesity in childhood and adolescence.[23]

The prevalence of type 2 diabetes varies by race and ethnicity, as reported by the IDF Diabetes Atlas.[24–26]

1.3 Impaired glucose tolerance and impaired fasting glucose

Impaired glucose tolerance (IGT) and impaired fasting glucose (IFG) are conditions of blood glucose levels above the normal range and below the threshold recommended for diagnosis of diabetes (see Figure 1.1). The terms 'prediabetes', 'dysglycaemia', 'borderline diabetes' and 'intermediate hyperglycaemia' are often used interchangeably.[27] IGT and IFG are associated with a heightened risk of the future development of type 2 diabetes[28–31] and cardiovascular disease.[30,32–35] The detection of intermediate hyperglycaemia provides a target population for interventions.[36,37]

Progression from IGT or IFG to type 2 diabetes depends on the degree of hyperglycaemia and other risk factors, particularly age and excess body weight.[37,38] The absolute risk for this progression depends dramatically on individual characteristics such as age and BMI.

1.4 Diagnostic criteria for diabetes

Most guidelines use the standard diagnostic criteria proposed by IDF and the World Health Organization (WHO) Figure 1.1. The footnote in Figure 1.1 mentions the American Diabetes Association (ADA) inclusion of HbA1c as part of the diagnostic criteria of diabetes and prediabetes. WHO supports the use of HbA1c ≥6.5% for diabetes diagnosis but not for intermediate hyperglycaemia, partly on the grounds that quality-assured HbA1c measurement is not available on a global scale.[27]

Currently, IDF and WHO recommend the use of the 75-gram oral glucose tolerance test (OGTT) with measurement of both fasting and two-hour plasma glucose to detect IGT, IFG and diabetes. However, there is literature favouring the use of the one-hour 75-gram OGTT, which may be a more sensitive method of identifying intermediate hyperglycaemia.[39]

For type 2 diabetes, if a single random plasma glucose concentration is ≥ 11.1 mmol/l in the presence of symptoms such as polyuria, polydipsia, and unexplained weight loss, the diagnosis can be made without a second abnormal measurement.

Table 1.1 Diagnostic criteria in studies used for estimating hyperglycaemia in pregnancy.[55]

Criteria	Fasting		1-hour		2-hour		3-hour	
	mg/dL	mmol/L	mg/dL	mmol/L	mg/dL	mmol/L	mg/dL	mmol/L
NDDG (USA)*	105	5.9	190	10.6	165	9.2	145	8.1
Carpenter Coustan (USA)*	95	5.3	180	10.0	155	8.6	140	7.8
CDA	95	5.3	191	10.6	160	9.0	-	-
WHO 1985	140	7.8	-	-	140	7.8	-	-
WHO 1999	126	7.0	-	-	140	7.8	-	-
IADPSG/ ADA WHO/FIGO	92	5.1	180	10	153	8.5	-	-
(DIPSI non-fasting)	-	-	-	-	-	7.8	-	-
NICE (UK)	-	5.6	-	-	-	7.8	-	-

Note: ADA = American Diabetes Association; NDDG = National Diabetes Data Group; ADIPS = Australasian Diabetes in Pregnancy Society; CDA = Canadian Diabetes Association; DIPSI = Diabetes in Pregnancy Society of India; WHO = World Health Organization; IADPSG = International Association of the Diabetes and Pregnancy Study Groups; NICE = National Institute for Clinical Excellence

* after 50g glucose challenge test-if positive, uses 100g glucose load, at least two need to be positive

1.5 Hyperglycaemia in pregnancy

Classification

According to WHO and the International Federation of Gynaecology and Obstetrics (FIGO), hyperglycaemia in pregnancy (HIP) can be classified as either pre-gestational diabetes, gestational diabetes (GDM) or diabetes in pregnancy (DIP).[40,41] Pre-gestational diabetes includes women with known type 1, type 2 or rarer forms of diabetes before pregnancy. GDM may occur at any time during the antenatal period and is not expected to persist after the child is born.[42] DIP applies to pregnant women with hyperglycaemia who were first diagnosed during pregnancy and meet WHO criteria of diabetes in women who are not pregnant. DIP is best detected during the first trimester.[43] While screening for DIP, other women with lesser degrees of hyperglycaemia are often detected early in pregnancy and there is now randomised control trial evidence that such women and their babies can benefit from early treatment.[44–46] It has been estimated that most (75%–90%) cases of HIP are GDM.[47]

Pre-existing type 2 diabetes in pregnancy is a growing challenge[48] and the management of type 1 diabetes in pregnancy is increasingly supported by the use of new technology (e.g. continuous glucose monitoring and assisted insulin delivery).

Screening and diagnosis of GDM

Overt symptoms of hyperglycaemia during pregnancy are rare and may be difficult to distinguish from normal pregnancy symptoms. As a result, an OGTT is recommended for screening for GDM for all women between the 24th and 28th week of pregnancy, but should be conducted earlier in pregnancy for women at high-risk.[49]

The diagnostic criteria for GDM vary and remain controversial, complicating the comparison of research data. There has been a move towards the diagnostic criteria advocated by the International Association of the Diabetes and Pregnancy Study Groups (IADPSG)/WHO[50,51] which has resulted in a general increase in the overall prevalence of GDM.[52] Typically, an OGTT is performed by measuring the plasma glucose concentration while fasting and one and two hours after ingesting 75 grams of glucose. For diagnosing GDM, the criteria currently recommended across the world are summarised in Table 1.1. These criteria are under review with some countries starting to move to the Canadian Diabetes Association (CDA) criteria, alongside early screening for GDM (e.g., Belgium).[53] Consideration of the use of an early HbA1c to rule out GDM is also under active investigation.[54]

Erum Ghafoor, Pakistan - Living with type 2 diabetes

Besides those women with hyperglycaemia early in pregnancy, GDM arises in women with insufficient insulin secretory capacity to overcome the diminished action of insulin (insulin resistance) due to hormone production by the placenta as the pregnancy progresses[40] Risk factors for GDM include older age, overweight and obesity, previous GDM, excessive weight gain during pregnancy, a family history of diabetes, polycystic ovary syndrome, habitual smoking and a history of stillbirth or giving birth to an infant with a congenital abnormality. GDM is more common in some ethnic groups.

GDM: a life course condition

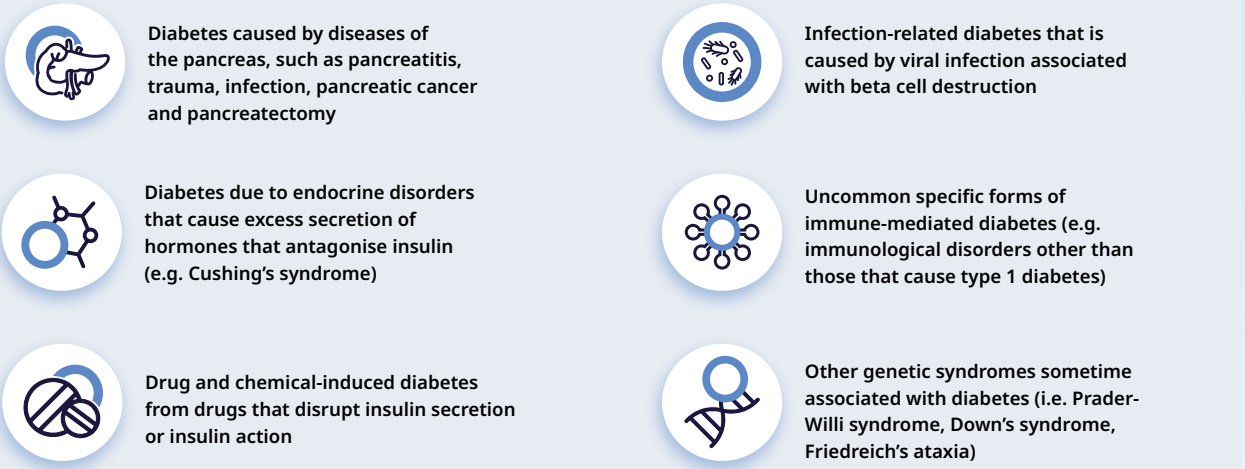
GDM is increasingly seen as a reflection of an underlying metabolic state predisposing to both type 2 diabetes and cardiovascular disease (CVD), although postpartum testing may initially be normal.[56] As a consequence, pregnant women with hyperglycaemia are at higher risk of developing GDM in subsequent pregnancies. In addition, the relative risk of developing type 2 diabetes is particularly high at 3–6 years after GDM and can occur under 40 years of age. The risks remain markedly elevated thereafter.[52] Considering the high risk of early-onset type 2 diabetes and the fact that prior GDM increases the risk of CVD, with or without type 2 diabetes, a lifestyle intervention to reduce risk should be started within three years after the pregnancy to achieve the maximum benefit for the prevention of diabetes.[52,57] Babies born to mothers with GDM also have a higher lifetime risk of obesity and developing type 2 diabetes.[58]

Management of hyperglycaemia in pregnancy

Women with hyperglycaemia detected during pregnancy are at greater risk of adverse pregnancy outcomes. These include high blood pressure (including pre-eclampsia) and a large baby for gestational age (termed 'macrosomia'), which can make a normal birth difficult and hazardous, with the baby more prone to fractures and nerve damage. Identification of hyperglycaemia in pregnancy, combined with optimal management of blood glucose during pregnancy can reduce these risks. Women of childbearing age who are known to have diabetes prior to pregnancy should receive advice before conception, higher dose folic acid treatment, a medication review, intensive diabetes management and a planned approach to pregnancy.

All women who have HIP – be it GDM, previously undiagnosed DIP or existing and known diabetes – require optimal antenatal care and appropriate assistance with postnatal management. Women with hyperglycaemia during pregnancy may be able to control their blood glucose levels through a healthy diet, weight management, moderate exercise and blood glucose monitoring. Interaction with healthcare professionals is important to support self-management and to identify when medical (e.g. prescription of insulin and/or oral medications) or obstetric intervention is needed.

Figure 1.3. Other specific types of diabetes.[59]



1.6 Other types of diabetes

The recently published WHO report on the classification of diabetes[59] lists a number of 'other specific types' of diabetes, including monogenic diabetes and what was once termed 'secondary diabetes'.

Monogenic diabetes, as the name implies, results from a single gene rather than the contribution of multiple genes and environmental factors, as seen in type 1 and type 2 diabetes. Monogenic diabetes is much less common and represents 1.5–2% of all cases, though this may well be an underestimate as it is often misdiagnosed as either type 1 or type 2 diabetes.[60]

These monogenic forms present a broad spectrum, from neonatal diabetes (sometimes called 'monogenic diabetes of infancy'), maturity onset diabetes of the young (MODY) and rare diabetes associated syndromic diseases.[61] Although rare, these can help provide insight into diabetes pathogenesis.[62]

From a clinical perspective, the exact diagnosis of the monogenic forms of diabetes is important because, in some instances, therapy can be tailored to the specific genetic defect.[60] Further distinction between the 14 different sub-types of MODY leads not only to differences in clinical management but different predictions of complication risk. In recent years, with the accumulation of genome-wide association studies, an increasing number of monogenic forms of diabetes are being discovered.[10,61,62] Thus the true prevalence of these types may be underestimated.

Diabetes can also arise as a consequence of other conditions. These other specific types of diabetes are listed below, according to the most recent WHO diabetes classification.[59]

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Key messages:

- 246 data sources from 153 countries were selected to estimate diabetes prevalence for the current IDF Diabetes Atlas.
- Data sources come from countries which comprise over 93% of the global population.
- Other sources, such as registries, have also been included, but only after rigorous scrutiny of their quality, just as for the peer-reviewed publications.
- Future projections have been calculated using the United Nations population predictions and degree of urbanisation. These predictions only take into account changes in the distribution of age, sex and urban/rural residence ratio.

2.1 Interpretation of estimates

Monitoring prevalence, the number of people with diabetes at any one time divided by the total population, is an important indicator of disease impact and is valuable for monitoring the impact of preventive interventions.

In each edition of the IDF Diabetes Atlas, we estimate diabetes prevalence based on the best quality data available at the time of analysis as judged by the international diabetes experts who comprise the IDF Diabetes Atlas Committee.

Depending on study design, sample size, type of measurements performed, definitions, and methods of analysis, these estimates can vary markedly between studies and countries as well as over time. Therefore, changes in the magnitude of prevalence of individual countries from edition to edition and comparisons between countries should be treated with caution. Large differences are usually the result of new studies, which may have been performed several years after those previously available. Additionally, future estimates are based only on projected changes in age, sex, and rural-urban residence as defined by the United Nations (UN).

2.2 Gathering and selecting data sources

The data used for the estimation of diabetes prevalence in this edition of the IDF Diabetes Atlas were obtained from a variety of sources. The vast majority were extracted from peer-reviewed publications and national health surveys. The latter included selected WHO STEPwise approach to NCD risk factor surveillance (WHO STEPS) studies.[1] In total, 59 WHO STEPS were included as data sources, and 18 were excluded, having been recently shown to overestimate diabetes prevalence.[2] Data from other official sources, such as registries and reports from health regulatory bodies, were also used, provided there was sufficient information to assess their quality. Data sources required sufficient methodological details on key areas of interest such as the method of diagnosis and representativeness of the sample to be included. Given the importance of age as a major determinant for diabetes prevalence, only studies with at least three age-specific estimates across their age range were included. Data sources published before 2005 were excluded.

Furthermore, locations with population of less than 50,000 were excluded. As a result, this edition presents data for 215 countries and territories.

In addition to data sources used in the previous 10th edition of the Atlas, new sources were sought. The Atlas systematically reviewed the literature published between September 2020 and March 2024, adding 63 data sources from 31 countries to the existing database (Map 2.1).

As in previous IDF Diabetes Atlas editions, each source was scored to evaluate the quality of available data, using an analytical hierarchy process[3] that considers the criteria mentioned in Figure 2.1. Each criterion's classification possibilities are presented from the highest to the lowest degree of preference in the figure. Preference was thus given to data sources based on the objective measurement of diabetes status (rather than self-reported), with a sample size >5000, nationally representative, conducted in the past five years, and published in peer-reviewed journals or derived from national health surveys.† The final score of a data source is the sum of scores on the five criteria mentioned in Figure 2.1. Among studies meeting this cut off for a given country, the one with the highest score and others with a score within 0.1 of this highest score were included in prevalence calculations.

In total, 241 out of 991 identified data sources (24.3%) were used to generate estimates and projections. The identified data sources received a score above threshold and agreed in consensus with members of the IDF Diabetes Atlas Committee. An additional five studies, with quality below the Atlas threshold, were included by expert consensus for this 11th edition, usually given the alternative of having no study to estimate a given country's prevalence.

† Data sources used in this edition can be found on the IDF Diabetes Atlas website: **diabetesatlas.org**

Map 2.1 Countries and territories with in-country data sources on diabetes.

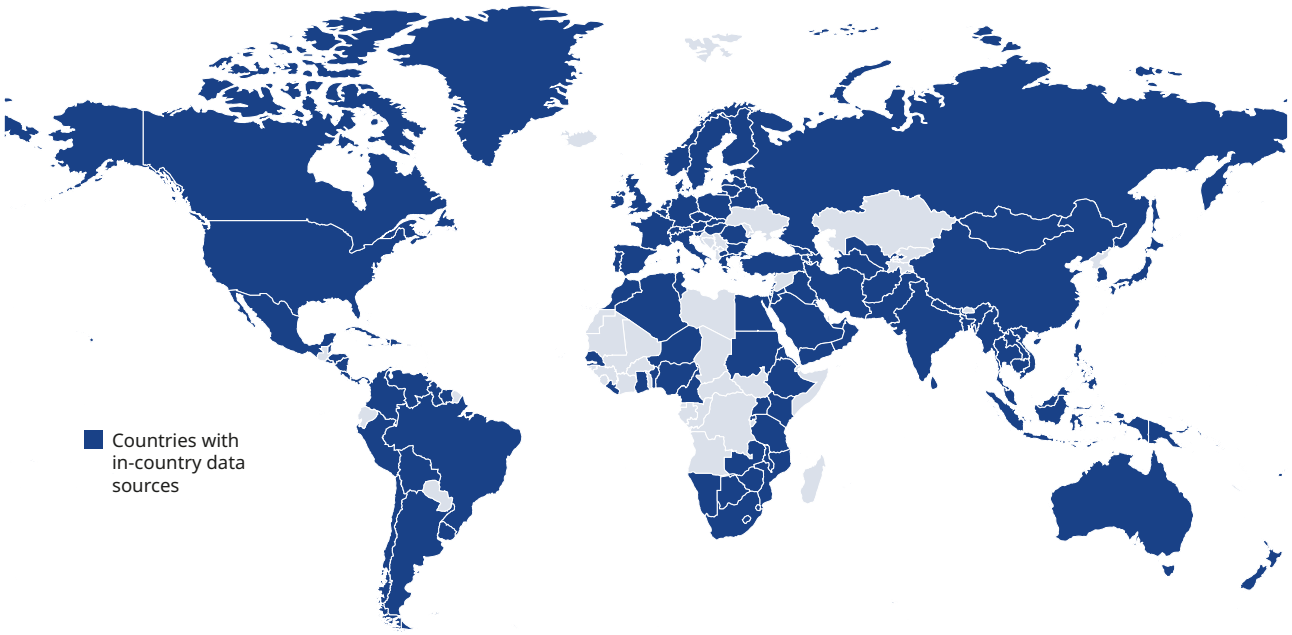


Figure 2.1 Classification of diabetes data sources

Method of diabetes diagnosis

- Oral glucose tolerance test (OGTT)
- Fasting blood glucose (FBG)
- Haemoglobin A1c (HbA1c)
- Self-reported diabetes
- Medical record or clinical diagnosis

Age of the data source
(i.e. time since study conducted)

- Less than 5 years
- 5 to 9 years
- 10 to 19 years
- 20 or more years

Sample size

- Equal to or greater than 5,000 people
- 1,500 to 4,999 people
- 700 to 1,499 people
- Less than 700 people

Type of publication

- Peer-reviewed publication
- National health survey
- Other official report or publication by a health regulatory body
- Unpublished study

Representativeness of study sample

- Nationally representative
- Regionally representative
- Locally representative
- Ethnic (or other) specific group representative

2.3 Estimating diabetes prevalence and projections for the future

Smoothed age- and sex-specific prevalence estimates for each selected data source were produced using a logistic regression model.

If more than one data source was available for an individual country, the country-level diabetes estimates were derived as the average prevalence estimated from the various data sources, each weighted by the analytical hierarchy process quality score. This permitted the higher-quality studies to contribute more to the final country estimate. The details of the logistic regression model have been described in a previous publication,[4].

For each country, age- sex- and urban/rural-specific diabetes estimates were generated. When a study was not nationally representative, the national prevalence was estimated, taking into account the urban/rural ratio of the study in relation to that of the country. The ratio of urban to rural disease prevalence was estimated for studies that did not present results stratified by urban and rural residence in countries. Atlas data from countries judged to be similar and the United Nations Population Division (UNPD)[6] approximation of the country's urban/rural population ratio were used to distribute the results by urban and rural prevalence.

Country prevalence estimates were then aggregated to produce estimates for the seven IDF Regions and for countries in the four World Bank income classification categories.

The UNPD World Population Prospects (2022 Revision) estimates were used to transform prevalence estimates into the number of people with diabetes for each nation. To project diabetes estimates forward to the year 2050, the population projection for 2050 from the UNPD for each country was used. The 2050 diabetes projection assumes that diabetes prevalence does not change for each age group but considers the changes in population age structure and degree of urbanisation.[7] This approach is likely to underestimate future diabetes prevalence as it does not take into account an increasing prevalence of obesity and other risk factors, independent of age and urbanisation, known to result in a higher diabetes incidence.

2.4 Extrapolating data

One-third of countries or territories with more than 50,000 habitants (62 countries out of 215 countries or territories, 29%) do not have in-country data sources on diabetes prevalence that fulfil the IDF Diabetes Atlas inclusion criteria. Under such circumstances, estimates were generated by extrapolation using diabetes prevalence data from countries that are similar in ethnicity,[8] language,[9] World Bank income classification,[10] and geographic location.

Extrapolated estimates are less reliable than estimates based on national data sources and should be interpreted with caution. Countries with extrapolated estimates are designated in the country summary table (Appendices) and Map 2.1. The use of extrapolation emphasises the importance of conducting high-quality studies worldwide that help to address gaps in diabetes prevalence information.

2.5 Estimating confidence intervals

Confidence intervals are provided to indicate the degree of uncertainty around each of the estimates. Heterogenous data sources provide diabetes prevalence estimates that are not harmonized for analysis. Polynomial regression models are thus used to harmonize the data from heterogenous studies. Predicted estimates from models for specific country population subgroups (regarding female or male gender, urban or rural location type and 5-year age groups in the range 20 to 79 years) are weighted and combined (weighted average formula) taking into account the quality of the data sources and also the population size of the analysed subgroups. The predicted estimates are combined in order to derive country-level and regional-level average estimates. The standard error is also computed for each predicted estimate from the models. Error propagation using the weighted variances of the estimates was used to derive the variance of the combined estimates. Correlation between the errors of the estimates was accounted in the error propagation process, in the case of extrapolated countries that were missing data sources and data sources from similar countries were used. Confidence intervals were constructed using the propagated error in the national, regional and global level.[5,11]

2.6 Standardisation of estimates

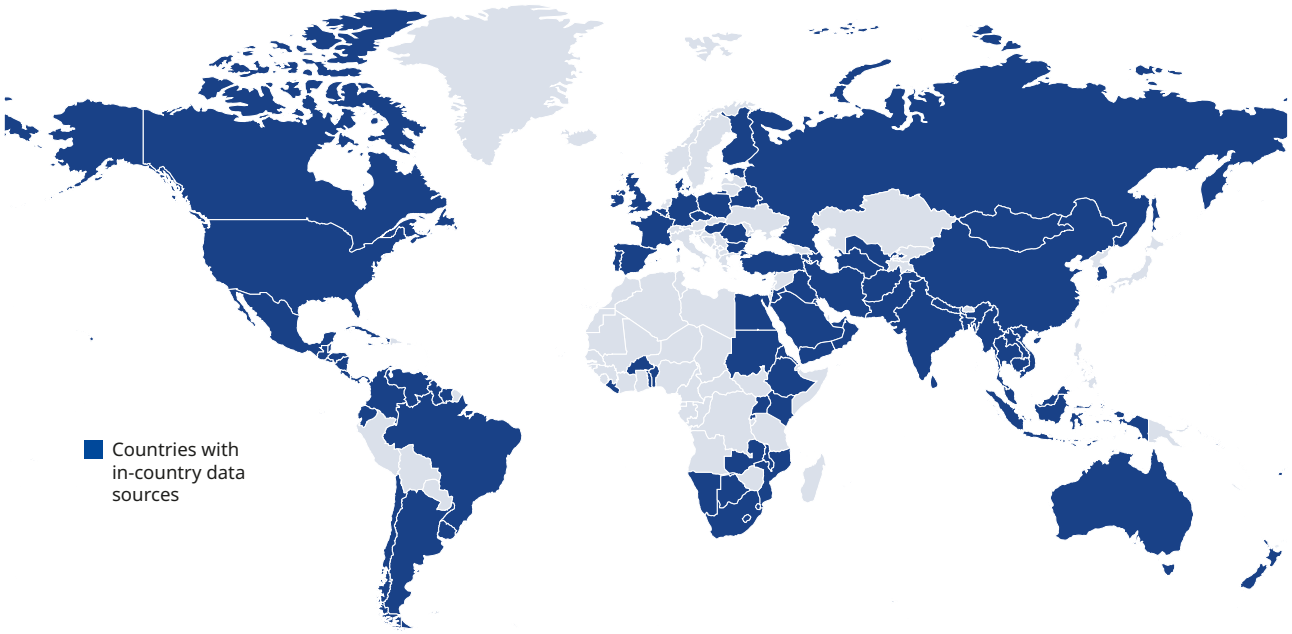
It is important to appreciate that the IDF Diabetes Atlas presents two sets of prevalence estimates for diabetes, impaired glucose tolerance (IGT), and impaired fasting glucose (IFG) for each country in 2024.

The first set is calculated by applying the computed age-, sex- and urbanisation-specific prevalence rates from the literature to the country's 2024 age-, sex- and urban/rural setting distribution as estimated by the UN Population Division, World Population Prospects (2024 Revision).[6,12]

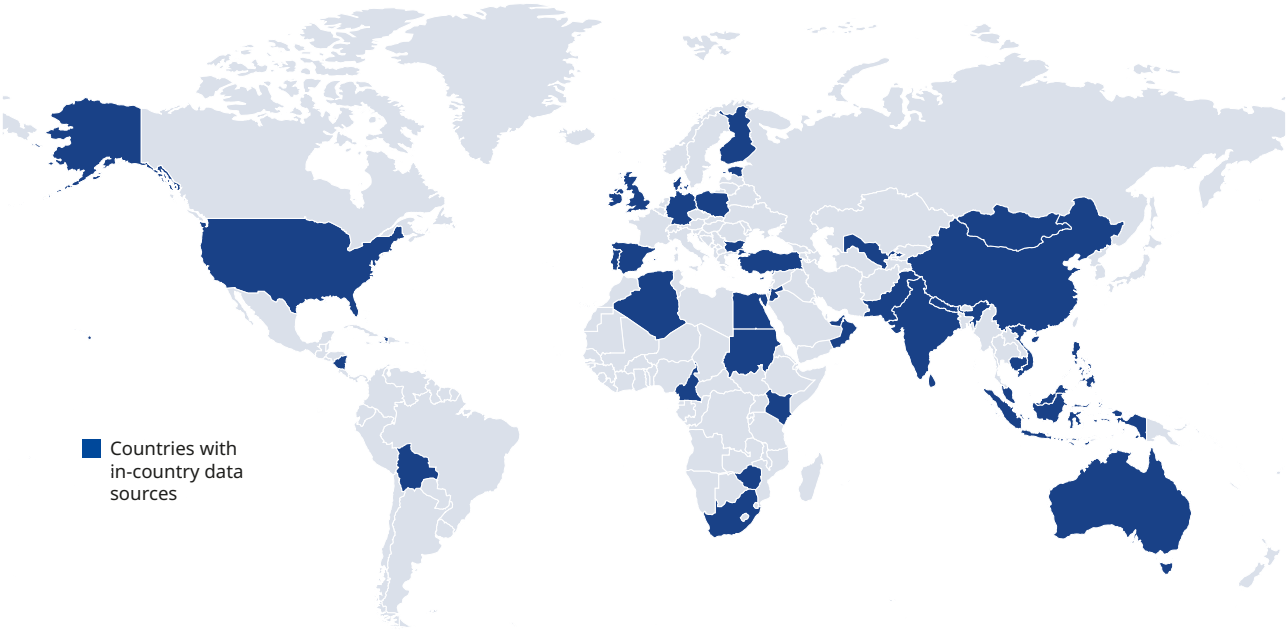
This provides a prevalence estimate per country, as indicated in the table and figure footnotes: 'national prevalence'. However, to permit comparison of diabetes prevalence between countries, additional 'age-standardised' estimates were also calculated.

These were produced by standardising 2024 prevalence estimates from each country to the age structure of the UN Population Division's estimated world population (2022 Revision). They are referred to as age-standardised and indicated with a footnote: 'standardised to world population'. This latter standardisation approach removes the effect of differences in the age structure between countries. The age-standardised diabetes prevalence in 2050 was calculated using the UN projected global age structure for 2050.[6]

Map 2.2 Countries and territories with data sources on the proportion of adults (20–79 years) with previously undiagnosed diabetes.



Map 2.3 Countries and territories with selected data sources on impaired glucose tolerance adults (20–79 years).



2.7 Estimating undiagnosed diabetes prevalence

The early detection of diabetes and initiation of treatment is extremely important in the management of diabetes and prevention of complications. The longer a person has diabetes but remains undiagnosed, the greater the risk of developing complications. People are defined as having undiagnosed diabetes when their blood glucose levels would satisfy the diagnostic criteria for diabetes, but the diagnosis has not been confirmed by a health professional.

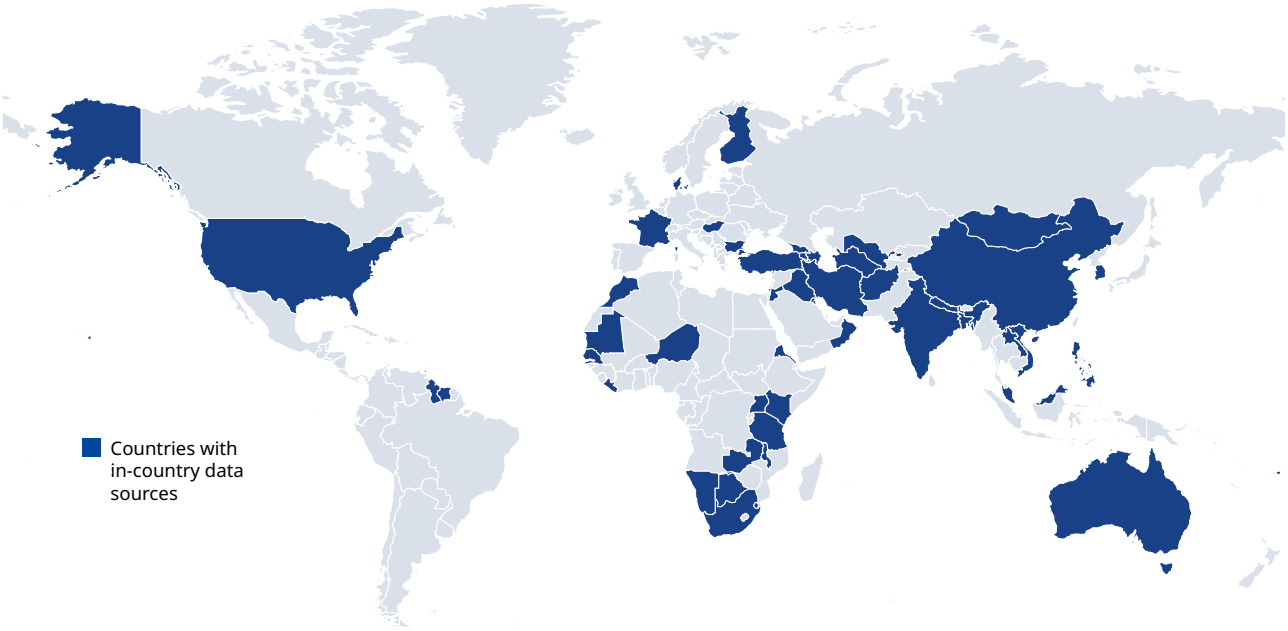
Population-based scientific studies allow us to estimate the prevalence of undiagnosed diabetes worldwide. A sample of the population is surveyed to assess how many people have diabetes by testing blood glucose levels. Additionally, all participants are asked whether they were previously diagnosed with diabetes by a health professional. This helps establish the proportion of people with diabetes-level blood glucose who remain undiagnosed.

The proportion of undiagnosed diabetes may differ greatly across countries, for example, depending on access to healthcare services, disease awareness, and socioeconomic context. In a final step, prevalence estimates and proportions undiagnosed are multiplied with population size numbers to calculate the total number of people with undiagnosed diabetes in a respective country.

It is important to keep in mind that diagnostic tests are based on different biochemical processes and often yield different results.[13] Common diabetes biomarkers, such as fasting plasma glucose (FPG) or haemoglobin A1c (HbA1c), detect different subgroups of people with diabetes and those groups only partially overlap. Studies using different combinations of diabetes biomarkers may thus report different diabetes prevalence estimates. Furthermore, this affects the number of undiagnosed people. That said, the limited availability of data means that reports of this nature must make decisions on which diagnostic methods for diabetes are prioritised.

For this edition of the IDF Diabetes Atlas, we have assembled all published studies reporting undiagnosed diabetes that met defined selection criteria (see Chapter 2, “Gathering and selecting data sources”), regardless of the diabetes biomarker used. The average of the estimates was calculated for countries that reported data on estimates of undiagnosed diabetes. However, in countries without in-country data sources, the undiagnosed proportion was approximated by the average of the estimates from countries with data sources within the same IDF Region (e.g., Europe IDF Region) or IDF Region and World Bank Income Group. Estimates of undiagnosed diabetes were generated using 193 data sources representing 109 countries (Map 2.2).

Map 2.4 Countries and territories with selected data sources on impaired fasting glucose in adults (20–79 years).



2.8 Estimating the prevalence of intermediate states of hyperglycaemia

Data sources for IGT and IFG prevalence were identified and selected according to previously described criteria (See Chapter 1). There were 51 high-quality studies (from 46 countries) for IGT and 63 high-quality studies (from 60 countries) for IFG that satisfied the selection criteria (Map 2.3 and Map 2.4). A logistic regression model was used to estimate smoothed prevalence of IGT and IFG by country. The prevalence estimates for the remaining countries were extrapolated from similar countries (see Chapter 2, "Extrapolating data" and www.diabetesatlas.org under Resources).

New to this edition, we identified studies with national estimates of HbA1c-defined intermediate hyperglycaemia, based on the American Diabetes Association (ADA) criteria (HbA1c 5.7-6.4%). There were 21 countries with published data of HbA1c-defined intermediate hyperglycaemia. As there were fewer countries with published data, we did not extrapolate prevalence estimates for HbA1c-defined intermediate hyperglycaemia in countries that were missing data.

Anita Sabidi, Indonesia - Living with type 1 diabetes

2.9 Estimating the prevalence of hyperglycaemia in pregnancy

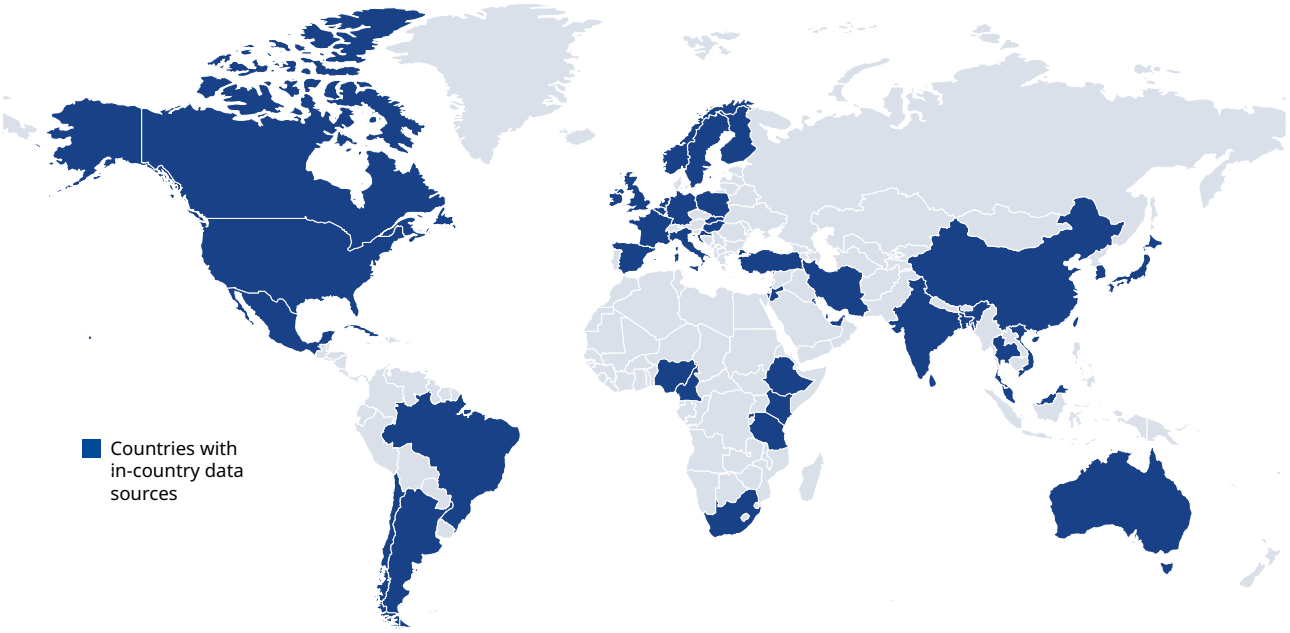
Data sources reporting age-specific prevalence of gestational diabetes (GDM) and diabetes first detected in pregnancy were searched[14] and selected according to the criteria described previously.[15] UN fertility projections[16] and IDF estimates of diabetes were used to calculate the total percentage of live births affected by hyperglycaemia in pregnancy (HIP).

All studies were scored according to the diagnostic criteria used, the year the study was carried out, study design, the representativeness of the sample and the screening approach. Studies which met our predefined threshold were then selected to calculate country-level estimates. For this edition of the IDF Diabetes Atlas, 65 studies from 52 countries were used to estimate country-level, age-specific prevalence of HIP using a generalised linear regression model (Map 2.5). The detailed methods for estimation of prevalence of HIP have been described previously.[15]

It should be noted that the method for selecting data sources was updated in the 9th edition of the IDF Diabetes Atlas. Thus, any comparison of the prevalence estimates from the 9th, 10th and 11th editions with those of previous editions must be viewed with caution. The changes in the selection of data sources include:

- International Association of Diabetes and Pregnancy Study Group (IADPSG) diagnostic criteria have been given more weight in this edition compared to previous editions.
- A new criterion, termed “screening approach”, has been added that includes the following options: universal one step, selective, two or more steps, and selective two or more steps.

Map 2.5 Countries and territories with selected data sources on hyperglycaemia in pregnancy in adults (20–49 years).



2.10 Estimating diabetes-related mortality

The total number of deaths attributable to diabetes by country was calculated by combining information on the number of annual deaths from all-causes stratified by age and sex,[17] age- and sex-specific mortality relative risks separately for people with diagnosed and undiagnosed diabetes compared to those without diabetes, and country-specific diagnosed and undiagnosed diabetes prevalence by age and sex for the year 2024. Relative risks attributable to diabetes are derived from cohort studies comparing death rates in those with diabetes (diagnosed and undiagnosed) and no diabetes.[18–25] This method of estimating diabetes-related mortality (regardless of diagnosis status) is described in more detail elsewhere.[26–28]

2.11 Estimating the economic impact of diabetes

The direct cost estimates in this edition of the IDF Diabetes Atlas were calculated using an attributable fraction method, which relies on the following inputs:

- IDF Diabetes Atlas estimates of diagnosed and undiagnosed diabetes prevalence for each country and for each age and sex sub-group, stratified by rural and urban setting.
- UN population estimates for 2024 and UN population projections for 2050.
- WHO global health expenditures per capita for 2022 (latest available data).
- The ratios of health expenditures for people with diabetes compared to people without diabetes, stratified by age, sex, rural versus urban setting, diagnosed and undiagnosed diabetes, and income per IDF Region.

The WHO definition of health expenditure includes provision of health services (preventive and curative), family planning activities, nutrition activities, and emergency aid designated for health, but does not include provision of water and sanitation services. The definition includes health expenditures from both public and private sources.[29] The same method was used as in the previous editions to distribute the total health expenditure in a given country into expenditure by age and sex.[30]

Another critical component of the analyses is the ratio of health expenditures for people with diabetes (diagnosed or undiagnosed) compared to those without diabetes. Since the publication of the 8th edition of the IDF Diabetes Atlas, these ratios have been refined by the work of Bommer *et al*. (2017),[31] providing estimates for this ratio with much more specificity in relation to age, sex, rural versus urban setting, whether diabetes is diagnosed, region, and income levels of countries.

The diabetes-related health expenditure estimates are presented in US dollars (USD), and in international dollars (ID), as well as a percentage of total health expenditures and of gross domestic product (GDP). IDs account for local purchasing power and facilitate direct cross-country comparisons of health expenditures. Health expenditures for diabetes as a percentage of total health expenditures and of GDP reflect the direct economic burden of diabetes to a national economy.

2.12 Estimating diabetes prevalence for type 1 diabetes across all age groups

The 11th Edition IDF Diabetes Atlas for the type 1 diabetes estimates, uses outputs from Version 3.0 of the T1D Index (t1dindex.org). The Index utilises a Markov Model and machine learning methods to estimate individual country and thereby global T1D numbers.[32] It combines published and available unpublished population-based data on T1D incidence and prevalence, as well as mortality among those with and without T1D, to estimate prevalence, incidence and life expectancy for those with T1D in all countries.

Childhood and adolescent T1D incidence data were sourced from recently published literature,publications cited in all previous editions of the Atlas with study dates from 2000 onwards, and also unpublished registry and study data provided by in-country researchers. In the T1D Index Version 3.0, incidence data were available for 83 countries, and extrapolated for the 119 (of 202) other countries/territories using previously-described Atlas methodology.[33]

Adult incidence data were derived from 30 studies from 21 countries and used to estimate incidence as a function of age, assuming a similar pattern of age of onset across countries. Estimates for countries in Sub-Saharan Africa were produced separately due to the later peak age of onset in that region.[32,34]

Changes in incidence over time were then estimated for the period between 1985 and 2019, using the most representative data for each country, either from local data or extrapolated from regional or global averages. Data from the COVID-19 pandemic years 2020-22 were excluded from the incidence over time model as a number of studies showed marked temporal variation in incidence during this period,[35] and very limited data have been published as yet for 2023 onwards. Incidence was assumed to be constant prior to 1985, unless there were earlier historical data, and assumed to be increasing/decreasing into the future at the same rate as occurred in the final year of available data.

Actual prevalence data for single or multiple years were used when available (26 countries), and otherwise were modelled. Age-standardised mortality over time was modelled using random forest regression of mortality data from 39 countries, as well as infant mortality and under five year mortality rates, percent of population living in cities, doctors per capita, gross domestic product, and the mortality rate associated with the varying levels of T1D care across countries. T1D levels of care and diagnosis rates were estimated from an expert survey. Life expectancy was calculated using standard methods.[32]

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Gulninder Kaur, UK - Living with type 2 diabetes

3

The global picture of diabetes

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Key messages:

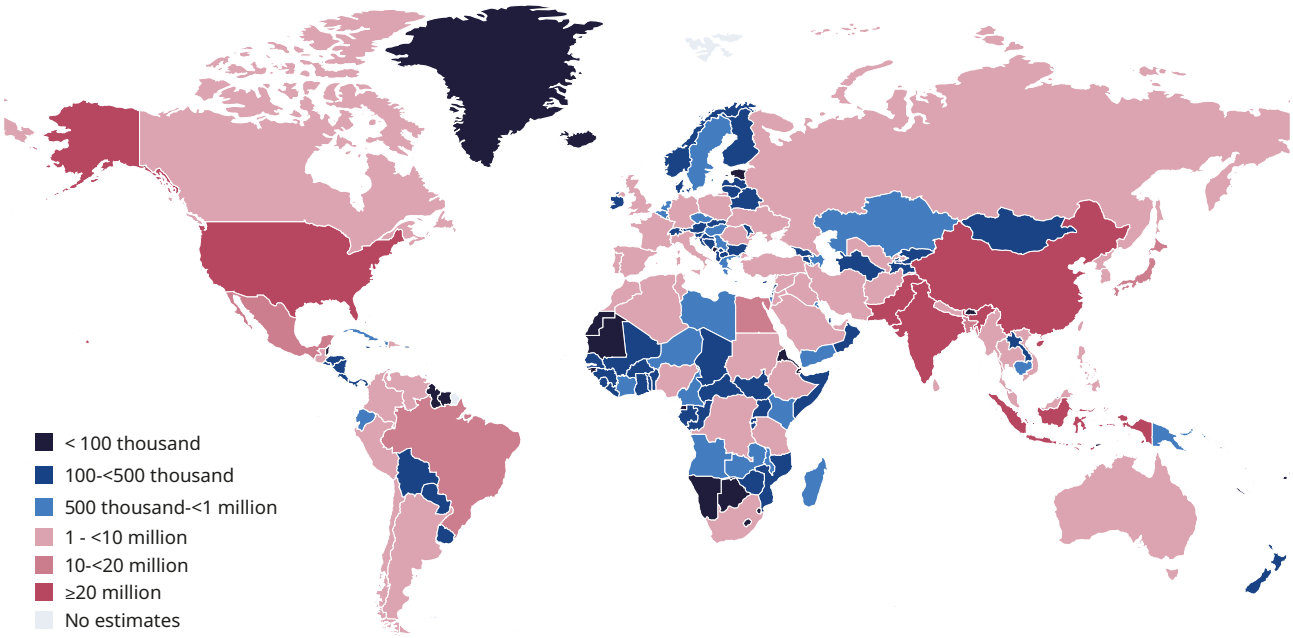
- An estimated 589 million adults aged 20–79 years are living with diabetes. This represents 11.1% of the world's population in this age group.
- The total number of adults living with diabetes is predicted to rise to 853 million (13%) by 2050.
- An estimated 252 million adults living with diabetes are unaware they have the condition.
- One in four adults (158 million) living with diabetes are aged over 65.
- An estimated 635 million adults aged 20–79 years are living with impaired glucose tolerance (12%).
- Over USD 1 trillion was spent on diabetes in 2024. This represents 12% of global health expenditure.
- Over 3.4 million people died as a result of diabetes in 2024. This corresponds to 9.3% of global deaths from all causes.
- An estimated 9.1 million people are living with type 1 diabetes. The majority (69%) are aged 20-59.
- An estimated 1 in 5 live births (23 million) are affected by some form of hyperglycaemia in pregnancy.

This 11th edition of the IDF Diabetes Atlas provides estimates for diabetes in 2024 and projected estimates for 2050. The estimates include diagnosed and undiagnosed diabetes for adults aged 20–79.

Worldwide, a total of 589 million adults aged 20–79 are estimated to have diabetes (11.1% of all adults in this age group). By 2050, the number of adults living with diabetes will rise to a projected 852.5 million.

While the world's population is estimated to grow 25% over the next 25 years, the number of people with diabetes is estimated to increase by 45% (Map 3.1, Table 3.1, Map 3.2).

Map 3.1 Estimated number of adults (20–79 years) with diabetes by country, 2024.



3.1 Diabetes prevalence in 2024 and projection to 2050 (20–79 years)

The estimates in the 11th edition of the IDF Diabetes Atlas are provided for 215 countries and territories, grouped into the seven IDF Regions: Africa (AFR), Europe (EUR), Middle East and North Africa (MENA), North America and Caribbean (NAC), South and Central America (SACA), South-East Asia (SEA) and Western Pacific (WP). In total, 246 data sources from 153 countries and territories were included in the analyses (See Resources www.diabetesatlas.org).[1] Data are presented considering each country´s current age structure and, after adjustment to reflect the prevalence, the age structure of the world population.

Our projection for 2050 predicts a growth of 17% in the prevalence of diabetes due to the ageing of the population and increased urbanisation across the globe. It is estimated that 95% of the increase in the number of people with diabetes by 2050 will occur in low- and middle-income countries, where population growth is expected to be greater than in high-income countries (Table 3.2).

Table 3.1 Global estimates of key aspects of diabetes, intermediate hyperglycaemia, and hyperglycaemia in pregnancy in 2024 and 2050.

At a glance	2024	2050
World Population		
Total	8.1 billion	9.7 billion
Adults (20-79 years)	5.3 billion	6.6 billion
All diabetes (20–79 years)		
Number of people with diabetes	588.7 million	852.5 million
Prevalence[i]	11.1%	13.0%
Number of deaths attributed to diabetes	3.4 million	-
Total health expenditure due to diabetes[ii] (2024 USD)	1.015 trillion	1.043 trillion
Type 1 diabetes		
Number of people with type 1 diabetes (all age groups)	9.2 million	
Number of people with type 1 diabetes (>20 years)	1.8 million	
Intermediate Hyperglycaemia		
Impaired glucose tolerance (20–79 years)		
Number of people	634.8 million	846.5 million
Prevalence[i]	12.0%	12.9%
Impaired fasting glucose (20–79 years)		
Number of people with impaired fasting glucose	487.7 million	647.5 million
Prevalence[i]	9.2%	9.8%
Hyperglycaemia in pregnancy (20–49 years)		
Number of live births affected	23 million	
Proportion of live births affected	19.7%	

i. National prevalence. Updated to reflect the country's current age, sex and urbanisation structure.
ii. Health expenditure for people with diabetes is assumed to be on average two fold higher than people without diabetes

Table 3.2 Number of adults (20–79 years) with diabetes and diabetes prevalence for countries grouped by World Bank income classification, 2024 and 2050.

At a glance	2024			2050		
World Bank income classification	**Diabetes prevalence[i] (%)**	**Age-standardised diabetes prevalence[ii] (%)**	**Number of people with diabetes (millions)**	**Diabetes prevalence[i] (%)**	**Age-standardised diabetes prevalence[ii] (%)**	**Number of people with diabetes (millions)**
World	**11.1**	**11.1**	**588.7**	**13.0**	**13.0**	**852.5**
High-income countries	12.4	10.2	114.1	14.0	12.0	126.5
Middle-income countries	11.3	11.5	452.9	13.7	13.5	674.8
Low-income countries	6.1	7.5	21.8	6.8	8.2	51.2

i. National prevalence
ii. Prevalence is standardised to world population for the respective year

Variation in diabetes prevalence across age, sex and setting

Age is an important risk factor for diabetes. Ageing of the world's population contributes to higher diabetes prevalence that results in an increasing proportion of people with diabetes over the age of 60.

Prevalence was lowest among adults aged 20–24 (1.9% in 2024 and 2.2% in 2050). Conversely, it was highest among adults aged 75–79, with an estimated prevalence of 24.8% in 2024, which is expected to rise to 25.4% by 2050.

The estimated diabetes prevalence is similar in women and men aged 20–79 (10.9% vs 11.3%). In 2024, the IDF estimates that 9.8 million more men than women were living with diabetes (Figure 3.2).

Map 3.2 Estimated age-standardised country prevalence of diabetes in adults (20–79 years), 2024.

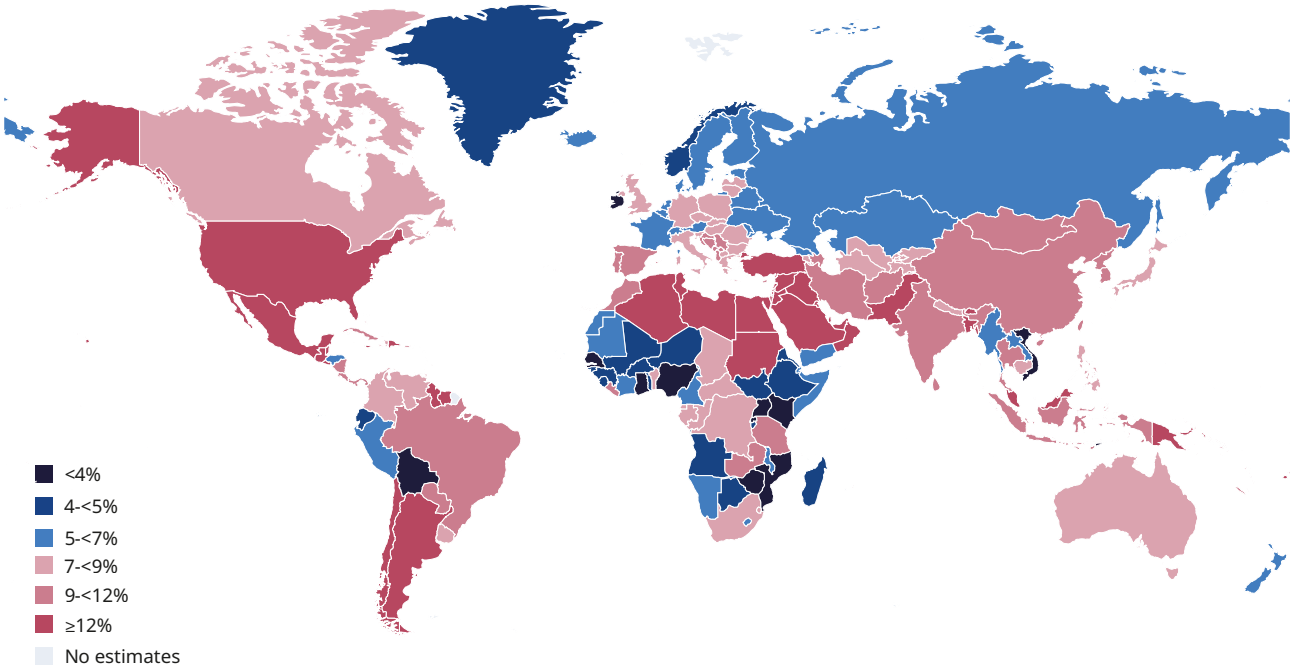


Figure 3.1 Estimated numbers of people with diabetes (top panel) and estimated world-standardised prevalence of diabetes (bottom panel) in adults (20–79 years) by age group in 2024 and 2050.

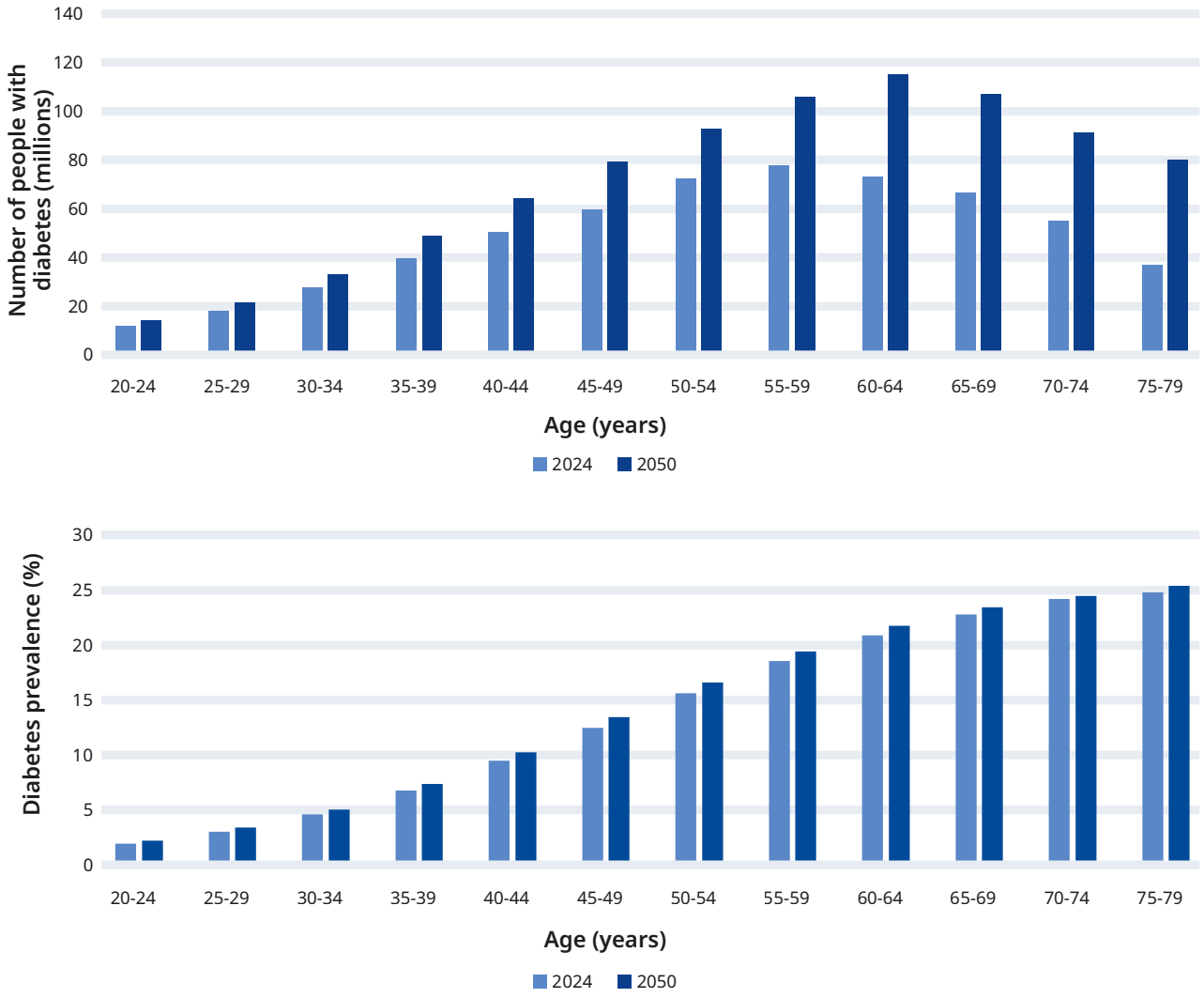
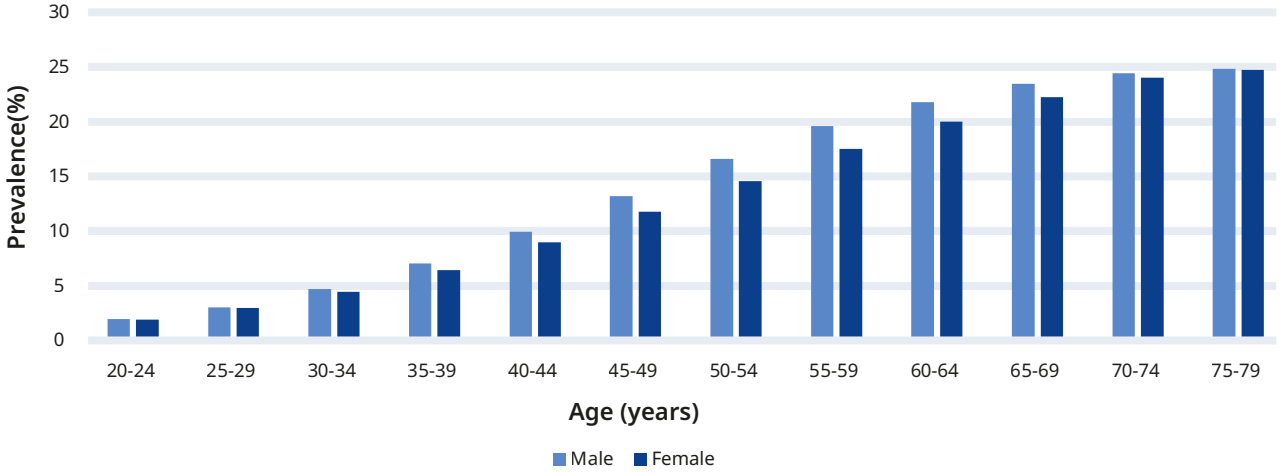
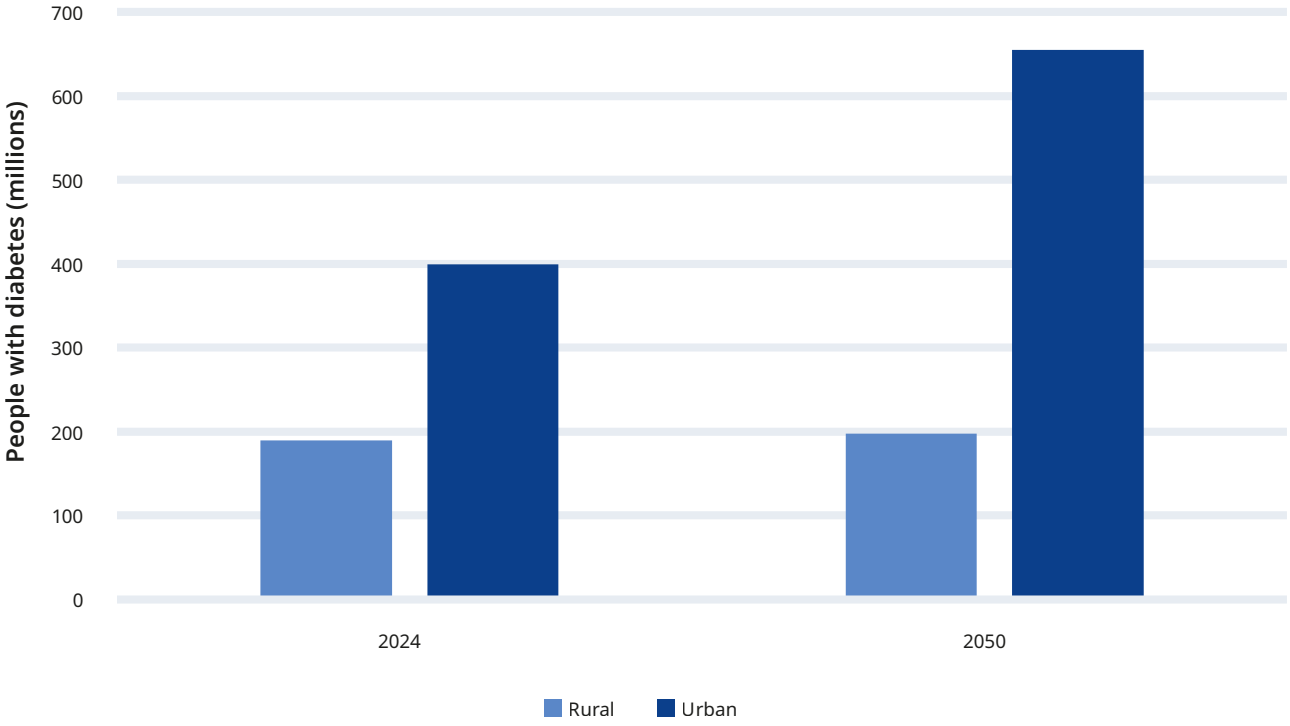


Figure 3.2 Prevalence of diabetes among men and women (20–79 years), 2024.



In 2024, more people with diabetes were living in urban (399.6 million) than rural (189.1 million) areas – the prevalence in urban areas was 12.7% and in rural areas 8.8%. The number of people with diabetes living in urban areas is expected to increase to 654.7 million, while the number in rural areas should remain stable (Figure 3.3). The projected prevalence is expected to reach 14.5% and 9.6% in urban and rural settings, respectively.

Figure 3.3 Number of adults (20–79 years) with diabetes living in urban and rural areas in 2024 and 2050.



Regional distribution

As explained in Chapter 2, age is a major determinant of diabetes risk. Thus, age-standardised diabetes prevalence estimates and projections have been generated to allow comparisons at IDF regional and country levels that remove the effect of different age distributions, using age-standardisation based on United Nations estimates of the age distribution of the world's population, the "world-standard" for each specific year. The MENA Region had the highest age-standardised diabetes prevalence (19.9%) in people aged 20–79 years in 2024. This estimate is expected to increase, with the MENA Region continuing to have the highest age-standardised prevalence in 2050 (22.8%).

The AFR Region currently has the lowest age-standardised estimates of prevalence (5.0% in 2024 and 5.9% in 2050), which can be attributed in part to low levels of urbanisation and low prevalence of overweight and obesity. The increase in percentage points over time is smaller than in other IDF regions (Table 3.3). This is likely to be underestimated given the rapid urbanisation and expected changes in lifestyles and ecosystems in this region.

Country distribution

The countries with the largest numbers of adults with diabetes aged 20–79 years in 2024 are China, India, and the USA. Pakistan is predicted to overtake the USA in the ranking of the estimated number of people with diabetes by 2050 (Table 3.4). Because of differences in population sizes, the countries with the highest number of people with diabetes do not necessarily have the highest prevalence. Differences in age distribution across countries affect rankings of the number of people with diabetes and the world-standardised prevalence estimates.

The highest age-standardised diabetes prevalence rates in 2024 were reported in Pakistan (31.4%), Marshall Islands (25.7%), and Kuwait (25.6%) (Table 3.5). The countries that are expected to have the highest overall age-standardised diabetes prevalence in 2050 are almost the same, with Pakistan reaching 34.2%, Marshall Islands 28.7% and Kiribati 28.5%.

Table 3.3 Number and world-standardised prevalence of diabetes in adults (20–79 years) in the world and in IDF Regions, 2024 and 2050, ranked by the 2024 world-standardised prevalence.

		2024			2050		
Rank	IDF Region	Age-standardised diabetes prevalence (%)	Diabetes prevalence (%)	Number of people with diabetes (millions)	Age-standardised diabetes prevalence (%)	Diabetes prevalence (%)	Number of people with diabetes (millions)
	World	**11.1**	**11.1**	**588.7**	**13.0**	**13.0**	**852.5**
1	MENA	19.9	17.6	84.7	22.8	21.0	162.6
2	NAC	13.8	15.1	56.2	15.3	16.4	68.1
3	WP	11.1	12.4	215.4	12.8	14.7	253.8
4	SEA	10.8	9.7	106.9	13.0	13.2	184.5
5	SACA	10.1	10.0	35.4	11.5	12.3	51.5
6	EUR	8.0	9.8	65.6	9.4	11.0	72.4
7	AFR	5.0	4.2	24.6	5.9	5.0	59.5

IDF: International Diabetes Federation; AFR: Africa; EUR: Europe; MENA: Middle East and North Africa; NAC: North America and Caribbean; SACA: South and Central America; SEA: South-East Asia; WP: Western Pacific

Table 3.4 Top 10 countries or territories by number of adults (20–79 years) with diabetes in 2024 and 2050.

2024			2050		
Rank	Country or territory	Number of people with diabetes (millions)	Rank	Country or territory	Number of people with diabetes (millions)
1	China	148.0	1	China	168.3
2	India	89.8	2	India	156.7
3	United States of America	38.5	3	Pakistan	70.2
4	Pakistan	34.5	4	United States of America	43.0
5	Indonesia	20.4	5	Indonesia	28.6
6	Brazil	16.6	6	Egypt	24.7
7	Bangladesh	13.9	7	Brazil	24.0
8	Mexico	13.6	8	Bangladesh	23.1
9	Egypt	13.2	9	Mexico	19.9
10	Japan	10.8	10	Turkey	14.1

Table 3.5 Top 10 countries or territories with age-standardised diabetes prevalence in adults (20–79 years) in 2024 and 2050.

2024			2050		
Rank	Country or territory	Age-standardised diabetes prevalence (%)	Rank	Country or territory	Age-standardised diabetes prevalence (%)
1	Pakistan	31.4	1	Pakistan	34.2
2	Marshall Islands	25.7	2	Marshall Islands	28.7
3	Kuwait	25.6	3	Kiribati	28.5
4	Samoa	25.4	4	Kuwait	28.2
5	Qatari	24.6	5	Samoa	27.2
6	Kiribati	24.6	6	Qatar[i]	27.0
7	Saudi Arabia	23.1	7	Egypt	25.7
8	French Polynesia	22.8	8	Saudi Arabia	25.4
9	Egypt	22.4	9	Bahrain	25.3
10	Bahrain	22.1	10	French Polynesia	23.9

i. Countries without in-country data sources. Estimates are extrapolated.

Table 3.6 Global diabetes estimates in people (65-99 years) in 2024 and 2050.

	2024	2050
Adult population (65-99 years)	667.8 million	1.1 billion
Prevalence (65-99 years)	23.7%	24.3%
Number of people over 65 with diabetes (65–99 years)	158.3 million	278 million

3.2 Diabetes prevalence in older adults in 2024 and projection to 2050

Diabetes prevalence increases with age. Therefore, the highest estimated prevalence is in people over 65 (Figure 3.1). In 2024, the estimated number of people with diabetes aged 65–99 years was 158.3 million (23.7%). If the current trend continues, the number of people aged 65-99 years with diabetes will be 278 million in 2050 (Table 3.6). These data point to a significant increase in the diabetes population of ageing societies in the next 25 years and the inevitable public health and economic challenges this will bring. It will require all countries to commit to sufficient resources to tackle diabetes.

Regional distribution

There are significant regional differences in the prevalence of diabetes in people over 65. Regions included in the top five places remained the same in 2024 compared with 2019, but the MENA region had the highest prevalence at (32.3%). The lowest prevalence remains in the AFR region (7.8%). This is generally true for 2050 as well (Table 3.7). However, the EUR region will fall to 6th place in the table with the SEA region taking its place. Overall, the projected diabetes prevalence in 2050 in this age group does not forecast significant increases. As an example, in the SACA Region the figures are 23.2% in 2024 and 23.6% in 2050, and in AFR 7.8% in 2024 and 8.3% in 2050.

Country distribution

The countries with the highest number of people over 65 with diabetes are China, India and the USA. India ranked higher than the USA in the number of people over 65 with diabetes for 2024 and 2050. (Map 3.3 and Table 3.8). Projected rises by 2050 are shown and indicate that Germany and the Russian Federation will be replaced by Turkey and Egypt in the top 10 list of countries with for people over 65 with diabetes.

Type 1 diabetes in older adults

For this edition of the IDF Diabetes Atlas, we were able to report some additional data on type 1 diabetes in people over 60. The global number of type 1 diabetes in adults is estimated to be 9.15 million, of which 1.1 million are over 60, with a breakdown by age 655,000 (60-69), 325,000 (70-79), and 81,000 (80 and above).

Mortality and health expenditure in older adults

Total global mortality for people with diabetes over 60 is 2.2 million, and 9.2% of all-cause mortality deaths were due to diabetes in this age group. In 2024, 63% of deaths due to diabetes were in people over 60, and total health expenditure for people with diabetes over 60 is a staggering USD501.9 billion.

Table 3.7 Diabetes age-standardised prevalence in people (65-99 years) by IDF Region in 2024 and 2050.

	2024			2050		
Rank	IDF Region	Age-standardised diabetes prevalence (%)	Number of people with diabetes (millions)	IDF Region	Age-standardised diabetes prevalence (%)	Number of people with diabetes (millions)
1	MENA	32.3	11.8	MENA	33.7	33.4
2	NAC	28.7	18.3	NAC	29.0	24.3
3	WP	25.3	67.0	WP	25.9	106.7
4	SACA	23.2	9.9	SACA	23.6	19.3
5	EUR	21.6	27.1	SEA	22.9	52.1
6	SEA	21.0	21.8	EUR	22.3	35.1
7	AFR	7.8	2.5	AFR	8.2	7.2

IDF: International Diabetes Federation; AFR: Africa; EUR: Europe; MENA: Middle East and North Africa; NAC: North America and Caribbean; SACA: South and Central America; SEA: South-East Asia; WP: Western Pacific

Map 3.3 Number of people over 65 with diabetes in 2024.

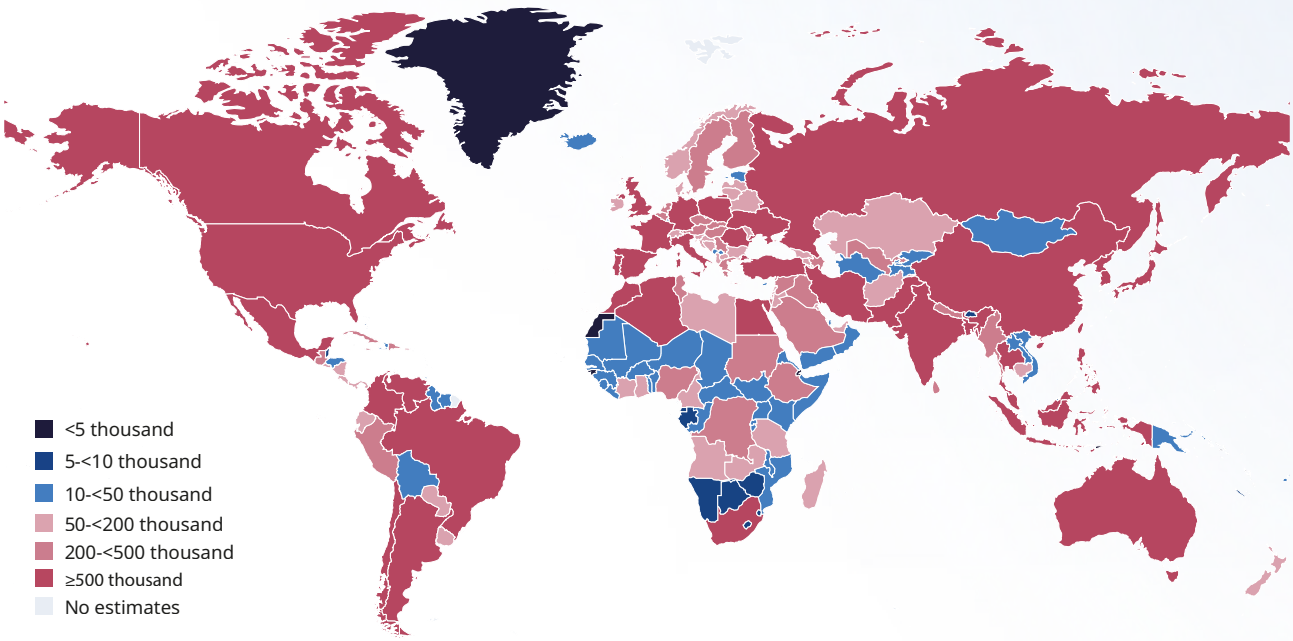


Table 3.8 Top 10 countries or territories by number of adults (65-99 years) with diabetes in 2024 and 2050.

2024			2050		
Rank	Country or territory	Number of people with diabetes (millions)	Rank	Country or territory	Number of people with diabetes (millions)
1	China	47.9	1	China	76.6
2	India	19.3	2	India	45.8
3	United States of America	14.1	3	United States of America	16.4
4	Japan	5.8	4	Brazil	10.6
5	Brazil	5.2	5	Pakistan	9.6
6	Pakistan	4.2	6	Indonesia	7.8
7	Indonesia	3.4	7	Mexico	5.9
8	Russian Federation	3.2	8	Japan	5.6
9	Germany	3.0	9	Turkey	5.5
10	Mexico	2.7	10	Egypt	5.4

Table 3.9 Adults (20–79 years) with undiagnosed diabetes by World Bank income classification in 2024.

World Bank income classification	Proportion undiagnosed (%)	Number of people with undiagnosed diabetes (millions)
High-income countries	28.9	32.9
Middle-income countries	45.5	206.0
Low-income countries	58.7	12.8

3.3 Undiagnosed diabetes

Estimates of undiagnosed diabetes were generated using 193 data sources from 109 countries. For the remaining 106 countries, which either lacked data sources or data sources did not meet the quality criteria for inclusion, the prevalence of undiagnosed diabetes was extrapolated (see Chapter 2).

In 2024, just over four in ten (42.8%; 251.7 million) adults living with diabetes (20–79 years old) were undiagnosed. High prevalence of undiagnosed diabetes is often the result of insufficient access to healthcare services, as well as a limited capacity of health systems to identify diabetes cases.[2]

Early diagnosis and the timely initiation of treatment are crucial for individuals with diabetes to prevent or delay complications, avoid premature death, and improve quality of life.[3] Furthermore, the early detection and management of diabetes can help avoid substantial costs related to diabetes complications.[4] Scaling-up cost-effective diabetes screening and diagnostic capacity is a crucial first step towards improving care for people with diabetes.

Global and regional disparities in undiagnosed diabetes

Across low-income, middle-income, and high-income countries, 58.7%, 45.5%, and 28.9% of adults living with diabetes are undiagnosed (Table 3.9). Globally, 86.9% of all people with undiagnosed diabetes live in low- and middle-income countries, home to four-fifths of the world's population.[5]

There are large differences in the proportion of undiagnosed diabetes across IDF regions. The highest proportion of undiagnosed diabetes is found in Africa (72.6%), followed by the Western Pacific (50.0%), and South-East Asia (42.7%) (Table 3.10). The lowest proportion of undiagnosed diabetes is found in North America and Caribbean (29.1%). Variation in undiagnosed diabetes across regions and countries is often linked to several factors, including social and economic conditions, health system performance, and awareness about diabetes among health professionals and the public.

The proportion of people living with undiagnosed diabetes varies by country (Map 3.4). Colombia (16.2%), Hungary (16.7%), and the Czech Republic (16.7%) have the lowest proportions of undiagnosed diabetes, whereas Burkina Faso (90.4%), Benin (89.8%), and Mozambique (88.6%) have the highest. In absolute terms, 50.5% of all people with undiagnosed diabetes globally live in just three countries, namely China, India, and Indonesia (Table 3.11). These three countries are among the four most populous countries in the world and among the top five countries in terms of number of people with diabetes (Table 3.4).

Overall, around half of all countries and territories included in this edition of the IDF Diabetes Atlas lack reliable in-country data sources (see Chapter 2: Methods). To improve estimates of undiagnosed diabetes and guide health-system responses, investments in surveillance and monitoring systems for diabetes are urgently needed. Crucially, data quality depends on the collection of diabetes biomarkers in population-based studies. For reliable estimates, a combination of both HbA1c and FPG is recommended.[6] However, diabetes monitoring efforts, particularly in low-resource settings, will need to balance diagnostic accuracy of different diabetes tests with their feasibility and the cost of implementation.

Globally, more than four in ten adults with diabetes in 2024 were unaware that they have the condition. This translates to 252 million people living with undiagnosed – and therefore untreated – diabetes, placing them at increased risk of complications and premature death. Thus, there is a clear need to scale up screening programmes and high-quality, person-centred health services, especially in low- and middle-income countries, where over 85% of people with undiagnosed diabetes live.

Table 3.10 Adults (20–79 years) with undiagnosed diabetes in IDF Regions in 2024, sorted by proportion undiagnosed from highest to lowest.

IDF Region	Proportion undiagnosed (%)	Number of people with undiagnosed diabetes (millions)
World	**42.8**	**251.7**
AFR	72.6	17.9
WP	50.0	107.6
SEA	42.7	45.6
MENA	37.2	31.5
EUR	33.6	22.0
SACA	30.4	10.7
NAC	29.1	16.3

IDF: International Diabetes Federation; AFR: Africa; EUR: Europe; MENA: Middle East and North Africa; NAC: North America and Caribbean; SACA: South and Central America; SEA: South-East Asia; WP: Western Pacific

Map 3.4 Proportion of adults (20–79 years) with undiagnosed diabetes by country in 2024.

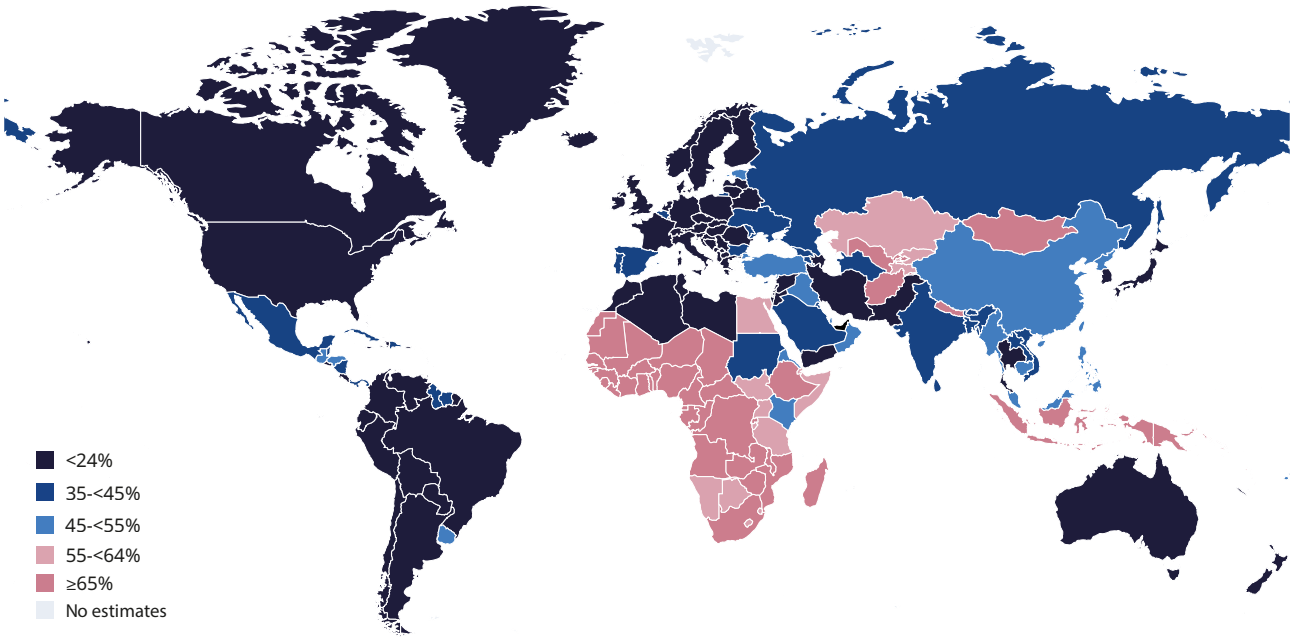


Table 3.11 Top 10 countries with the largest number of adults (20–79 years) with undiagnosed diabetes in 2024.

Rank	Country	Proportion undiagnosed (%)	Number of people with undiagnosed diabetes (millions)
1	China	49.7	73.5
2	India	43.0	38.6
3	Indonesia	73.2	15.0
4	United States of America	24.8	9.6
5	Pakistan	26.9	9.3
6	Egypt	62.0	8.2
7	Mexico	41.3	5.6
8	Bangladesh	39.1	5.4
9	Brazil	31.9	5.3
10	Turkey	45.5	4.4

3.4 Intermediate states of hyperglycaemia

Prevalence of impaired glucose tolerance

In 2024, 634.8 million adults or 12.0% of adults worldwide were estimated to have impaired glucose tolerance (IGT). The age-standardised prevalence of IGT in 2024 was highest in the South-East Asia region and lowest in Europe (Table 3.12). The age-standardised prevalence of IGT was 10.4% for high-income countries, 12.3% for middle-income countries, and 11.6% for low-income countries (Table 3.13). By 2050, an estimated 846.5 million adults or 12.9% of the global adult population are projected to have IGT

Prevalence of impaired fasting glucose

In 2024, an estimated 487.7 million adults or 9.2% of the global adult population were estimated to have impaired fasting glucose (IFG). The age-standardised prevalence of IFG in 2024 was highest in North America and Caribbean regions and lowest in Europe (Table 3.14). The age-standardised prevalence of IFG was 8.4% for high-income countries, 9.5% for middle-income countries, and 6.7% for low-income countries (Table 3.15). By 2050, an estimated 647.5 million adults or 9.8% of the global adult population are projected to have IFG.

Table 3.12 Age-standardised prevalence of impaired glucose tolerance (20–79 years) by IDF regions, ranked by 2024 prevalence (%).

		2024		2050	
Rank	IDF Region	Age-standardised IGT prevalence (%)	Number of people with IGT (millions)	Age-standardised IGT prevalence (%)	Number of people with IGT (millions)
1	SEA	13.8	145.7	14.6	204.9
2	WP	13.5	251.3	14.3	267.8
3	NAC	11.6	46.6	12.6	55.3
4	AFR	11.5	56.8	13.7	135.1
5	SACA	11.0	38.7	11.9	51.9
6	MENA	11.0	49.7	11.6	85.3
7	EUR	5.9	45.9	6.2	46.2

IDF: International Diabetes Federation; AFR: Africa; EUR: Europe; MENA: Middle East and North Africa; NAC: North America and Caribbean; SACA: South and Central America; SEA: South-East Asia; WP: Western Pacific

Prevalence of HbA1c-based intermediate hyperglycaemia

The reported prevalence of intermediate hyperglycaemia based on the ADA HbA1c criteria (see Chapter 1: What is diabetes?) ranged from 5.5% in Ireland to 40.5% in Nigeria (Figure 3.4).

Summary

The global prevalence of intermediate hyperglycaemia is substantial, although there is no consensus definition for intermediate states of hyperglycaemia or “prediabetes”. However, regardless of definition, intermediate states of hyperglycaemia are common and important risk factors for the development of type 2 diabetes, suggesting major challenges for future risk of diabetes across the globe.

Table 3.13 Age-standardised prevalence of impaired glucose tolerance in adults (20–79 years), by World Bank income group classification.

		Impaired Glucose Tolerance			
		2024		2050	
World Bank income classification	N countries	Age-standardised IGT prevalence (%)	Number of people with IGT (millions)	Age-standardised IGT prevalence (%)	Number of people with IGT (millions)
High-income countries	84	10.4	108.6	11.3	112.7
Middle-income countries	113	12.3	491.3	13.1	648.9
Low-income countries	29	11.6	34.8	13.9	84.9

IGT: Impaired glucose tolerance

Table 3.14 Comparative prevalence of impaired fasting glucose in adults (20–79 years), by IDF regions, ranked by 2024 prevalence (%).

		2024		2050	
Rank	IDF Region	Age-standardised IFG prevalence (%)	Number of people with IFG (millions)	Age-standardised IFG prevalence (%)	Number of people with IFG (millions)
1	NAC	13.6	53.0	14.3	61.6
2	SEA	12.2	129.4	12.8	180.9
3	SACA	9.2	32.2	10.0	43.2
4	WP	8.6	159.5	9.2	171.1
5	MENA	8.0	36.2	8.4	62.2
6	AFR	6.6	37.6	7.4	88.1
7	EUR	5.3	39.7	5.7	40.4

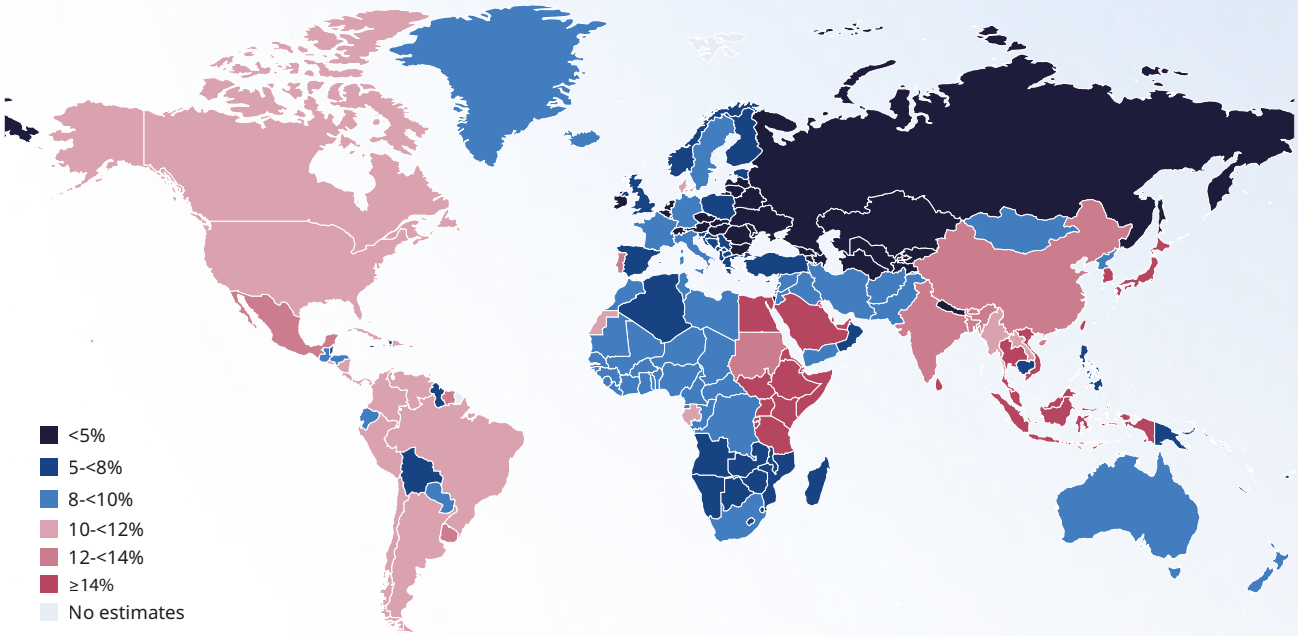
IFG: Impaired fasting glucose; IDF: International Diabetes Federation; AFR: Africa; EUR: Europe; MENA: Middle East and North Africa; NAC: North America and Caribbean; SACA: South and Central America; SEA: South-East Asia; WP: Western Pacific

Table 3.15 Age-standardised prevalence of impaired fasting glucose in adults (20–79 years), by World Bank income classification.

		Impaired Fasting Glucose			
		2024		2050	
World Bank income classification	N countries	Age-standardised IFG prevalence (%)	Number of people with IFG (millions)	Age-standardised IFG prevalence (%)	Number of people with IFG (millions)
High-income countries	84	8.4	83.9	9.2	88.4
Middle-income countries	113	9.5	381.3	10.2	507.4
Low-income countries	29	6.7	22.5	7.2	51.7

IFG: Impaired fasting glucose

Map 3.5 Age-standardised prevalence of impaired glucose tolerance in adults in 2024.



Map 3.6 Age-standardised prevalence of impaired fasting glucose in adults in 2024.

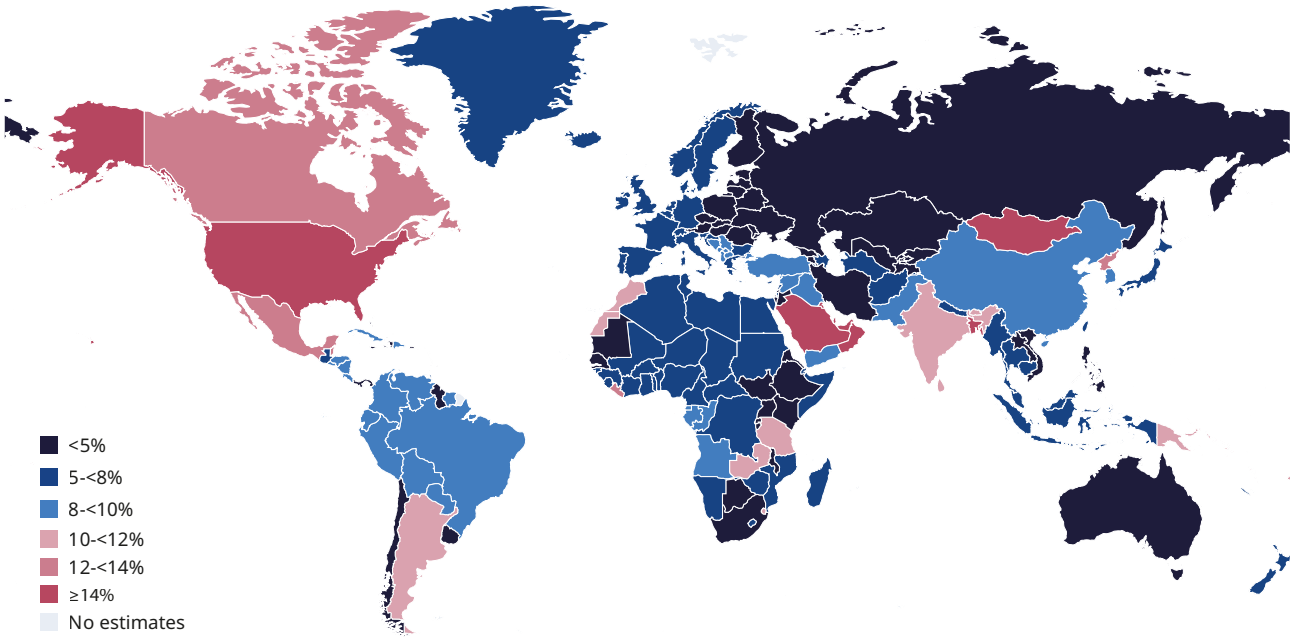
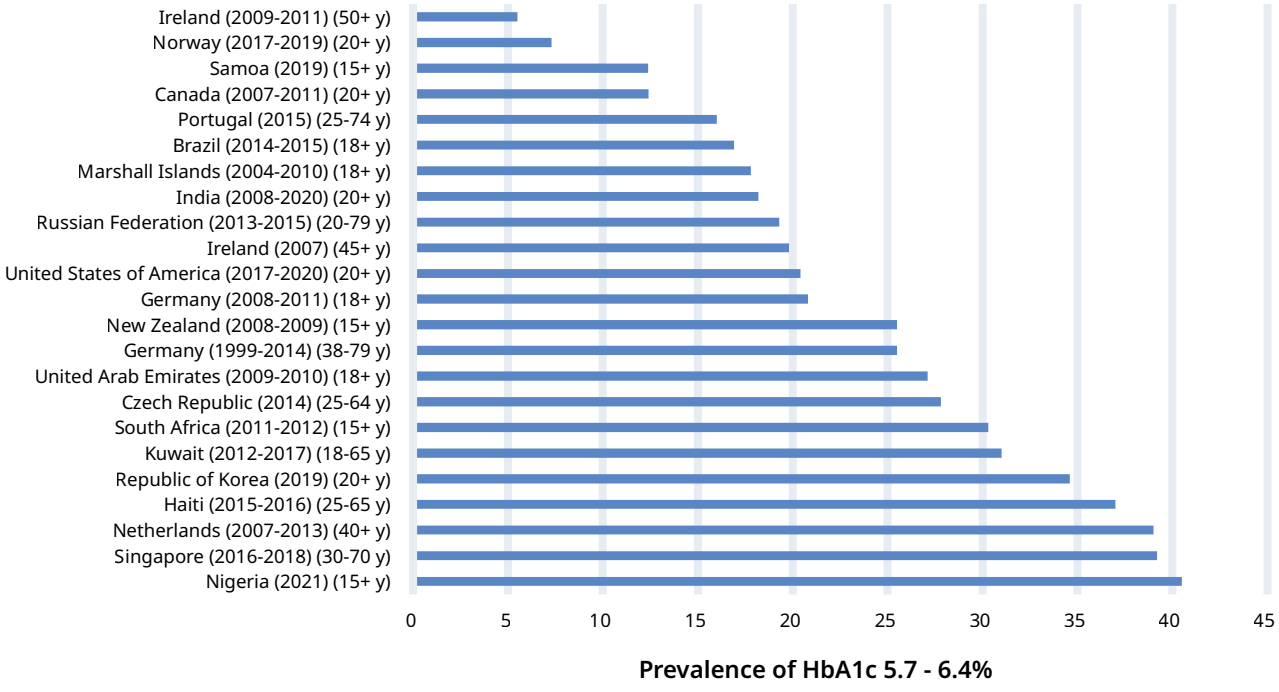


Figure 3.4 Reported prevalence of HbA1c between 5.7 to 6.4%. Label includes the country, study year, and age range of the study participants.



3.5 Hyperglycaemia in pregnancy

It is estimated that 23.0 million (19.7%) of live births to women in 2024 had some form of hyperglycaemia in pregnancy. Of these, 79.2% were due to gestational diabetes (GDM), while 11% were the result of diabetes detected prior to pregnancy, and 9.9% due to diabetes (including type 1 and type 2) first detected in pregnancy (Table 3.16).

Differences in these results compared to previous editions of the IDF Diabetes Atlas are possibly due to improved detection before and during pregnancy. More information on the methods can be found in Chapter 2.

There are some regional differences in the prevalence of HIP, with the SEA Region having the highest age-standardised prevalence at 31.7%, compared to 13.8% in the AFR Region (Table 3.17). The vast majority (89.5%) of cases of hyperglycaemia in pregnancy are seen in low and middle-income countries, where access to antenatal care is limited.

The prevalence of HIP as a proportion of all pregnancies increases rapidly with age, with the highest prevalence, almost half (49.2%), in women aged 45–49 years, although there are fewer pregnancies in this age group (Figure 3.5). This age group has a higher prevalence of diabetes among non-pregnant women. As a result of higher fertility rates in younger women, almost half (43.5%) of all cases of HIP (10.2 million) occur in women under the age of 30.

Table 3.16 Global estimates of hyperglycaemia in pregnancy in 2024.

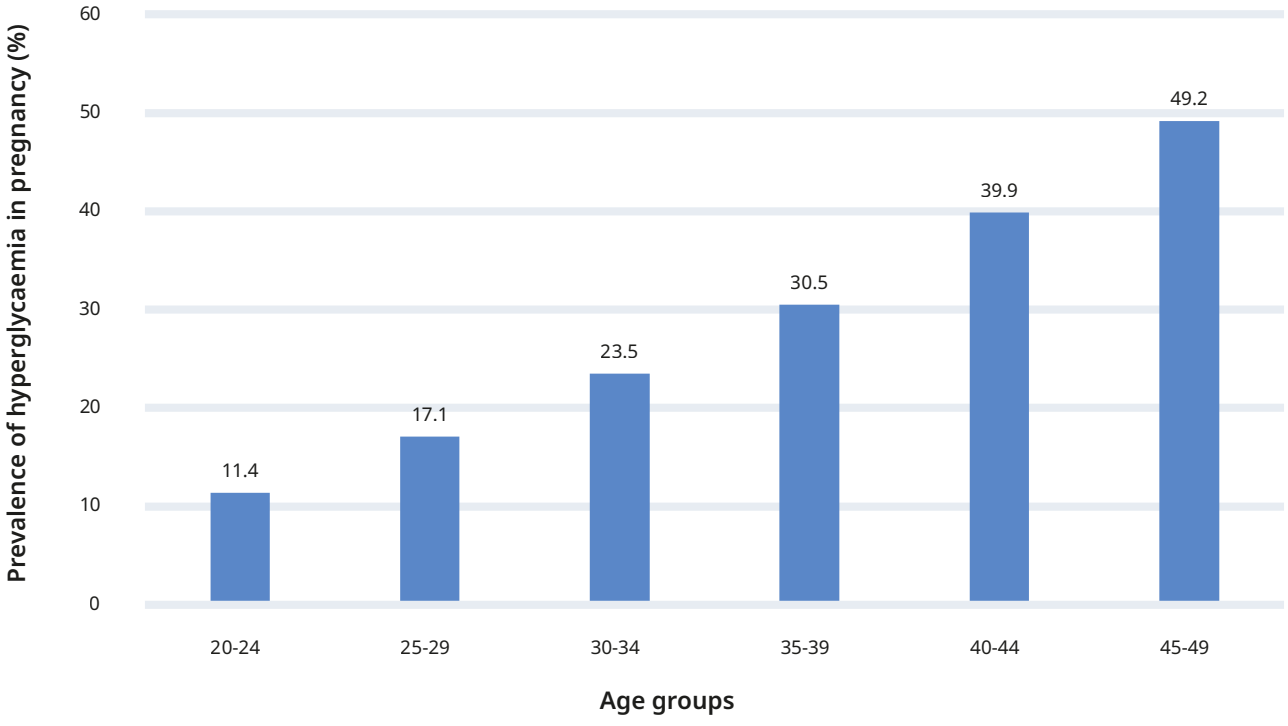
Global live births in women aged 20-49 years	118.5 million
Global prevalence of HIP	19.7%
Number of live births affected in millions	23.0 million
Proportion of cases due to GDM	79.2%
Proportion of cases due to other types of diabetes first detected in pregnancy	9.9%
Proportion of cases due to diabetes detected prior to pregnancy	11.0%

Table 3.17 Hyperglycaemia in pregnancy (20–49 years) by IDF Region, ranked by 2024 age-standardised prevalence estimates.

IDF Region	Age-standardised prevalence (%)	Prevalence (%)	Number of live births affected in millions
World	**19.7**	**19.7**	**23.0**
SEA	31.7	27.8	7.1
NAC	22.4	23.6	1.4
WP	19.8	20.8	4.2
MENA	19.4	19.7	3.6
SACA	15.8	16.0	1.0
EUR	14.2	15.9	1.5
AFR	13.8	13.9	4.7

IDF: International Diabetes Federation; AFR: Africa; EUR: Europe; MENA: Middle East and North Africa; NAC: North America and Caribbean; SACA: South and Central America; SEA: South-East Asia; WP: Western Pacific

Figure 3.5 Prevalence of hyperglycaemia in pregnancy by age-group in 2024.



3.6 Diabetes-related mortality

Diabetes is a significant cause of mortality worldwide, though its impact varies by region due to differences in the prevalence of diabetes, age distribution and the role of other contributing causes of death. Approximately 3.4 million adults aged 20-79 years are estimated to have died because of diabetes or its complications in 2024 (2.4 million diagnosed diabetes-related deaths and 1 million undiagnosed diabetes-related deaths). This corresponds to 9.3% of global deaths from all causes in this age group. Almost 40% of the estimated number of deaths related to diabetes occurred in the most economically active age group (20-59 years) (Figure 3.6). Diabetes led to nearly one in ten (9.3%) of all deaths in this age group.

The 2024 estimates for the number of deaths related to diabetes are lower than in prior editions of Diabetes Atlas due to multiple changes in methodology. The original source data for overall country-level mortality data was switched from an older WHO source to an updated United Nations source. The updated United Nations source has lower overall mortality numbers. In addition, the new estimates now account for mortality risk differences between diagnosed and undiagnosed diabetes. Relative risks of mortality compared to people without diabetes are generally lower in individuals with undiagnosed vs diagnosed diabetes.

Regional distribution

The IDF Western Pacific Region has the highest estimated number of diabetes-related deaths among adults aged 20-79 years of all the IDF Regions, with approximately 1.2 million deaths. This is followed by NAC, with approximately 0.53 million deaths. The IDF Regions with the lowest number of deaths are AFR and SACA, with approximately 0.22 million deaths each. These regional discrepancies are largely driven by the relative size of their respective populations with diabetes and their age distribution.

The proportion of total deaths associated with diabetes is an indicator of the relative mortality burden of diabetes within each IDF Region. Diabetes is associated with the highest percentage of deaths from all causes in NAC at 21.4% (Map 3.7). The second highest region is MENA, with 16.7% of all deaths associated with diabetes. The IDF Region with the lowest percentage of deaths associated with diabetes is AFR, at 4.0%.

Country distribution

Partly due to its large population, China has the highest estimated number of deaths from diabetes, at approximately 0.76 million. Due to its large population and high prevalence of diabetes, the USA has the second highest number of deaths with 0.36 million. The next highest is India (0.33 million), followed by Pakistan (0.23 million), Indonesia (0.13 million) and Mexico (0.12 million).

The countries with the highest proportion of total deaths associated with diabetes are Guam (36%), New Caledonia (34%), French Polynesia (31%), Israel (30%), and Italy (29%). The countries with the lowest proportions are Russia (0.42%), followed by Zimbabwe and Rwanda, each with approximately 1.3% of total deaths estimated to be associated with diabetes.

Map 3.7 Proportion of total deaths related to diabetes among adults (20-79 years) in 2024.

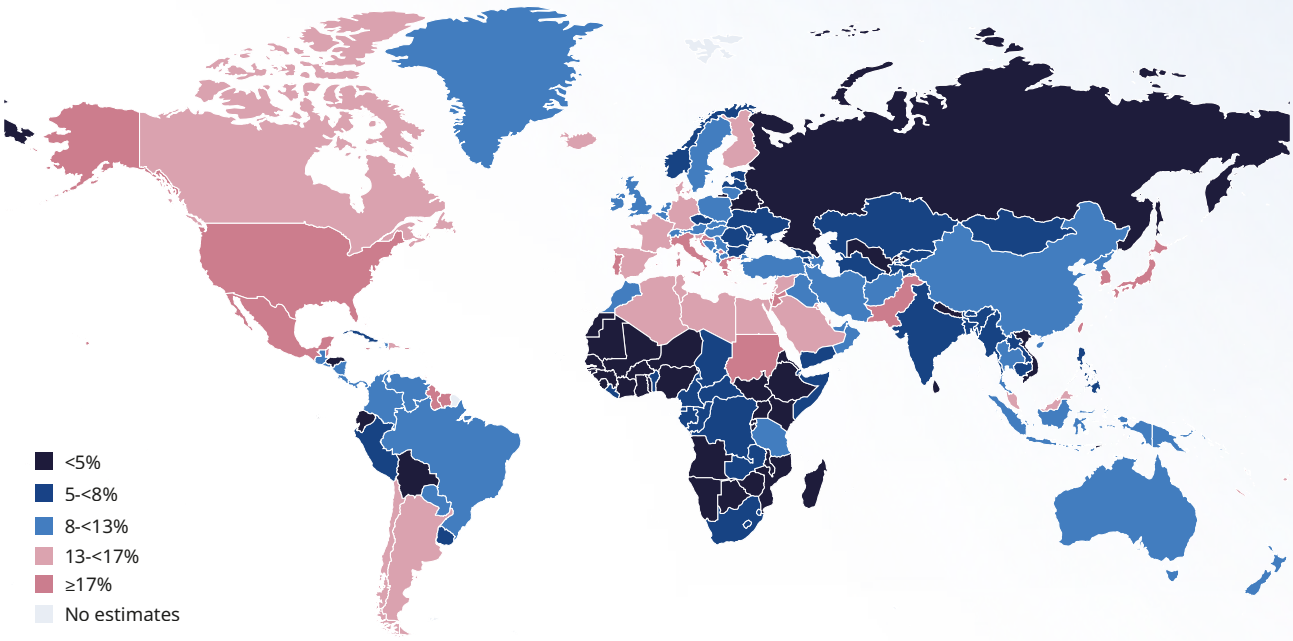
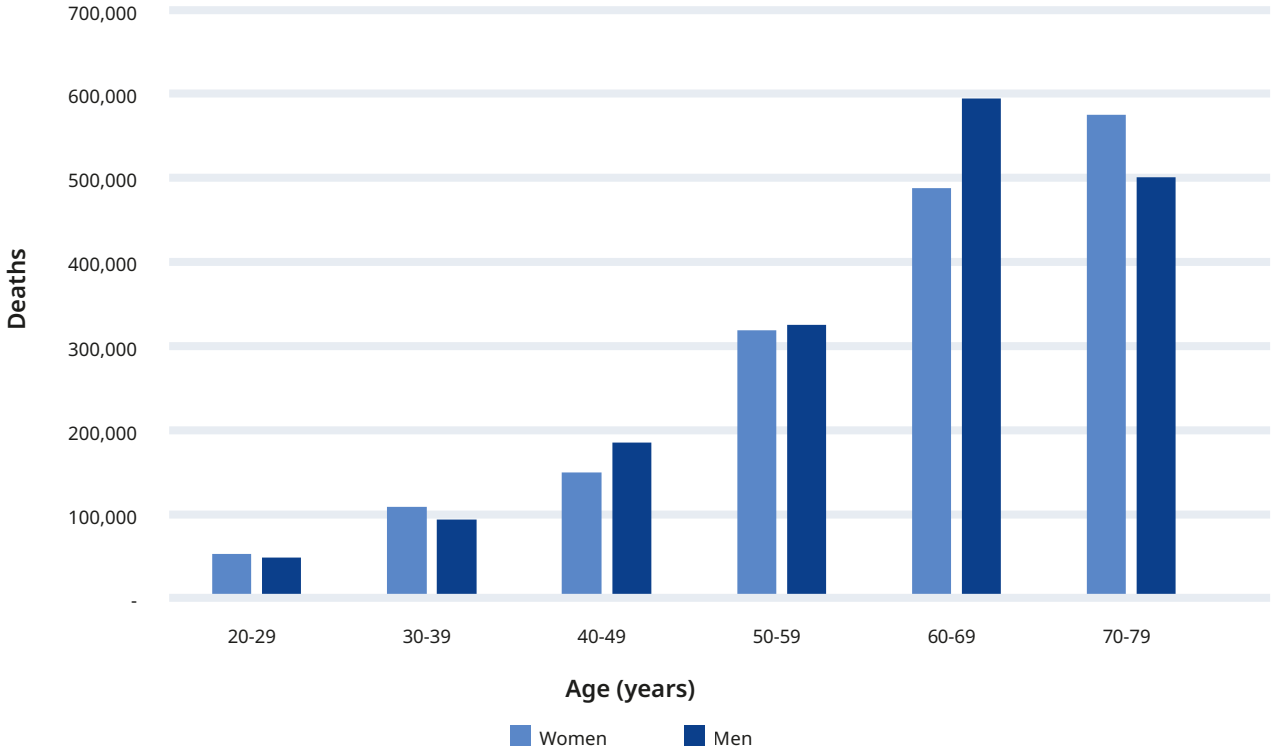


Figure 3.6 Estimated number of deaths due to diabetes in adults (20–79 years), by age and sex in 2024.



3.7 The economic impact of diabetes

Diabetes imposes a substantial economic burden on countries, health systems, people with diabetes, and their families.[7–9]

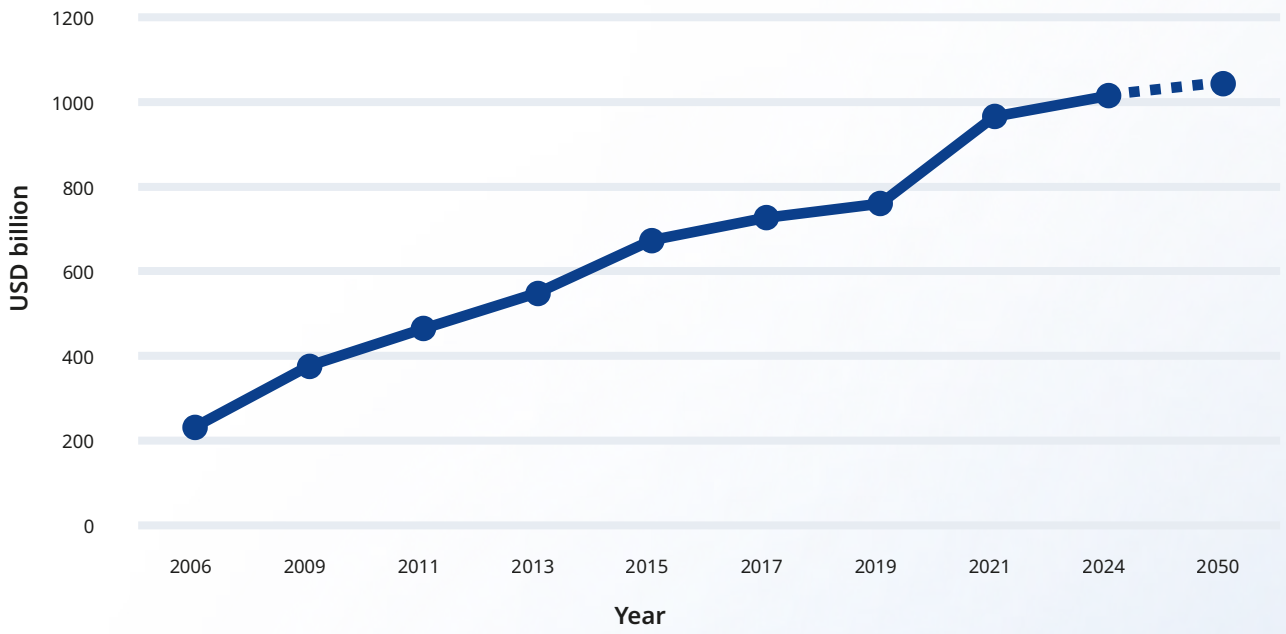
Direct costs of diabetes

Direct costs are the health expenditures that occur due to diabetes – regardless of whether the expenditure is borne out of pocket by people living with diabetes or by private or public payers, including governments. The IDF Diabetes Atlas has included estimates of health expenditure due to diabetes[10–14] since its 3rd edition in 2006. The increase in global health expenditure due to diabetes has been considerable, growing from USD 232 billion in 2007 to more than a trillion USD (1,015 billion) in 2024 for adults aged 20–79 years (Figure 3.7).

This represents a 338% increase over 17 years. Part of this increase can be attributed to improved data quality. The direct costs of diabetes are expected to continue to grow. IDF estimates that total diabetes-related health expenditure will reach USD 1.043 trillion by 2050. This projection is conservative as it considers only population size, ageing, changes in sex distribution and urbanisation and assumes that age and sex-specific diabetes prevalence and diabetes-related expenditure remain constant.

In 2024, the total global diabetes-related health expenditure exceeded **one trillion USD** for the first time.

Figure 3.7 Total diabetes-related health expenditure for adults (20–79 years) with diabetes from 2006 to 2050.



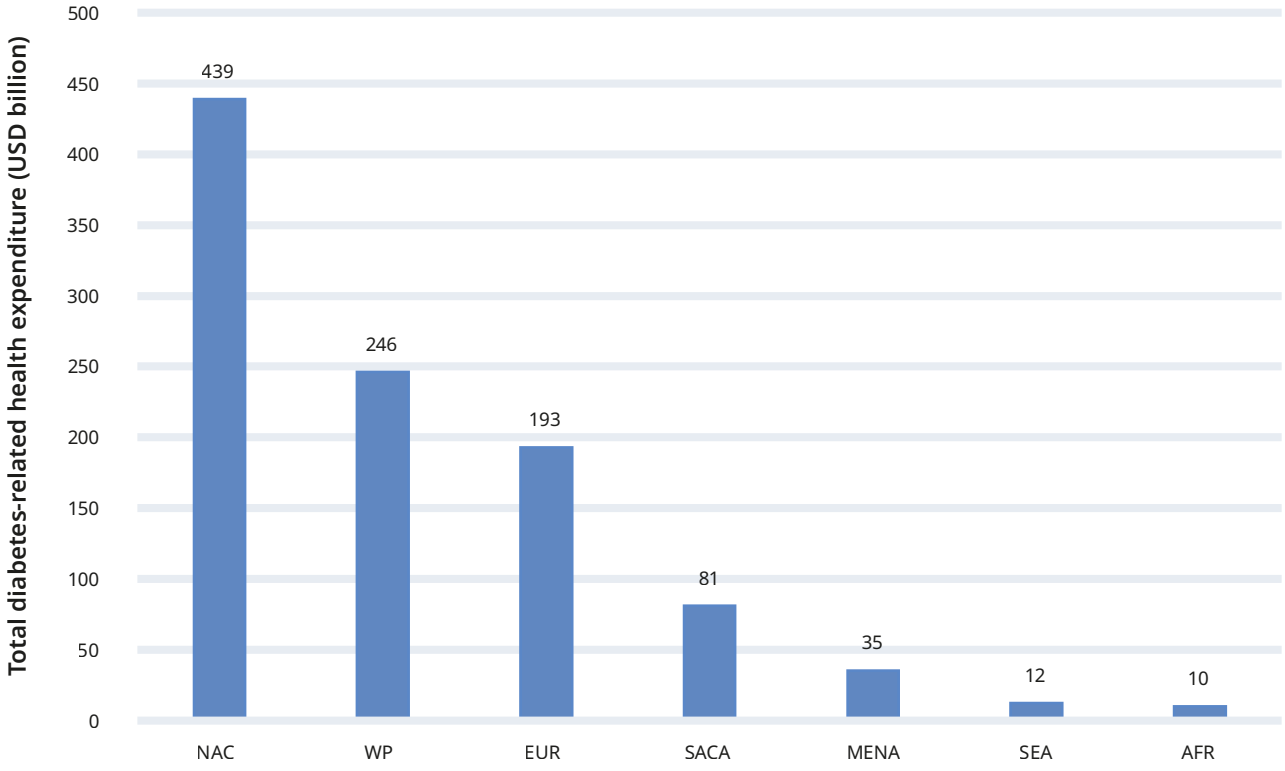
Regional distribution

The NAC Region has the highest total diabetes-related health expenditure of the seven IDF Regions (USD 438.6 billion) and accounts for 43.2% of total global diabetes-related health expenditure in 2024. The second highest is the WP Region, with USD 246.3 billion, followed by the EUR Region (USD 192.9 billion), corresponding to 24.3% and 19.0% of total global diabetes-related health expenditure, respectively. Despite being home to 42.7% of people with diabetes in the world, the SACA, MENA, SEA, and AFR Regions collectively account for only 13.5% of global diabetes-related health expenditure (Figure 3.8).

The NAC Region also has the highest diabetes-related health expenditure per adult with diabetes (USD 7,811), followed by the EUR Region (USD 2,950), SACA Region (USD 2,417) and WP Region (USD 1,173) (Figure 3.9). Health expenditure is USD 429 per person with diabetes in the MENA region, USD 414 in the AFR region, and USD 108 in the SEA region (Figure 3.9). In 2024, diabetes-related health expenditure per adult with diabetes varied across IDF regions by more than 70-fold.

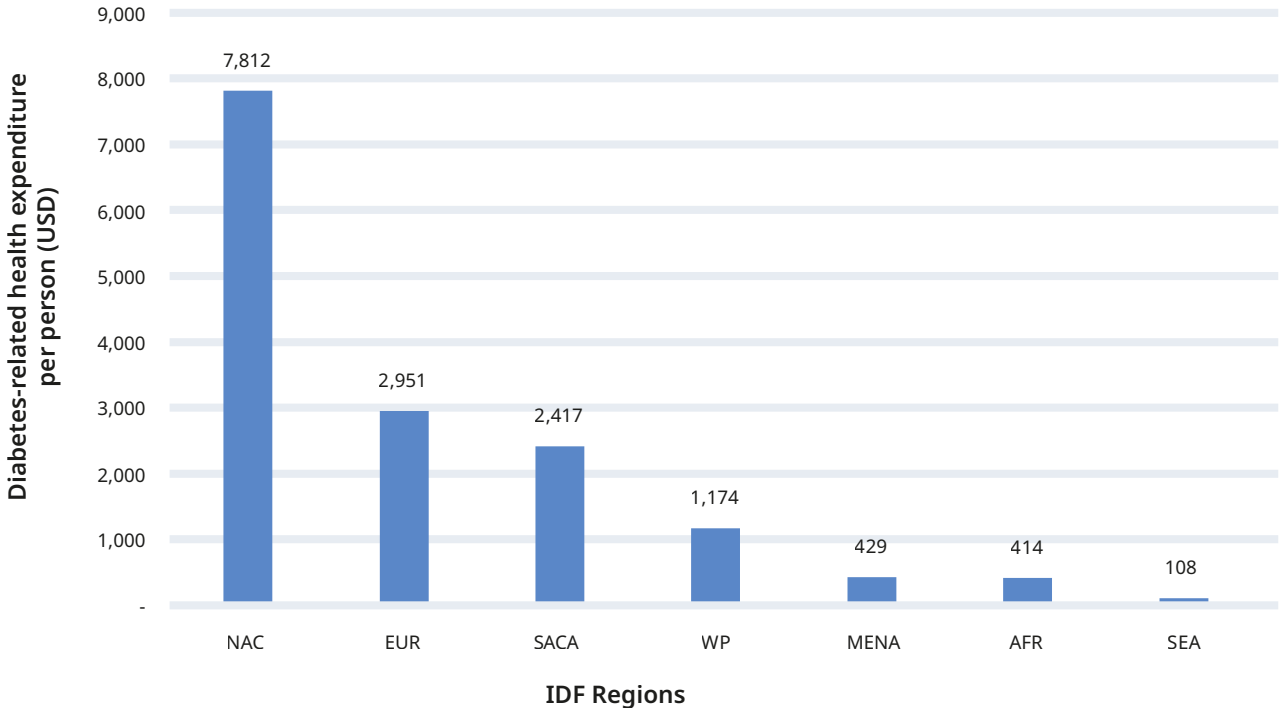
Expenditure due to diabetes has a substantial impact on total health expenditure worldwide, representing 11.9% of total global health spending. In the SACA Region, an average of 22.4% of the total health expenditure was due to diabetes, the highest percentage of the IDF Regions, followed by 17.0% in the MENA Region. The lowest percentage of health expenditure due to diabetes was observed in the EUR Region (8.8%) (Figure 3.10).

Figure 3.8 Total diabetes-related health expenditure (USD billion) in adults with diabetes (20–79 years) by IDF Region in 2024.



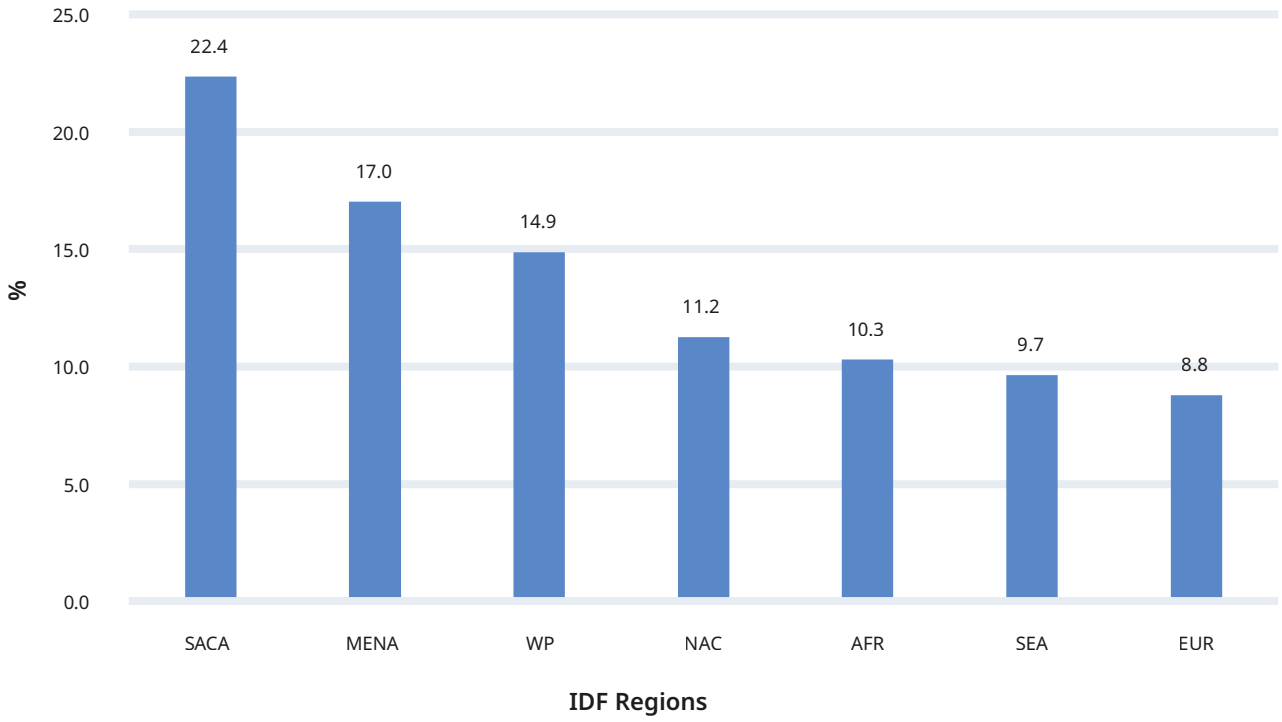
IDF: International Diabetes Federation; AFR: Africa; EUR: Europe; MENA: Middle East and North Africa; NAC: North America and Caribbean; SACA: South and Central America; SEA: South-East Asia; WP: Western Pacific

Figure 3.9 Diabetes-related health expenditure (USD) per adult with diabetes (20–79 years) by IDF Region in 2024.



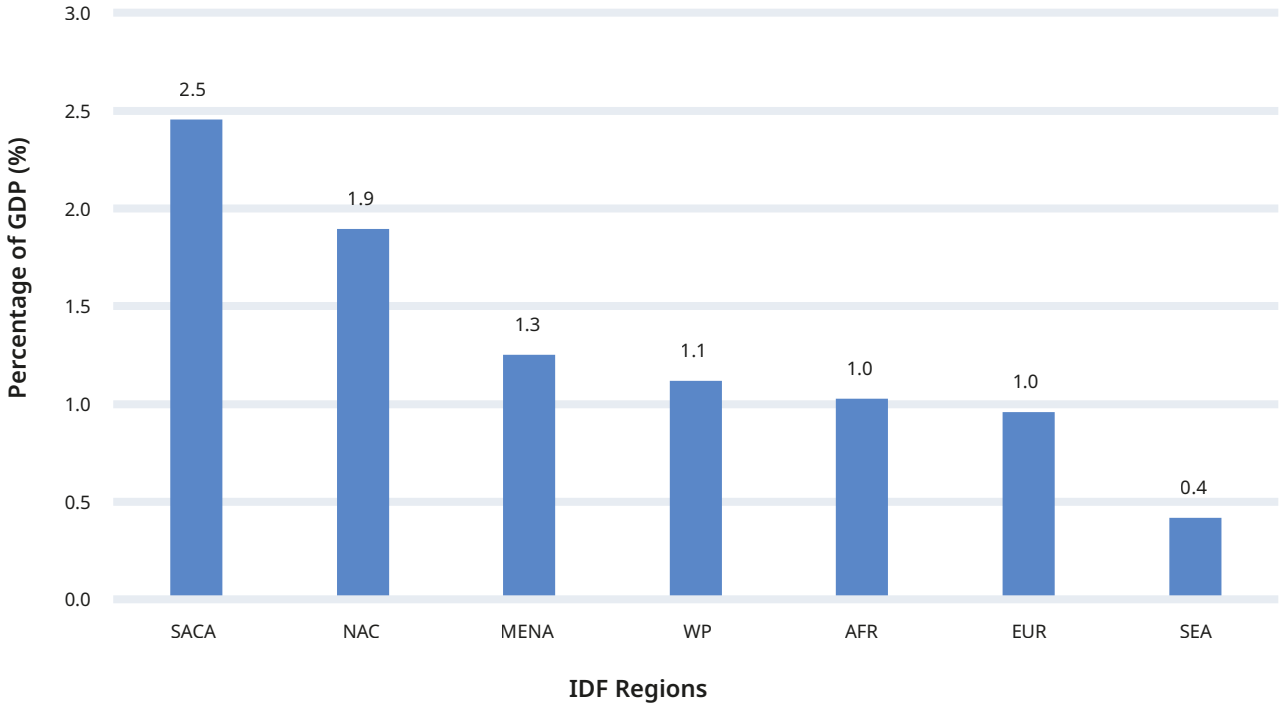
IDF: International Diabetes Federation; AFR: Africa; EUR: Europe; MENA: Middle East and North Africa; NAC: North America and Caribbean; SACA: South and Central America; SEA: South-East Asia; WP: Western Pacific

Figure 3.10 Diabetes-related health expenditure as a percentage of total health expenditure for adults (20–79 years) with diabetes by IDF Region in 2024.



IDF: International Diabetes Federation; AFR: Africa; EUR: Europe; MENA: Middle East and North Africa; NAC: North America and Caribbean; SACA: South and Central America; SEA: South-East Asia; WP: Western Pacific

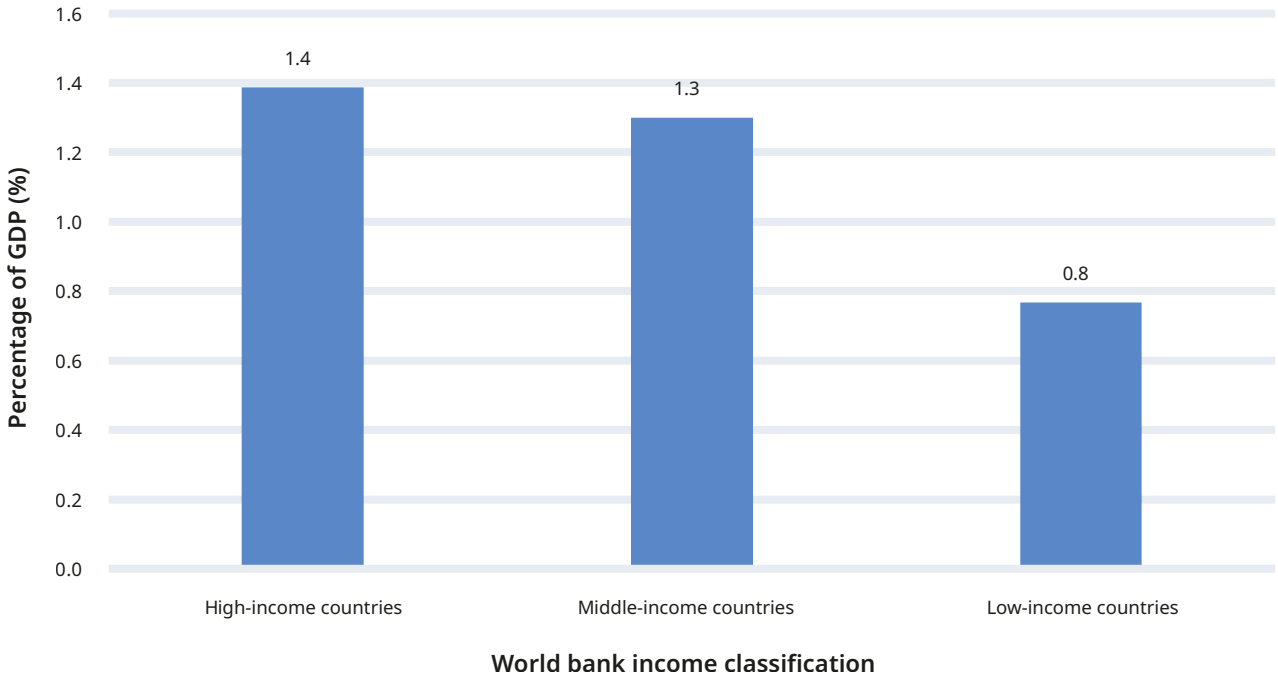
Figure 3.11 Diabetes-related health expenditure as a percentage of Gross Domestic Product (GDP) by IDF region in 2024.



IDF: International Diabetes Federation; AFR: Africa; EUR: Europe; MENA: Middle East and North Africa; NAC: North America and Caribbean; SACA: South and Central America; SEA: South-East Asia; WP: Western Pacific

Diabetes-related health expenditure as a percentage of Gross Domestic Product (GDP) is highest in the SACA Region at 2.5%, followed by 1.9% in the NAC Region (Figure 3.11). When considering World Bank income classification, diabetes-related health expenditure as a percentage of GDP is highest amongst high-income countries (1.4%), followed by middle income countries (1.3%), and followed distantly by low-income countries (0.8%) (Figure 3.12).

Figure 3.12 Diabetes-related health expenditure as a percentage of Gross Domestic Product (GDP) by World Bank income classification, 2024.



Country distribution

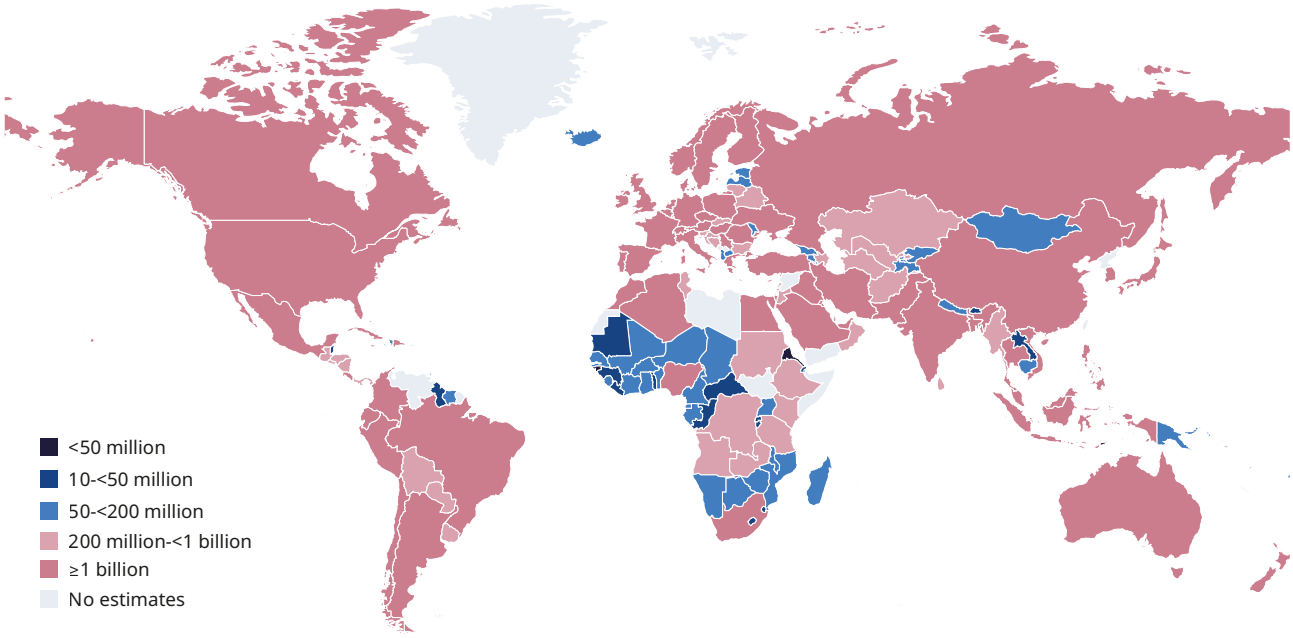
On a country level, the highest diabetes-related health expenditure is observed in the USA (USD 404.5 billion), followed by China and Brazil, (USD 168.9 billion and USD 45.1 billion, respectively) (Table 3.18).

The countries with the lowest diabetes-related health expenditure in 2024 were Niue and Nauru, with total expenditure of USD 0.8 million and USD 1.7 million, respectively (Map 3.8).

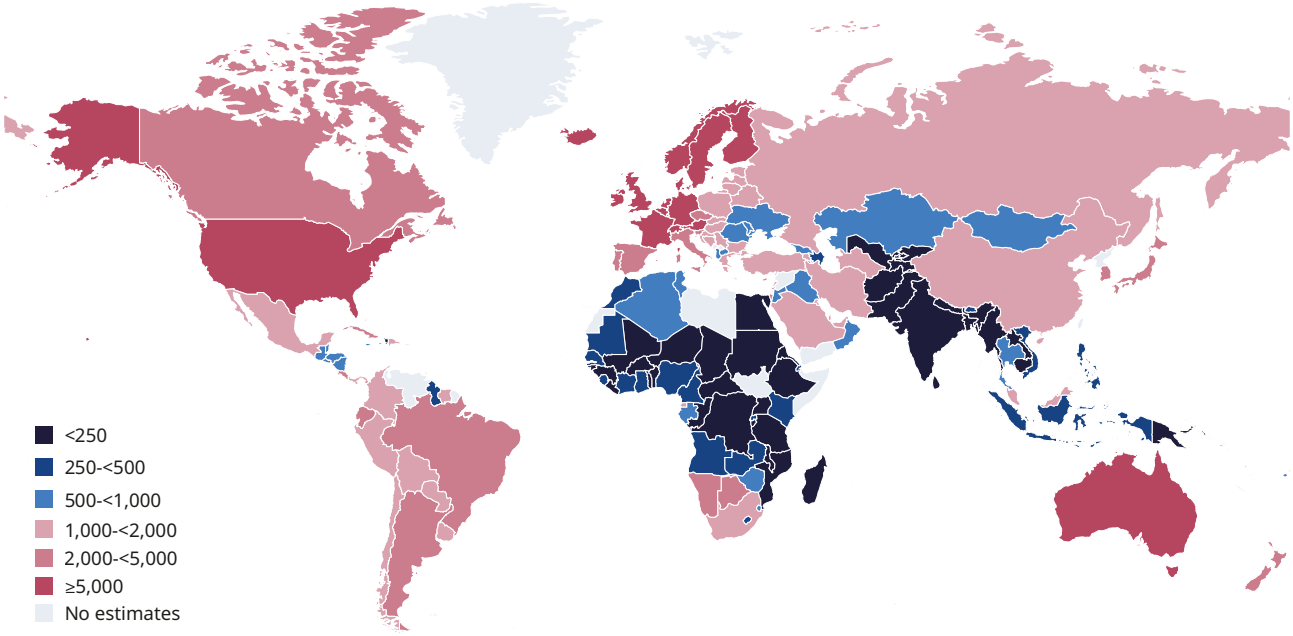
Table 3.18 Ten countries or territories with the highest and lowest total health expenditure (USD) in adults (20–79 years) due to diabetes in 2024.

Rank	Country or territory	Total diabetes-related health expenditure in 2024 (USD billion) in adults (20-79 years)
Highest		
1	United States of America	404.5
2	China	168.9
3	Brazil	45.1
4	Germany	40.4
5	Japan	34.0
6	United Kingdom	23.6
7	France	22.5
8	Mexico	19.5
9	Argentina	15.4
10	Italy	15.4
Lowest		
1	Niue	0.8
2	Nauru	1.7
3	Tuvalu	2.1
4	Tonga	4.5
5	St Kitts and Nevis	5.6
6	St Vincent and the Grenadines	5.9
7	Gambia	5.9
8	Sao Tome and Principe	6.3
9	Seychelles	6.6
10	Comoros	7.1

Map 3.8 Total diabetes-related health expenditure (USD) by country for adults (20–79 years) with diabetes in 2024.



Map 3.9 Diabetes-related health expenditure (USD) by country per adult (20–79 years) with diabetes in 2024.



In 2024, considerable disparities in diabetes-related health expenditure per person (20–79 years) existed among countries. The countries with the highest yearly expenditure per person are Switzerland (USD 12,234), followed by the USA (USD 10,497) and Norway (USD 10,226). Countries with the lowest annual expenditure per person are Bangladesh (USD 74), Pakistan (USD 79) and Democratic Republic of the Congo (USD 81) (Map 3.9).

Of the 10 countries with the highest health expenditure for diabetes per person, nine are from the EUR Region and one is from the NAC Region (Table 3.19).

Table 3.19 Ten countries or territories with the highest and lowest diabetes-related health expenditure (USD) per person with diabetes (20–79 years) in 2024.

Rank	Country or territory	Diabetes-related health expenditure in 2024 (USD) per person with diabetes (20-79 years)
Highest		
1	Switzerland	12,234
2	United States of America	10,497
3	Norway	10,227
4	Iceland	8,055
5	Luxembourg	8,026
6	Denmark	7,718
7	Ireland	7,234
8	Sweden	7,081
9	Austria	6,268
10	Germany	6,237
Lowest		
1	Bangladesh	74
2	Pakistan	79
3	Democratic Republic of the Congo	81
4	Madagascar	91
5	Nepal	91
6	Ethiopia	96
7	Burundi	103
8	Gambia	109
9	India	109
10	Chad	111

3.8 Type 1 diabetes estimates in children and adults

Previous editions of the IDF Diabetes Atlas were restricted to children and adolescents living with type 1 diabetes (T1D) and did not consider potential changes in incidence and mortality in the interval between the study dates of the respective individual country data and publication dates of the Atlas.

Development of the Type 1 Diabetes Index (T1D Index) has enabled more current and accurate estimates to be calculated for all ages across all countries.[15–17] The T1D Index is a joint initiative of Breakthrough T1D, Life for a Child, The International Diabetes Federation, and the International Society for Paediatric and Adolescent Diabetes. The Index uses a Markov model with machine learning and all available population-based incidence, prevalence and mortality data to produce national and, thereby, global estimates.[17]

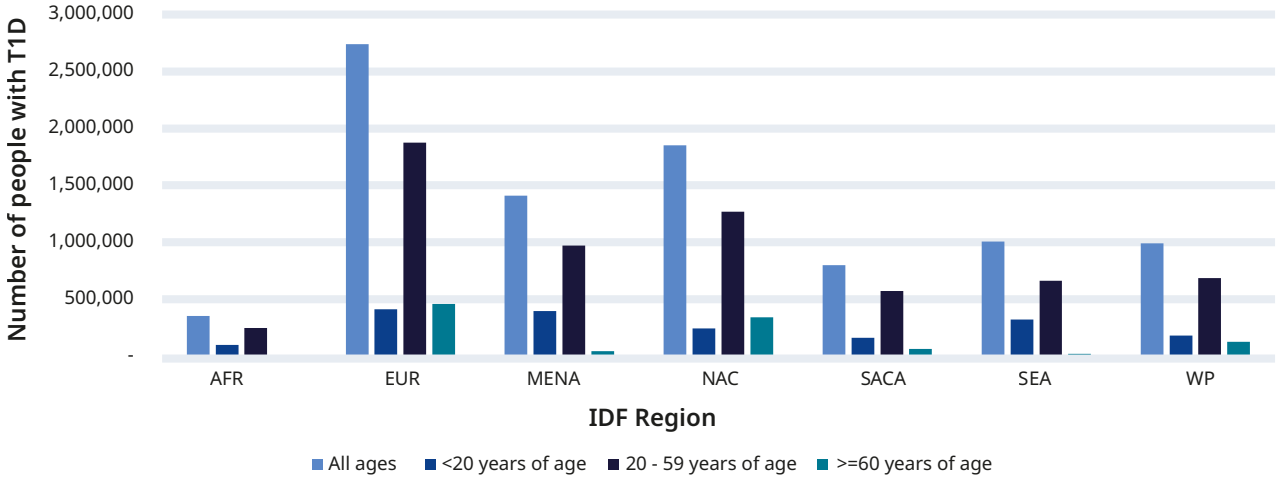
Findings

In 2024, there were an estimated 9.15 million individuals worldwide living with diagnosed clinical T1D,[17] with 22.3% (2.04 million) of these living in low-income and lower-middle-income countries.

Of this total population of 9.15 million, 1.81 million (19.8%), were younger than 20 years, 6.28 million (68.6%) were between 20 and 59 and 1.06 million (11.8%) were 60 or older.

Figure 3.13 shows the number of people with T1D in each of these age brackets by IDF Region. The IDF Europe Region has the highest number of cases, followed by the IDF North America and Caribbean Region. The lowest number of people with T1D was observed in the Africa Region.

Figure 3.13 Number of individuals with type 1 diabetes in each world region in 2024.



IDF: International Diabetes Federation; AFR: Africa; EUR: Europe; MENA: Middle East and North Africa; NAC: North America and Caribbean; SACA: South and Central America; SEA: South-East Asia; WP: Western Pacific

In 2024, there were 503,000 new cases of T1D diagnosed at all ages, with 219,000 of these new cases in children and young adults under 20 years of age.

The T1D Index numbers clearly show that T1D is not just a condition that affects children and youth. With good care, people developing T1D in childhood live to older ages, adding to the number of adults with diabetes. Furthermore, adult onset of T1D is common. In 2024, 284,000 (56.5%) of all new clinically diagnosed T1D cases occurred in people aged 20 years or older. The current mean age of a person living with T1D is 35 years.

For the 83 countries with published data from recent years, the ten countries with the highest estimated incidence in children under 15 years of age in 2024 were Finland, Saudi Arabia, Kuwait, Qatar, Estonia, Algeria, Sweden, Canada, Norway and Libya, ranked in order of highest incidence.

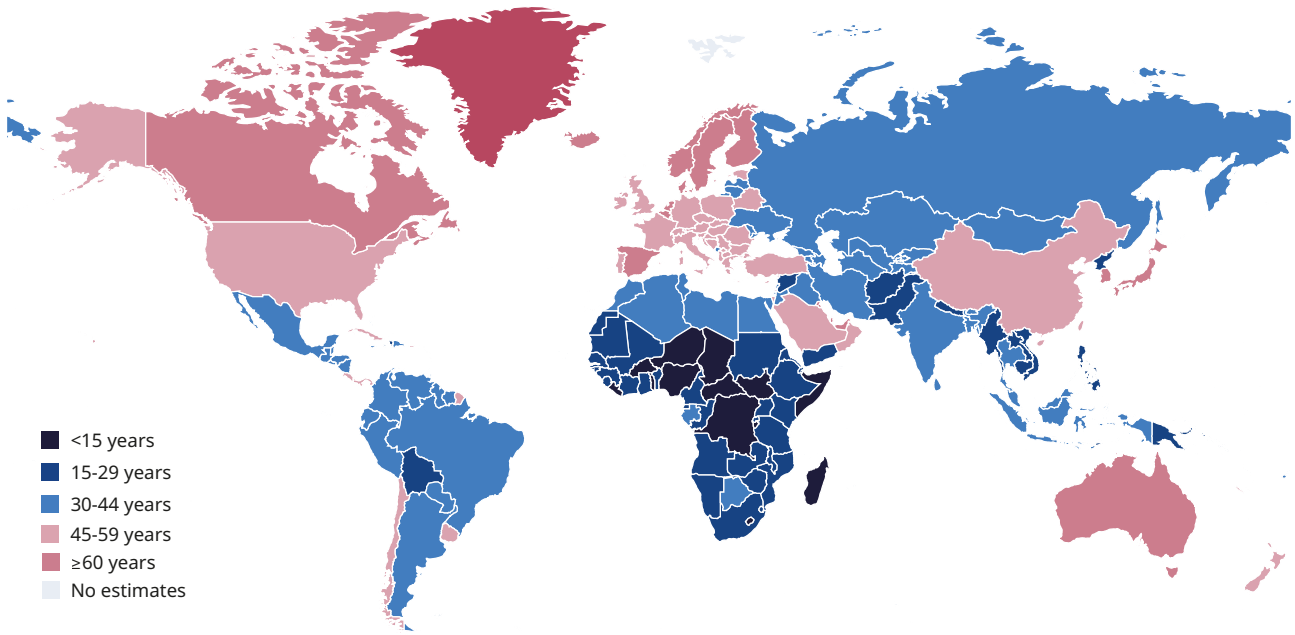
Table 3.20 shows the ten countries with the highest number of people of all ages living with T1D, and the number of children and adolescents living with T1D. The different ranking in the two columns reflects the younger population and the higher T1D-specific and overall mortality in lower-income countries such as India. This reduces the relative proportion of the number of adults living with T1D.

Table 3.20 Countries with the highest number of people living with T1D in 2024.

Rank	Country	Number of people of all ages living with T1D	Country	Number of children and adolescents under 20 living with T1D
1	United States of America	1,477,000	India	301,000
2	India	941,000	United States of America	197,000
3	China	599,000	China	117,000
4	Brazil	499,000	Brazil	99,000
5	United Kingdom	341,000	Egypt	69,000
6	Germany	337,000	Russian Federation	61,000
7	Russian Federation	323,000	Algeria	56,000
8	Canada	243,000	Turkey	47,000
9	Saudi Arabia	223,000	Saudi Arabia	46,000
10	Turkey	196,000	Morocco	43,000

Access to quality diabetes care has an impact on life expectancy and varies markedly around the world. Map 3.10 shows the estimated average remaining life expectancy for a 10-year-old child diagnosed with T1D in 2024, which ranges from 6 years in one Sub-Saharan African country to over 66 years in some high-income countries.

Map 3.10: Remaining life expectancy of a 10-year-old child diagnosed with type 1 diabetes in 2024.



In 2024 there were an estimated 168,000 premature deaths due to T1D among which 30,000 were in the SEA Region, 31,000 in AFR, 34,000 in EUR, 18,000 in NAC, 27,000 in MENA, 14,000 in WP, and 14,000 in SACA.

Notably, approximately 30,000 of T1D deaths in 2024 were in non-diagnosed individuals under 25 years of age who died within 12 months of the onset of symptoms. These young people develop typical symptoms and signs of T1D, including passing too much urine, drinking excessive amounts of water and unexpected weight loss. In time, if not diagnosed and treated, diabetic ketoacidosis develops. Regretfully, T1D is frequently misdiagnosed as pneumonia, gastroenteritis, malaria, typhoid, appendicitis or other condition.[18] Without a fast and accurate diagnosis, the child or young adult dies quickly. Health professional and community education and awareness initiatives have been shown to reduce the rate of ketoacidosis in some high-income countries[19] and increase T1D diagnosis rates in low-income countries.[20,21]

One new feature of the T1D Index is its ability to estimate 'Missing Prevalence' (the number of people who would still be living in 2024 if they had not developed T1D) The number is estimated to be 4.0 million. This highlights the substantial past and current premature mortality associated with T1D.

Many gaps in T1D epidemiological knowledge remain, particularly with regard to mortality and prevalence. There are also gaps in our knowledge of T1D incidence, especially in adults. The difficulty of distinguishing T1D from type 2 diabetes in adults is an area that requires further investigation.[22,23]

Full data are available at the T1D Index website: **www.t1dindex.org.**

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Nupur Lalvani, **India** - Living with type 1 diabetes

4 Diabetes by region

74 Africa
76 Europe
78 Middle-East and North Africa
80 North America and the Caribbean
82 South and Central America
84 South-East Asia
86 Western Pacific

Key messages:

- The total number of people with diabetes in the IDF Africa Region is predicted to increase by 142% to 60 million by 2050, the highest percentage increase of all IDF Regions.
- The IDF Europe Region has the highest number of people with type 1 diabetes (2.7 million).
- 1 in 6 adults has diabetes in the IDF Middle-East and North Africa Region – 85 million. The highest proportion of all IDF Regions.
- The North America and Caribbean Region has the highest diabetes-related expenditure (USD 439 billion), 43% of global expenditure.
- 1 in 3 (30.4%) adults living with diabetes in the IDF South and Central America Region are undiagnosed.
- 1 in 3 live births in the IDF South-East Asia Region are affected by hyperglycaemia in pregnancy, the highest proportion of all IDF Regions.
- Western Pacific is the IDF region with the highest number of adults living with diabetes (215 million) – 1 in 8.

Diabetes in Africa
2024

Estimates are provided for 49 Sub-Saharan African countries and territories in the IDF Africa (AFR) Region. For this edition of the IDF Diabetes Atlas, a total of 35 data sources from 27 countries met the inclusion criteria. About half (45%) of the countries in the IDF AFR Region lack high-quality, in-country data sources. Only three countries (Cape Verde, Gambia and Sao Tome and Principe) had studies conducted within the past five years.

Despite the lowest prevalence estimate of 5.0% among IDF Regions, the expected increase in the number of people with diabetes by 2050 is the highest at 142%, reaching 60 million. The AFR Region is also predicted to have the highest increase in the number of people with impaired glucose tolerance and impaired fasting glucose by 2050, reaching 135 million (138% increase) and 88 million (134% increase) respectively. The proportion of undiagnosed diabetes is also highest of all the IDF Regions at 72.6%.

Diabetes care receives the lowest level of investment in the AFR Region, with only 10 billion USD spent on diabetes, representing a mere 1% of the total spent worldwide, despite the Region being home to 11.4% of people with diabetes worldwide.

Map 4.1 Age-standardised prevalence (%) of diabetes (20–79 years), IDF Africa Region 2024.

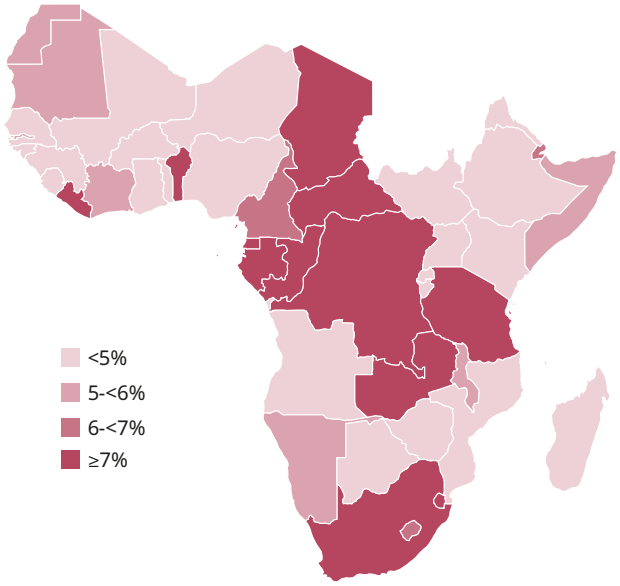
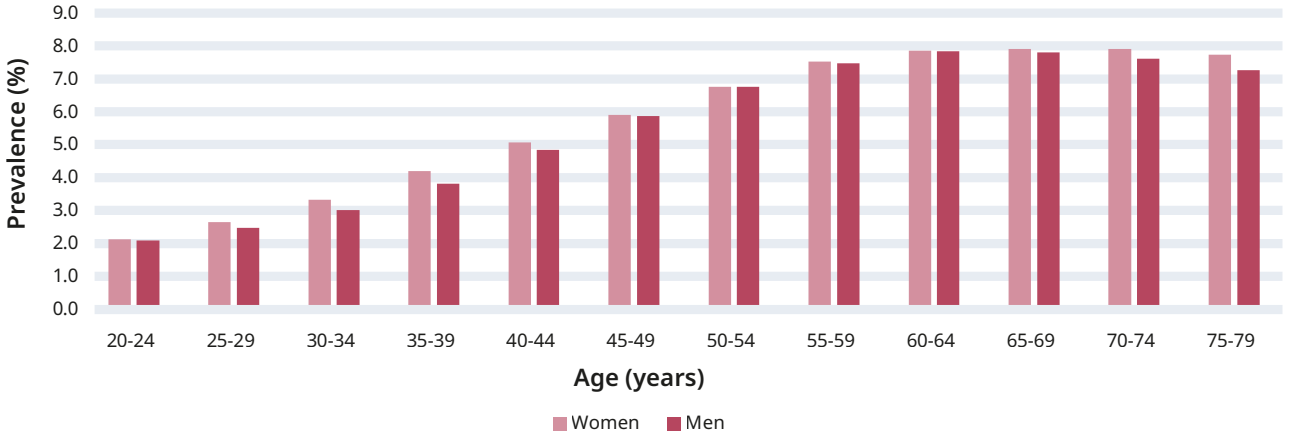


Figure 4.1 Estimated prevalence (%) of diabetes by age and sex, IDF Africa Region 2024.



At a glance

	2024	2050
Adult population (20-79 years)	581m	1.2b
Diabetes (20-79 years)		
Regional prevalence	4.2%	5.0%
Age-standardised prevalence	5.0%	5.9%
Number of people with diabetes (20-79 years)	25m	60m
Number of deaths due to diabetes (20-79 years)	216,000	
Healthcare expenditure due to diabetes (20-79 years)		
Total healthcare expenditure, USD	10.0b	18.0b
Impaired glucose tolerance (20-79 years)		
Regional prevalence	9.8	11.3
Age-standardised prevalence	11.5	13.7
Number of people with impaired glucose tolerance	57.0m	135m
Impaired fasting glucose (20-79 years)		
Regional prevalence	6.5	7.4
Age-standardised prevalence	6.6	7.4
Number of people with impaired glucose tolerance	38m	88m
Undiagnosed diabetes (20-79 years)		
Regional proportion	72.6%	
Number of people with undiagnosed diabetes	18m	
Type 1 diabetes (all age groups)		
Number of people with type 1 diabetes	352,000	

Top 5 countries

	2024	2050
Top five countries for number of people with diabetes (20-79 years)		
Nigeria	3.0m	6.6m
United Republic of Tanzania	2.9m	7.6m
Democratic Republic of the Congo	2.9m	7.3m
South Africa	2.3m	4.0m
Ethiopia	2.3m	6.0m
Top five countries for age-standardised prevalence of people with diabetes (20-79 years)		
Sao Tome and Principe	12.1%	13.7%
Comoros	10.8%	12.7%
Zambia	10.3%	12.5%
United Republic of Tanzania	9.8%	11.2%
Seychelles	10.1%	10.1%

m = million | b = billion

Highlights

- 1 in 20 adults have diabetes — 25 million.
- The total number of adults with diabetes is predicted to increase by 142% to 60 million by 2050, the highest percentage increase of all IDF Regions.
- 4 in 5 (73%) adults living with diabetes are undiagnosed, the highest proportion of all IDF Regions.
- Diabetes was responsible for 216,000 deaths in 2024.
- Africa has the lowest diabetes-related expenditure (USD 10 billion) associated with diabetes, 1% of global expenditure.
- 1 in 7 live births are affected by hyperglycaemia in pregnancy.

Diabetes in Europe
2024

Estimates were produced for 60 countries and territories in the IDF Europe (EUR) Region. A total of 71 data sources from 41 countries met our inclusion criteria and were used to generate the diabetes estimates for adults in the Region. Estimates for nine countries (Bulgaria, United Kingdom, Russian Federation, Lithuania, Denmark, Israel, Italy, United Kingdom, Uzbekistan) were based on studies conducted within the past five years.

The estimated diabetes prevalence (9.8%) and the number of people with diabetes (66 million) in the EUR Region will see a 10% increase by 2050. The EUR Region has the highest number of people with type 1 diabetes (2.7 million), 15% of whom are people <20 years (419,000). In 2024, an estimated 193 billion USD was spent on diabetes in the EUR Region, representing 19% of the total spent worldwide. The Region has the second highest average cost per person with diabetes (USD 2,951).

Map 4.2 Age-standardised prevalence (%) of diabetes (20–79 years), IDF Europe Region 2024.

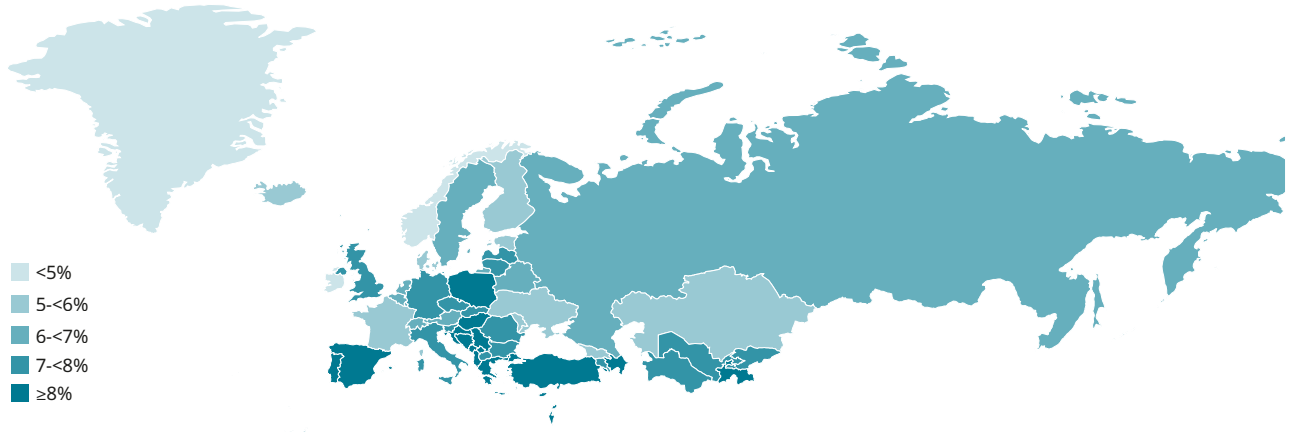
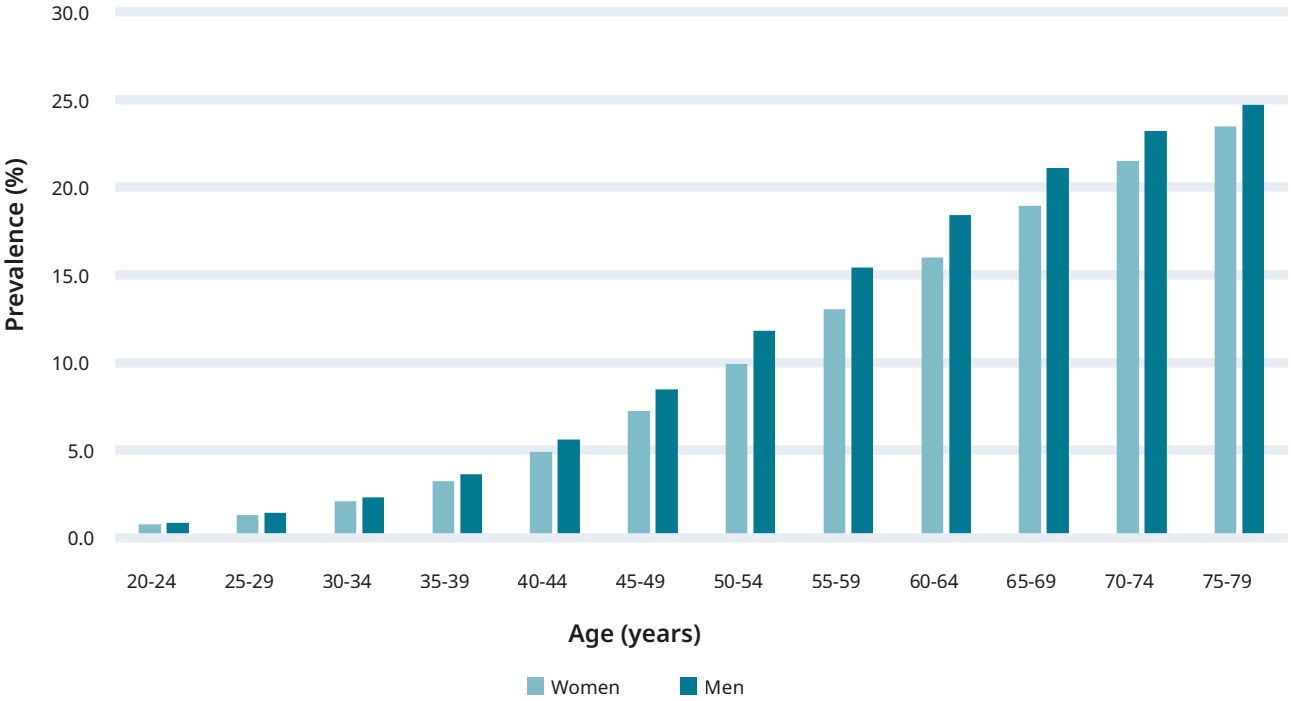


Figure 4.2 Estimated prevalence (%) of diabetes by age and sex, IDF Europe Region 2024.



At a glance

	2024	2050
Adult population (20-79 years)	672m	659m
Diabetes (20-79 years)		
Regional prevalence	9.8%	11.0%
Age-standardised prevalence	8.0%	9.4%
Number of people with diabetes (20-79 years)	66m	72m
Number of deaths due to diabetes (20-79 years)	433,000	
Healthcare expenditure due to diabetes (20-79 years)		
Total healthcare expenditure, USD	193b	179b
Impaired glucose tolerance (20-79 years)		
Regional prevalence	6.8%	7.0%
Age-standardised prevalence	5.9%	6.2%
Number of people with impaired glucose tolerance	45.9m	46.2m
Impaired fasting glucose (20-79 years)		
Regional prevalence	5.9%	6.0%
Age-standardised prevalence	5.3%	5.7%
Number of people with impaired glucose tolerance	39.7m	40.4m
Undiagnosed diabetes (20-79 years)		
Regional proportion	33.6%	
Number of people with undiagnosed diabetes	22m	
Type 1 diabetes (all age groups)		
Number of people with type 1 diabetes	2.7m	

Top 5 countries

	2024	2050
Top five countries for number of people with diabetes (20-79 years)		
Turkey	9.6m	14.1m
Russian Federation	7.6m	7.7m
Germany	6.5m	6.1m
Italy	5.0m	4.7m
Spain	4.7m	4.9m
Top five countries for age-standardised prevalence of people with diabetes (20-79 years)		
Turkey	16.5%	18.6%
Montenegro	10.7%	12.3%
Albania	10.6%	12.3%
Portugal	10.5%	12.2%
Croatia	10.5%	12.2%

m = million | b = billion

Highlights

- 1 in 10 adults have diabetes – 66 million.
- 1 in 3 (34%) adults living with diabetes are undiagnosed.
- 1 in 7 live births are affected by hyperglycaemia in pregnancy.
- The Region has the highest number of people with type 1 diabetes (2.7 million).
- Diabetes-related expenditure totals USD 193 billion – 19% of global expenditure.
- The Region has the second highest average cost per person with diabetes (20-79 years) – USD 2,951.

Diabetes in Middle-East and North Africa
2024

Estimates were made for 21 countries and territories in the IDF Middle-East and North Africa (MENA) Region. A total of 34 data sources from 18 countries were used to estimate diabetes prevalence among adults aged between 20 and 79 years. Three countries: Islamic Republic of Iran, State of Palestine and Jordan had studies conducted within the past five years.

The MENA Region has the highest regional prevalence at 17.6% and the second highest expected increase (92%) in the number of people with diabetes, reaching a predicted 163 million by 2050. The MENA Region has 1.4 million people with type 1 diabetes. The Region has the highest percentage (21.6%) of diabetes-related deaths in people of working age (<60 years). Despite being home to 14.4% of people with diabetes worldwide, only 35 billion USD was spent on diabetes in the Region, representing 3.4% of the total invested worldwide.

Map 4.3 Age-standardised prevalence (%) of diabetes (20–79 years), IDF Middle-East and North Africa Region 2024.

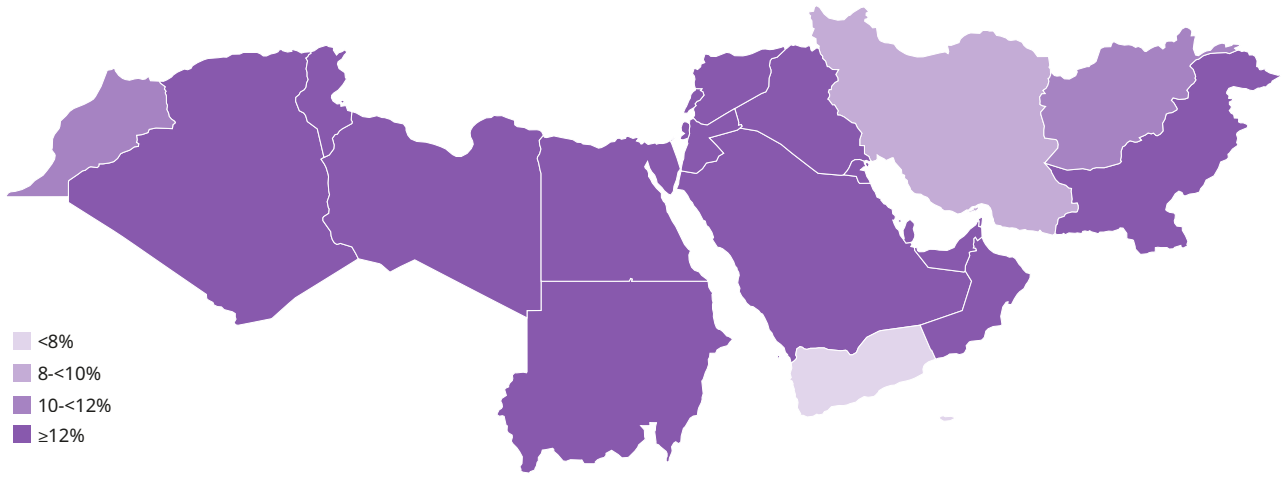
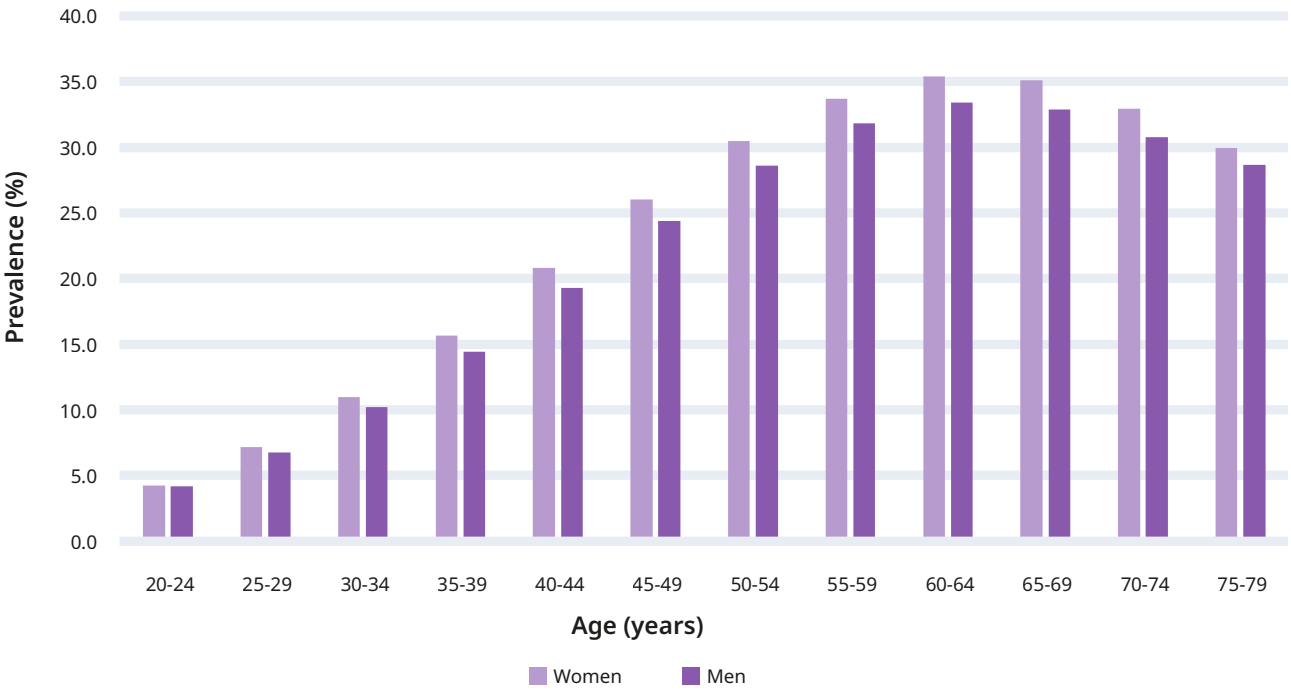


Figure 4.3 Estimated prevalence (%) of diabetes by age and sex, Middle-East and North Africa Region 2024.



At a glance

	2024	2050
Adult population (20-79 years)	480m	773m
Diabetes (20-79 years)		
Regional prevalence	17.6%	21.0%
Age-standardised prevalence	19.9%	22.8%
Number of people with diabetes (20-79 years)	85m	163m
Number of deaths due to diabetes (20-79 years)	467,000	
Healthcare expenditure due to diabetes (20-79 years)		
Total healthcare expenditure, USD	35b	50b
Impaired glucose tolerance (20-79 years)		
Regional prevalence	10.4%	11.0%
Age-standardised prevalence	11.0%	11.6%
Number of people with impaired glucose tolerance	50m	85m
Impaired fasting glucose (20-79 years)		
Regional prevalence	7.5%	8.1%
Age-standardised prevalence	8.0%	8.4%
Number of people with impaired glucose tolerance	36m	62m
Undiagnosed diabetes (20-79 years)		
Regional proportion	37.2%	
Number of people with undiagnosed diabetes	32m	
Type 1 diabetes (all age groups)		
Number of people with type 1 diabetes	1.4m	

Top 5 countries

	2024	2050
Top five countries for number of people with diabetes (20-79 years)		
Pakistan	35.0m	70.0m
Egypt	13.0m	25.0m
Islamic Republic of Iran	5.5m	8.2m
Saudi Arabia	5.3m	9.5m
Algeria	4.8m	7.9m
Top five countries for age-standardised prevalence of people with diabetes (20-79 years)		
Pakistan	31.4%	34.2%
Kuwait	25.6%	28.2%
Qatar	24.6%	27.0%
Saudi Arabia	23.1%	25.4%
Egypt	22.4%	25.7%

m = million | b = billion

Highlights

- 1 in 6 adults has diabetes – 85 million. The highest proportion of all IDF Regions.
- The number of adults with diabetes is predicted to increase by 92% to 163 million by 2050 – the second highest increase of all IDF Regions.
- 1 in 3 adults living with diabetes are undiagnosed.
- The Region has the highest diabetes prevalence in older adults (32.3%).
- Diabetes-related expenditure totals USD 35 billion in 2024.
- 1 in 5 live births are affected by hyperglycaemia in pregnancy.

Diabetes in North America and Caribbean
2024

Estimates were made for Canada, Mexico, the United States of America and 22 Caribbean countries and territories in the IDF North America and Caribbean (NAC) Region. Estimates for diabetes in adults in the Region were based on 21 data sources, representing 15 of the 22 countries. Estimates for Mexico and USA were based on studies conducted within the past five years.

The NAC Region has the second highest diabetes prevalence among IDF Regions at 15.1%. IDF projects that the number of people with diabetes in the NAC Region will increase by 22%, to reach 68 million by 2050. The NAC Region has the second highest number of people with type 1 diabetes – 1.9 million in total. The NAC Region has the highest proportion (21.4%) of diabetes-related mortality to all-cause mortality and the second highest number of deaths due to diabetes (526,000) among IDF Regions. The NAC Region has the highest diabetes-related expenditure (USD 439 billion), 43% of global expenditure, and has the highest average cost per person with diabetes (20–79 years) at USD 7,811.

Map 4.4 Age-standardised prevalence (%) of diabetes (20–79 years), IDF North America and Caribbean Region 2024.

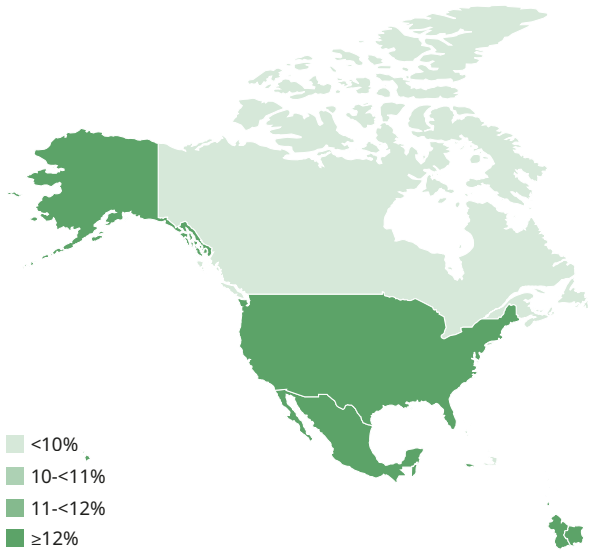
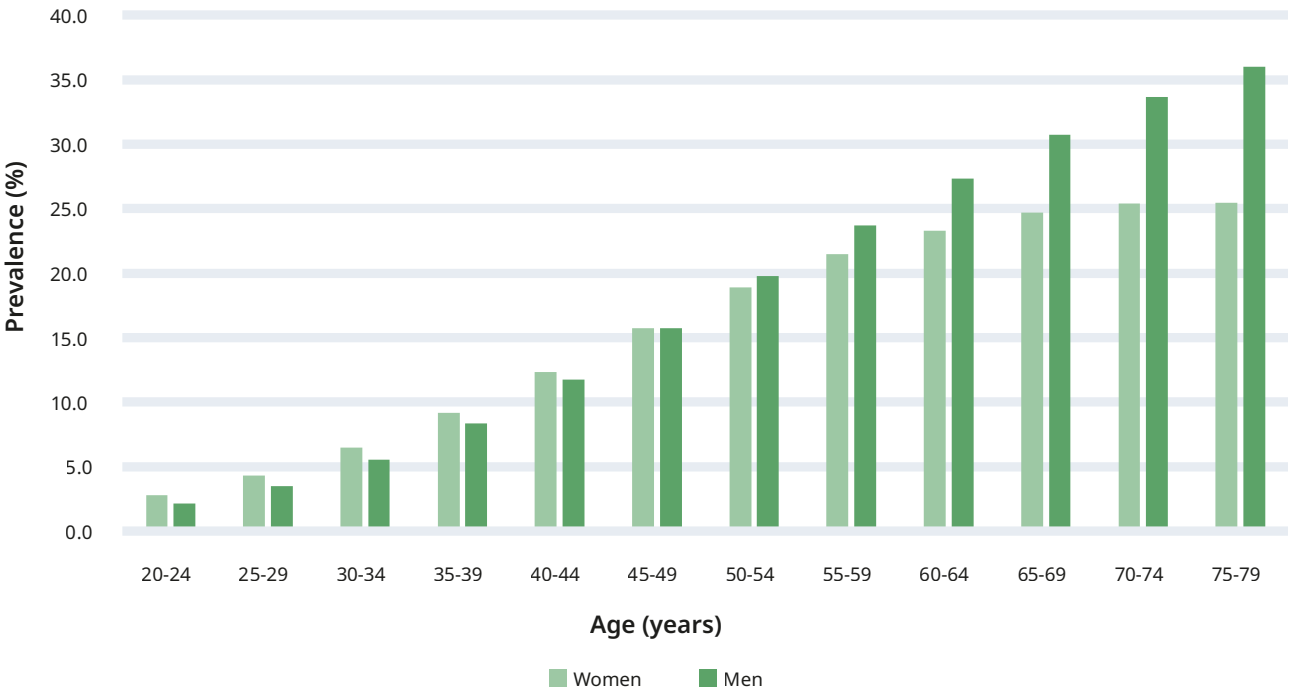


Figure 4.4 Estimated prevalence (%) of diabetes by age and sex, IDF North America and Caribbean Region 2024.



At a glance

	2024	2050
Adult population (20-79 years)	373m	415m
Diabetes (20-79 years)		
Regional prevalence	15.1%	16.4%
Age-standardised prevalence	13.8%	15.3%
Number of people with diabetes (20-79 years)	56m	68m
Number of deaths due to diabetes (20-79 years)	526,000	
Healthcare expenditure due to diabetes (20-79 years)		
Total healthcare expenditure, USD	439b	446b
Impaired glucose tolerance (20-79 years)		
Regional prevalence	12.5%	13.3%
Age-standardised prevalence	11.6%	12.6%
Number of people with impaired glucose tolerance	47m	55m
Impaired fasting glucose (20-79 years)		
Regional prevalence	14.2%	14.8%
Age-standardised prevalence	13.6%	14.3%
Number of people with impaired glucose tolerance	53m	62m
Undiagnosed diabetes (20-79 years)		
Regional proportion	29.1%	
Number of people with undiagnosed diabetes	16m	
Type 1 diabetes (all age groups)		
Number of people with type 1 diabetes	1.9m	

Top 5 countries

	2024	2050
Top five countries for number of people with diabetes (20-79 years)		
United States of America	39.0m	43.0m
Mexico*	14.0m	20.0m
Canada	2.8m	3.3m
Haiti	542.0t	884.0t
Jamaica	236.0t	329.0t
Top five countries for age-standardised prevalence of people with diabetes (20-79 years)		
Mexico	16.4%	18.0%
Guyana	16.4%	17.9%
Belize	14.1%	14.9%
St Kitts and Nevis	13.8%	15.8%
Suriname	13.8%	15.2%

t = thousand | m = million | b = billion

Highlights

- 1 in 7 adults have diabetes – 56 million.
- The Region has the second highest diabetes prevalence (15.1%) of all IDF Regions.
- 1 in 3 adults living with diabetes are undiagnosed.
- The Region has the highest diabetes-related expenditure (USD 439 billion), 43% of global expenditure.
- The Region has the highest proportion of diabetes-related mortality, 21.4%.
- The Region has the second highest number of people with type 1 diabetes – 1.9 million in total.
- The Region has the highest average cost per person with diabetes (20-79 years) – USD 7,811.
- 1 in 4 live births are affected by hyperglycaemia in pregnancy, the second highest prevalence among all IDF regions.

*At the time of analysing the data for this edition, Mexico was included in the country listing for the IDF NAC Region. The country will be listed among the countries in the IDF SACA Region for future editions.

Diabetes in South and Central America
2024

Estimates were made for 19 countries and territories in the IDF South and Central America (SACA) Region. Estimates for diabetes prevalence in adults aged 20–79 years were based on 29 data sources from 15 countries. Five countries: Brazil, Peru, Brazil, Panama and Bolivia had studies conducted within the past five years.

IDF projects that the number of people with diabetes in the SACA Region will increase by 46%, reaching 52 million by 2050. Over the same period, the prevalence of diabetes will increase by 23%, reaching 12.3%. In 2024, 81 billion USD was spent on diabetes in the SACA Region, representing 8% of total expenditure worldwide.

Map 4.5 Age-standardised prevalence (%) of diabetes (20–79 years), IDF South and Central America Region 2024.

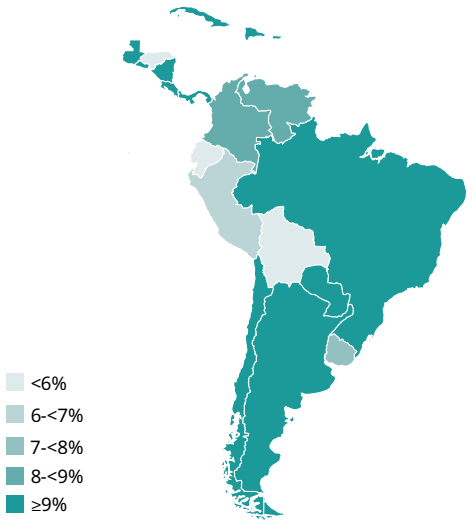
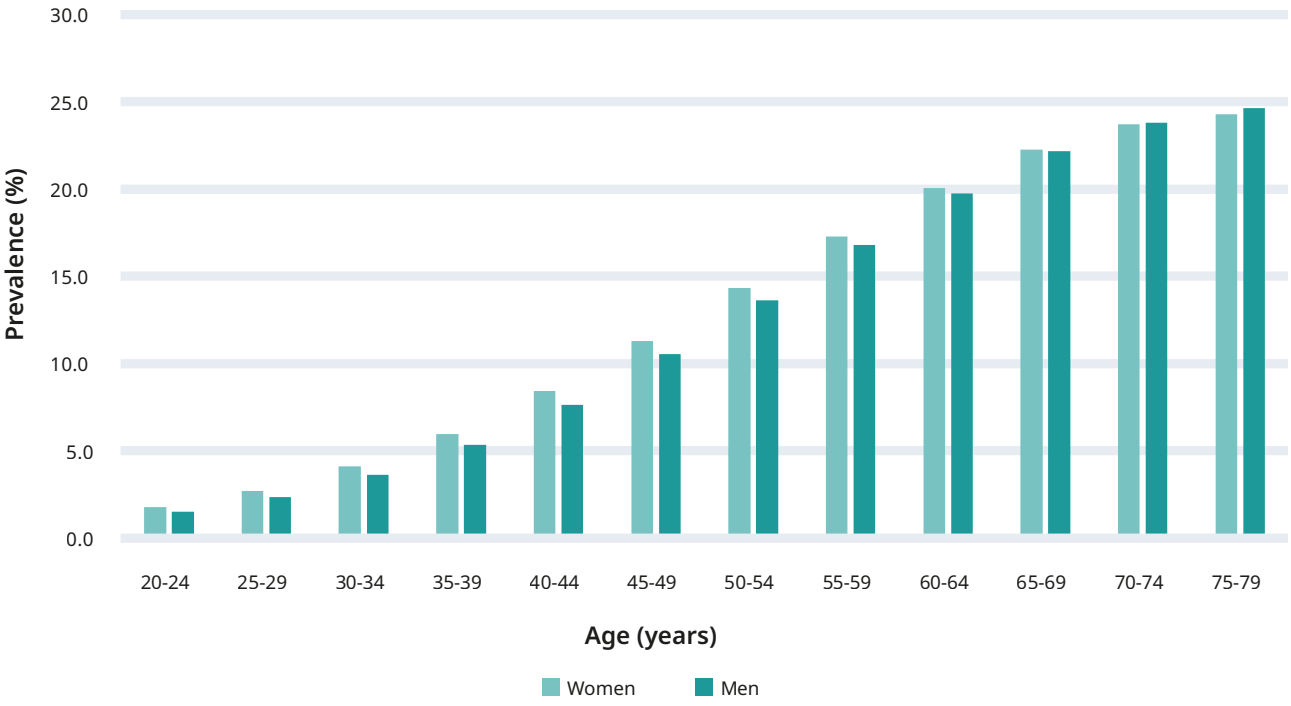


Figure 4.5 Estimated prevalence (%) of diabetes by age and sex, IDF South and Central America Region 2024.



At a glance

	2024	2050
Adult population (20-79 years)	355m	420m
Diabetes (20-79 years)		
Regional prevalence	10.0%	12.3%
Age-standardised prevalence	10.1%	11.5%
Number of people with diabetes (20-79 years)	35m	52m
Number of deaths due to diabetes (20-79 years)	224,000	
Healthcare expenditure due to diabetes (20-79 years)		
Total healthcare expenditure, USD	81b	95b
Impaired glucose tolerance (20-79 years)		
Regional prevalence	10.9%	12.4%
Age-standardised prevalence	11.0%	12.0%
Number of people with impaired glucose tolerance	39m	52m
Impaired fasting glucose (20-79 years)		
Regional prevalence	9.1%	10.3%
Age-standardised prevalence	9.2%	10.0%
Number of people with impaired glucose tolerance	32m	43m
Undiagnosed diabetes (20-79 years)		
Regional proportion	30.4%	
Number of people with undiagnosed diabetes	11m	
Type 1 diabetes (all age groups)		
Number of people with type 1 diabetes	797,000	

Top 5 countries

	2024	2050
Top five countries for number of people with diabetes (20-79 years)		
Brazil	17.0m	24.0m
Argentina	4.3m	5.9m
Colombia	3.0m	4.3m
Chile	1.9m	2.4m
Venezuela	1.6m	2.4m
Top five countries for age-standardised prevalence of people with diabetes (20-79 years)		
Dominican Republic	17.6%	19.9%
Argentina	14.0%	15.4%
Guatemala	13.2%	13.8%
El Salvador	12.7%	14.8%
Chile	12.2%	13.7%

m = million | b = billion

Highlights

- 1 in 10 adults have diabetes – 35 million.
- The number of adults with diabetes is expected to increase by 46% to 52 million by 2050.
- 1 in 3 adults living with diabetes (30.4%) are undiagnosed.
- Diabetes is responsible for 224,000 deaths in 2024.
- 797,000 people live with type 1 diabetes.
- Diabetes-related expenditure totals USD 81 billion in 2024.
- 1 in 6 live births are affected by hyperglycaemia in pregnancy.

Diabetes in South-East Asia
2024

Estimates were made for the seven countries and territories in the IDF South-East Asia (SEA) Region. All countries except Bhutan had primary data sources, which were used to generate estimates for diabetes in adults aged 20–79 years. A total of nine data sources from these six countries were used. Estimates for Mauritius, India and Sri Lanka were based on studies conducted within the past five years.

IDF projects that the number of people with diabetes in the SEA Region will increase by 73%, reaching 185 million by 2050. Over the same period, the prevalence of diabetes will increase 36% to reach 13.2%. The proportion of undiagnosed diabetes is the third highest of the seven IDF Regions at 42.7%. The proportion of pregnancies affected by hyperglycaemia is also the highest at 27.8%.

Only 12 billion USD was spent on diabetes in the SEA Region, representing a mere 1% of the total spent worldwide, despite the region being home to 18.2% of people with diabetes worldwide.

Map 4.6 Age-standardised prevalence (%) of diabetes (20–79 years), IDF South-East Asia Region 2024.

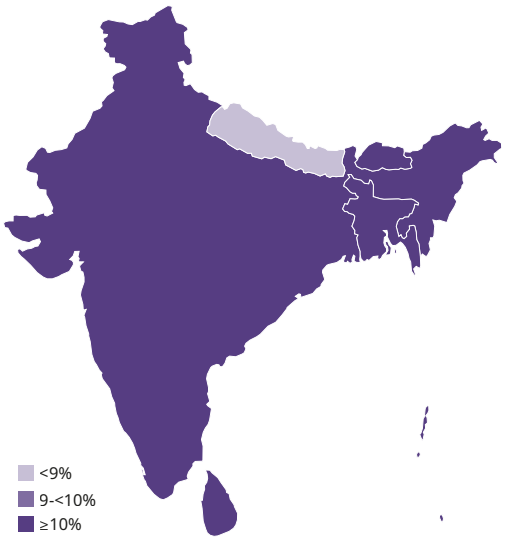
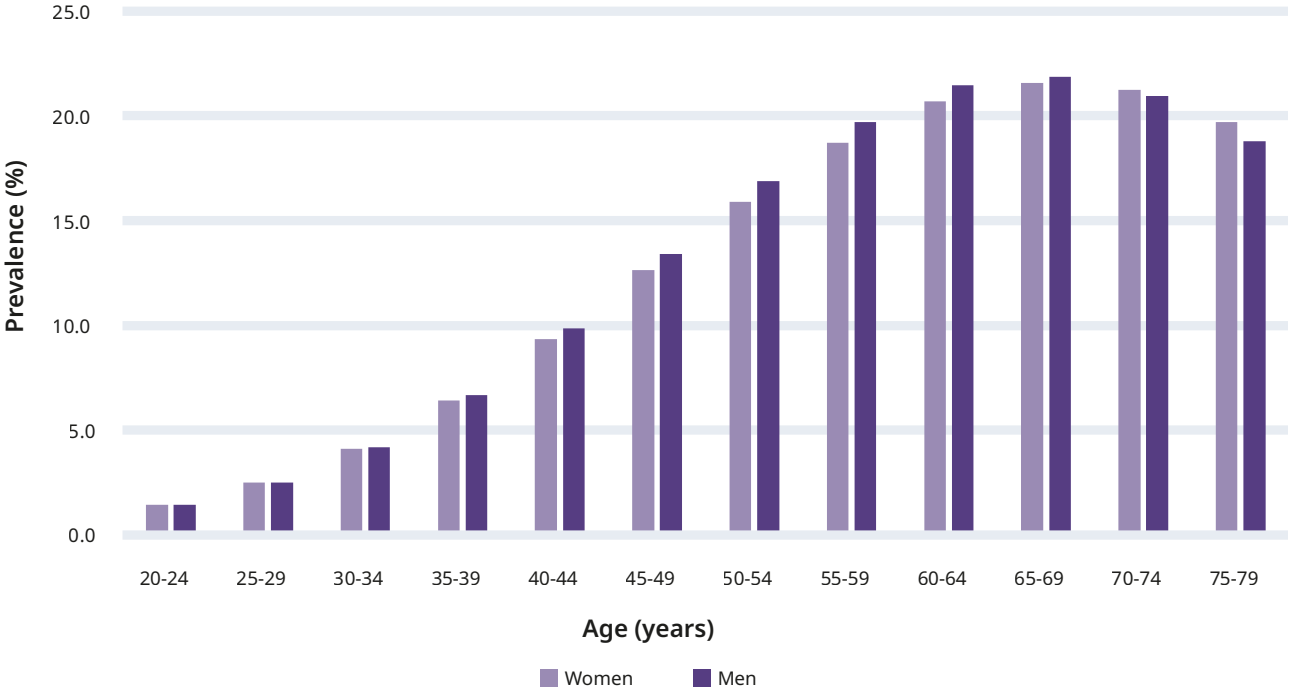


Figure 4.6 Estimated prevalence (%) of diabetes by age and sex, IDF South-East Asia Region 2024.



At a glance

	2024	2050
Adult population (20-79 years)	1.1b	1.4b
Diabetes (20-79 years)		
Regional prevalence	9.7%	13.2%
Age-standardised prevalence	10.8%	13.0%
Number of people with diabetes (20-79 years)	106.9m	184.5m
Number of deaths due to diabetes (20-79 years)	374,000	
Healthcare expenditure due to diabetes (20-79 years)		
Total healthcare expenditure, USD	11.5b	17.5b
Impaired glucose tolerance (20-79 years)		
Regional prevalence	13.3%	14.7%
Age-standardised prevalence	13.8%	14.6%
Number of people with impaired glucose tolerance	145.7m	204.9m
Impaired fasting glucose (20-79 years)		
Regional prevalence	11.8%	12.9%
Age-standardised prevalence	12.2%	12.8%
Number of people with impaired glucose tolerance	129.4m	180.9m
Undiagnosed diabetes (20-79 years)		
Regional proportion	42.7%	
Number of people with undiagnosed diabetes	46m	
Type 1 diabetes (all age groups)		
Number of people with type 1 diabetes	1m	

Top 5 countries

	2024	2050
Top five countries for number of people with diabetes (20-79 years)		
India	90.0m	157.0m
Bangladesh	14.0m	23.0m
Sri Lanka	1.6m	1.9m
Nepal	1.3m	2.4m
Mauritius	218.0t	248.0t
Top five countries for age-standardised prevalence of people with diabetes (20-79 years)		
Mauritius	20.1%	23.5%
Bangladesh	13.2%	15.4%
Bhutan	12.0%	13.8%
India	10.5%	12.8%
Sri Lanka	10.2%	12.0%

t = thousand | m = million | b = billion

Highlights

- 1 in 10 adults have diabetes – 107 million.
- India accounts for 1 in 7 of all adults living with diabetes worldwide.
- The number of adults living with diabetes is predicted to increase by 73% to 185 million by 2050.
- Almost 1 in 2 (42.7%) adults living with diabetes are undiagnosed.
- Diabetes was responsible for an estimated 374,000 deaths in 2024.
- Total diabetes-related expenditure in the Region amounts to USD 12 billion – the second lowest of all IDF Regions.
- 1 in 3 live births are affected by hyperglycaemia in pregnancy.

Diabetes in Western Pacific
2024

Estimates were made for 37 countries and territories in the IDF Western Pacific (WP) Region. For this edition of the IDF Diabetes Atlas, 40 data sources from 28 countries were used to generate estimates of diabetes in adults aged 20–79 years. Estimates for Australia, Vietnam, Republic of Korea, Singapore, Malaysia and Mongolia were based on studies conducted within the past five years.

The WP Region accounts for over a third (37%) of the total number of adults living with diabetes. The WP Region has the third highest prevalence of diabetes (12.4%) in the world. IDF projects that the number of people with diabetes in the WP Region will increase by 18%, reaching 254 million by 2050, and that the prevalence of diabetes will increase by 19% to reach 14.7% in 2050. The proportion of undiagnosed diabetes (50%) is the second highest of all IDF Regions. Diabetes is responsible for 1.2 million deaths in 2024, the highest number of all IDF Regions. Diabetes-related expenditure in 2024 totals USD 246 billion, the second highest of all IDF Regions and representing 24% of global expenditure.

Map 4.7 Age-standardised prevalence (%) of diabetes (20–79 years), IDF Western Pacific Region 2024.

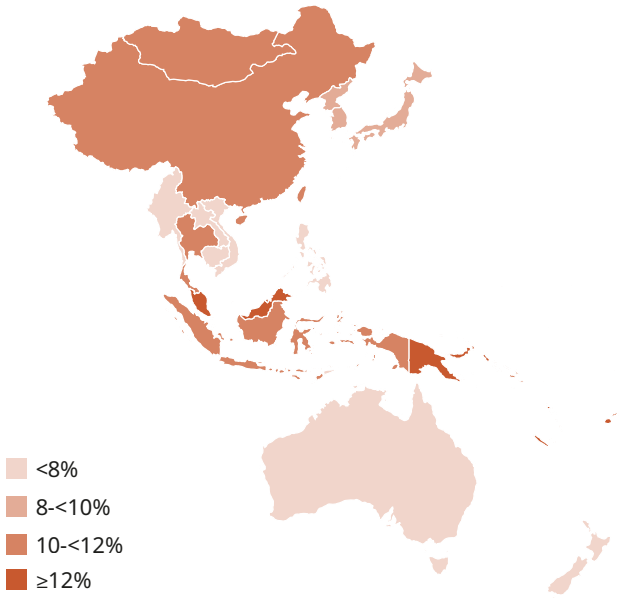
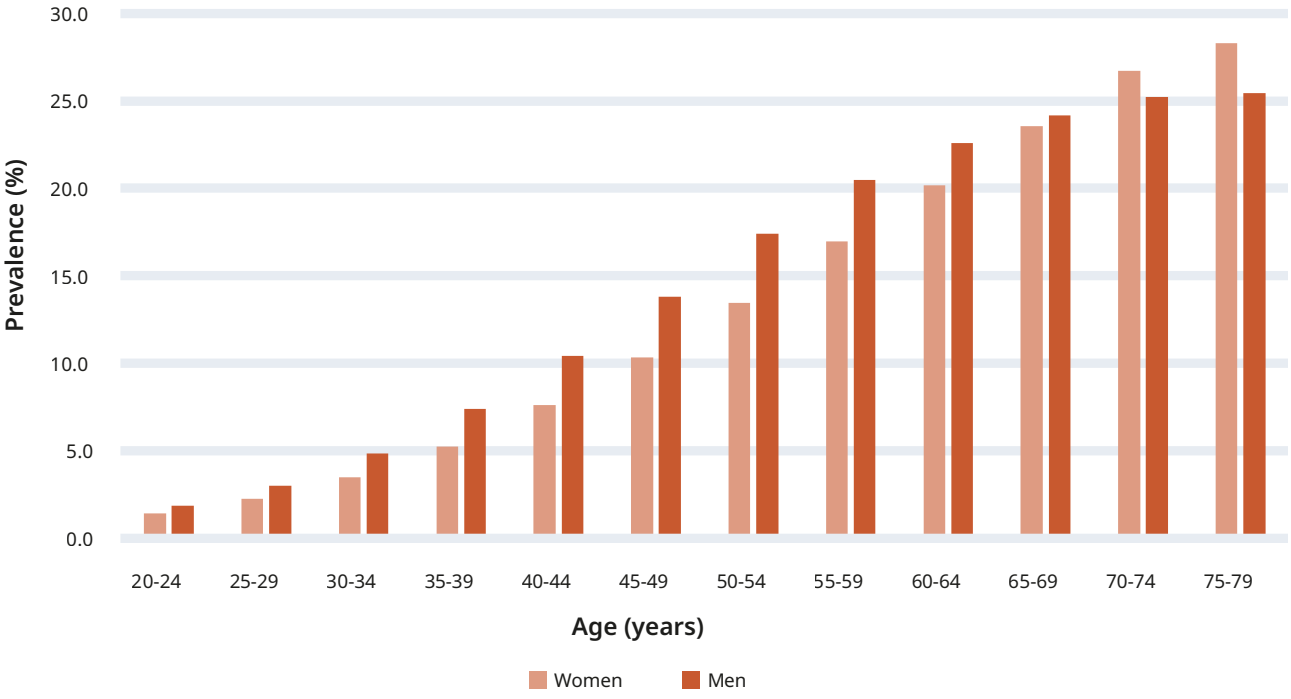


Figure 4.7 Estimated prevalence (%) of diabetes by age and sex, IDF Western Pacific Region 2024.



At a glance

	2024	2050
Adult population (20-79 years)	1.74b	1.72b
Diabetes (20-79 years)		
Regional prevalence	12.4%	14.7%
Age-standardised prevalence	11.1%	12.8%
Number of people with diabetes (20-79 years)	215m	254m
Number of deaths due to diabetes (20-79 years)	1.2m	
Healthcare expenditure due to diabetes (20-79 years)		
Total healthcare expenditure, USD	246.3b	237.7b
Impaired glucose tolerance (20-79 years)		
Regional prevalence	14.4%	15.5%
Age-standardised prevalence	13.5%	14.3%
Number of people with impaired glucose tolerance	251m	268m
Impaired fasting glucose (20-79 years)		
Regional prevalence	9.1%	9.9%
Age-standardised prevalence	8.6%	9.2%
Number of people with impaired glucose tolerance	160m	171m
Undiagnosed diabetes (20-79 years)		
Regional proportion	50.0%	
Number of people with undiagnosed diabetes	108m	
Type 1 diabetes (all age groups)		
Number of people with type 1 diabetes	991,000	

Top 5 countries

	2024	2050
Top five countries for number of people with diabetes (20-79 years)		
China	148.0m	168.3m
Indonesia	20.4m	28.6m
Japan	10.1m	9.4m
Thailand	6.4m	6.6m
Republic of Korea	5.0m	5.1m
Top five countries for age-standardised prevalence of people with diabetes (20-79 years)		
Marshall Islands	25.7%	28.7%
Samoa	25.4%	27.2%
Kiribati	24.6%	28.5%
French Polynesia	22.8%	23.9%
New Caledonia	22.0%	23.3%

m = million | b = billion

Highlights

- 1 in 8 adults have diabetes – 215 million.
- The Region accounts for over a third (37%) of the total number of adults living with diabetes.
- China accounts for 1 in 4 of all adults living with diabetes worldwide.
- Half (50%) of adults living with diabetes in the Region are undiagnosed.
- Diabetes was responsible for 1.2 million deaths in 2024 – the highest number of all IDF Regions.
- Diabetes-related expenditure in 2024 totals USD 246 billion – 24% of global expenditure.
- 1 in 5 live births are affected by hyperglycaemia in pregnancy.

Ana Alvarez, Spain - Living with type 1 diabetes

5 Diabetes complications

90 5.1 Type 2 diabetes and the risk of cardiovascular diseases
92 5.2 Diabetes and the risk of dementia
95 5.3 Diabetes-related eye disease
98 References

Key messages:

- People with type 2 diabetes are at higher risk of cardiovascular diseases, including a 72% higher risk of heart attack, a 52% higher risk of stroke, and an 84% higher risk of heart failure.
- People with diabetes have a 56% higher risk of dementia compared with people who do not have diabetes.
- The earlier someone develops type 2 diabetes, the higher their chance of dementia in later life.
- Close to one in four adults with diabetes have some form of diabetes-related retinopathy.
- More than one in ten people with some form of diabetes-related retinopathy are at risk of losing their vision or have lost it already.

5.1 Type 2 Diabetes and the risk of cardiovascular diseases

Cardiovascular diseases (CVD) are a leading cause of illness and death among people with type 2 diabetes (T2D).[1–3] Diabetes-related metabolic changes include elevated blood glucose, increased levels of fat in the blood (including high cholesterol and triglycerides), high blood pressure, as well as weight gain and a build-up of ectopic fat (excess fat within vital tissues that do not typically contain it, such as the liver, muscles, heart, and pancreas). Together, these factors significantly increase the risk of serious heart diseases, including heart attack, stroke, and heart failure.[4] This chapter explores the latest research on how T2D might increase the risk of developing heart-related diseases, with some additional data on cardiovascular risk in people with undiagnosed diabetes and pre-diabetes.

Risk of cardiovascular diseases in people with type 2 diabetes

A systematic review of the latest evidence up to December 2024 was conducted using major databases, including MEDLINE, SCOPUS, and Web of Science. The search identified nine studies that met our inclusion criteria (i.e. population representative studies in people with type 2 diabetes and without diabetes who have experienced cardiovascular incidents). We selected studies since the last meta-analysis undertaken by the Emerging Risk Factor Collaborative group in 2010. New studies all focused on risks in individuals with T2D compared to those without and studies that adequately captured atherosclerotic cardiovascular disease (ASCVD) risk, stroke, myocardial infarction and heart failure. Where data clearly appeared to be from the same country covering similar or overlapping patient populations, the latest representative data were included.

The included studies came from Australia, China, Hungary, Italy, Sweden, Taiwan (POC), the UK and the US. The studies included a total of over 6.3 million individuals. Among these individuals, more than 1.02 million had T2D with reported CVD incidents. The findings from these studies were then pooled in a meta-analysis (Figure 5.1).[3,5–21]

Findings from these studies indicate that, compared to those without diabetes, people with T2D face:

- **60%** higher risk of developing any form of **CVD**
- **54%** higher risk of **stroke**
- **73%** higher risk of **myocardial infarction (heart attack)**
- **84%** higher risk of **heart failure**

Considerable differences between the studies reflect, in part, adjustments for conventional risk factors, but other factors are also likely to be relevant, especially in the context of heart failure, which could reflect different diagnostic practices across countries.

Notably, the greater *relative risk* of CVD events in women with diabetes is likely due to the low risk in women without diabetes, though absolute risk remains higher in men with T2D.[22] The absolute lifetime risk is, however, substantially greater in people who develop T2D when much younger (e.g. <40 years) as compared to later in life, linked to far greater obesity and longer time to exposure to risk factors. In people with pre-diabetes and undiagnosed diabetes in the UK, and after adjustment for classical risk factors, cardiovascular risks were 11% (2-30%) and 20% (4-38%) higher relative to those with normal glycaemia (HbA1c <42 mmol/mol), respectively.[23]

A major limitation of these cardiovascular findings is the lack of data from low- and middle-income countries (LMICs), making it impossible to estimate the true burden of non-fatal CVD among people with T2D in these regions.

Gaps to be addressed

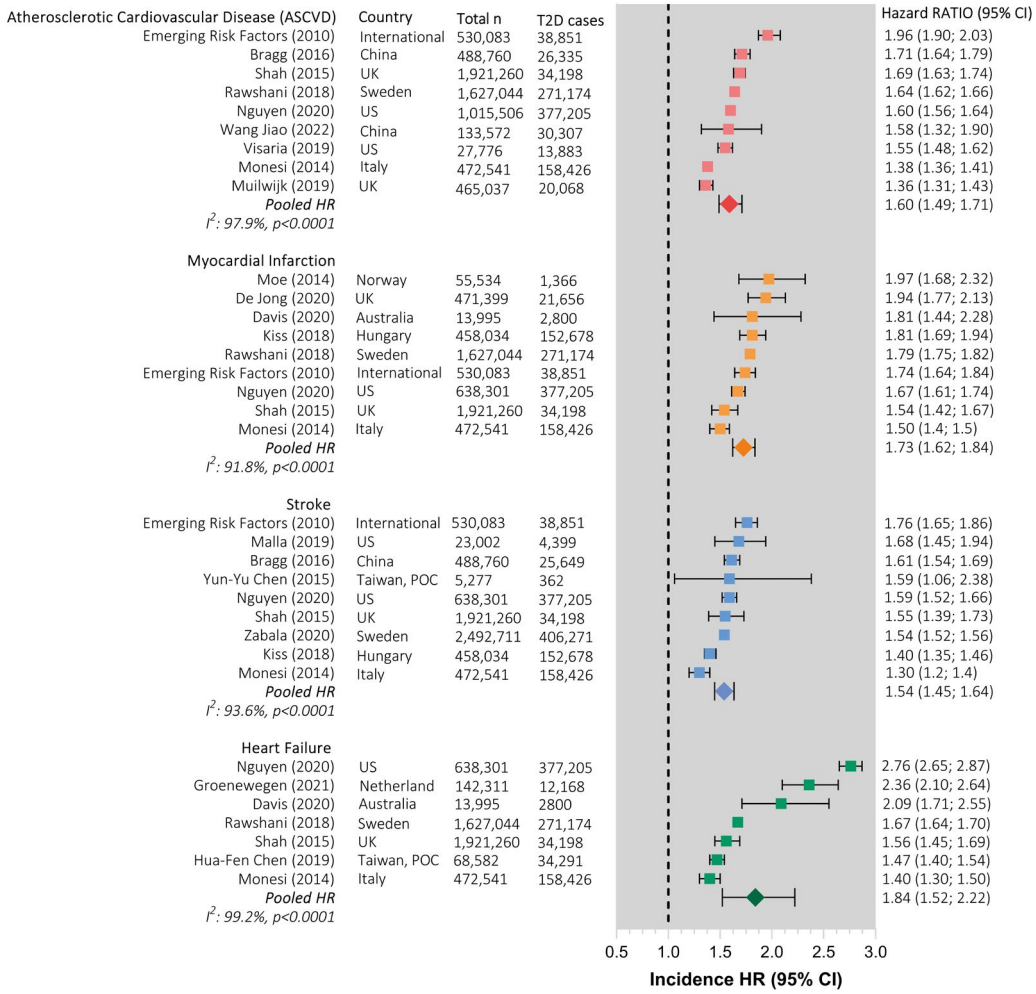
The IDF Diabetes Atlas highlights critical data gaps in the capture of cardiovascular outcome data that compare risks in people living with and without T2D in LMICs. Studies suggest that individuals with diabetes in these countries face a higher risk of diabetes-related deaths compared to those in high-income countries (HICs).[2] For instance, the rates of heart-related mortality among people with diabetes are significantly higher in low-income countries (LICs) (5.7 per 1,000 person-years) compared to middle-income countries (MICs) (2.2) and HICs (1.0).[2] These disparities highlight the greater risk of adverse cardiovascular outcomes in LICs. However, the lack of comprehensive data in these regions on non-fatal outcomes in representative population studies limits an understanding of the full extent of diabetes cardiovascular complications in these regions, which will also be changing over time due to multiple, potentially opposing, changes in preventative medications versus increases in incidence, especially at younger ages.

To address these gaps, improving data collection and strengthening healthcare infrastructure in LMICs would be essential. Expanding global surveillance systems and investing in targeted healthcare interventions will be crucial in mitigating the growing impact of diabetes-related cardiovascular diseases in these vulnerable populations.

Summary

The evidence reinforces the link between diabetes and cardiovascular diseases, emphasising the need for early detection, comprehensive management, and public health interventions to mitigate the risks. As the global prevalence of diabetes continues to rise, tackling its cardiovascular complications must remain a priority for healthcare systems and policymakers worldwide.

Figure 5.1 Meta-analysis of the incidence risk of atherosclerotic cardiovascular disease, stroke, myocardial infarction, and heart failure in people with type 2 diabetes versus those without diabetes.

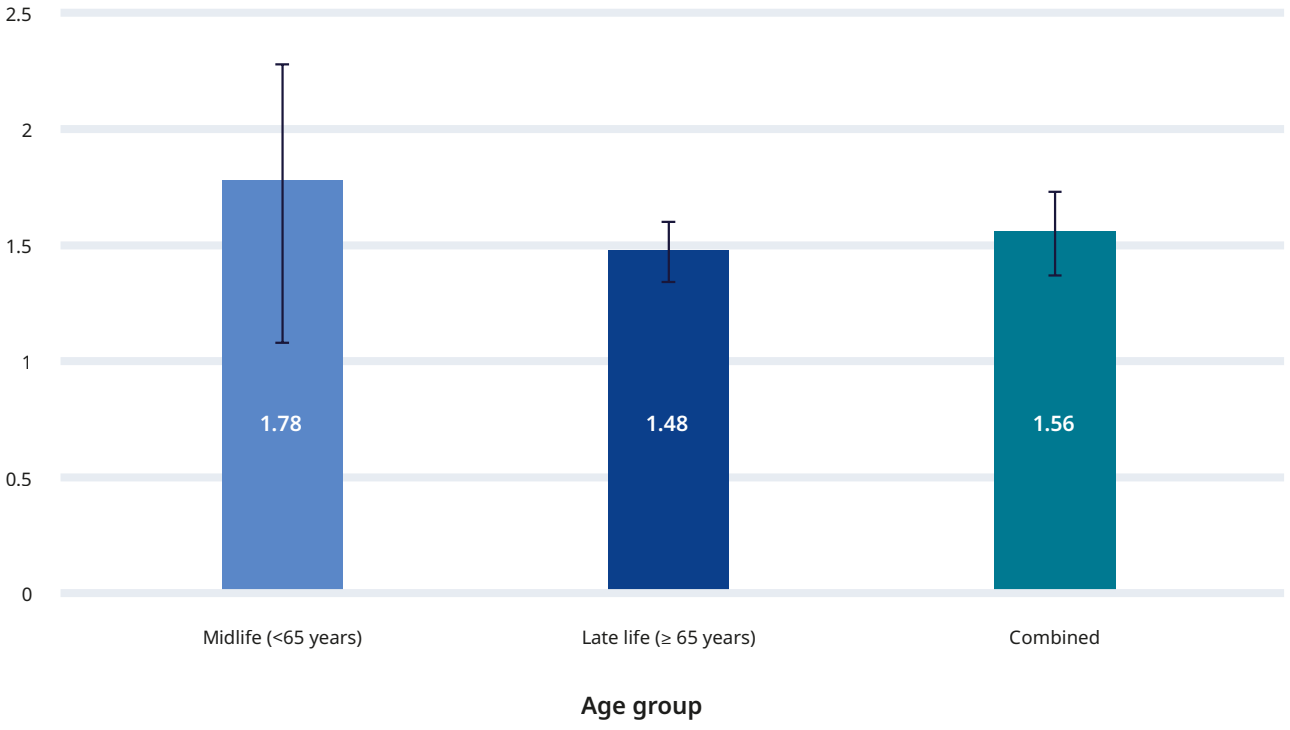


5.2 Diabetes and the risk of dementia

Globally, an estimated 57.4 million people currently live with dementia. This figure is projected to increase to 152.8 million by 2050, largely due to population ageing.[24] Dementia incidence is expected to increase more in low- and-middle-income countries than in high-income countries. The most common type of dementia is caused by Alzheimer's disease (65%), followed by vascular dementia, which comprises about 20% of cases. Diabetes has been associated with an increased risk of cognitive decline and dementia in cohort studies for over 20 years.[25] The 2024 Lancet Commission report on dementia[26] estimates that diabetes accounts for 2.6% of dementia cases globally. Diabetes is associated with midlife obesity, and hypertension, which are both risk factors for dementia.[27] Diabetes also increases the risk of stroke,[3] and dementia occurs in approximately 16.5% of older adults within 6-18 months of stroke.[28] In general, T2D has been shown to have a greater impact on the risk of vascular dementia (VaD) than Alzheimer's disease (AD), which is borne out in neuropathological studies as well as epidemiological research.[29]

The younger a person develops T2D, the higher the risk of developing dementia in later life.

Figure 5.2 Relative risks of dementia in midlife, late life and combined age ranges.



Systematic review of current evidence on incidence and prevalence of dementia in T2D

The IDF Diabetes Atlas conducted a systematic review and meta-analysis of the global literature to obtain up-to-date estimates of the risk of dementia in people living with diabetes. In order to be included, articles had to be population-based, include more than 100 participants and report data on the diagnosis of diabetes and dementia from clinical tests or medical records using established criteria. Of 127 articles identified, 34 had the required data on both diabetes and dementia to be included in the meta-analyses. The relative risk of dementia for people with diabetes was estimated with mean age < 65 as 1.78 and for studies that had a mean age of ≥ 65 as 1.48 (Figure 5.2).

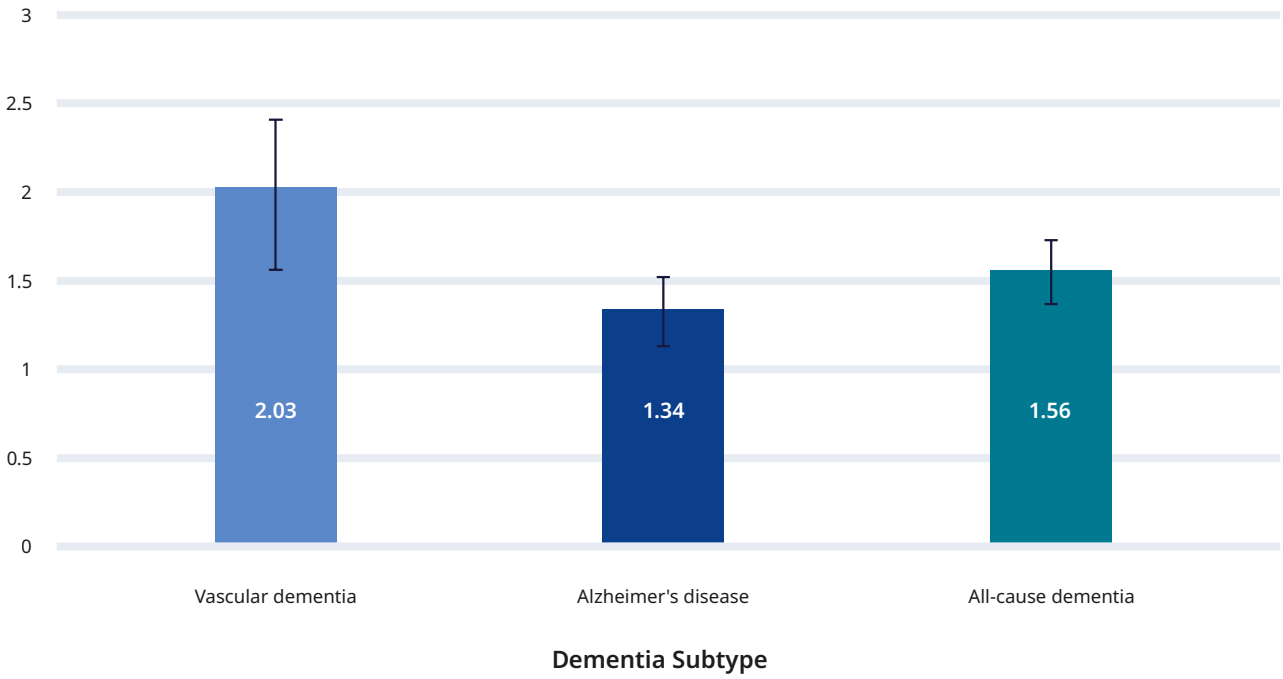
There were insufficient studies to differentiate by age group when considering subtypes of dementia. Among the participants in the included studies, people with diabetes had a 56% increased risk of all-cause dementia. When examined by subtype, they had a 34% increased risk of developing Alzheimer's disease and a 103% increased risk of developing vascular dementia (Figure 5.3).

The proportion of dementia cases in the population that can be attributed to having diabetes was estimated using the IDF Diabetes Atlas prevalence data for 2024 and 2050[30] and the relative risk estimates in our meta-analysis using Levin's equation.[31] Map 5.1 shows the cases of dementia globally attributable to diabetes in 2024, and Map 5.2 shows the same figures projected for 2050 using data from the IDF Diabetes Atlas 11th Edition.

Limitations

Epidemiological studies primarily classify dementia subtypes according to clinical symptoms and not biomarkers. Hence there is likely some degree of misclassification of AD, and VaD. In addition, many older adults have mixed pathology. Diabetes may lead to shorter life expectancy due to other conditions such as heart disease and stroke, which means that the meta-analysis did not account for competing causes of death. There are modifiable risk factors for dementia and diabetes, as well as emerging risk factors that were not considered in the cohort studies which provided the data.

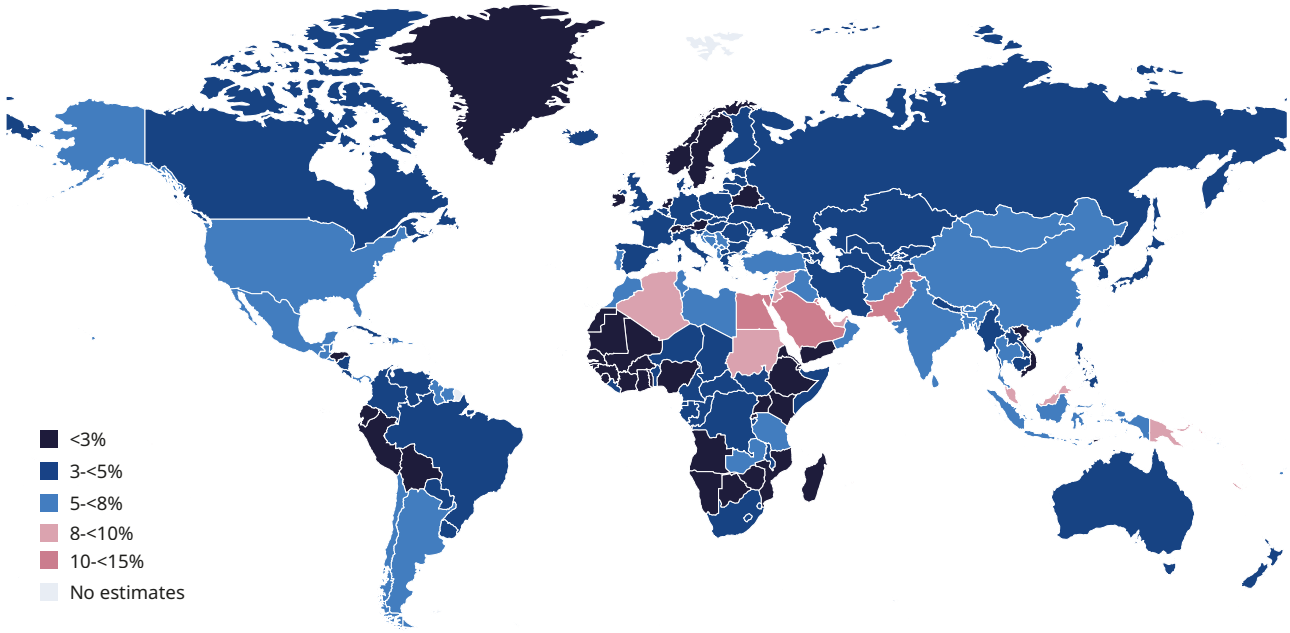
Figure 5.3 Relative risk of vascular dementia (VaD), Alzheimer's disease (AD) and all-cause dementia in people with diabetes.



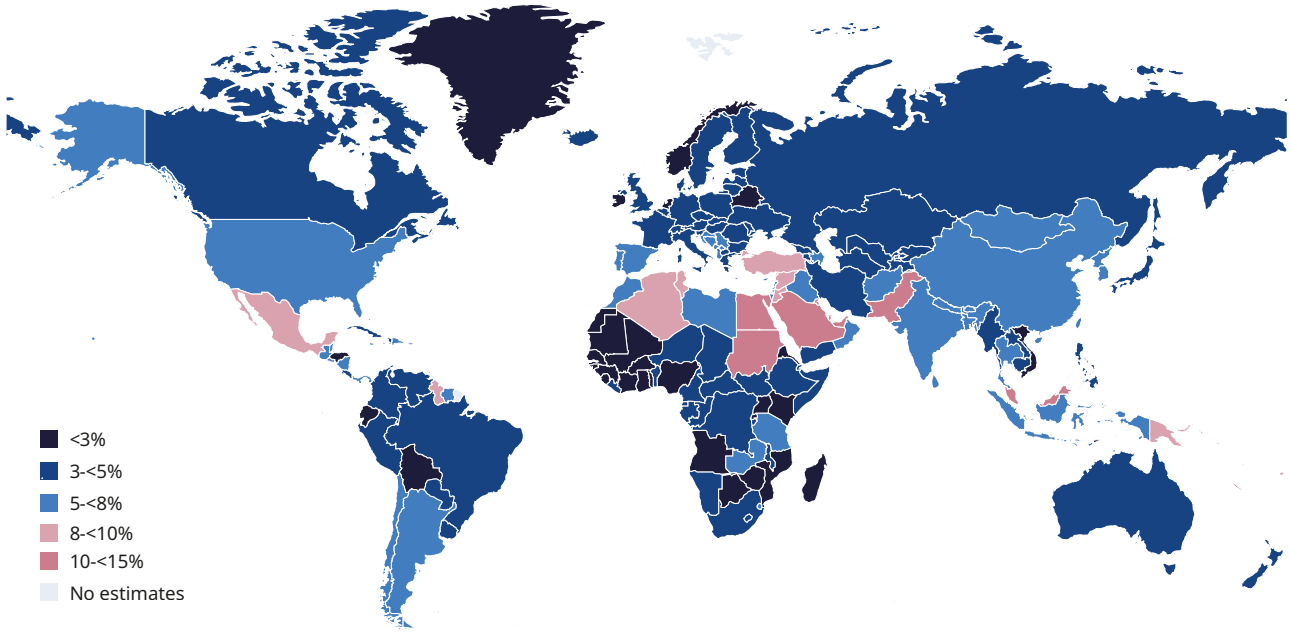
Summary

Diabetes is a risk factor for dementia occurring both beyond and before age 65 years. The younger a person develops T2D, the higher the risk of developing dementia in later life. A recent study has indicated that for each year earlier that T2D is diagnosed, the individual's risk of developing dementia increases by 1.9%.[32] Diabetes is a cause of vascular disease, the occurrence of which depends in part on lifestyle factors. Thus, vascular dementia risk associated with diabetes may be potentially modifiable. Intensive preventive efforts using all available interventions are required to prevent the enormous global burden of disease that is projected from diabetes and dementia with population ageing.

Map 5.1 The proportion of dementia cases in the population attributed to diabetes, in 2024.



Map 5.2 The proportion of dementia cases in the population attributed to diabetes, in 2050.



5.3 Diabetes-related eye disease

The adoption of various methods for detecting and defining the severity of diabetes-related retinopathy (DR), including maculopathy, has compounded the difficulty of generalising the extent of the problem globally.[33,34] However, reviewers who have attempted this task suggest that around 30% of people with diabetes show signs of DR, with a proportion below 10% developing sight-threatening lesions, such as proliferative diabetic retinopathy and/or diabetic macular oedema.[33,35–37]

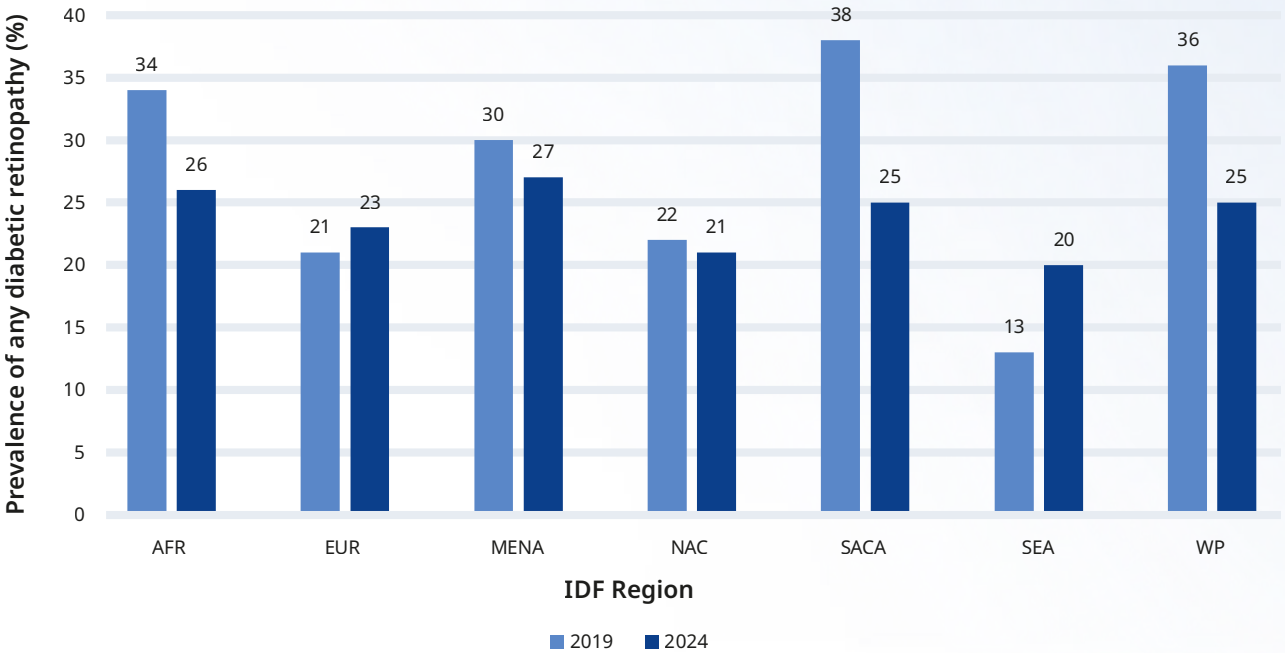
If left unchecked, the current global prevalence of diabetes at 589 million and the anticipated increase to 853 million by 2050 presents a monumental challenge to global health.[38] The number of people living with undiagnosed diabetes and the increasing prevalence of pre-diabetes[39] add to this challenge, underscoring a pressing need to take action to address the numerous complications associated with diabetes. Among the complications, loss of vision is one of the most feared. Elevated blood glucose, high blood pressure, renal dysfunction, and the duration and type of diabetes are potent risk factors.[40,41] Worryingly, there is also evidence for increased susceptibility to retinopathy in people who develop T2D early in life.[42]

Since the beginning of this century, important advances have been made in both the diagnosis and management of diabetes-related eye disease. However, the application of these innovations has varied considerably both within and between countries and regions of the world.

In the UK, the introduction of systematic screening for diabetes-related eye disease, along with enhancements in diabetes management, has relegated DR as a primary cause of serious sight impairment (blindness) in the working-age population.[43] Progression to referable retinopathy rarely occurs within two years in individuals without retinopathy or considered to be at low risk. As a result, the screening interval has been extended beyond yearly to biennially, allowing those with more advanced eye disease to be reviewed more frequently.[44,45] Telemedicine has also had a significant positive impact on screening programmes.[46,47]

Despite all the progress in screening for DR over the last two decades, the Diabetic Retinopathy Barometer Study, conducted across[41] countries, found considerable deficiencies in education of people with diabetes, professional training[48,49] and access to affordable treatment, especially in LMICs, and among minority populations where the highest disease burden resides.[50,51]

Figure 5.4 The overall global prevalence of any DR per IDF Regions in 2019[34] and 2024.[52]



The latest review of the global prevalence of DR, restricted to studies published between 2017 and 2024 where DR was assessed using retinal images, includes 42 studies from 21 countries involving a total of 707,657 individuals, predominantly living with T2D. The IDF Western Pacific (WP) Region contributed 38% (16/42) of the studies, with seven studies each from the IDF Europe (EUR) and North America and Caribbean (NAC) Regions, three each from IDF Africa (AFR) and Middle East and North Africa (MENA) Regions, and one study from the South and Central America (SACA) Region. A total of 39 studies recorded the presence of any DR, whereas a lesser number noted the presence of proliferative retinopathy (24/42, 57%), macular oedema (15/42, 36%) and sight-threatening DR (27/42, 64%).

The overall global prevalence of any DR, as represented by countries within the studies across the seven IDF regions, was 23.0% (95% CI: 20-26%), with proliferative DR at 6.0% (95% CI: 3-9%), diabetes related macular oedema 5.0% (95% CI: 4-6%), and sight-threatening DR at 11.0% (95% CI: 9 to 14%). This represents a slight decrease in the prevalence of any DR from 27% reported earlier in the IDF Diabetes Atlas 10th Edition.[34]

Table 5.1 Prevalence the any diabetes-related retinopathy and sight threatening diabetes-related retinopathy within the IDF Regions in 2024.[52]

	Any diabetes-related retinopathy				Sight threatening diabetes-related retinopathy			
IDF Region	Number studies	Total population	Cases	Modelled prevalence (95% CI)	Number studies	Total population	Cases	Modelled prevalence (95% CI)
EUR	6	493,837	59,559	23 (21,26)	4	418,368	6,861	9 (1,23)
WP	16	39,102	9,341	25 (19,31)	10	33,364	3,341	10 (6,15)
SEA	4	62,735	11,555	20 (16,25)	5	63,457	3,529	11 (7,15)
SACA	1	219	54	25 (19,31)	1	219	18	8 (5,12)
NAC	6	107,789	26,068	21 (16,27)	3	58,163	3,588	16 (9,25)
MENA	3	2,505	370	27 (5,59)	2	616	110	19 (6,38)
AFR	3	1,771	451	26 (15,39)	2	1,275	114	7 (0,23)
GLOBAL	39	707,657	107,257	23 (20,26)	27	575,462	17,561	11 (9,14)

*Sight Threatening diabetes-related retinopathy - presence of severe non-proliferative retinopathy, proliferative DR, or clinically significant macular oedema

A reduction in the prevalence of any DR was seen in five IDF regions (AFR, MENA, NAC, SACA, WP), two of which (SACA and WP) recorded a decrease of more than 10% (12.7% and 11.2%, respectively) (Figure 5.4). In contrast, the remaining two regions (EUR and SEA) exhibited increases of 2.4% and 7.5%, respectively (Figure 5.4). In addition, the current analysis reveals a four-fold higher prevalence of proliferative DR than seen previously, whereas macular oedema remains unchanged at approximately 5%.

This review further highlights the continuing burden of diabetes-related eye disease worldwide[52] and the inherent difficulties in accurately estimating the global prevalence of DR in its various forms, and especially when attempting to make meaningful comparisons over time.

Table 5.2 Prevalence the proliferative diabetes-related retinopathy and macular oedema within IDF Regions in 2024.[52]

	Proliferative diabetes-related retinopathy				Diabetes-related macular oedema			
IDF Region	Number studies	Total population	Cases	Prevalence (95% CI)	Number studies	Total population	Cases	Prevalence (95% CI)
EUR	1	2,272	107	5 (4,6)	0			N/A
WP	9	15,466	437	4 (2,7)	5	5,877	396	9 (6,13)
SEA	4	62,735	11,557	20 (16,25)	3	56,602	2,045	4 (2,6)
SACA	1	219	3	1 (0,4)	1	219	10	5 (2,8)
NAC	6	106,807	2,815	3 (2,4)	4	101,198	2,717	3 (2,4)
MENA	2	2,110	232	11 (10,12)	1	1,889	40	2 (1,3)
AFR	1	739	5	1 (0,2)	1	739	81	11 (9,13)
GLOBAL	24	190,348	15,156	6 (3,9)	15	166,524	5,290	5 (4,6)

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Appendices

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Country summary in IDF Africa Region
2024

Africa

Country or territory	Number of adults with diabetes (20–79 years), in 1,000s	Diabetes prevalence adults (20-79 years), (%)	Age-adjusted comparative diabetes prevalence (20–79 years), (%)	Proportion of undiagnosed diabetes (20–79 years), %	
AFR	**24,600**	**4.2**	**5.0**	**73.0**	
Angola	688.8	4.1	4.9	68.8	
Benin	466.8	7.1	8.1	89.8	
Botswana	58.2	3.7	4.6	60.5	
Burkina Faso	372.3	3.4	4.5	90.4	
Burundi	214.1	3.6	4.3	60.2	
Cameroon	774.2	5.6	6.9	73.1	
Cabo Verde	22.0	5.6	6.8	30.8	
Central African Republic	141.1	6.0	7.6	73.1	
Chad	464.2	5.9	7.3	73.1	
Comoros	39.0	8.6	10.8	47.5	
Democratic Republic of the Congo	2,859.8	6.3	7.7	73.1	
Djibouti	41.0	5.9	6.5	60.2	
Equatorial Guinea	65.6	7.2	8.2	73.1	
Eritrea	70.2	3.7	4.4	46.1	
Eswatini	40.8	6.1	7.9	61.3	
Ethiopia	2,297.3	3.6	4.4	76.4	
Gabon	100.9	7.5	8.5	73.1	
Gambia	54.0	4.1	5.5	78.7	
Ghana	317.4	1.7	2.7	78.7	
Guinea	244.6	3.5	4.6	78.7	
Guinea-Bissau	39.9	3.7	4.8	78.7	
Côte d'Ivoire	529.2	3.7	5.0	78.7	
Kenya	813.3	2.8	3.1	53.6	
Lesotho	63.3	4.8	6.2	58.2	
Liberia	198.1	7.4	9.2	85.1	
Madagascar	599.3	3.8	4.6	68.8	
Malawi	540.1	5.5	5.7	78.7	
Mali	357.4	3.6	4.8	78.7	
Mauritania	95.7	4.0	5.2	78.7	
Mayotte	6.4	4.1	4.6	68.8	
Mozambique	404.5	2.5	3.0	88.6	
Namibia	62.8	4.4	5.3	56.4	
Niger	505.9	4.5	4.1	78.7	
Nigeria	2,988.5	2.8	3.0	78.7	
Congo	213.7	7.0	8.1	73.1	
Rwanda	130.8	1.8	2.1	85.6	
Sao Tome and Principe	12.4	10.7	12.1	73.1	
Senegal	251.6	2.9	3.8	78.7	
Seychelles	7.4	9.9	9.3	39.7	
Sierra Leone	170.0	3.7	4.8	78.7	
Somalia	377.6	4.8	5.8	60.2	
South Africa	2,324.2	6.1	7.2	70.3	
South Sudan	207.4	4.1	4.6	60.2	
Togo	177.5	3.9	4.8	80.1	
Uganda	369.1	1.7	2.2	61.2	
United Republic of Tanzania	2,928.0	9.2	9.8	60.2	
Western Sahara	22.3	5.5	5.8	78.7	
Zambia	750.4	7.6	10.3	86.0	
Zimbabwe	106.5	1.28	1.5	68.8	

	Diabetes-related expenditure per person with diabetes (20–79 years), (USD)	Total diabetes-related expenditure (20–79 years), (USD)	Diabetes-related deaths in adults (20–79 years)	Type 1 diabetes across all age groups	Age-adjusted comparative prevalence of impaired glucose tolerance (20–79 years), (%)	Age-adjusted comparative prevalence of impaired fasting glucose (20–79 years), (%)
	414.3	**9,931,943,458.2**	**216,000.0**	**351,955.0**	**12.0**	**7.0**
	470.3	323,950,519.2	5,113.0	13,960.0	7.4	8.1
	130.2	60,754,792.2	3,700.1	4,001.0	9.6	7.4
	2,261.4	131,664,518.0	353.0	1,330.0	7.6	4.6
	167.7	62,426,663.6	2,573.2	543.0	9.3	7.0
	103.1	22,082,446.3	2,058.6	2,856.0	15.8	4.2
	252.0	195,127,919.5	5,439.7	8,715.0	9.8	7.9
	756.2	16,650,758.5	112.8	215.0	9.8	8.4
	236.7	33,388,943.4	1,520.1	243.0	9.5	7.7
	110.7	51,395,689.6	6,207.2	1,158.0	9.2	6.4
	182.4	7,106,522.7	336.9	343.0	11.5	4.7
	80.6	230,517,629.4	25,111.2	23,951.0	9.6	7.9
	313.6	12,848,559.1	311.4	1,794.0	24.0	6.5
	1,293.9	84,830,484.3	496.5	667.0	9.9	8.7
	110.7	7,774,891.6	524.8	6,913.0	20.9	1.7
	912.1	37,216,896.2	464.4	423.0	5.5	11.4
	96.2	221,036,089.1	13,369.5	16,513.0	17.2	4.6
	961.3	96,988,941.6	572.6	979.0	10.2	9.5
	109.4	5,912,371.8	397.9	225.0	9.9	9.0
	258.8	82,156,351.0	2,328.4	10,189.0	9.8	7.9
	164.1	40,126,219.4	2,154.6	1,184.0	9.4	6.8
	239.2	9,541,433.2	296.8	182.0	9.5	7.8
	342.1	181,068,826.1	5,381.6	9,233.0	9.7	7.6
	409.6	333,162,955.3	9,377.0	20,818.0	17.3	4.1
	434.2	27,486,725.1	982.4	721.0	5.7	6.2
	180.6	35,762,062.7	1,468.4	363.0	9.7	12.8
	91.3	54,738,046.5	4,785.6	9,971.0	6.6	7.3
	141.1	76,180,418.7	2,960.2	7,196.0	5.4	4.5
	170.7	61,005,100.2	2,977.3	1,424.0	9.5	7.8
	255.2	24,431,208.8	544.3	462.0	9.8	4.7
			17.1	953.0	13.8	5.7
	213.1	86,184,701.1	2,306.8	11,476.0	6.6	7.1
	2,126.3	133,452,384.2	567.1	1,332.0	6.9	5.8
	126.1	63,790,188.9	2,829.7	1,596.0	9.1	6.0
	474.8	1,419,060,879.3	40,990.2	59,097.0	9.7	7.6
	210.8	45,037,113.1	1,621.8	1,970.0	9.9	8.4
	252.6	33,029,254.8	721.3	4,114.0	16.5	4.4
	506.5	6,295,337.8	71.8	77.0	10.0	13.9
	255.1	64,186,040.9	1,186.4	6,340.0	9.6	2.0
	899.9	6,624,636.4	56.2	438.0	9.7	3.9
	360.5	61,267,964.6	1,167.7	702.0	9.5	7.7
			4,020.0	19,822.0	21.5	5.8
	1,978.9	4,599,462,032.3	24,797.9	30,629.0	9.0	4.2
			2,413.8	9,362.0	17.0	4.5
	174.8	31,026,891.3	1,513.8	696.0	9.5	7.7
	222.6	82,153,655.1	2,750.4	18,191.0	18.1	2.0
	153.4	449,128,737.6	21,907.7	24,955.0	18.4	11.0
			94.6	61.0	10.1	10.4
	318.6	239,041,584.3	3,790.8	8,099.0	6.4	10.1
	796.6	84,868,073.3	1,091.4	5,473.0	5.1	6.3

Country summary in IDF Europe Region
2024

Europe

Country or territory	Number of adults with diabetes (20–79 years), in 1,000s	Diabetes prevalence adults (20-79 years), (%)	Age-adjusted comparative diabetes prevalence (20–79 years), (%)	Proportion of undiagnosed diabetes (20–79 years), %	
EUR	**65,600**	**9.8**	**8.0**	**34.0**	
Albania	261.4	12.4	10.6	33.5	
Andorra	7.9	12.5	10.1	28.5	
Armenia	168.1	8.5	7.7	40.6	
Austria	479.4	7.2	5.4	28.5	
Azerbaijan	715.3	9.9	10.2	33.9	
Belarus	445.4	6.3	5.1	29.1	
Belgium	641.6	7.6	5.9	37.0	
Bosnia and Herzegovina	316.4	12.9	10.3	33.5	
Bulgaria	482.0	9.6	7.4	38.1	
Croatia	409.8	13.7	10.5	28.5	
Cyprus	106.1	11.1	10.0	36.6	
Czechia	765.9	9.8	7.6	16.7	
Denmark	354.7	8.2	6.4	22.3	
Estonia	83.9	8.8	6.9	48.7	
Faroe Islands	2.5	7.0	5.3	31.4	
Finland	400.4	9.8	6.9	18.8	
France	4,107.0	9.0	6.5	24.1	
Georgia	200.7	7.8	6.7	36.9	
Germany	6,485.3	10.6	7.8	20.4	
Greece	873.8	11.4	8.0	28.5	
Greenland	2.0	5.0	4.3	28.5	
Guernsey	4.2	8.9	7.6	28.5	
Hungary	765.0	10.1	8.3	16.7	
Iceland	21.9	8.1	6.9	28.5	
Ireland	158.5	4.4	3.6	31.2	
Isle of Man	6.4	10.2	7.5	28.5	
Israel	616.4	10.8	10.1	28.5	
Italy	5,018.4	11.4	7.7	28.5	
Jersey	7.6	8.8	7.6	28.5	
Kazakhstan	842.3	6.9	6.8	56.7	
Kosovo (under UNSC res.1244)	119.6	10.4	10.4	33.5	
Kyrgyzstan	263.1	6.8	7.6	56.7	
Latvia	126.6	9.6	7.1	28.5	
Liechtenstein	2.9	9.7	7.2	28.5	
Lithuania	210.6	10.6	7.5	28.5	
Luxembourg	33.1	6.7	5.8	26.2	
Malta	48.0	11.5	10.0	43.2	
Republic of Moldova	165.5	6.8	6.3	36.9	
Monaco	2.8	11.4	6.9	28.5	
Montenegro	57.8	12.7	10.7	33.5	
Netherlands	895.7	6.9	5.0	28.5	
North Macedonia	140.8	8.9	7.4	33.5	
Norway	246.2	6.1	4.8	28.5	
Poland	3,098.6	10.2	8.1	18.9	
Portugal	1,094.8	14.3	10.5	43.6	
Romania	1,320.0	9.1	7.5	21.4	
Russian Federation	7,577.6	7.1	5.9	40.5	
San Marino	3.1	12.2	8.6	28.5	
Serbia	718.5	13.3	10.5	33.5	
Slovakia	393.6	9.1	7.1	28.5	

	Diabetes-related expenditure per person with diabetes (20–79 years), (USD)	Total diabetes-related expenditure (20–79 years), (USD)	Diabetes-related deaths in adults (20–79 years)	Type 1 diabetes across all age groups	Age-adjusted comparative prevalence of impaired glucose tolerance (20–79 years), (%)	Age-adjusted comparative prevalence of impaired fasting glucose (20–79 years), (%)
	2,950.9	**192,880,787,692.9**	**433,000.0**	**2,740,885.0**	**5.9**	**5.3**
	653.2	170,770,833.2	1,120.4	3,497.0	7.5	8.5
	3,138.9	24,918,211.5	43.5		9.5	5.5
	1,181.1	198,534,698.8	1,125.2	3,382.0	2.8	4.7
	6,267.7	3,004,882,944.8	4,452.7	27,042.0	4.3	4.1
	483.8	346,056,181.3	4,378.7	9,533.0	3.1	5.3
	1,213.2	540,340,717.2	3,660.5	27,792.0	1.9	4.5
	5,688.7	3,649,563,678.5	5,377.3	39,326.0	4.2	5.5
	1,156.3	365,844,483.7	2,116.4	6,077.0	7.5	8.4
	1,864.8	898,947,982.2	3,425.1	9,244.0	1.5	6.2
	1,088.3	445,995,047.9	4,657.6	11,399.0	7.5	7.7
	2,307.6	244,924,276.3	741.9	2,984.0	6.3	7.6
	2,184.6	1,673,241,959.2	4,341.4	33,205.0	2.2	4.0
	7,717.7	2,737,744,209.4	3,476.3	30,596.0	10.7	5.6
	1,704.4	143,055,162.7	434.2	5,260.0	7.1	4.1
			27.9		1.1	5.2
	5,118.0	2,049,075,184.1	4,042.1	54,307.0	7.9	4.6
	5,478.5	22,500,449,823.6	33,902.9	174,694.0	9.5	5.5
	930.3	186,712,560.2	1,510.4	7,291.0	2.9	2.1
	6,236.9	40,448,132,549.2	62,716.6	336,936.0	8.3	5.5
	1,706.9	1,491,460,097.7	8,271.6	23,699.0	7.4	7.6
			40.6		8.0	5.1
			33.8	349.0	4.4	5.7
	1,396.7	1,068,496,147.1	5,786.4	30,670.0	2.3	3.8
	8,054.8	176,657,677.2	165.5	1,406.0	8.5	5.0
	7,234.2	1,146,587,524.4	1,465.3	25,659.0	1.4	5.6
			56.0		4.3	5.6
	4,641.4	2,861,112,399.1	7,059.7	22,819.0	4.4	4.0
	3,073.3	15,423,128,121.7	62,364.5	183,782.0	9.6	5.5
			74.7	556.0	4.4	5.7
	762.2	642,040,133.0	4,848.8	23,273.0	3.9	3.5
			1,149.9	2,247.0	7.5	8.4
	231.5	60,918,197.1	1,779.4	2,557.0	3.7	4.4
	1,290.0	163,375,362.2	735.2	6,921.0	2.5	4.1
			19.7		4.4	4.1
	1,304.2	274,611,769.2	1,946.8	7,675.0	2.5	4.1
	8,026.0	265,337,496.9	247.7	2,327.0	4.3	5.5
	2,833.4	136,126,487.7	334.2	2,519.0	9.5	5.5
	558.4	92,390,518.4	1,833.5	3,040.0	3.7	4.4
	2,690.6	7,420,529.2	16.7		9.4	5.5
			383.2	1,663.0	7.5	8.5
	6,235.4	5,585,326,123.0	8,574.6	66,784.0	4.3	5.5
	952.6	134,140,566.5	938.1	2,292.0	7.5	8.4
	10,226.8	2,517,503,425.1	1,367.7	36,351.0	7.8	5.0
	1,234.8	3,826,247,143.7	20,326.1	130,658.0	7.9	4.1
	2,157.8	2,362,337,321.8	8,729.8	33,353.0	12.0	5.6
	900.1	1,188,180,622.6	10,033.6	25,578.0	3.2	4.1
	1,835.5	13,908,283,934.9	5,062.4	323,062.0	2.2	4.5
	3,720.0	11,715,633.9	15.6		9.4	5.5
	1,396.3	1,003,244,301.7	5,213.1	13,487.0	7.5	8.4
	1,565.0	615,928,526.7	2,707.4	18,679.0	3.2	4.1

Country summary in IDF Europe Region cont.
2024

Europe

Country or territory	Number of adults with diabetes (20–79 years), in 1,000s	Diabetes prevalence adults (20-79 years), (%)	Age-adjusted comparative diabetes prevalence (20–79 years), (%)	Proportion of undiagnosed diabetes (20–79 years), %	
Slovenia	153.4	9.7	7.0	28.5	
Spain	4,660.2	13.1	9.7	35.5	
Sweden	566.6	7.5	5.8	28.5	
Switzerland	433.3	6.6	5.3	28.5	
Tajikistan	383.5	6.8	8.0	56.7	
Türkiye	9,603.1	16.3	16.5	45.5	
Turkmenistan	264.1	6.6	7.1	39.5	
Ukraine	2,276.8	8.0	6.0	36.9	
United Kingdom	4,454.6	9.2	7.4	28.7	
Uzbekistan	1501.9	6.9	7.5	74.0	

	Diabetes-related expenditure per person with diabetes (20–79 years), (USD)	Total diabetes-related expenditure (20–79 years), (USD)	Diabetes-related deaths in adults (20–79 years)	Type 1 diabetes across all age groups	Age-adjusted comparative prevalence of impaired glucose tolerance (20–79 years), (%)	Age-adjusted comparative prevalence of impaired fasting glucose (20–79 years), (%)
	2,349.3	360,439,568.9	1,453.4	5,462.0	7.5	7.7
	2,808.9	13,089,885,041.1	22,125.1	189,078.0	7.1	5.5
	7,081.1	4,011,914,709.5	4,483.7	82,827.0	8.1	5.0
	12,234.2	5,301,343,052.5	2,847.6	20,756.0	4.3	5.5
	160.1	61,401,514.0	1,936.3	4,465.0	3.5	4.7
	1,005.5	9,656,242,550.9	42,558.2	195,853.0	7.6	8.6
	1,664.5	439,649,418.1	1,854.0	3,488.0	3.8	7.7
	624.5	1,421,868,149.9	18,003.2	108,643.0	2.5	4.5
	5,304.7	23,630,576,669.6	27,193.7	340,794.0	5.4	5.5
	210.2	315,706,453.7	7,447.4	15,548.0	3.7	1.4

Country summary in IDF Middle-East and North Africa Region
2024

Middle-East and North Africa

Country or territory	Number of adults with diabetes (20–79 years), in 1,000s	Diabetes prevalence adults (20-79 years), (%)	Age-adjusted comparative diabetes prevalence (20–79 years), (%)	Proportion of undiagnosed diabetes (20–79 years), %	
MENA	**84,700**	**17.6**	**19.9**	**37.2**	
Afghanistan	1,932.8	9.7	11.7	71.4	
Algeria	4,761.8	16.9	17.5	31.7	
Bahrain	197.6	17.8	22.1	46.4	
Egypt	13,214.5	19.8	22.4	62.0	
Iraq	2,669.4	11.0	13.4	47.1	
Iran (Islamic Republic of)	5,453.6	8.8	9.0	32.6	
Jordan	1,086.5	16.3	20.5	18.6	
Kuwait	908.5	28.4	25.6	37.3	
Lebanon	439.7	13.6	12.3	26.1	
Libya	634.8	14.6	15.8	31.7	
Morocco	2,881.0	11.6	11.9	31.7	
Oman	412.3	13.2	17.0	50.0	
Pakistan	34,532.4	26.5	31.4	26.9	
Qatar	409.3	18.7	24.6	46.4	
Saudi Arabia	5,344.6	21.4	23.1	43.6	
State of Palestine	315.3	11.2	15.5	30.2	
Sudan	3,860.6	16.0	19.0	37.3	
Syrian Arab Republic	2,246.1	15.7	19.0	26.1	
Tunisia	1,392.9	16.6	16.0	31.7	
United Arab Emirates	1,274.2	16.5	20.7	64.0	
Yemen	720.8	4.1	5.5	22.3	

	Diabetes-related expenditure per person with diabetes (20–79 years), (USD)	Total diabetes-related expenditure (20–79 years), (USD)	Diabetes-related deaths in adults (20–79 years)	Type 1 diabetes across all age groups	Age-adjusted comparative prevalence of impaired glucose tolerance (20–79 years), (%)	Age-adjusted comparative prevalence of impaired fasting glucose (20–79 years), (%)
	429.1	**34,661,252,786.4**	**467,000.0**	**1,410,471.0**	**11.1**	**8.0**
	137.8	266,352,048.3	11,641.7	13,600.0	8.7	5.0
	653.4	3,111,168,073.4	20,642.0	188,195.0	6.5	6.8
	960.9	189,841,149.7	337.9	7,706.0	17.6	16.1
	234.9	3,104,049,277.5	72,039.1	191,776.0	18.1	6.3
	778.4	2,077,975,623.8	14,683.1	65,550.0	8.6	9.2
	1341.8	7,317,829,779.6	23,379.9	134,623.0	8.5	4.0
	853.7	927,612,390.0	4,643.9	25,881.0	9.4	2.5
	1421.2	1,291,242,801.1	923.2	28,739.0	19.1	16.5
	1746.8	768,128,215.8	2,861.4	12,438.0	7.5	7.1
			5,164.3	28,085.0	8.1	6.9
	453.8	1,307,452,860.2	16,235.0	139,699.0	9.2	11.0
	720.6	297,078,595.6	625.0	34,676.0	6.8	14.9
	79.3	2,737,622,416.4	226,752.3	24,440.0	9.8	8.5
	1439.0	589,002,372.9	364.3	12,862.0	18.1	18.8
	1372.5	7,335,543,452.3	8,038.3	222,942.0	17.2	15.1
			2,722.7	10,958.0	5.6	6.4
	149.2	575,946,852.2	29,268.7	94,809.0	13.2	6.3
			13,677.4	42,393.0	8.6	9.0
	536.0	746,648,526.0	6,390.7	41,279.0	8.8	6.8
	1583.5	2,017,758,351.5	829.9	79,074.0	18.2	17.0
			5,997.6	10,746.0	8.6	8.6

Country summary in IDF North America and the Caribbean Region
2024

North America and the Caribbean

Country or territory	Number of adults with diabetes (20–79 years), in 1,000s	Diabetes prevalence adults (20-79 years), (%)	Age-adjusted comparative diabetes prevalence (20–79 years), (%)	Proportion of undiagnosed diabetes (20–79 years), %	
NAC	**56,200.0**	**15.1**	**13.8**	**29.1**	
Antigua and Barbuda	8.6	12.5	11.6	24.5	
Aruba	4.2	5.2	4.6	22.5	
Bahamas	26.8	8.9	8.9	24.5	
Barbados	34.4	16.4	13.2	23.8	
Belize	31.4	12.0	14.1	41.9	
Bermuda	8.1	16.7	13.4	26.4	
Canada	2,822.1	9.7	7.7	28.9	
Cayman Islands	6.2	11.4	11.1	26.4	
Curaçao	22.1	15.5	13.4	24.5	
Dominica	6.7	12.8	12.9	24.5	
Grenada	9.4	11.1	11.3	24.5	
Guyana	75.7	14.9	16.4	36.0	
Haiti	541.8	7.9	8.5	29.4	
Jamaica	235.6	11.6	12.5	24.3	
Mexico	13,587.4	15.8	16.4	41.3	
Saint Kitts and Nevis	5.0	14.5	13.8	24.5	
Saint Lucia	15.2	11.3	11.4	24.5	
Saint Vincent and the Grenadines	6.4	9.0	8.6	24.5	
Suriname	53.2	13.2	13.8	39.6	
Trinidad and Tobago	151.2	13.5	12.4	24.5	
United States of America	38,536.4	15.7	13.7	24.8	
United States Virgin Islands	8.7	12.5	9.1	26.9	

	Diabetes-related expenditure per person with diabetes (20–79 years), (USD)	Total diabetes-related expenditure (20–79 years), (USD)	Diabetes-related deaths in adults (20–79 years)	Type 1 diabetes across all age groups	Age-adjusted comparative prevalence of impaired glucose tolerance (20–79 years), (%)	Age-adjusted comparative prevalence of impaired fasting glucose (20–79 years), (%)
	7811.7	**438,603,587,491.7**	**526,000.0**	**1,853,030.0**	**11.6**	**13.6**
	991.5	8,573,690.0	85.8	71.0	5.6	4.1
			17.0	87.0	5.6	4.1
	2449.6	65,547,669.2	344.5	341.0	5.6	4.1
	1172.2	40,285,229.1	404.6	229.0	5.6	4.1
	791.6	24,864,109.2	308.5	391.0	5.2	12.9
			37.6		11.6	12.2
	4867.8	13,737,322,842.5	23,139.8	243,390.0	11.5	12.2
			33.9		11.5	12.2
			185.3	115.0	5.5	4.1
	1296.7	8,745,588.4	113.9		5.4	4.5
	1152.2	10,818,602.7	115.4	93.0	5.2	4.3
	360.6	27,285,389.2	1,072.5	405.0	5.6	4.0
	241.5	130,843,628.5	6,683.6	4,536.0	5.3	4.5
	863.4	203,389,462.0	3,621.5	1,658.0	5.3	4.4
	1438.0	19,539,071,826.1	123,364.6	122,731.0	12.9	13.5
	1103.4	5,552,250.8	71.7		5.6	4.1
	934.2	14,195,630.9	209.4	143.0	5.0	4.2
	913.1	5,886,640.5	104.5	72.0	5.3	2.5
	1212.8	64,544,131.8	610.6	514.0	12.6	8.9
	1230.9	186,073,348.5	1,944.5	1,218.0	5.6	6.5
	10497.4	404,530,587,452.5	363,427.0	1,476,859.0	11.5	14.2
			133.7	177.0	11.5	12.1

Country summary in IDF South and Central America Region
2024

South and Central America

Country or territory	Number of adults with diabetes (20–79 years), in 1,000s	Diabetes prevalence adults (20-79 years), (%)	Age-adjusted comparative diabetes prevalence (20–79 years), (%)	Proportion of undiagnosed diabetes (20–79 years), %	
SACA	**35,400**	**10.0**	**10.1**	**30.4**	
Argentina	4,342.1	14.1	14.0	29.1	
Bolivia (Plurinational State of)	194.0	2.6	3.4	25.5	
Brazil	16,621.4	10.7	10.6	31.9	
Chile	1,863.7	13.0	12.2	17.1	
Colombia	3,033.8	8.3	8.4	16.2	
Costa Rica	375.7	10.0	9.8	26.4	
Cuba	847.4	10.1	9.4	39.0	
Dominican Republic	1,203.7	16.6	17.6	42.8	
Ecuador	552.8	4.6	4.9	20.0	
El Salvador	463.3	11.2	12.7	23.2	
Guatemala	1,103.7	10.5	13.2	48.8	
Honduras	259.6	4.0	5.0	51.9	
Nicaragua	377.0	8.7	10.4	44.6	
Panama	312.8	10.7	11.1	39.8	
Paraguay	352.2	8.2	9.4	33.2	
Peru	1,335.8	6.0	6.4	25.5	
Puerto Rico	345.8	14.1	10.9	26.9	
Uruguay	201.5	8.4	7.8	48.9	
Venezuela (Bolivarian Republic of)	1,580.7	8.5	8.6	33.6	

	Diabetes-related expenditure per person with diabetes (20–79 years), (USD)	Total diabetes-related expenditure (20–79 years), (USD)	Diabetes-related deaths in adults (20–79 years)	Type 1 diabetes across all age groups	Age-adjusted comparative prevalence of impaired glucose tolerance (20–79 years), (%)	Age-adjusted comparative prevalence of impaired fasting glucose (20–79 years), (%)
	2,417.4	**80,840,139,260.0**	**224,000.0**	**796,838.0**	**11.0**	**9.0**
	3,553.1	15,427,924,938.7	26,163.8	86,977.0	11.6	10.0
	1,092.8	211,977,463.7	1,699.7	3,246.0	7.0	8.7
	2,714.9	45,125,340,371.2	111,392.9	499,402.0	11.3	9.7
	1,600.0	2,982,003,925.8	9,444.9	40,712.0	11.9	4.8
	1,909.8	5,794,051,819.7	15,092.0	47,732.0	10.9	9.4
	2,913.3	1,094,482,802.4	1,783.6	4,772.0	10.9	9.4
	2,877.5	2,438,279,617.1	4,906.7	6,424.0	10.5	9.1
	1,353.9	1,629,660,833.4	7,156.8	6,506.0	11.1	9.5
	2,204.6	1,218,644,466.4	2,545.1	16,130.0	9.6	8.3
	958.3	444,018,847.6	3,655.3	5,316.0	10.5	9.0
	839.9	926,959,846.1	6,116.9	15,367.0	8.8	7.5
	789.4	204,919,357.7	1,724.7	8,820.0	9.3	8.0
	587.0	221,305,928.3	1,854.5	5,315.0	10.3	8.0
	1,317.8	412,172,423.6	1,331.7	3,925.0	11.6	4.7
	1,474.7	519,375,809.5	2,558.0	5,930.0	9.5	8.2
	1,408.0	1,880,823,770.4	7,217.8	19,247.0	10.7	9.2
			3,160.8	2,714.0	12.1	4.9
	1,529.8	308,197,038.3	1,269.7	3,113.0	12.1	4.9
			14,464.6	15,190.0	11.4	9.8

Country summary in IDF South-East Asia Region
2024

South and Central America

Country or territory	Number of adults with diabetes (20–79 years), in 1,000s	Diabetes prevalence adults (20-79 years), (%)	Age-adjusted comparative diabetes prevalence (20–79 years), (%)	Proportion of undiagnosed diabetes (20–79 years), %	
SEA	**106,900**	**9.7**	**10.8**	**42.7**	
Bangladesh	13,877.4	12.3	13.2	39.1	
Bhutan	57.3	10.4	12.0	39.9	
India	89,826.9	9.5	10.5	43.0	
Maldives	30.9	8.4	9.5	28.2	
Mauritius	218.1	22.2	20.1	28.2	
Nepal	1,259.1	6.6	7.7	70.4	
Sri Lanka	1,600.5	10.7	10.2	37.7	

	Diabetes-related expenditure per person with diabetes (20–79 years), (USD)	Total diabetes-related expenditure (20–79 years), (USD)	Diabetes-related deaths in adults (20–79 years)	Type 1 diabetes across all age groups	Age-adjusted comparative prevalence of impaired glucose tolerance (20–79 years), (%)	Age-adjusted comparative prevalence of impaired fasting glucose (20–79 years), (%)
	107.6	**11,497,657,846.3**	**375,000.0**	**1,005,022.0**	**13.8**	**12.2**
	74.4	1,031,800,822.1	31,619.5	25,520.0	13.5	17.1
	374.1	21,420,759.3	155.2	572.0	13.5	10.4
	109.5	9,834,399,121.6	334,922.2	940,840.0	13.9	11.7
	1,619.3	50,089,665.8	33.1	485.0	11.6	10.3
	671.3	146,430,963.8	814.7	4,170.0	11.8	5.7
	91.4	115,064,511.1	2,775.8	18,087.0	4.7	5.0
	186.5	298,452,002.7	4,159.9	15,348.0	19.2	10.1

Country summary in IDF Western Pacific Region
2024

Western Pacific

Country or territory	Number of adults with diabetes (20–79 years), in 1,000s	Diabetes prevalence adults (20-79 years), (%)	Age-adjusted comparative diabetes prevalence (20–79 years), (%)	Proportion of undiagnosed diabetes (20–79 years), %	
WP	**215,400**	**12.4**	**11.1**	**50.0**	
Australia	1,693.7	8.85	7.4	28.0	
Brunei Darussalam	44.6	13.85	13.7	44.7	
Cambodia	723.2	6.8	7.5	50.0	
China	147,981.2	13.79	11.9	49.7	
Dem. People's Republic of Korea	2,043.5	10.78	9.9	53.5	
Micronesia (Fed. States of)	12.1	17.41	19.2	73.2	
Fiji	90.3	15.34	16.6	47.5	
French Polynesia	51.2	23.47	22.8	32.9	
Guam	24.4	21.93	20.3	32.9	
China, Hong Kong SAR	706.0	11.91	8.2	54.2	
Indonesia	20,426.4	11.0	11.3	73.2	
Japan	10,763.5	12.0	8.1	31.3	
Kiribati	16.0	21.5	24.6	55.0	
Lao People's Democratic Republic	255.1	5.5	6.7	41.9	
China, Macao SAR	52.3	9.3	8.1	54.2	
Malaysia	4,753.9	19.9	21.1	50.4	
Marshall Islands	6.0	24.0	25.7	65.0	
Mongolia	208.5	10.0	10.3	74.7	
Myanmar	2,365.8	6.4	6.7	49.7	
Nauru	1.3	19.1	21.8	32.9	
New Caledonia	46.1	22.8	22.0	32.9	
New Zealand	292.0	7.8	6.7	25.7	
Niue	0.3	21.1	18.1	56.3	
Palau	2.7	20.8	19.3	56.3	
Papua New Guinea	838.0	14.2	14.1	73.2	
Philippines	4,726.3	6.6	7.5	53.5	
Republic of Korea	5,030.1	12.2	9.6	28.3	
Samoa	28.2	23.7	25.4	83.9	
Singapore	699.1	14.1	11.4	37.3	
Solomon Islands	38.4	10.0	12.0	80.6	
Taiwan, Province of China	2,598.2	13.7	10.7	54.2	
Thailand	6,360.8	11.7	10.2	33.3	
Timor-Leste	21.6	2.9	3.2	77.5	
Tonga	10.1	17.0	19.6	73.2	
Tuvalu	1.2	17.9	19.0	56.3	
Vanuatu	29.0	16.7	19.7	73.2	
Viet Nam	2,499.9	3.6	3.4	37.8	

	Diabetes-related expenditure per person with diabetes (20–79 years), (USD)	Total diabetes-related expenditure (20–79 years), (USD)	Diabetes-related deaths in adults (20–79 years)	Type 1 diabetes across all age groups	Age-adjusted comparative prevalence of impaired glucose tolerance (20–79 years), (%)	Age-adjusted comparative prevalence of impaired fasting glucose (20–79 years), (%)
	1,173.5	**246,342,889,303.4**	**1,200,000.0**	**990,990.0**	**13.5**	**8.6**
	5,471.4	9,266,818,019.7	8,294.9	114,545.0	9.4	3.1
	816.4	36,378,598.7	447.4	132.0	16.3	2.5
	236.4	170,939,731.3	4,983.4	582.0	7.3	7.0
	1,141.2	168,882,601,413.0	755,511.4	598,906.0	13.3	9.9
			13,503.3	12,247.0	9.7	12.4
	835.6	10,100,754.1	91.4	4.0	7.6	11.9
	564.5	50,991,991.7	973.8	120.0	7.8	13.7
			176.6	14.0	7.8	5.0
			294.0	7.0	7.9	5.0
			4,552.0	4,435.0	14.9	1.0
	308.2	6,296,212,412.0	131,643.8	11,713.0	16.3	7.7
	3,155.9	33,968,521,728.8	84,288.1	79,463.0	14.8	5.0
	499.4	7,966,913.5	106.5	4.0	7.8	12.4
	190.6	48,609,643.8	1,784.6	138.0	10.0	2.4
			352.4	462.0	14.9	5.2
	1,052.5	5,003,555,184.7	21,796.3	10,275.0	16.3	5.9
	1,589.4	9,564,067.0	39.3		7.9	13.8
	505.5	105,399,492.2	1,165.4	1,373.0	8.8	18.5
	164.1	388,127,700.6	19,968.3	1,739.0	10.1	7.2
	1,331.0	1,693,645.6	14.0		8.0	6.4
			318.9	13.0	7.9	5.0
	4,232.3	1,235,884,639.8	1,964.8	17,474.0	9.4	5.0
	3,010.3	777,033.3	0.3		7.9	12.6
	3,858.2	10,279,127.6	21.9		7.8	14.0
	154.4	129,418,207.3	4,516.4	333.0	7.5	11.5
	454.5	2,148,007,104.9	35,309.9	29,870.0	6.6	2.6
	2,312.1	11,630,291,893.8	33,204.5	32,615.0	14.8	8.8
	420.1	11,837,150.2	146.4	7.0	7.0	24.2
	2,444.9	1,709,175,241.8	4,013.2	3,931.0	14.7	5.0
	262.6	10,079,696.6	234.5	28.0	7.6	12.4
			25,980.0	26,707.0	14.8	5.0
	647.2	4,116,695,867.4	34,752.6	20,689.0	15.9	7.6
	365.8	7,890,377.8	122.5	49.0	10.1	7.2
	444.1	4,473,027.6	64.9	4.0	8.8	1.5
	1,772.3	2,136,602.0	8.5		7.7	13.5
	255.6	7,417,862.7	150.8	11.0	7.6	11.9
	428.4	1,071,044,173.8	7,563.4	23,100.0	15.4	3.6

Abbreviations and Acronyms

A

ADA	American Diabetes Association
AHP	analytical hierarchy process
AFR	IDF Africa Region
ARDS	acute respiratory distress syndrome
AD	Alzheimer's disease

B

BP	blood pressure

C

CVD	cardiovascular diseases
CI	confidence intervals

D

DIP	diabetes in pregnancy
DKA	diabetic ketoacidosis
DR	diabetes-related retinopathy

E

EUR	IDF Europe Region

F

FBG	fasting blood glucose
FPG	fasting plasma glucose
FIGO	International Federation of Gynaecology and Obstetrics

G

GDM	gestational diabetes mellitus
GDP	gross domestic product
GLP-1	glucagon-like peptide 1

H

HAPO	hyperglycaemia and adverse pregnancy outcomes
HbA1c	haemoglobin A1c (or glycosylated haemoglobin)
HDL	high-density lipoprotein
HIP	hyperglycaemia in pregnancy

I

IADPSG	International Association of Diabetes and Pregnancy Study Group
ID	international dollar
IDF	International Diabetes Federation
IFG	impaired fasting glucose
IGT	impaired glucose tolerance
IMR	infant mortality rate

L

LDL-C	low-density lipoprotein cholesterol

M

MENA	IDF Middle East and North Africa Region
mg/dL	milligrams per decilitre
mmol/L	millimoles per litre mmol/mol millimoles per mole
MODY	maturity onset diabetes of the young

N

NAC	IDF North America and Caribbean Region

O

OGTT	oral glucose tolerance test

S

SACA	IDF South and Central America Region
STEPS	WHO STEPwise approach to surveillance

T

T1D	type1 diabetes
T2D	type2 diabetes

U

UHC	universal health coverage
UN	United Nations
UNPD	United Nations Population Division USD United States dollar

V

VaD	vascular dementia

W

WDD	World Diabetes Day
WHO	World Health Organization
WP	IDF Western Pacific Region

Y

YLD	Young Leaders in Diabetes

Glossary

A

Age-adjusted comparative prevalence

Also referred to as comparative prevalence, this is the prevalence calculated by adjusting to the age structure of a standard population. In this IDF Diabetes Atlas, the standard population is the UN population in 2021, 2030 or 2045. Adjusting rates is a way to make fairer comparisons between groups with different distributions. Age-adjusted rates are rates that would have existed if the population under study had the same age distribution as the "standard" population.

Analytical hierarchy process (AHP) scoring

A methodological approach that quantifies the relative value of a variety of different aspects of study methods.

Attributable fraction method

The contribution of a risk factor to a disease is measured using the population attributable fraction (PAF). The PAF is the proportional reduction in population disease that would occur if exposure to a risk factor was removed from the population.

Autoimmune reaction

A reaction that is characterised by a specific humoral or cell-mediated immune response against the constituents of the body's own tissues.

B

Beta cells

Cells found in the pancreas that produce, store and release insulin.

Body mass index (BMI)

A measure of weight (or body mass), which is approximately independent of height. It is calculated by dividing weight in kilograms by the square of height in metres. The units are kilograms per square metre (kg/m^2).

C

Cardiovascular diseases (CVD)

Diseases and injuries of the circulatory system: the heart, blood vessels of the heart and the system of blood vessels throughout the body and to (and in) the brain; generally, refers to conditions that involve narrowed or blocked blood vessels.

D

Dementia

A progressive condition (such as Alzheimer's disease) marked by the development of multiple cognitive deficits (such as memory impairment, aphasia, and the inability to plan and initiate complex behaviour).

Diabetes complications

Acute and chronic conditions caused by diabetes.

Diabetic foot

A foot that exhibits any disease that results directly from diabetes or a complication of diabetes.

Diabetes in pregnancy (DIP)

Diabetes occurring in pregnancy in women who have previously been diagnosed with diabetes or those who have hyperglycaemia first diagnosed during pregnancy, meeting the WHO criteria of diabetes in the non-pregnant state.

Diabetic ketoacidosis (DKA)

A complex metabolic disorder that occurs when the liver starts breaking down fat at an excessive rate. The by-product of this process, ketones, can cause the blood to become dangerously acidic.

Diabetes (mellitus)

A chronic condition marked by high concentrations of glucose (sugar) in the blood. It is caused by the body being unable to produce insulin (a hormone made by the pancreas to control blood glucose levels) or to use insulin effectively, or both. The three most common forms of diabetes are type 1, type 2 and gestational.

Diabetic neuropathy

A type of nerve damage that can occur if a person has diabetes; depending on the affected nerves, symptoms of diabetic neuropathy can range from pain and numbness in the legs and feet to problems with the digestive system, urinary tract, blood vessels, and heart.

Direct costs

The costs of providing, for a given condition or disease, health services (preventive and curative), family planning activities, nutrition activities and emergency aid designated for health. It does not include the provision of water and sanitation, but it does include health expenditures from both public and private sources.

DPP-4 inhibitors

A class of oral hypoglycaemic drugs that blocks the enzyme dipeptidyl peptidase4 (DPP-4), used to treat type 2 diabetes.

Glossary

E

Epidemiology

The study of the occurrence, distribution and patterns of disease in populations, including factors that influence disease and the application of this knowledge to improve public health.

Essential hormone

Hormones that are required for life including: insulin, parathyroid hormone, glucocorticosteroids (cortisol), mineral corticosteroids (aldosterone).

Estimates

Values that are usable for some purpose even if input data may be incomplete, uncertain, or unstable; the value is nonetheless usable because it is derived from the best information available.

Extrapolate

Extending values or conclusions from a known situation to an unknown situation, assuming that similar conditions, methods or trends are applicable.

F

Fasting plasma glucose (FPG)

FPG is a person's blood glucose concentration after fasting – not eating anything for at least eight hours. Normal FPG is less than or equal to 6.1 millimoles per litre (mmol/l) or less than or equal to 110 milligrams per decilitre (mg/dL). The disadvantages of using FPG for screening include: the possibility that the person has not fasted, its inability to detect diabetes diagnosed by a post-glucose load value alone and the fact that FPG alone cannot identify impaired glucose tolerance (see letter I). FPG alone fails to detect approximately 30% of undiagnosed diabetes. Using FPG to detect diabetes is a common but less sensitive diagnostic method. G Genes The basic physical and functional units of heredity found in the nuclei of all cells.

G

Gestational diabetes mellitus (GDM)

Gestational diabetes is a condition where a woman develops high blood glucose, less than overt diabetes, that begins in, or is first recognised during pregnancy.

Glucagon

A hormone produced in the pancreas. If blood glucose levels decrease, it triggers the body to release stored glucose into the bloodstream.

Glucagon-like peptide1

Also known as GLP-1, a naturally occurring peptide hormone, released from the gut after eating. Glucose Also called dextrose or blood sugar. The main sugar the body absorbs, uses as a form of energy and stores for future use. Glucose is the major source of energy for living cells and is carried to each cell through the bloodstream. However, the cells cannot use glucose without the action of insulin.

H

Haemoglobin A1c (HbA1c)

Also referred to as glycosylated haemoglobin, a haemoglobin to which glucose is bound. Glycosylated haemoglobin is measured to determine the average level of blood glucose over the past two to three months.

Heterogeneity

The quality or state of being diverse in character or content.

High-income country

A country defined by the World Bank to have a gross national income per capita of USD 12,696 or more (in 2020).

Hyperglycaemia

A raised concentration of glucose in the blood. It occurs when the body does not have enough insulin or cannot use the insulin it does have to turn glucose into energy. Signs of hyperglycaemia include great thirst, dry mouth, weight loss and the need to urinate often.

Hyperglycaemia in pregnancy (HIP)

Hyperglycaemia in pregnancy (HIP) can be classified as either gestational diabetes mellitus (GDM) or diabetes in pregnancy (DIP).

Hypoglycaemia

A low concentration of glucose in the blood. This may occur when a person with diabetes has injected too much insulin, eaten too little food, or has exercised without extra food.

I

IDF Region

The International Diabetes Federation (IDF) is divided into seven regions: Africa, Europe, Middle East and North Africa, North America and the Caribbean, South and Central America, South-East Asia and Western Pacific. The IDF Regions aim to strengthen the work of national diabetes associations and enhance collaboration between them.

Impaired fasting glucose (IFG)

Blood glucose that is higher than normal blood glucose, but below the diagnostic threshold for diabetes after fasting (typically after an overnight fast). Sometimes termed impaired fasting glycaemia.

Impaired glucose tolerance (IGT)

Blood glucose that is higher than normal but below the diagnostic threshold for diabetes, after ingesting a standard amount of glucose during an oral glucose tolerance test. Fasting and two-hour glucose values are needed for its diagnosis.

Incidence

The number of new cases of a disease or condition among a group of people without the disease who are at risk of developing this condition during a specified time period.

Insulin

A hormone produced in the pancreas, as a response to glucose. Insulin triggers cells to take up glucose from the blood stream and convert it to energy.

Insulin resistance

The inability of cells to adequately respond to circulating insulin, resulting in increased levels of blood glucose.

Intermediate hyperglycaemia

The condition of raised blood glucose levels above the normal range and below the diabetes diagnostic threshold. Alternative terms are prediabetes, non-diabetic hyperglycaemia, IFG and IGT.

International Dollar (ID)

A hypothetical unit of currency that has the same purchasing power in every country. Conversions from local currencies to international dollars are calculated using tables of purchasing power parities, taken from studies of prices for the same basket of goods and services in different countries. Internationals Dollars are used to compare expenditures between different countries or regions.

L

Low-income country

A country defined by the World Bank with a gross national income per capita of USD 1,045 or less (in 2020).

M

Macrosomia

Birth weight more than 4.0 kg Maturity-onset diabetes of the young (MODY) A group of rare forms of diabetes caused by one of several single gene mutations, belonging to the monogenic types of diabetes.

Metformin

An oral therapy for type 2 diabetes, and one of a group of drugs known as biguanides. These lower blood glucose levels in people with type 2 diabetes by increasing the sensitivity of muscle cells to insulin, and by reducing the amount of glucose produced by the liver.

Microvascular complications

Complications of diabetes that include diabetic nephropathy, neuropathy and retinopathy, which are caused by pathological changes in the microvasculature.

Monogenic diabetes

Less common types of diabetes, resulting from single genetic mutations. Examples include MODY and Neonatal Diabetes Mellitus.

N

Neonatal diabetes mellitus

A rare form of diabetes that is diagnosed in children under six months of age. Caused by a mutation in a single gene. It is a type of monogenic diabetes.

Glossary

O

Obesity

A condition in which a person carries excess weight or body fat that might affect their health (Defined by, for example, a BMI ≥30 Kg/m^2 in non-Asians).

Oral glucose tolerance test (OGTT)

A medical test in which glucose is given orally after an overnight fast and blood samples taken after a certain time to determine how quickly it is cleared from the blood.

Oral medication

A medication administered by mouth.

Overweight

A condition of having more body fat than is optimally healthy, though not in the obese range (Defined by a BMI of 25.0 Kg/m2 to 29.9 Kg/m2 in non-Asians).

P

Pancreas

An organ situated behind the stomach, which produces several important hormones, including insulin and glucagon.

Peripheral vascular disease (PVD) or peripheral artery disease (PAD)

A progressive disorder that causes narrowing or blocking of the blood vessels outside the heart, including arteries, veins, or lymphatic vessels.

Prediabetes

Elevated blood glucose above the normal range but below the diabetes diagnostic threshold. Alternative terms are IFG, IGT, non-diabetic hyperglycaemia, and intermediate hyperglycaemia.

Polydipsia

Excessive thirst.

Polyuria

Frequent urination.

Prevalence

The proportion of individuals in a population that has a disease or condition at a particular time (a point in time or over a period of time). For example, the proportion of adults aged 20–79 with diabetes in 2017. For prevalence, the numerator is the number of people with the condition or disease and the denominator is the total population. It can be expressed as a proportion or a percentage.

Primary prevention

Disease prevention before a disease or condition occurs. Usually refers to the prevention of exposures to hazards that cause disease or injury and altering unhealthy or unsafe behaviours.

Projections

Estimates of a future situation based on a study of past and present trends.

R

Ratio

The diabetes cost ratio, which is the ratio of health expenditures for people with diabetes compared to health expenditures for age and sex matched persons who do not have diabetes. The R=2 estimates assume that healthcare expenditures for people with diabetes are on average two-fold higher than people without diabetes, and the R=3 estimate assumes that healthcare expenditures for people with diabetes are on average three-fold higher than people without diabetes.

Raw diabetes prevalence

Also called country, national or regional prevalence, the percentage of each country or region's population that has diabetes. It is useful for assessing the impact of diabetes for each country or region.

Relative risk

The ratio of the probability of an outcome in an exposed group to the probability of an outcome in an unexposed group.

S

Screening approach

A method used to make a diagnosis of a given disease or condition before it has caused symptoms.

Secondary diabetes

Less common forms of diabetes, which arise as a consequence of other diseases or conditions (e.g. diseases of the pancreas such as cystic fibrosis).

Self-management

Management of or by oneself; the taking of responsibility for one's own behaviour and well-being.

Sulphonylureas

Oral medications used for the treatment of type 2 diabetes. They work mainly by stimulating the cells in the pancreas to release more insulin.

T

Type 1 diabetes

Type1 diabetes is thought to be an autoimmune disease that usually occurs in childhood or early adulthood, resulting in the inability to produce enough insulin due to the destruction of insulin producing islet cells in the pancreas. The condition can affect people of any age, but onset usually occurs in children or young people.

Type 2 diabetes

Type 2 diabetes is the most common form of diabetes and is characterised by high blood glucose, called hyperglycaemia. In people with type 2 diabetes, the body does not use the hormone insulin properly or cannot produce enough insulin, or both which in turn leads to hyperglycaemia. It is potentially preventable and is often associated with lifestyle factors such as insufficient physical activity, unhealthy diet, obesity and tobacco smoking. Risk is also associated with genetic and family-related factors. Type 2 diabetes is much more common than type 1 and occurs mainly in adults, although it is now also increasingly diagnosed in children and young people.

U

Universal health coverage (UHC)

Universal healthcare coverage, also referred to as universal coverage or universal care, is a healthcare system that provides free healthcare at the point of delivery to all residents of a particular country or region.

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