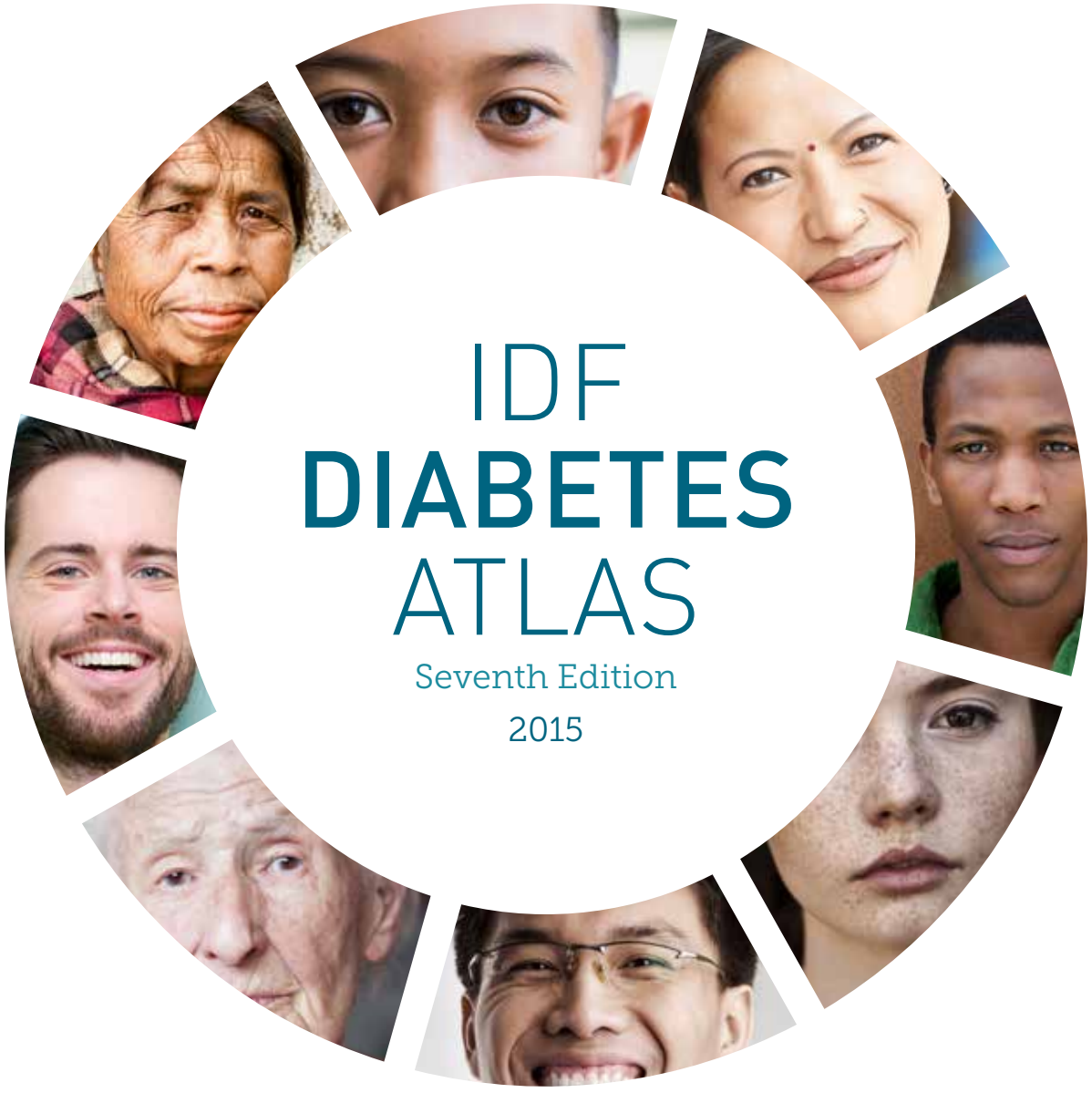
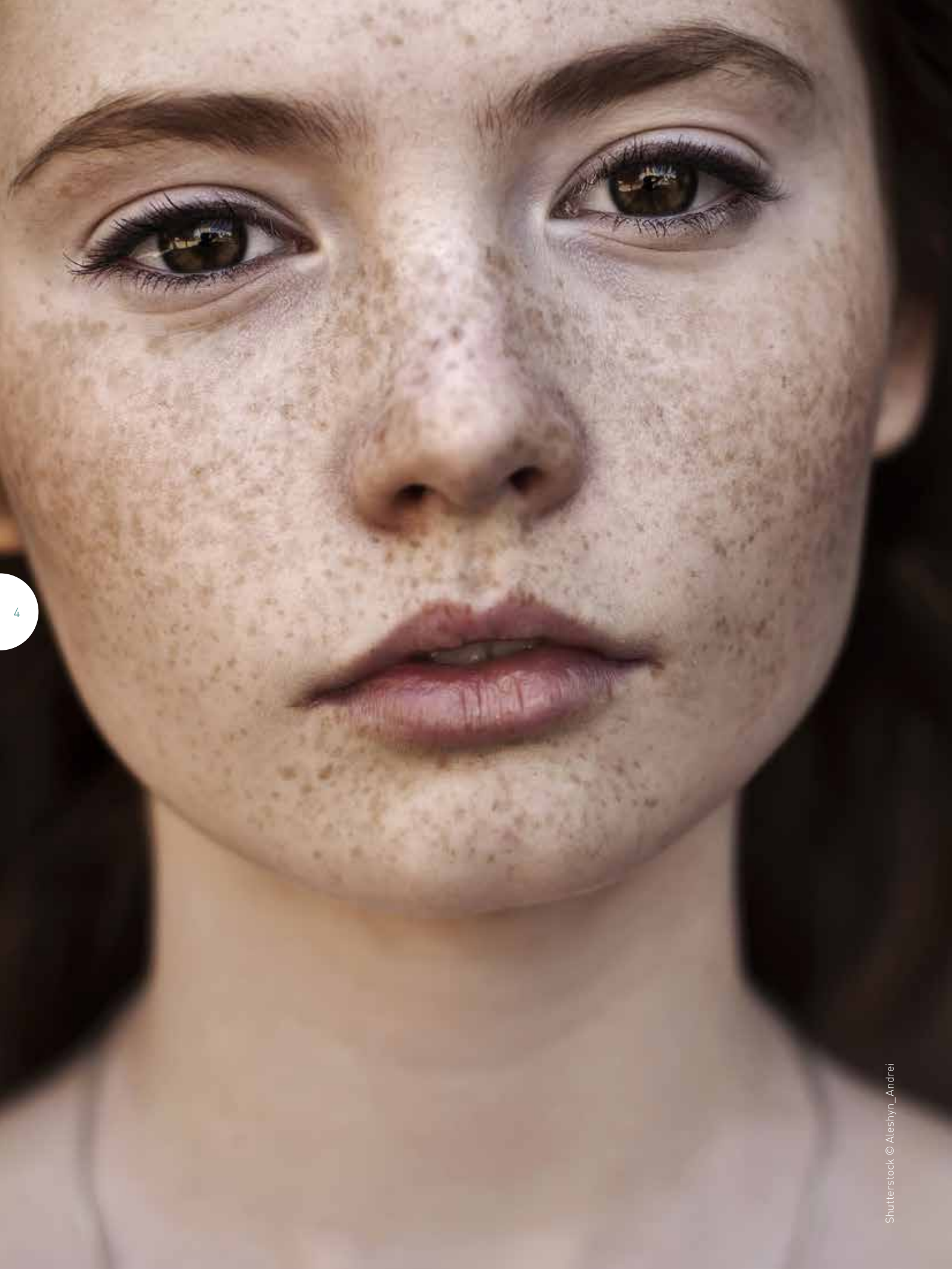


IDF DIABETES ATLAS

Seventh Edition

2015

International Diabetes Federation



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Foreword

The International Diabetes Federation (IDF) is a global umbrella organisation of over 230 national diabetes associations in 170 countries and territories. The *IDF Diabetes Atlas*, produced in collaboration with global and national health experts, is the foundation and evidence base of IDF's mission to promote diabetes care, prevention and a cure worldwide.

The *Atlas* draws upon a wealth of global data to clearly articulate global trends on the growth of diabetes and, most importantly, the action that is needed to halt its proliferation.

While diabetes can cause devastating personal suffering, it is also an economic burden for every country around the world. As the incidence of diabetes rises, so too does the requirement for healthcare. Less obvious is the impact on the overall economy, but it is clear that an unhealthy population is not able to fulfil its potential in contributing to economic development.

We are pleased to report that IDF's persistent efforts to position diabetes more prominently on the political agenda are starting to yield results. This year we used the G7 Summit in Germany as a platform to urge all G7 nations to develop and implement cost-effective policies to help tackle the rise in diabetes. This call for action was just the first step in a campaign that will build momentum over the next few years.

Another milestone was reached in September this year when diabetes became part of the new United Nations sustainable development agenda, with the inclusion of non-communicable diseases in the Sustainable Development Goals.

We believe that continued efforts to raise awareness are vital to encourage governments to take a more proactive role in helping to prevent the increase in people with diabetes. Governments must do more to raise awareness and educate populations about healthy living, as an essential step in the prevention of new cases of type 2 diabetes. There is also a need for early diagnosis of diabetes, and to ensure that those with the condition receive appropriate support and care, including access to medicines where required.

By ensuring the health of future generations around the world, we can collectively play a part in taking a healthy approach to sustainable development.

Sir Michael Hirst
President,
International Diabetes Federation

Welcome to the seventh edition of the *IDF Diabetes Atlas*, where regrettably we must once again report a further rise in the number of cases of diabetes around the world.

You will find the prevalence of diabetes in 2015 laid out in stark figures. Distressingly, for the first time it is estimated there are now more than half a million children aged 14 and under living with type 1 diabetes. We also estimate there are now 415 million adults aged 20-79 with diabetes worldwide, including 193 million who are undiagnosed. A further 318 million adults are estimated to have impaired glucose tolerance, which puts them at high risk of developing the disease. By the end of this year, diabetes will have caused 5.0 million deaths and have cost between USD673 billion and USD1,197 billion in healthcare spending. If this rise is not halted, by 2040 there will be 642 million people living with the disease.

To help you understand how we have collected and collated the data, we have included a new chapter that explains the methodology employed to generate the global estimates for today and 2040, with additional details available on our website. These estimates derive from data and surveys conducted in communities around the world and provide the raw data from which we have modelled estimates at both global and national levels.

As we can only generate estimates of prevalence, which by definition are not recorded actual prevalence figures, we have introduced uncertainty intervals. These will guide the reader as to the range in which the true prevalence of diabetes is likely to lie.

The prevalence of both type 1 and type 2 diabetes is increasing, despite the fact that many cases of type 2 diabetes can be delayed or prevented. While the cause of the increase in type 1 diabetes incidence in children is currently unknown, global trends such as urbanisation, unhealthy diets, and reduced physical activity are all contributing lifestyle factors that increase the risk of developing type 2 diabetes.

We can only tackle these factors if we are able to see the full picture. There are many countries where no prevalence studies have been conducted, especially in the low and middle income countries where diabetes appears to be increasing rapidly. Most of all, we must gather more information on children with diabetes; an area where data is woefully deficient. In short, there needs to be more research and more studies. By arming ourselves with greater knowledge, we will be able to develop the tools and programmes required to bring the rise of diabetes under control.

Professor Nam Han Cho
Chair,
IDF Diabetes Atlas Committee, Seventh Edition

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Introduction

Since 2000, the *IDF Diabetes Atlas* has detailed the extent of diabetes and this seventh edition shows how it is impacting every country, every age group and every economy across the world.

Notably, healthcare costs continue to increase with 12% of global health expenditure dedicated to diabetes treatment and related complications that account for the majority of the total expenditure. Increases in future health expenditure will be driven by the population growth expected in low- and middle- income countries, as well as increasing urbanisation and lifestyle changes.

There are some changes to be found in the figures reported in this latest edition. In 2013, the *IDF Diabetes Atlas* produced estimates of high blood glucose in pregnancy for the first time, estimating that 21.4 million live births were affected. With adjustments in data calculation, this has decreased slightly in 2015, to 20.9 million, which still accounts for a staggering one in 7 births.

Certain sectors of the population, such as indigenous peoples, often have higher prevalence rates than the surrounding population. This is particularly evident for gestational diabetes, with some indigenous women having at least two-fold higher rates of gestational diabetes compared to non-indigenous women.

We also witness the worrying growth of type 1 diabetes in children. The trend toward more children developing type 1 diabetes has continued and now in 2015, more than half a million children are estimated to be living with type 1 diabetes.

These estimates and the countless others published in the *IDF Diabetes Atlas* have been produced through extensive modelling based on raw data from sources and surveys conducted worldwide, and validated by a scientific committee with experts from all over the world. Such is the importance of the data, that a new chapter has been created, which explains in detail the methodology used to generate the 2015 *IDF Diabetes Atlas* figures. Furthermore, uncertainty intervals have been produced that provide a plausible range within which the true diabetes prevalence can be expected to lie.

There may be some discrepancies between estimates in the *IDF Diabetes Atlas* and other reported national estimates. This may be due to a difference in sampling methods or populations. The *IDF Diabetes Atlas* 2015 uses age-stratified data and a consistent methodology to estimate the diabetes prevalence in adults aged 20-79 years, across 220 countries and territories. As a result, other national estimates may report a higher number of diabetes cases.

While much research has been done, further studies are required to provide a more accurate picture of the prevalence of diabetes. Half of all countries and territories worldwide have no recent nationwide studies, and their estimates are based on extrapolations from other similar countries. In the Africa Region, over three-quarters of all countries and territories lack primary data on the diabetes prevalence in adults.

Tackling this global epidemic is a monumental task and the International Diabetes Federation (IDF) continues to act as an advocate for people with diabetes by educating both individuals and governments on the steps that can be taken for prevention and management of the disease. Further research will serve as a catalyst for governments and organisations to act with more haste and greater effectiveness to put in place early interventions, improved screening and timely management to reduce the impact of diabetes on the individual and society.

Diabetes: A global emergency

Diabetes is one of the largest global health emergencies of the 21st century. Each year more and more people live with this condition, which can result in life-changing complications. In addition to the 415 million adults who are estimated to currently have diabetes, there are 318 million adults with impaired glucose tolerance, which puts them at high risk of developing the disease in the future.

Many countries are still unaware of the social and economic impact of diabetes. This lack of understanding is the biggest barrier to effective prevention strategies that could help halt the inexorable rise of type 2 diabetes.

Despite better awareness and new developments in treatment of type 1 and type 2 diabetes and prevention of type 2 diabetes, each edition of the *IDF Diabetes Atlas* has shown an unrelenting increase in the number of people with the disease.

This 2015 edition is no exception. The seventh edition looks at the current status of diabetes worldwide and shows a vision of the future by estimating what will happen in 2040 should present growth continue.

A person with diabetes has high blood glucose either because they are **not producing enough insulin,** or because **the body does not respond properly to insulin**

The three main types of diabetes

Type 1 diabetes

- Risk factors: family history of diabetes, genetics, infections and other environmental influences
- Appears very suddenly and is currently incurable
- Without insulin, a person with type 1 diabetes will die

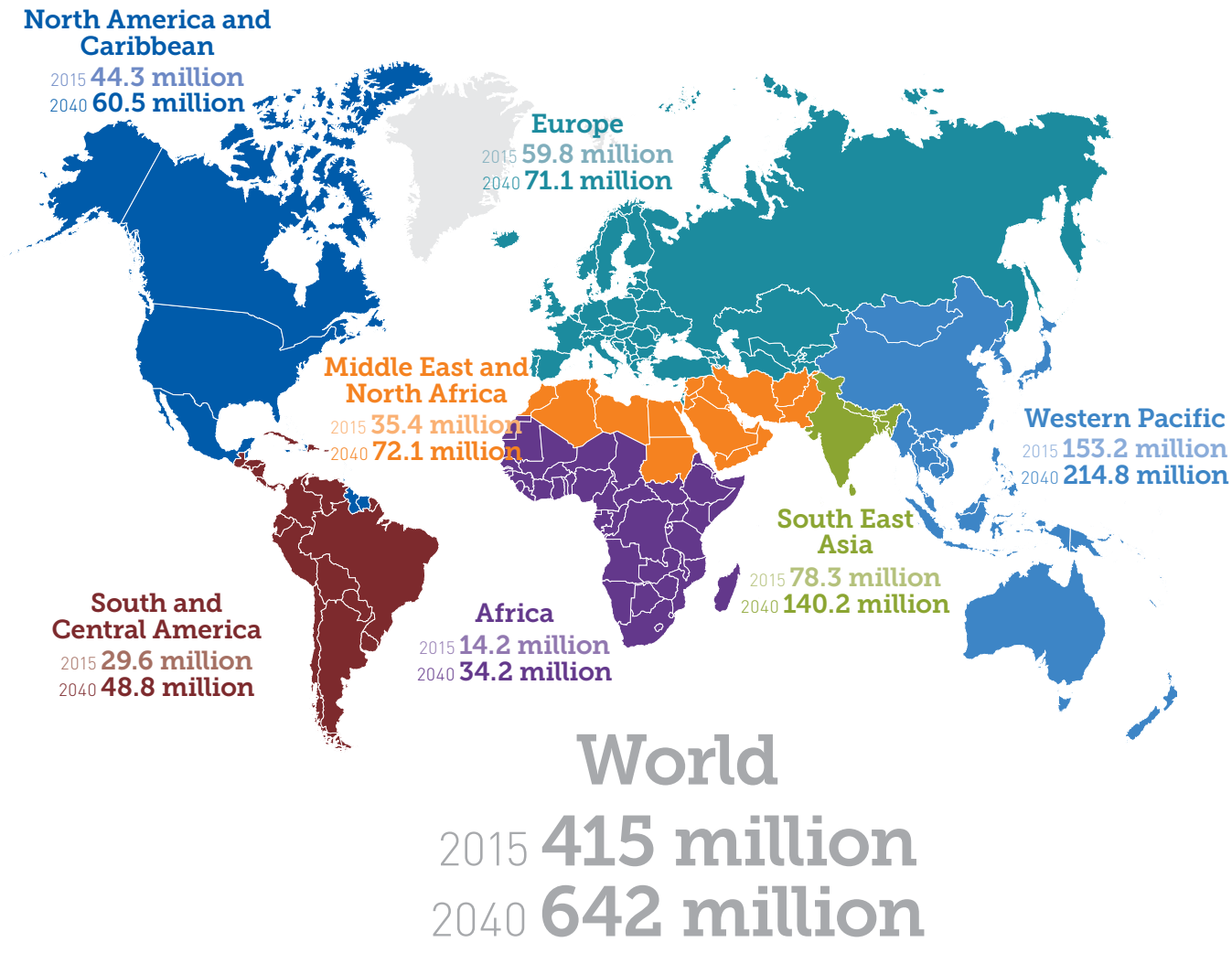
Type 2 diabetes

- Risk factors: excess body weight, physical inactivity, poor nutrition, genetics, family history of diabetes, past history of gestational diabetes and older age
- Can go unnoticed and undiagnosed for years
- Can often be managed with dietary changes and increasing physical activity. In some cases medication is required

Gestational diabetes

- Appears during pregnancy
- Can lead to serious health risks for both the mother and child
- Associated with an increased risk of both mother and child developing type 2 diabetes later in life

Estimated number of people with diabetes worldwide and per region in 2015 and 2040 (20-79 years)



Adults who died from diabetes, HIV/AIDS, tuberculosis, and malaria

5.0 million
from diabetes
2015
IDF

1.5 million
from HIV/AIDS
2013
WHO Global Health Observatory Data Repository 2013

1.5 million
from tuberculosis
2013
WHO Global Health Observatory Data Repository 2013

0.6 million
from malaria
2013
WHO Global Health Observatory Data Repository 2013

Diabetes around the world

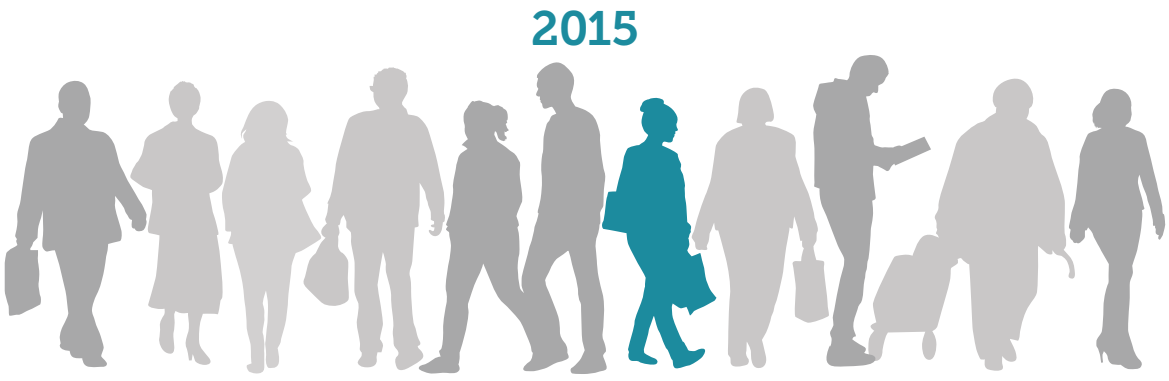
The human cost

Diabetes and its complications are major causes of death in most countries.

Type 2 diabetes is the most prevalent form of diabetes and has increased alongside cultural and societal changes. In high-income countries up to 91% of adults with the disease have type 2 diabetes[1-4]. It is estimated by IDF that 193 million people with diabetes are undiagnosed and are therefore more at risk of developing complications.

Furthermore, one in 15 adults is estimated to have impaired glucose tolerance, and one in seven births is affected by gestational diabetes. Both of these conditions are associated with an increased risk of developing type 2 diabetes in later life.

The prevalence of diabetes



One in **11 adults** has diabetes

One in **10 adults** will have diabetes

Diabetes by gender

Number of **men** with diabetes

2015 215.2 million
2040 328.4 million

Number of **women** with diabetes

2015 199.5 million
2040 313.3 million

Diabetes in urban and rural environments

Diabetes in **urban** areas

2015 269.7 million
2040 477.9 million

Diabetes in **rural** areas

2015 145.1 million
2040 163.9 million

One in **two** adults with diabetes is **undiagnosed**

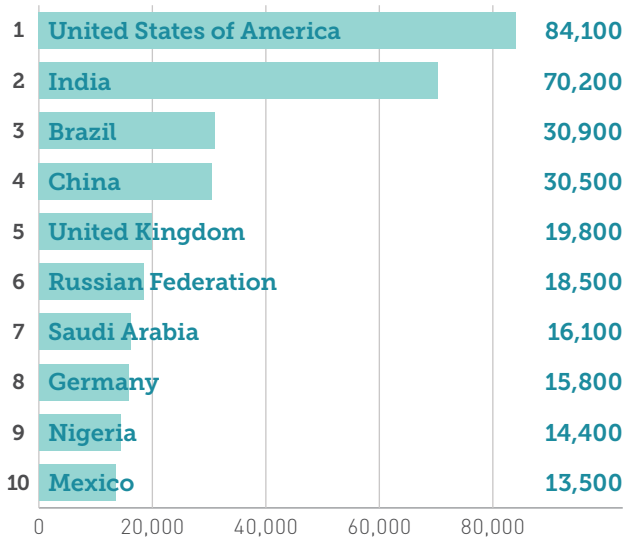
Diabetes in children

Whilst type 1 diabetes is less common, it is still increasing by around 3% every year, particularly among children. Around 86,000 children develop type 1 diabetes each year and when insulin is not available, the life expectancy for a child with type 1 diabetes is very short. The IDF Life For A Child programme supplies insulin to 17,000 children in 46 countries.

In 2015 the number of **children** with type 1 diabetes exceeded **half a million** for the first time

Children with diabetes

Top 10 countries for number of **children** with type 1 diabetes (0-14 years)

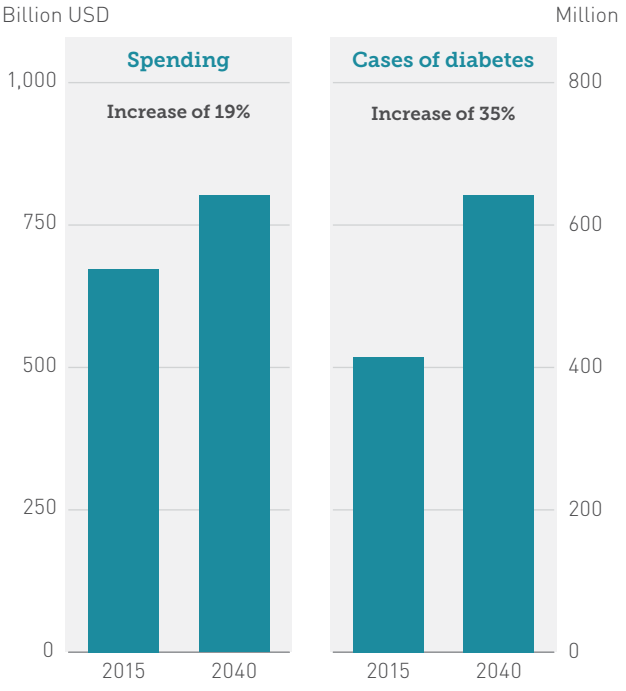


Number of children with type 1 diabetes worldwide 542,000

The financial cost

In addition to placing a large financial burden on individuals and their families due to the cost of insulin and other essential medicines, diabetes also has a substantial economic impact on countries and national health systems. This is because of an increased use of health services, loss of productivity and the long-term support needed to overcome diabetes related complications, such as kidney failure, blindness or cardiac problems. The majority of countries spend between 5% and 20% of their total health expenditure on diabetes. With such a high cost, the disease is a significant challenge for healthcare systems and an obstacle to sustainable economic development.

Global health spending to treat diabetes



A regional perspective

Most regions have seen a continuous increase in diabetes. The heavily populated Western Pacific Region has 153 million adults with diabetes; substantially more than any other region. It is however, the North America and Caribbean Region which has the highest prevalence per capita with one out of eight adults with the disease.

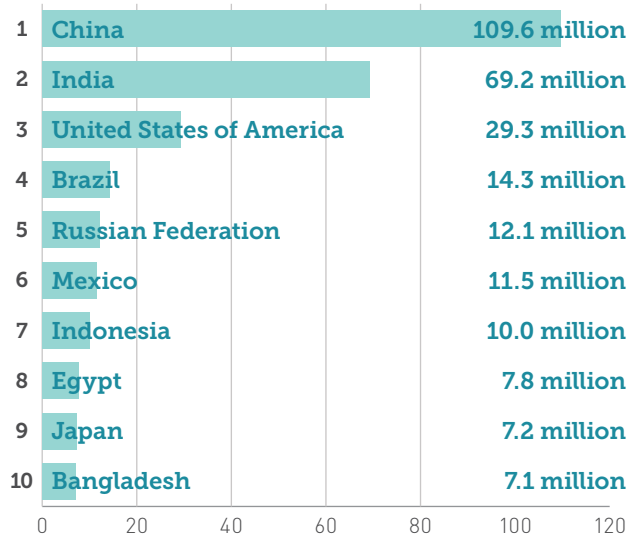
Europe has the highest number of children with type 1 diabetes; approximately 140,000, and faces an increase of around 21,600 new cases per year.

In the South-East Asia Region, 24.2% of all live births are affected by high blood glucose during pregnancy. In the Middle East and North Africa Region, two out of five adults with diabetes are undiagnosed. In the South and Central America Region, the number of people with diabetes will increase by 65% by 2040.

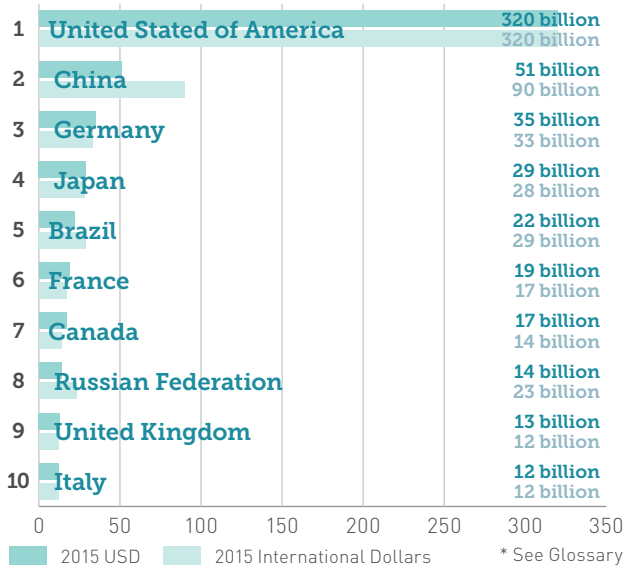
It is particularly challenging to estimate the total number of people with diabetes in the Africa Region, as more than three quarters of countries lack nationwide data, the highest of any IDF region. Thus, the regional estimate is produced by using the data from the 12 countries that had data to estimate the number of people with diabetes in the other 37 countries without data. In the sixth edition, the choice of which country to use for extrapolation was primarily based on similarities in World Bank income levels. In this seventh edition, countries for extrapolation were chosen on the basis of similar ethnicity, language, geography and World Bank income levels. In 2015, it is estimated that between 9.5 million and 29.3 million people live with diabetes in the Africa Region. Of these, three quarters are estimated to be undiagnosed, the highest of any IDF region.

For the first time, intervals have been produced to quantify the uncertainty around diabetes prevalence estimates. The uncertainty interval around the global estimate of adults with diabetes was estimated to range from 7.2% to 11.4% [339-536 million].

Top ten countries/territories for number of adults with diabetes



Top ten countries/territories for diabetes-related health expenditure (R=2*)



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Halting the rise in diabetes

Greater education is needed to improve the diagnosis and management of all types of diabetes and to embed lifestyle changes that will slow the rise in type 2 diabetes. While educational programmes can help improve the management of people with diabetes, public health education is needed at the population level to encourage behaviour change to prevent type 2 diabetes.

Early diagnosis can prevent or delay the long-term health complications of people who are undiagnosed with type 2 diabetes. Progress has been made in introducing screening programmes, and diabetes risk scores have now been tested in 32 countries around the world.

IDF's call for action

IDF's mission is to promote diabetes care, prevention and a cure worldwide and it takes a leading role in influencing policy, increasing public awareness and encouraging improvements in health.

Notably in 2015, the United Nations Member States adopted the Sustainable Development Goals which included targets on non-communicable diseases. The previous Millennium Development Goals had omitted diabetes and other non-communicable diseases which presented an obstacle to establishing resources and political focus to tackle diabetes.

During the 2015 G7 Summit, IDF launched a call to action for all G7 nations to develop and implement cost-effective policies to improve the health outcomes for people with diabetes and to prevent new cases.

In 2015, IDF published its Framework for Action on Sugar, which recognises the important role that excess sugar consumption has in increasing the risk of type 2 diabetes, and presents a series of policy initiatives aimed at reducing consumption of sugar and increasing production and availability of more healthy foods.

As part of IDF's work with The European Connected Health Alliance to create a global network of Diabetes Aware Cities, IDF piloted the Diabetes Prevention Score in 2015. This will enable cities globally to assess how their urban environments can be improved to support prevention of type 2 diabetes in communities.

By continuing to increase awareness of diabetes and promote care and prevention, IDF hopes that today's estimates for 2040 will be purely hypothetical.

United Nations Sustainable Development Goal:

By 2030, **reduce premature mortality** from non-communicable diseases **by one third**

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1 What is diabetes?

1 What is diabetes?

Diabetes is a chronic condition that occurs when the body cannot produce enough insulin or cannot use insulin[1], and is diagnosed by observing raised levels of glucose in the blood. Insulin is a hormone produced in the pancreas; it is required to transport glucose from the bloodstream into the body's cells where it is used as energy. The lack, or ineffectiveness, of insulin in a person with diabetes means that glucose remains circulating in the blood. Over time, the resulting high levels of glucose in the blood (known as hyperglycaemia) causes damage to many tissues in the body, leading to the development of disabling and life-threatening health complications.

There are three main types of diabetes:

- Type 1 diabetes
- Type 2 diabetes
- Gestational diabetes

Less common types of diabetes include:

- Monogenic diabetes, the result of a genetic mutation. Examples of monogenic diabetes include Maturity-Onset Diabetes of the Young and Neonatal Diabetes Mellitus. An estimated 4% to 13% of diabetes in children is due to monogenic diabetes[2,3].
- Secondary diabetes, which arises as a complication of other diseases, such as hormone disturbances (e.g. Cushing's disease or acromegaly) or diseases of the pancreas.

Type 1 diabetes

Type 1 diabetes is caused by an autoimmune reaction, in which the body's defence system attacks the insulin-producing beta cells in the pancreas. As a result, the body can no longer produce the insulin it needs. Why this occurs is not fully understood. The disease can affect people of any age, but onset usually occurs in children or young adults. People with this form of diabetes need insulin every day in order to control the levels of glucose in their blood. Without insulin, a person with type 1 diabetes will die.

Type 1 diabetes often develops suddenly and can produce symptoms such as:

- Abnormal thirst and a dry mouth
- Frequent urination
- Lack of energy, extreme tiredness
- Constant hunger
- Sudden weight loss
- Blurred vision

Type 1 diabetes is diagnosed by an elevated blood glucose level in the presence of the symptoms listed above. In some parts of the world, where type 1 diabetes is less common, the symptoms may be mistaken for other illnesses, and it is therefore essential that the blood glucose is measured when one or more of the above symptoms are present. Sometimes the type of diabetes is not clear and additional tests are required to distinguish between type 1 and type 2 diabetes or the rarer forms of diabetes[4]. With daily insulin treatment, regular blood glucose monitoring and maintenance of a healthy diet and lifestyle, people with type 1 diabetes can lead a normal, healthy life.

The number of people who develop type 1 diabetes is increasing. The reasons for this are still unclear, but may be due to changes in environmental risk factors and/or viral infections.

Type 2 diabetes

Type 2 diabetes is the most common type of diabetes. It usually occurs in adults, but is increasingly seen in children and adolescents. In type 2 diabetes, the body is able to produce insulin but becomes resistant so that the insulin is ineffective. Over time, insulin levels may subsequently become insufficient. Both the insulin resistance and deficiency lead to high blood glucose levels.

The symptoms of type 2 diabetes include:

- Frequent urination
- Excessive thirst
- Weight loss
- Blurred vision

Many people with type 2 diabetes remain unaware of their condition for a long time because the symptoms are usually less marked than in type 1 diabetes and may take years to be recognised. However, during this time the body is already being damaged by excess blood glucose. As a result, many people already have evidence of complications when they are diagnosed with type 2 diabetes (see *Diabetes complications*).

Although the exact causes for the development of type 2 diabetes are still not known, there are several important risk factors. The most important are excess body weight, physical inactivity and poor nutrition. Other factors which play a role are ethnicity, family history of diabetes, past history of gestational diabetes and advancing age.

In contrast to people with type 1 diabetes, most people with type 2 diabetes do not require daily insulin treatment to survive. The cornerstone of treatment of type 2 diabetes is the adoption of a healthy diet, increased physical activity and maintenance of a normal body weight. A number of oral medications are available to help control blood glucose levels. If blood glucose levels continue to rise however, people with type 2 diabetes may be prescribed insulin.

The number of people with type 2 diabetes is growing rapidly worldwide. This rise is associated with ageing populations, economic development, increasing urbanisation, less healthy diets and reduced physical activity[5].

There are **three main types** of diabetes:
Type 1 diabetes, type 2 diabetes and gestational diabetes

Poorly managed diabetes leads to **serious complications** and early death

With good self-management and **health professional support,** people with diabetes can live a long, **healthy life**

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Gestational diabetes

Hyperglycaemia that is first detected at any time during pregnancy is classified as either[6]:

- Gestational diabetes mellitus
- Diabetes mellitus in pregnancy

Women with slightly elevated blood glucose levels are classified as having gestational diabetes, whilst women with substantially elevated blood glucose levels are classified as having diabetes mellitus in pregnancy (see *Box*). Gestational diabetes tends to occur from the 24th week of pregnancy.

Overt symptoms of hyperglycaemia during pregnancy are rare and difficult to distinguish from normal pregnancy symptoms, but may include increased thirst and frequent urination. Screening by means of an oral glucose tolerance test is therefore recommended. This should be conducted early in pregnancy for high risk woman, and between the 24th and 28th week of pregnancy in all other women[7].

Women with hyperglycaemia detected during pregnancy are at greater risk of adverse pregnancy outcomes. These include very high blood pressure and foetal macrosomia (a significantly larger than average baby), which can make a vaginal birth difficult and risky. Good control of blood glucose during pregnancy can reduce these risks.

Women with hyperglycaemia during pregnancy can control their blood glucose levels through a healthy diet, gentle exercise and blood glucose monitoring. In some cases, insulin or oral medication may also be prescribed.

Gestational diabetes normally disappears after birth. However, women who have been previously diagnosed are at higher risk of developing gestational diabetes in subsequent pregnancies and type 2 diabetes later in life. Babies born to mothers with gestational diabetes also have a higher risk of developing type 2 diabetes in their teens or early adulthood[8].

Impaired glucose tolerance and impaired fasting glucose

People with raised blood glucose levels that are not high enough for a diagnosis of diabetes are said to have impaired glucose tolerance (IGT) or impaired fasting glucose (IFG) (see *Box*). These conditions are sometimes called "pre-diabetes".

World Health Organization Classifications of Hyperglycaemia in Pregnancy[6]

Gestational diabetes mellitus should be diagnosed at any time in pregnancy if **one or more** of the following criteria are met:

- Fasting plasma glucose 5.1-6.9 mmol/L (92-125 mg/dl)
- One-hour plasma glucose ⩾ 10.0 mmol/L (180 mg/dl) following a 75g oral glucose load
- Two-hour plasma glucose 8.5-11.0 mmol/L (153 -199 mg/dl) following a 75g oral glucose load

Diabetes in pregnancy should be diagnosed if **one or more** of the following criteria are met:

- Fasting plasma glucose ⩾ 7.0 mmol/L (126 mg/ dl)
- Two-hour plasma glucose ⩾ 11.1 mmol/L (200 mg/dl) following a 75g oral glucose load
- Random plasma glucose ⩾ 11.1 mmol/L (200 mg/ dl) in the presence of diabetes symptoms

People with impaired glucose tolerance are at increased risk of developing type 2 diabetes. Impaired glucose tolerance shares many characteristics with type 2 diabetes and is associated with advancing age and the inability of the body to use the insulin it produces. Not everyone with impaired glucose tolerance goes on to develop type 2 diabetes; a large body of evidence supports the effectiveness of lifestyle interventions – healthy diet and physical exercise – in preventing the progression to diabetes[9]. Lifestyle intervention can lead to normalisation of glucose tolerance in many people with impaired glucose tolerance.

Medications

Medication for type 1 diabetes

It is essential that everyone with type 1 diabetes has an uninterrupted supply of high quality insulin. There are several different types of insulin available, but as a minimum, regular quick-acting human insulin and longer-acting NPH-insulin should be available to everyone in all parts of the world.

Medication for type 2 diabetes

There are a number of medications for type 2 diabetes. Metformin is well-established and one of the most effective. Gliclazide is a sulfonylurea, which increases insulin secretion in type 2 diabetes. Both medications are on the World Health Organization list of essential medicines for diabetes. They should both be available and accessible to all people with type 2 diabetes worldwide, according to need. Other commonly used treatments for type 2 diabetes include GLP-1 analogues (injectable treatments that are not insulin) and DPP4 inhibitors. These treatments both enhance the body's natural response to ingested food, reducing glucose levels after eating.

In addition, people with all types of diabetes may need access to medications to control blood pressure and cholesterol levels.

2006 World Health Organization recommendations for the diagnostic criteria for diabetes and intermediate hyperglycaemia[10]

Diabetes should be diagnosed if **one or more** of the following criteria are met:

- Fasting plasma glucose ≥ 7.0 mmol/L (126 mg/ dl)
- Two-hour plasma glucose ≥ 11.1 mmol/L (200 mg/dl) following a 75g oral glucose load

Impaired Glucose Tolerance (IGT) should be diagnosed if **both** of the following criteria are met:

- Fasting plasma glucose < 7.0 mmol/L (126 mg/ dl)
- Two-hour plasma glucose 7.8-11.1 mmol/L (140 -200 mg/dl) following a 75g oral glucose load

Impaired Fasting Glucose (IFG) should be diagnosed if **both** of the following criteria are met:

- Fasting plasma glucose 6.1-6.9 mmol/L (110-125 mg/ dl)
- Two-hour plasma glucose < 7.8 mmol/L (140) following a 75g oral glucose load

Diabetes complications

People with diabetes are at higher risk of developing a number of disabling and life-threatening health problems than people without diabetes. Consistently high blood glucose levels can lead to serious diseases affecting the heart and blood vessels, eyes, kidneys and nerves. People with diabetes are also at increased risk of developing infections. In almost all high-income countries, diabetes is a leading cause of cardiovascular disease, blindness, kidney failure and lower-limb amputation. The growth in prevalence of type 2 diabetes in low- and middle-income countries means that without effective strategies to support better management of diabetes, it is likely that there will be large increases in the rates of these complications.

Diabetes complications can be prevented or delayed by maintaining blood glucose, blood pressure and cholesterol levels as close to normal as possible. Many complications can be picked up in their early stages by screening programmes that allow treatment to prevent them becoming more serious.

Figure 1.1
The major diabetes complications

Eye disease

Many people with diabetes develop some form of eye disease (retinopathy), which can damage vision or provoke blindness. Persistently high levels of blood glucose are the main cause of retinopathy. The network of blood vessels that supply the retina can become damaged in retinopathy, leading to permanent loss of vision. Retinopathy however, can become quite advanced before it affects vision, and it is therefore essential that people with diabetes have regular eye screenings. If detected early, treatment can be given to prevent blindness. Keeping good control of blood glucose greatly reduces the risk of retinopathy.

Cardiovascular disease

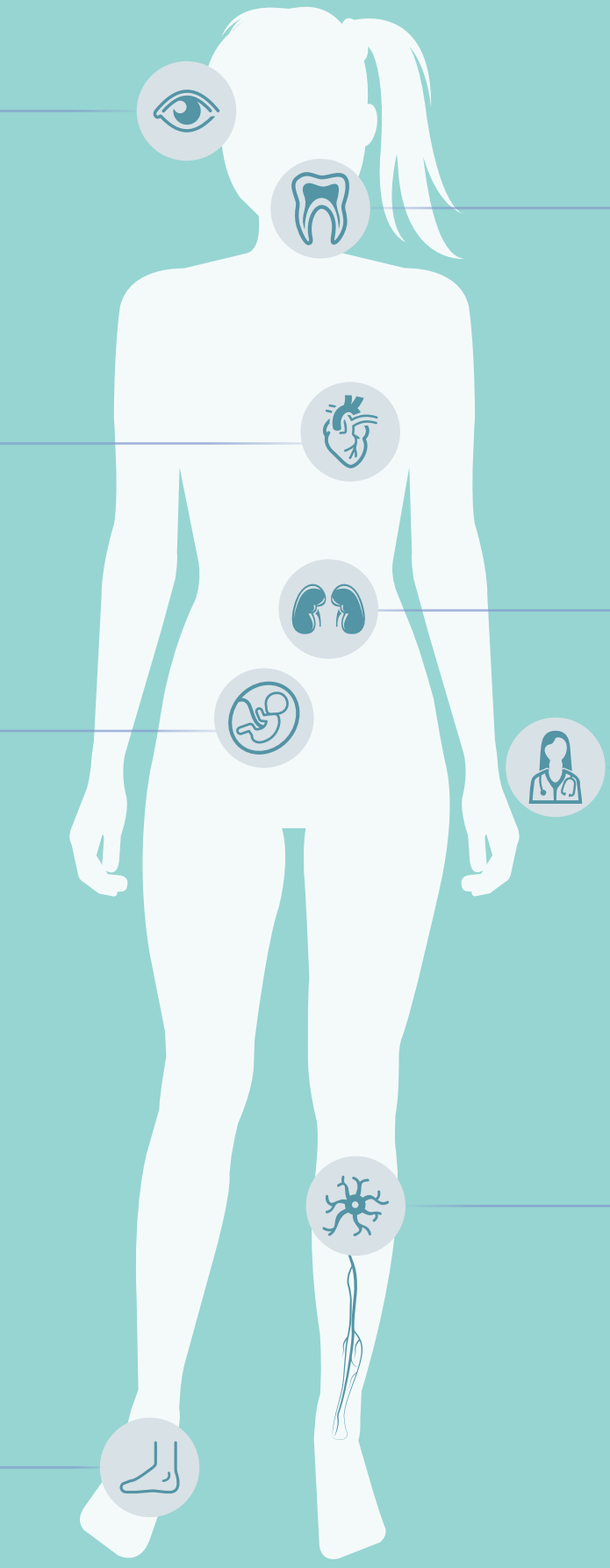
Cardiovascular disease is the most common cause of death and disability among people with diabetes. The cardiovascular diseases that accompany diabetes include angina, myocardial infarction (heart attack), stroke, peripheral artery disease and congestive heart failure. High blood pressure, high cholesterol, high blood glucose and other risk factors contribute to the increased risk of cardiovascular complications.

Pregnancy complications

Women with any type of diabetes are at risk of a number of complications during pregnancy, as high glucose levels can affect the development of the foetus. Women with diabetes therefore require careful monitoring before and during pregnancy to minimise the risk of these complications. High blood glucose during pregnancy can lead to changes in the foetus that cause it to gain excess size and weight. This in turn can lead to problems during delivery, injuries to the child and mother, and low blood glucose (hypoglycaemia) in the child after birth. Children who are exposed to high blood glucose in the womb are at higher risk of developing type 2 diabetes later in life[8].

Diabetic foot

As well as nerve damage, people with diabetes can experience problems with poor circulation to the feet, as a result of damage to blood vessels. These problems increase the risk of ulceration, infection and amputation. People with diabetes face a risk of amputation that may be more than 25 times greater than that in people without diabetes[11]. With good management however, a large proportion of amputations can be avoided. Even when a person undergoes amputation, the remaining leg – and the person's life – can be saved by good follow-up care from a multidisciplinary foot team[11]. In view of these risks, it is important that people with diabetes examine their feet regularly.



Oral health

Diabetes can pose a threat to oral health. There is an increased risk of inflammation of the tissue surrounding the tooth (periodontitis) in people with poor glucose control. Periodontitis is a major cause of tooth loss and is associated with an increased risk of cardiovascular disease. Management of periodontitis is very important in people with diabetes because optimal oral hygiene can prevent tooth loss, facilitate a healthy diet and improve glucose control.

Kidney disease

Kidney disease (nephropathy) is far more common in people with diabetes than in people without diabetes; diabetes is one of the leading causes of chronic kidney disease. The disease is caused by damage to small blood vessels, which can cause the kidneys to be less efficient, or to fail altogether. Maintaining near-normal levels of blood glucose and blood pressure greatly reduces the risk of nephropathy.

Prevention of complications

Common to all the major complications of diabetes is the fact that they are not inevitable – they can be prevented by good control of blood glucose levels, as well as good control of blood pressure and cholesterol levels. This requires a high level of education of the person with diabetes in managing their condition, as well as access to insulin, oral medications and monitoring equipment. People with diabetes should be supported by a well-educated health work force as well as health systems that provide regular blood tests and eye and foot examinations. The International Diabetes Federation (IDF) works in many places around the globe to provide treatments and services to improve the outcomes for people with diabetes.

Nerve damage

Nerve damage (neuropathy) also results from prolonged high blood glucose levels. It can affect any nerve in the body. The most common type is peripheral neuropathy, which mainly affects the sensory nerves in the feet. This can lead to pain, tingling, and loss of sensation. This is particularly significant because it can allow injuries to go unnoticed, leading to ulceration, serious infections and in some cases amputations. Neuropathy can also lead to erectile dysfunction, as well as problems with digestion, urination and a number of other functions.

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Insulin

Insulin is a hormone that is produced in the pancreas. Insulin allows glucose to enter the body's cells, where it is converted into energy.

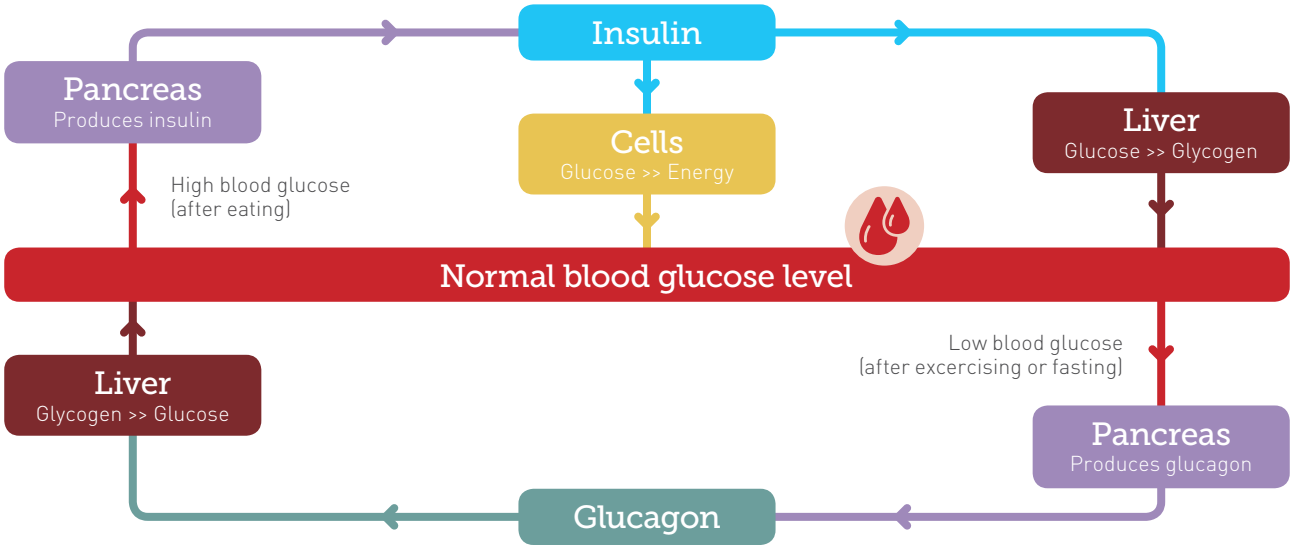
People with type 1 diabetes cannot survive without daily insulin doses. Some people with type 2 diabetes or gestational diabetes also need insulin treatment.

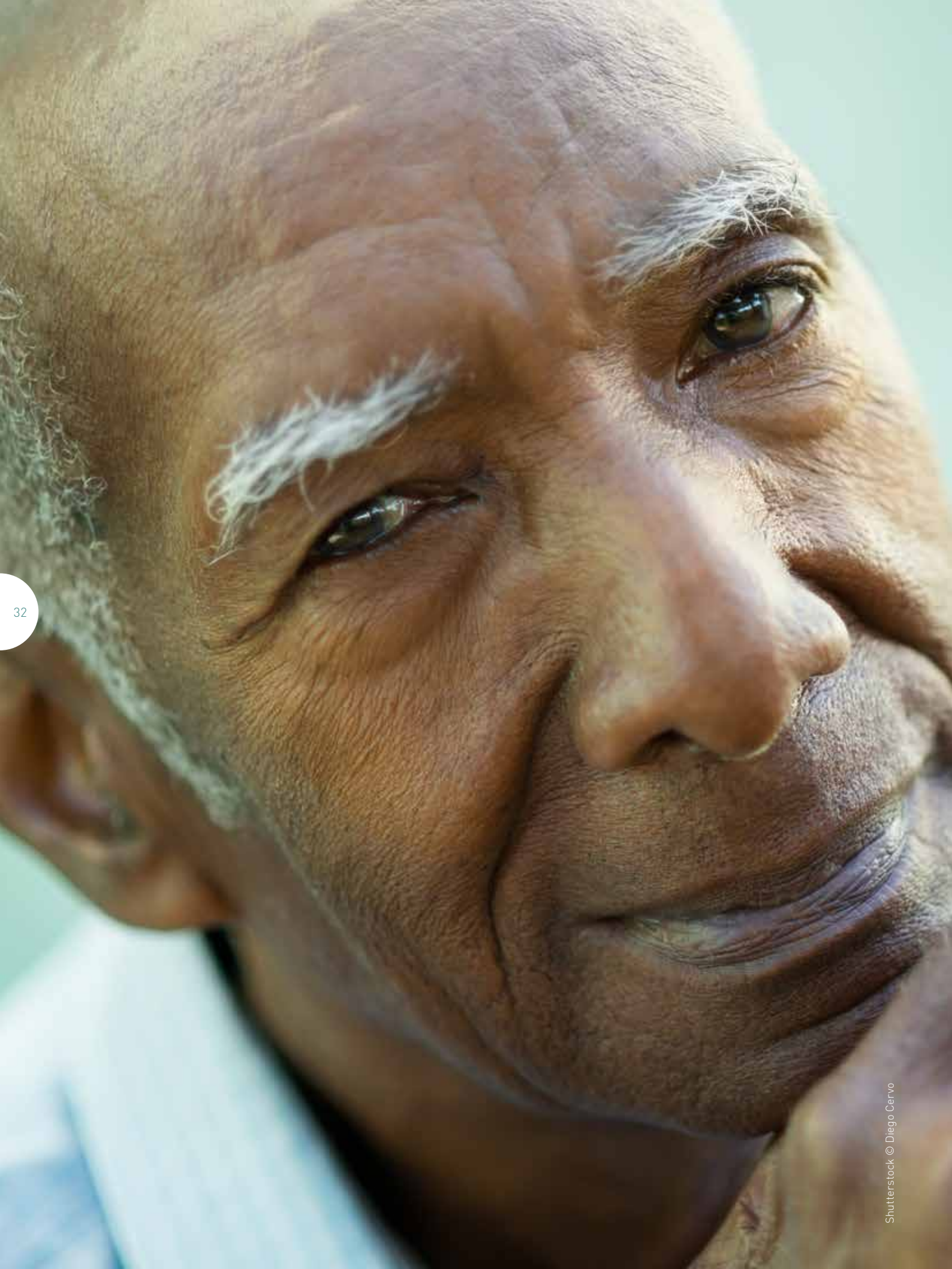
In Canada in 1921, scientist Frederick Banting and medical student Charles Best isolated a substance from the pancreas of dogs, which they named isletin – and which we now know as insulin. In a series of experiments, they found that a dog with its pancreas removed could be kept alive with injections of isletin. The following year, after much laboratory work to purify insulin extracted from a foetal calf, a 14-year-old boy called Leonard Thompson became the first person with diabetes to receive an insulin injection, and his condition improved significantly. Prior to the use of insulin, people with type 1 diabetes were put on a starvation diet and had no hope of survival.

News of the success with insulin spread very quickly, and demands for the drug skyrocketed worldwide. Since then, huge advances have been made in research and development. However, nearly a century since it was discovered, people with type 1 diabetes in many parts of the world cannot access insulin – either because they cannot afford to pay for it or because it is not readily available – and as a result they die soon after developing type 1 diabetes.

Nearly a hundred years after its discovery, it is tragic that people still die because they cannot access insulin. Through its Life For A Child programme, IDF provides insulin to over 17,000 of the poorest children and young people with type 1 diabetes in over 46 countries.

Figure 1.2 Insulin production and action





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2 Methodology

2 Methodology

Generating global estimates of the impact of diabetes relies heavily on the quality and availability of data from data sources and surveys conducted in communities all over the world. These raw data provide a basis for modelling estimates at a national and global scale.

The technical details behind the *IDF Diabetes Atlas* are described in depth in the methodology paper by Guariguata and colleagues[1], as well as the scientific paper that accompanies this 2015 report, both published in *Diabetes Research and Clinical Practice*[2].

Distinguishing between type 1 and type 2 diabetes

In most diabetes prevalence studies conducted in adults, the prevalence of type 1 and type 2 diabetes is not reported separately. If a blood test is used in the study, any adult with a blood glucose level over a certain threshold is simply classified as having diabetes. Thus, it is not yet possible to report the precise proportion of type 1 and type 2 diabetes in this edition of the *IDF Diabetes Atlas*.

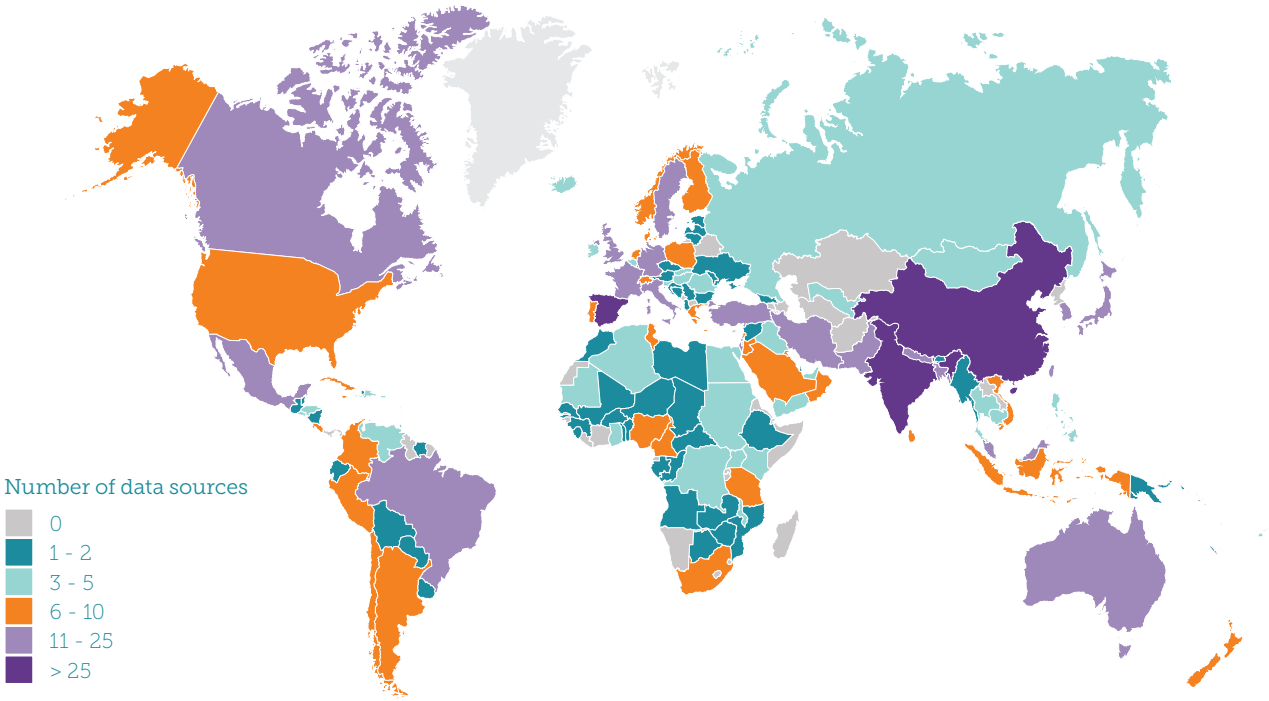
In high-income countries, a few studies[3-6] have estimated that approximately 87% to 91% of all people with diabetes are estimated to have type 2 diabetes, 7% to 12% are estimated to have type 1 diabetes, and 1% to 3% to have other types of diabetes. The relative proportions of type 1 and type 2 diabetes have not been reported in sufficient detail in low- and middle-income countries.

Gathering data sources

The data used in this edition of the *IDF Diabetes Atlas* came from a variety of sources. Electronic databases of peer-reviewed literature were searched, ministry of health websites were reviewed, and national and regional health surveys were sought from governments and researchers. Personal communication provided from investigators in the IDF network and official reports by multinational organisations, such as the United Nations and the World Health Organization (WHO) were also assessed for quality.

Data sources were excluded if they did not contain sufficient methodological information, did not provide enough data on age-specific prevalence of diabetes, did not base the sample collection on population distribution, were conducted in hospitals or clinics, were based only on treated diabetes or were conducted before 1990. Data sources reporting only prevalence of only type 1 or only type 2 diabetes in adults, newly diagnosed diabetes or with inconsistent results were also excluded.

Map 2.1 Countries and territories where data sources were reviewed with information on diabetes and impaired glucose tolerance in adults (20-79 years)



Scoring the data sources

Based on these classification criteria, a scoring system was developed as a synthesis of different opinions from a group of international experts to allow the comparison and weighting of different characteristics. Data sources that received a score over a certain threshold were included in the model and used to generate the *IDF Diabetes Atlas* estimates[7]. The threshold was determined by conducting a sensitivity analysis.

The data sources were classified according to the following criteria:

Method of diagnosis
- Oral glucose tolerance test
- Fasting blood glucose
- Self-reported
- Medical record or clinical diagnosis
- HbA1c

Sample size
- Greater than 5,000 people
- 1,500 to 4,999 people
- 1,499 to 700 people
- Less than 700 people

Representation
- Nationally representative
- Regionally representative
- Locally representative
- Ethnic or other specific group

Age of the data source
- Less than 5 years old
- 5 to 9 years old
- 10 to 19 years old
- 20 or more years old

Type of publication
- Peer-reviewed publication
- National health survey
- WHO STEPS study
- Other official report
- Personal communication

The highest score was assigned to data sources that were nationally representative, based on oral glucose tolerance tests, tested at least 5,000 people, conducted in the last five years and published in peer-reviewed journals.

It is important to emphasise that any studies that did not use oral glucose tolerance tests will likely underestimate the prevalence of diabetes, and will therefore generate less accurate estimates. Similarly, smaller or less representative studies will also be associated with greater uncertainty.

Estimating diabetes prevalence

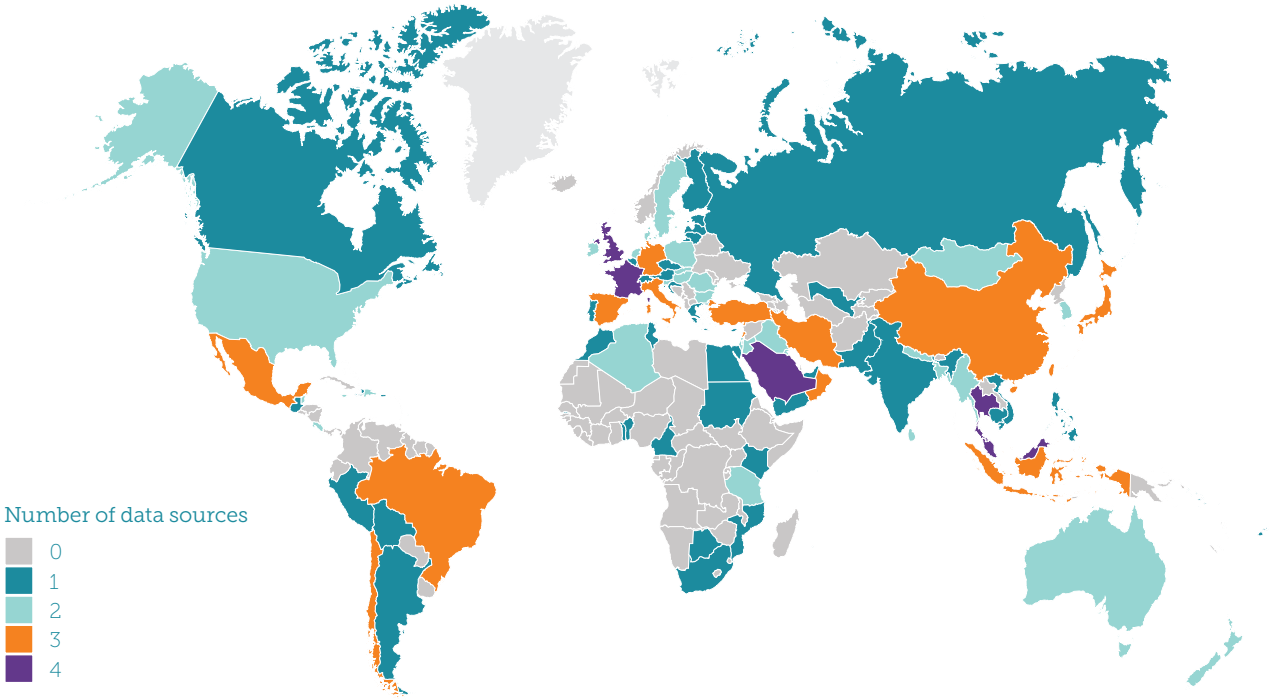
After the data source selection process, the information gathered from the data sources was analysed using statistical software R version 3.2.1[8]. The estimates for diabetes in adults also take into account the proportion of people that live in urban areas. If the data source only contained information on previously diagnosed diabetes, the number of undiagnosed cases is estimated from similar countries. The age- and sex-specific prevalence of diabetes was calculated for urban and rural settings for each country.

To determine the number of people living with diabetes, the 2015 population data from the United Nations Population Division for each country and territory were used[9]. To predict the number of people with diabetes in 2040, the middle 2040 population projections from the United Nations Population Division were used[9]. The 2040 diabetes prevalence projections take into account changes in population age structure and urbanisation[10], but do not explicitly include changes in the prevalence of any other diabetes risk factors.

Estimating undiagnosed diabetes

Population-based studies provide the basis for estimating undiagnosed diabetes. A group of people living in a particular area is tested for diabetes using a blood test, which identifies both known and previously undiagnosed cases. The *IDF Diabetes Atlas* estimates the proportion of undiagnosed diabetes in each country by using only high quality data sources that report the percentage of people with previously undiagnosed diabetes, and applies this to similar countries.

Map 2.2 Countries and territories for which data sources were selected for diabetes estimates in adults (20-79 years)



Age-adjusted comparative estimates

As the prevalence of diabetes increases with age, raw prevalence estimates cannot be used for comparing diabetes prevalence between countries that have different age structures, such as, for example, Japan and India. In order to make such comparisons between countries, age-adjusted comparative estimates were generated for each country by applying the country's age-specific diabetes prevalence estimates to each age-group and standardising the country's population age structure to the global age structure of 2001[11].

Extrapolating data

There are a number of countries for which no quality data on diabetes prevalence are available. In these cases, estimates were produced by extrapolating from diabetes prevalence data from similar countries matched by ethnicity[12], language[13], World Bank income level[14], and geography. Extrapolated estimates are less reliable than estimates based on studies conducted in the same country and are clearly marked as such in the prevalence tables in the Appendices.

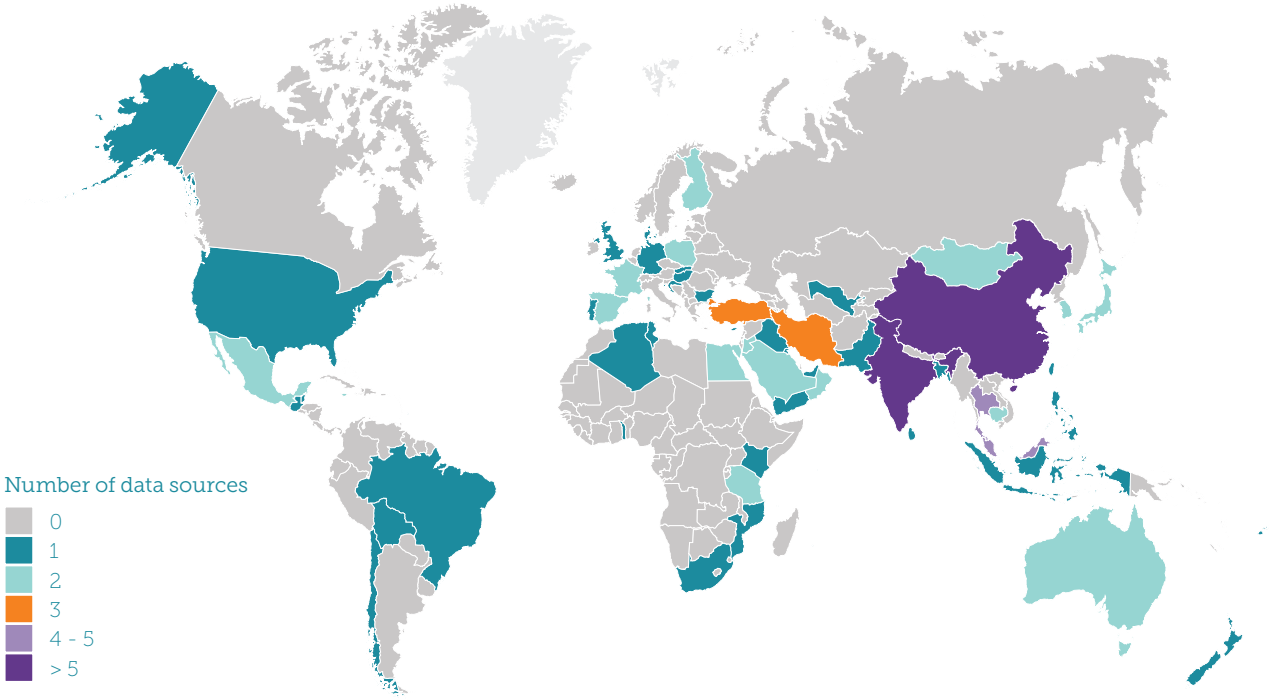
Estimating uncertainty

Uncertainty estimates were produced to estimate the impact of each of the above analytical decisions on the final prevalence estimates. In order to quantify the potential sources of uncertainty associated with the study selection process, two separate analyses were performed:

1. A bootstrap analysis of the sensitivity of the prevalence estimates to the study selection process
2. A simulation study to assess a variation of results in a range of 95% simulated distribution that reflect raw data uncertainty based on data sample sizes

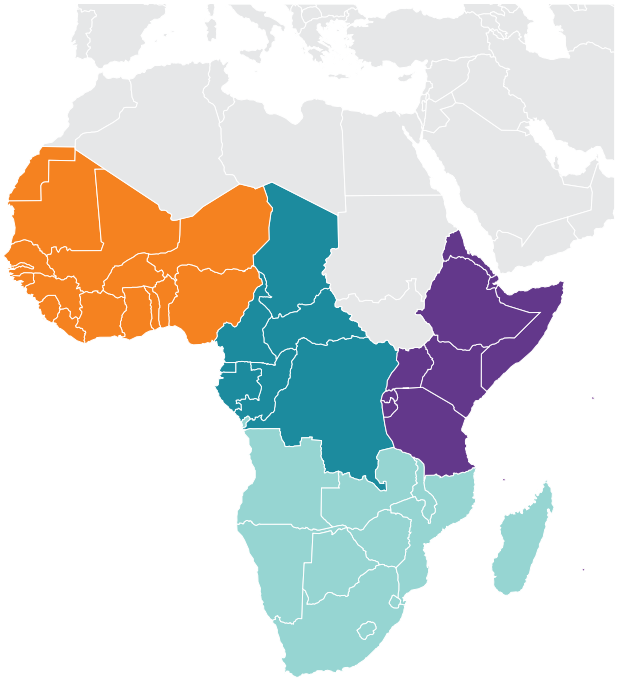
The results of these analyses were used to generate intervals to reflect the uncertainty levels around the diabetes prevalence estimates.

Map 2.3 Countries and territories with selected data sources reporting the percentage of people with previously undiagnosed diabetes (20-79 years)

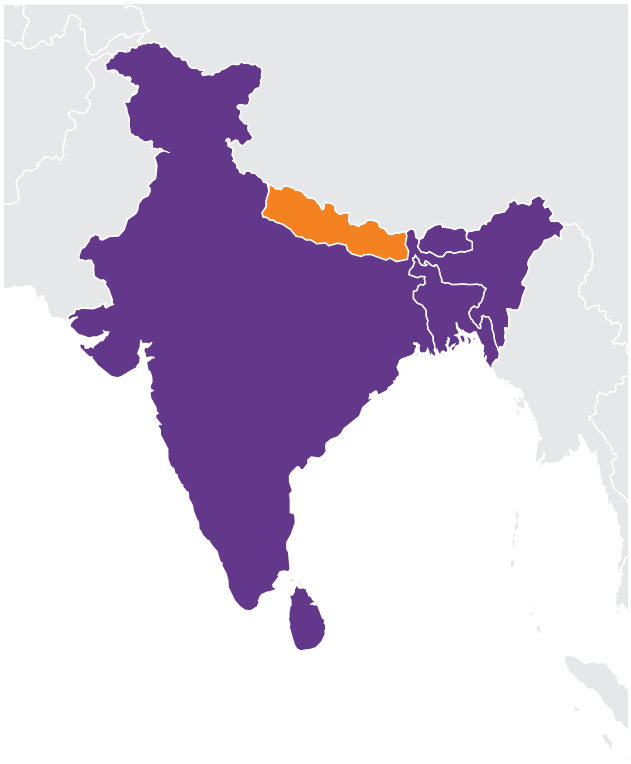


Map 2.4 Groups of similar countries and territories used for extrapolating estimates of diabetes prevalence (20-79 years)

Africa Region

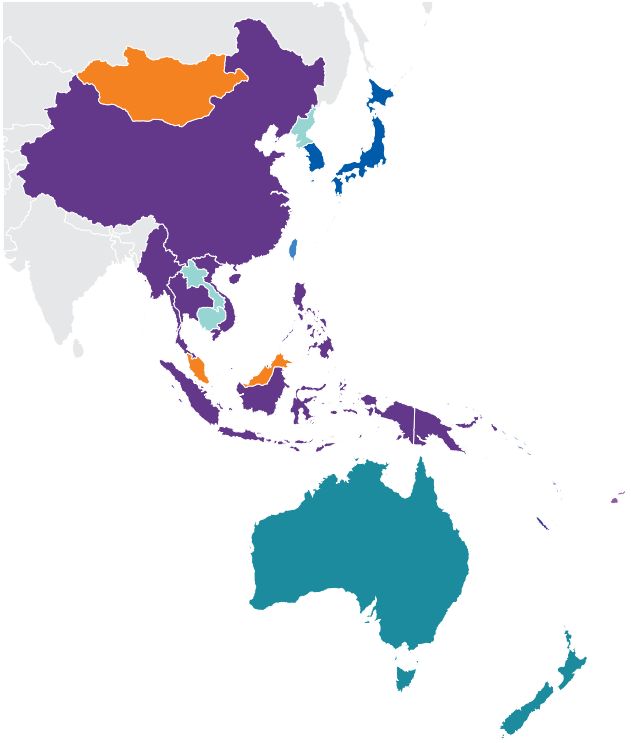


South-East Asia Region



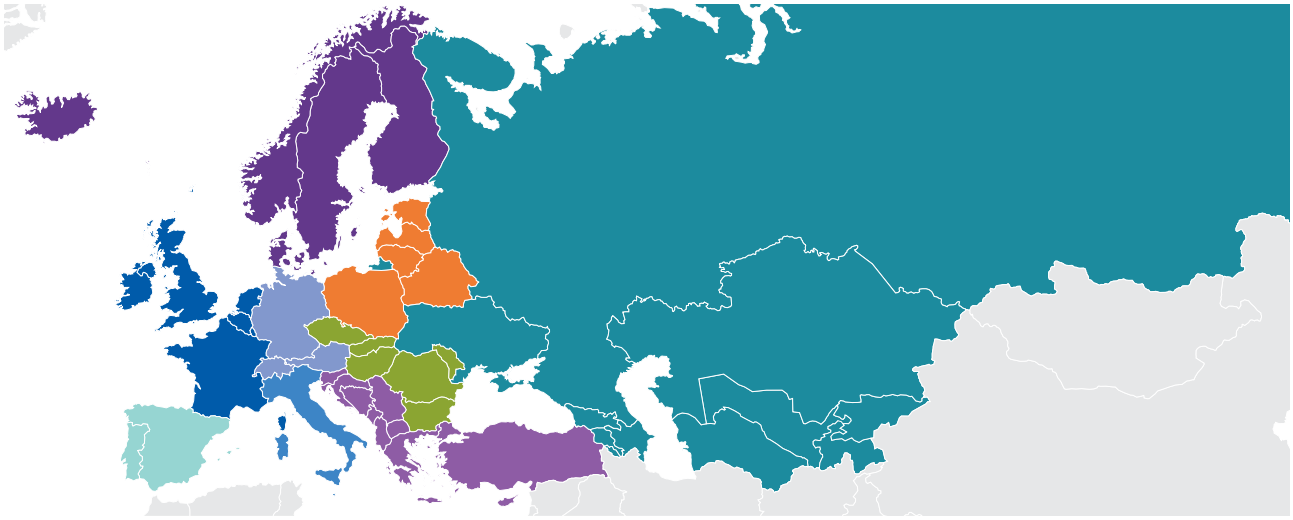
South and Central America Region

Western Pacific Region

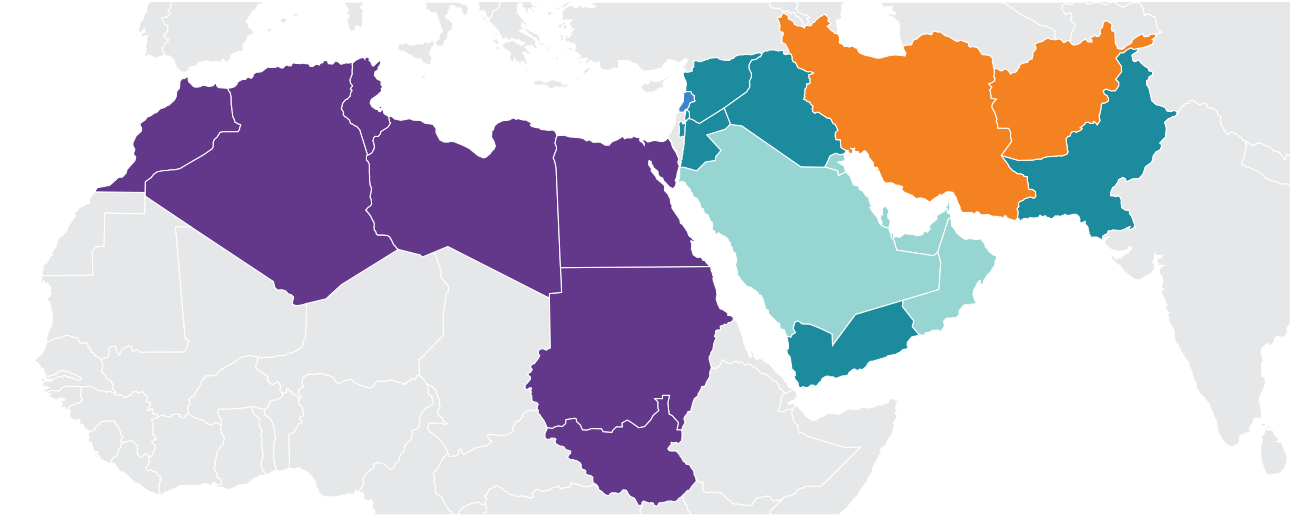


Each group of countries and territories is distinct. In this map, similar colours do not denote similar groups.

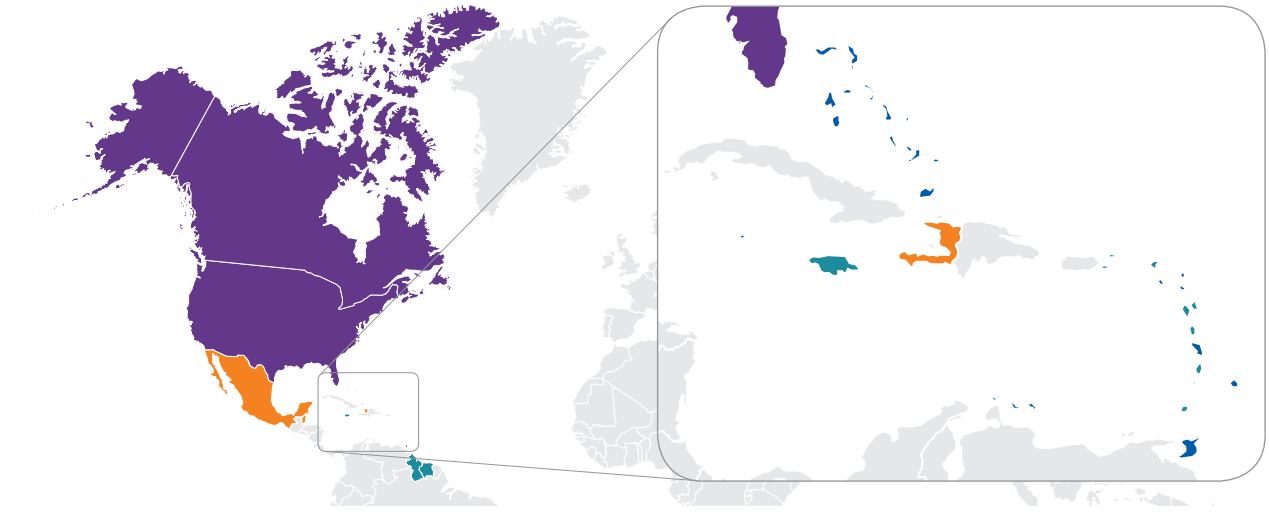
Europe Region



Middle East and North Africa Region



North America and Caribbean Region



Estimating impaired glucose tolerance

A similar method was used for estimating impaired glucose tolerance. Data sources containing information on the regional or national prevalence of impaired glucose tolerance were assessed for quality. Those that passed the quality threshold were included in the model. Estimates for countries without their own primary data were generated from similar countries.

Estimating diabetes-related mortality

To estimate the mortality due to diabetes, the following inputs were used:

1. *IDF Diabetes Atlas* estimates of diabetes prevalence
2. WHO estimates of the number of annual deaths from all causes[15]
3. Regional estimates of the relative risk a person with diabetes has of dying, compared to those without diabetes[16]

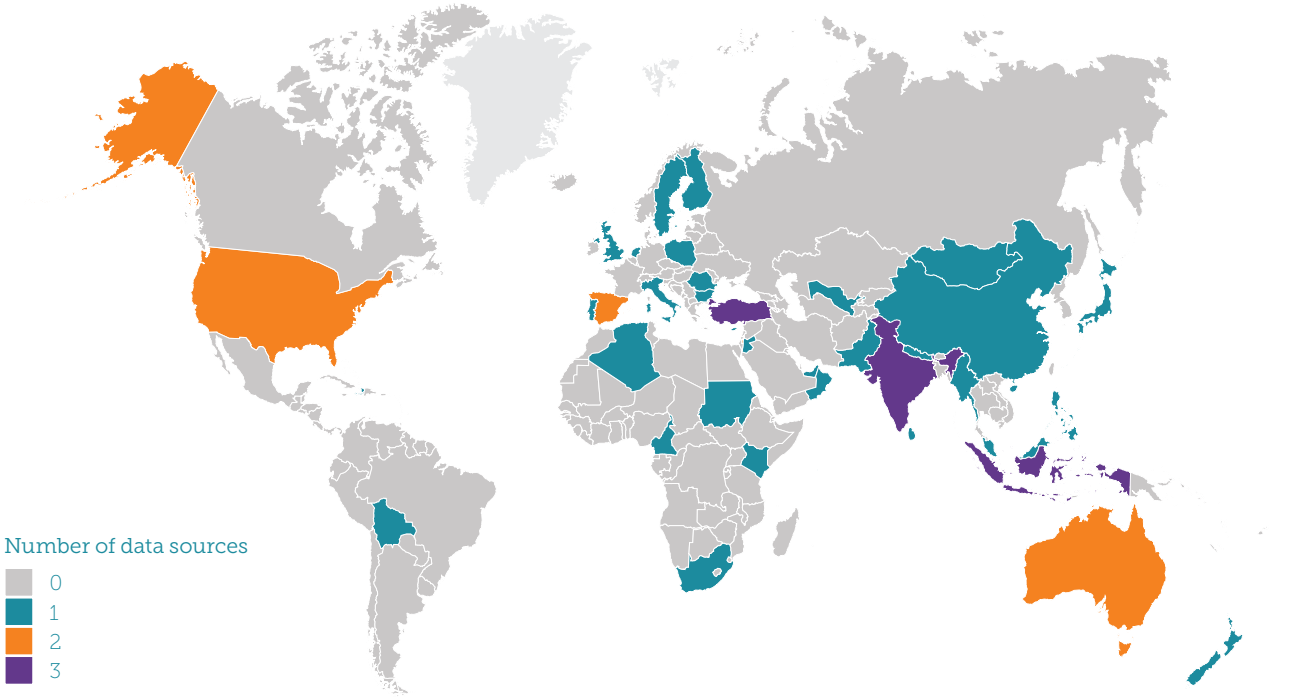
These inputs were combined in the WHO's *Global Burden of Disease* program, DisMod II, and then Miettinen's formula was used to calculate the number of deaths attributable to diabetes in people 20-79 years of age. The methods are outlined in more detail in the *Diabetes Research and Clinical Practice* scientific paper[16].

Estimating healthcare expenditures

The health expenditures for diabetes for each country were estimated from the combination of five inputs:

1. *IDF Diabetes Atlas* estimates of diabetes prevalence
2. United Nations population estimates[9]
3. WHO annual health expenditures[17]
4. WHO mortality rates[15]
5. The ratios of healthcare expenditures for people with diabetes compared to people without diabetes[18]

Map 2.5 Data sources selected for impaired glucose tolerance estimates in adults (20-79 years)



The methods are outlined in more detail in the *Diabetes Research and Clinical Practice* scientific paper[19].

Ratios of health care expenditures for people with diabetes compared to people without diabetes (R)

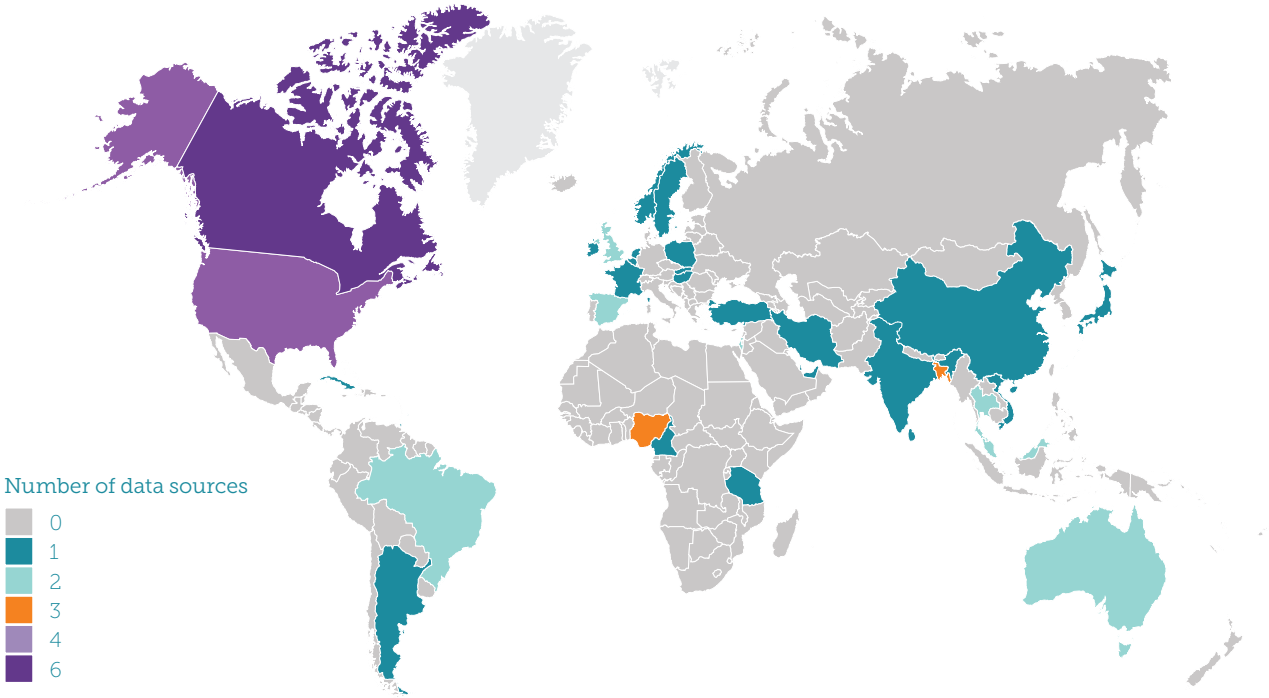
Globally, health care expenditures for people with diabetes are generally two- to three-fold higher than people without diabetes[20-26]. Due to the heterogeneity of healthcare provision and the uncertainty of healthcare costs, two separate estimates of healthcare costs were produced for this report. The 'R=2' estimates assume that health care expenditures for people with diabetes are on average two-fold higher than people without diabetes and the 'R=3' estimates assume that health care expenditures for people with diabetes are on average three-fold higher than people without diabetes.

United States Dollars and International Dollars

International Dollars are a hypothetical currency with the same purchasing power parity of United States Dollars in the United States of America at a given point in time. International Dollars can be used to make comparisons both between regions and over time. Purchasing power parity can be used as conversion factor to convert different currencies from different countries into the common currency unit of International Dollars. International Dollars are calculated by dividing the amount of national currency by the purchasing power parity exchange rate. For example, the purchasing power parity between the USA and Germany is the number of Euros that has the same purchasing power in Germany as 1.00 United States Dollar in the USA[6,27]. The estimates in this edition of the *IDF Diabetes Atlas* are based on the latest WHO estimates from 2013, adjusted to 2015 based on a standard growth rate.

Global estimates are presented in United States Dollars and International Dollars. International Dollars should be used to evaluate regional estimates against each other in order to ensure comparability.

Map 2.6 Countries and territories with data sources reporting the prevalence of hyperglycaemia in pregnancy (20-49 years)



Estimating hyperglycaemia in pregnancy

Hyperglycaemia in pregnancy can be classified into three main types:

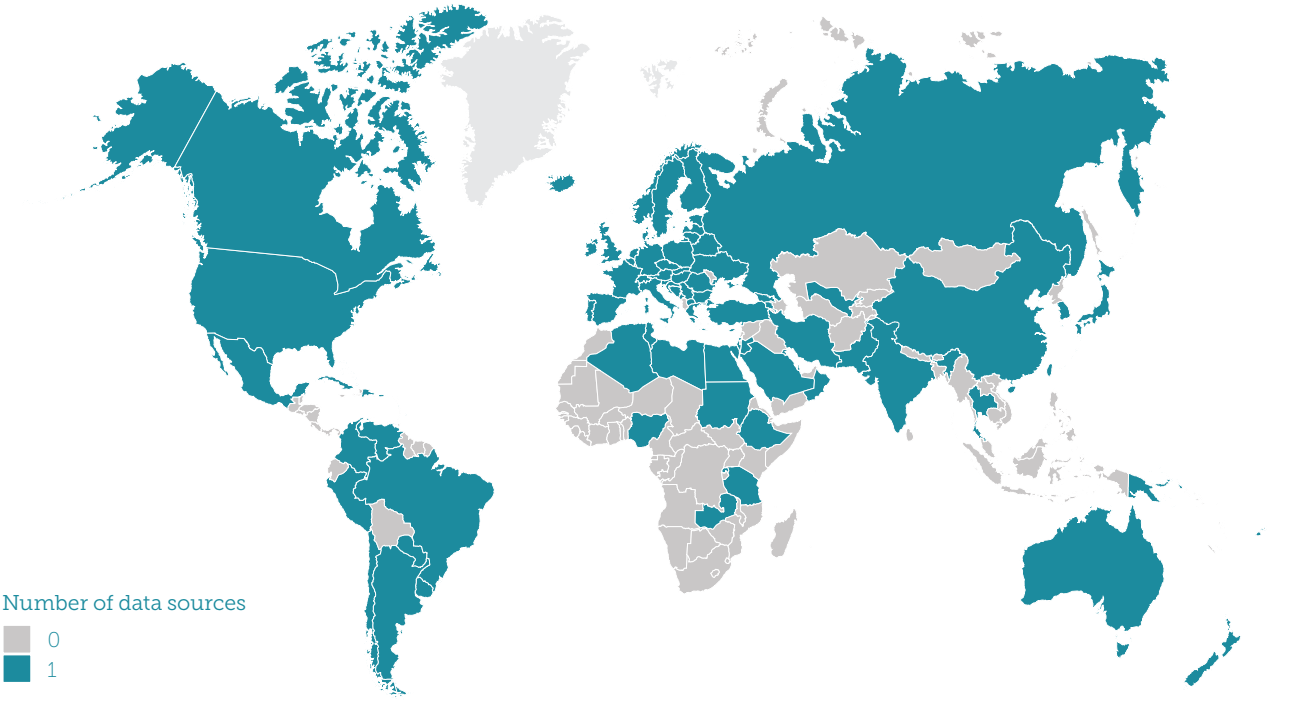
- Gestational diabetes
- Diabetes first detected in pregnancy
- Diabetes detected prior to pregnancy

When hyperglycaemia is first detected in pregnancy, women with slightly elevated blood glucose levels are classified as having gestational diabetes, and women with substantially elevated blood glucose levels are classified as having diabetes first detected in pregnancy (see Chapter 1).

Data sources reporting prevalence of gestational diabetes and diabetes first detected in pregnancy were identified through a literature review. A scoring system was developed to characterise studies on diagnostic criteria, year of the study, study design and representativeness of the study. The highest scoring data sources with sufficient information were selected for inclusion. Adjustments were made to account for differences in screening methods, diagnostic threshold and diagnostic criteria (see Chapter 1). United Nations fertility projections and IDF estimates of diabetes detected prior to pregnancy were also used to estimate the total percentage of live births affected by hyperglycaemia in pregnancy.

This methodology is described in more detail in the *Diabetes Research and Clinical Practice* paper by Linnenkamp and colleagues[28].

Map 2.7 Countries and territories with data available on the incidence or prevalence of type 1 diabetes in children (0-14 years)



Estimating type 1 diabetes in children

The scientific literature was searched for data sources that contained population-based studies on type 1 diabetes incidence (new cases each year) or prevalence (total cases) in children aged less than 15 years. The majority of relevant studies provided incidence rates derived from registers of newly diagnosed cases. Studies were graded on quality criteria. If no information was available in the published literature for a country, then its rate was extrapolated using the rate from a nearby similar country. Prevalence rates were then derived from these incidence rates and applied to United Nations population estimates for each country to obtain estimates of the number of prevalent cases[22].

This methodology assumes the effects of mortality are minimal, which may not be accurate in low-income countries with limited access to insulin, test-strips and appropriately trained health professionals. Thus, the total number of children with type 1 diabetes in low-income countries may be overestimated.

The estimates of the incidence and prevalence of type 1 diabetes in children were produced by researchers from Queen's University Belfast. The methodology is described in more detail in the *Diabetes Research and Clinical Practice* paper by Patterson and colleagues[23].

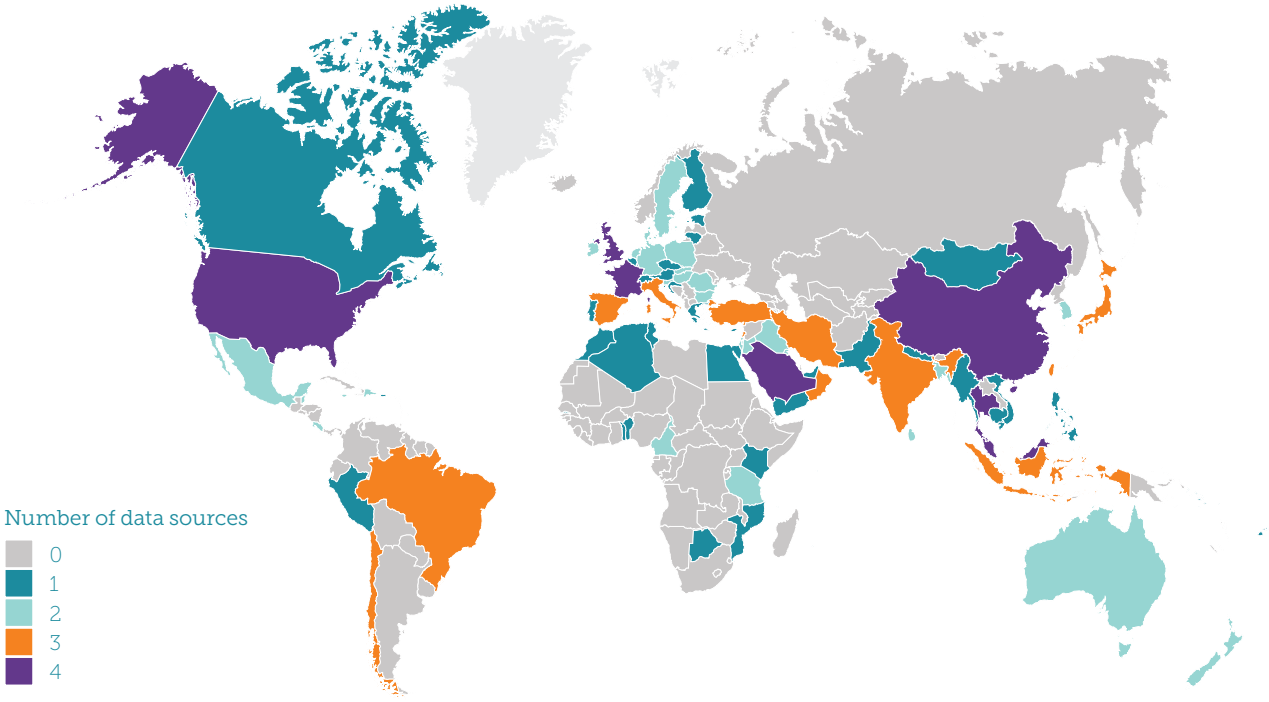
Data quantity and quality

All the estimates presented in the *IDF Diabetes Atlas* are sensitive to the quality of the data behind them. In order to ensure the highest possible accuracy of estimates, the researchers who conducted prevalence studies were contacted to validate data whenever needed. In order to ensure reliable global surveillance for diabetes, it is important that high quality, representative prevalence studies are performed at regular intervals. Reliable mortality estimates and reporting on health expenditures are also vulnerable to the availability of good data.

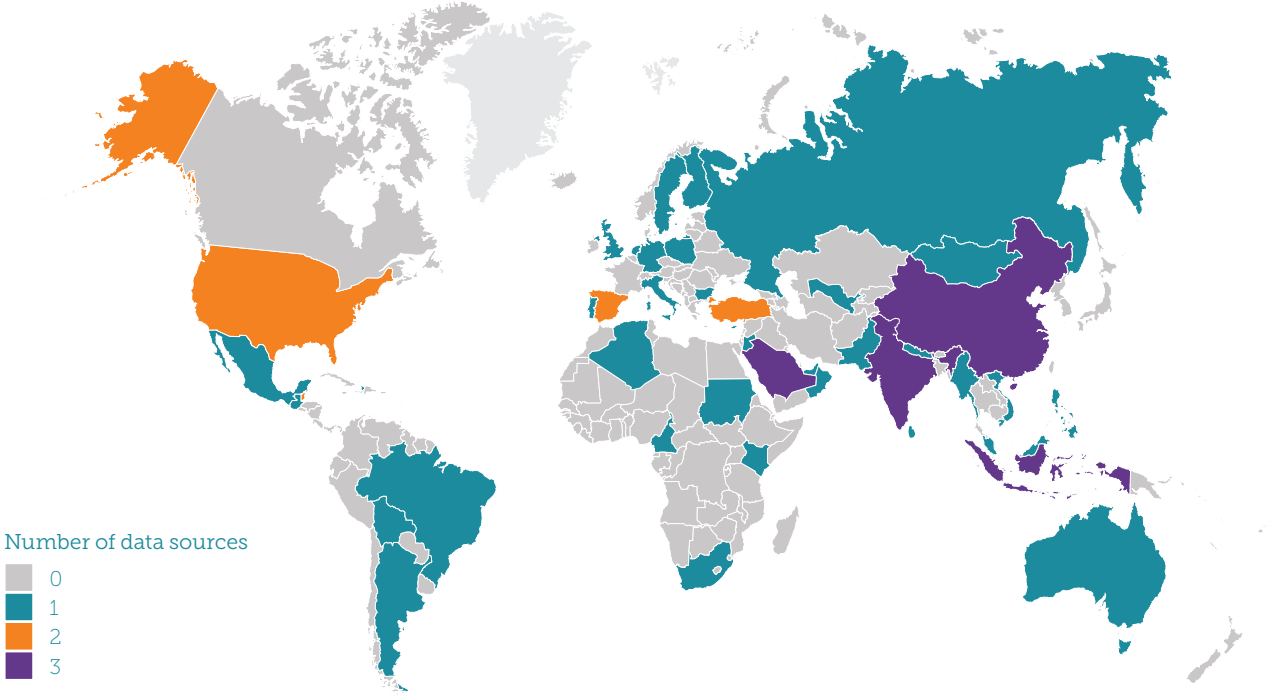
Therefore, IDF calls for all countries with sufficient resources to monitor their current diabetes prevalence by conducting studies that are population-based, nationally representative and that test at least 5,000 people using oral glucose tolerance tests. Such studies should be performed at least every five years.

The lack of reliable data on diabetes prevalence is a particular problem for low- and middle-income countries, but even some high-income countries do not have recent data. The maps below illustrate the countries that lack high-quality studies on the diabetes prevalence in adults. Estimates based on oral glucose tolerance tests are also identified in the Appendix.

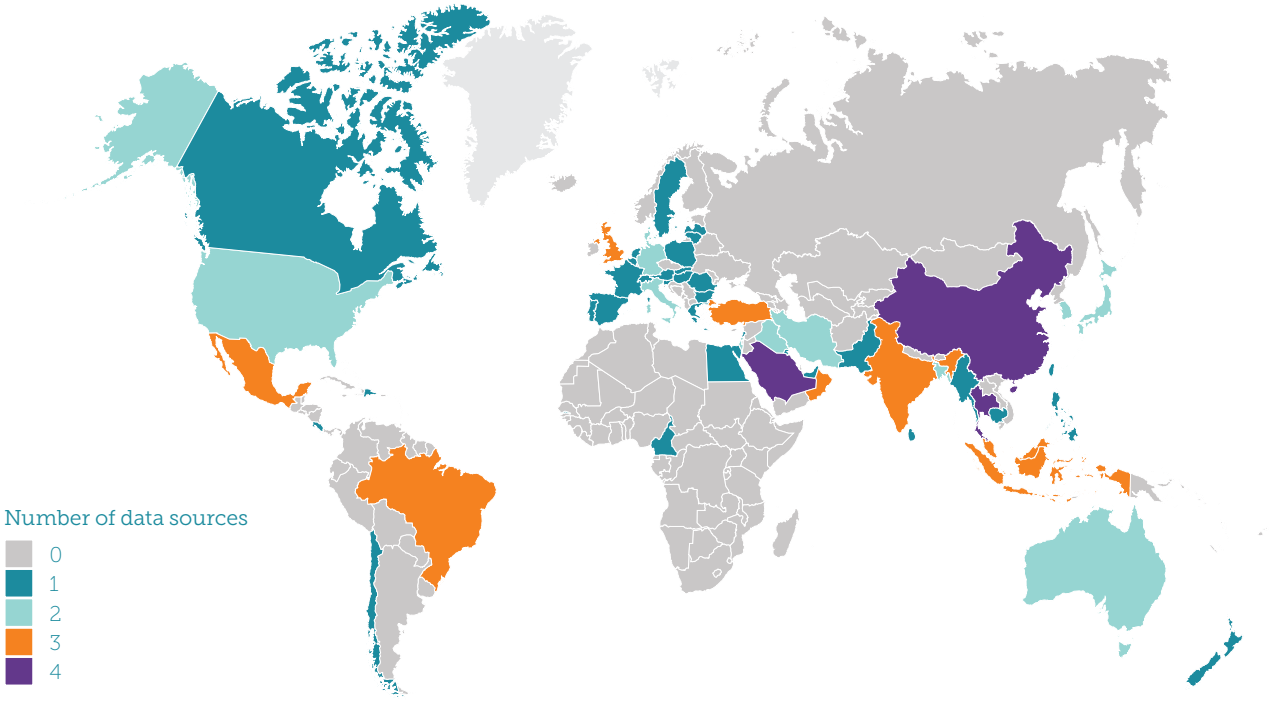
Map 2.8 Countries and territories with nationally-representative data sources used for estimating diabetes and impaired glucose tolerance prevalence (20-79 years)



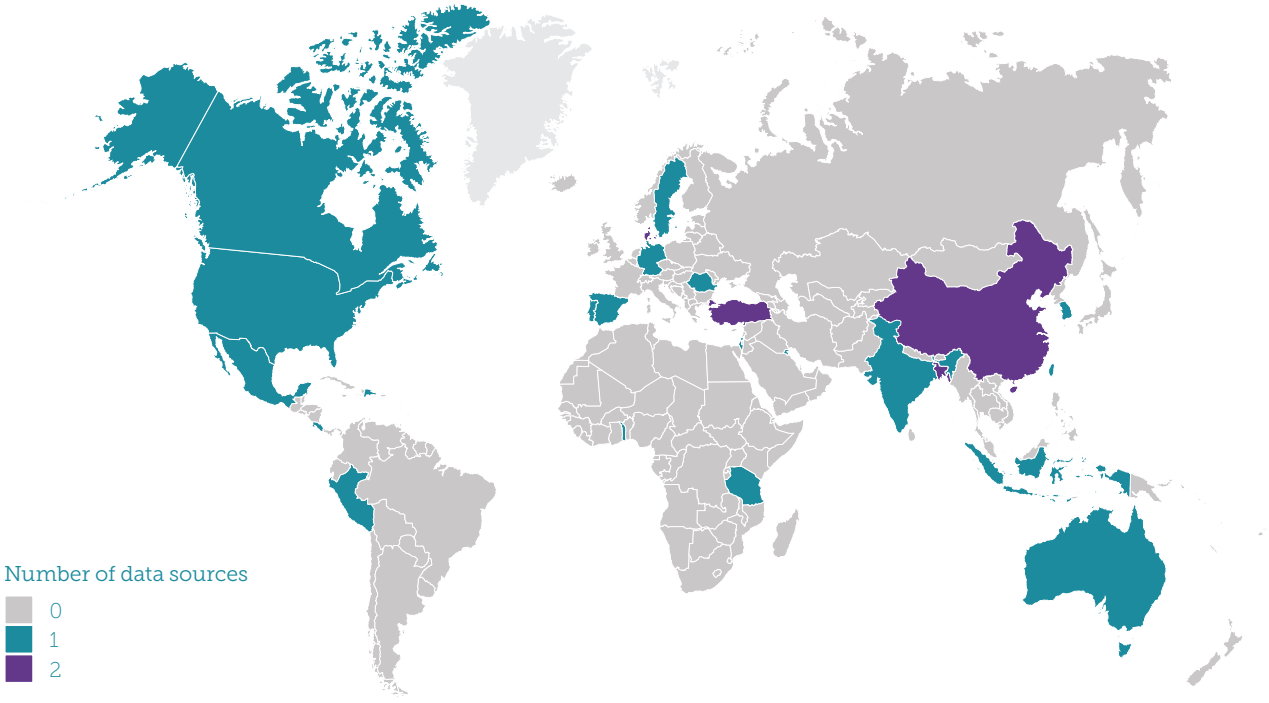
Map 2.9 Countries and territories with data sources that used oral glucose tolerance tests to estimate diabetes and impaired glucose tolerance prevalence (20-79 years)



Map 2.10 Countries and territories with data sources with a sample size greater than 5,000 people used for estimating diabetes and impaired glucose tolerance prevalence (20-79 years)



Map 2.11 Countries and territories with data sources less than five years old used for estimating diabetes and impaired glucose tolerance prevalence (20-79 years)



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3 The global picture

In 2015, IDF estimates that:

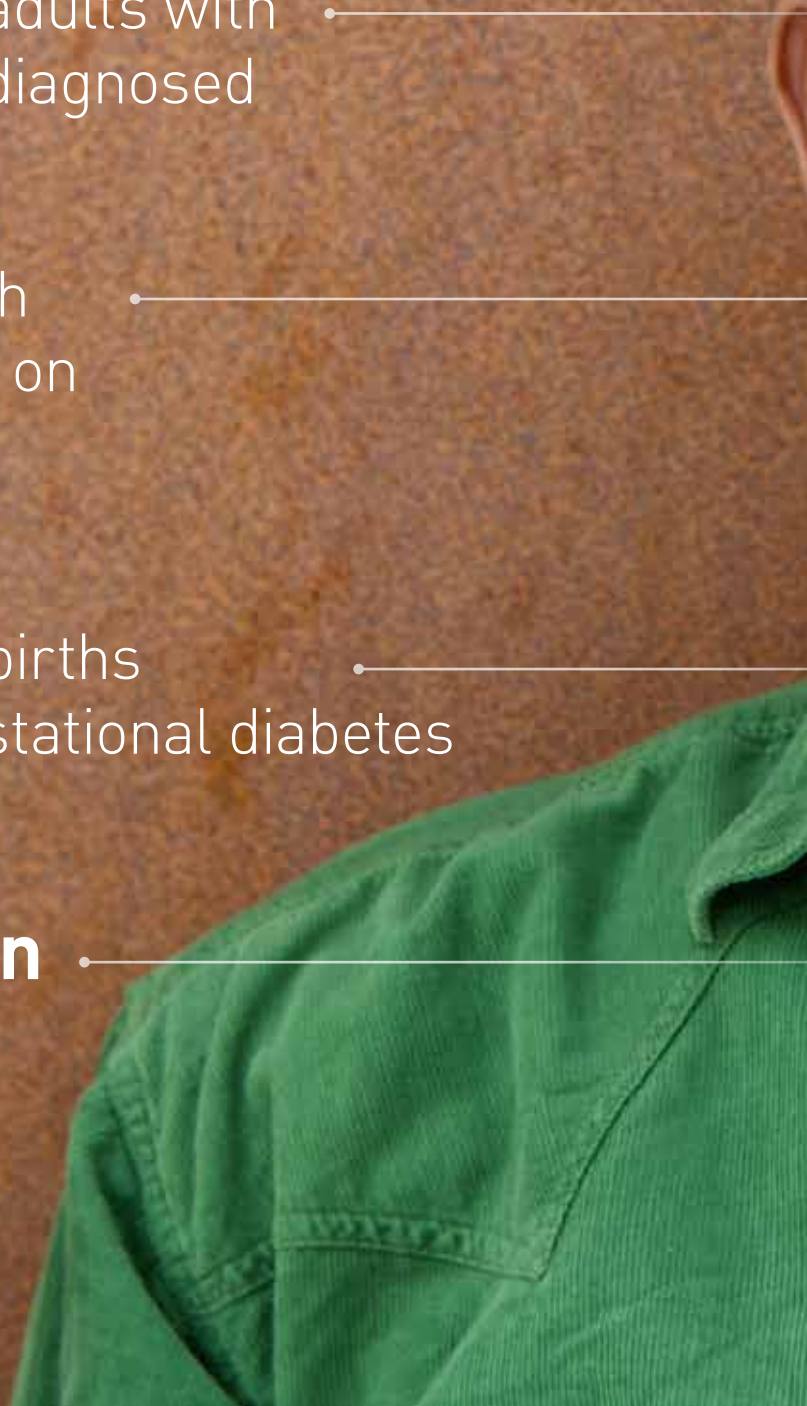
One in **11** adults has diabetes

One in **two** adults with diabetes is undiagnosed

12% of global health expenditure is spent on diabetes

One in **seven** births is affected by gestational diabetes

542,000 children have type 1 diabetes



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3 The global picture

Diabetes

Diabetes is one of the largest health emergencies of the 21st century.

The World Health Organization (WHO) estimates that globally, high blood glucose is the third highest risk factor for premature mortality, after high blood pressure and tobacco use[1]. Many governments and public health professionals however, remain largely unaware of the current impact of diabetes and its complications.

In many studies, a substantial proportion of those with diabetes had not been previously diagnosed. Many people remain undiagnosed because there are often few symptoms during the early years of type 2 diabetes or symptoms that do occur may not be recognised as being related to diabetes[2].

People living with diabetes can be found in every country. Without effective prevention and management programmes, the impact will continue to increase worldwide.

Table 3.1 *IDF Diabetes Atlas* global estimates, 2015 and 2040

	2015	2040
Total world population	7.3 billion	9.0 billion
Adult population (20-79 years)	4.72 billion	6.16 billion
Child population (0-14 years)	1.92 billion	-
Diabetes (20-79 years)		
Global prevalence	8.8% (7.2-11.4%)	10.4% (8.5-13.5%)
Number of people with diabetes	415 million (340-536 million)	642 million (521-829 million)
Number of deaths due to diabetes	5.0 million	-
Health expenditure due to diabetes (20-79 years)		
Total health expenditure, R=2* 2015 USD	673 billion	802 billion
Hyperglycaemia in pregnancy (20-49 years)		
Proportion of live births affected	16.2%	-
Number of live births affected	20.9 million	-
Impaired glucose tolerance (20-79 years)		
Global prevalence	6.7% (4.5-12.1%)	7.8% (5.2-13.9%)
Number of people with impaired glucose tolerance	318 million (212.2-571.6 million)	481 million (317.1-855.7 million)
Type 1 diabetes (0-14 years)		
Number of children with type 1 diabetes	542,000	-
Number of newly diagnosed cases each year	86,000	-

* See Glossary

In high-income countries, approximately 87% to 91% of all people with diabetes are estimated to have type 2 diabetes, 7% to 12% are estimated to have type 1 diabetes and 1% to 3% to have other types of diabetes[3-6]. The relative proportions of type 1 and type 2 diabetes have not been studied in great detail in low- and middle-income countries.

Type 1 diabetes is less common than type 2 diabetes, and is increasing by approximately 3% each year globally. In most high-income countries, the majority of diabetes in children and adolescents is type 1 diabetes.

Type 2 diabetes is a more common condition. In most countries, type 2 diabetes has increased alongside rapid cultural and social changes: ageing populations, increasing urbanisation, reduced physical activity, increased sugar consumption and low fruit and vegetable intake[7].

Prevalence and projections

In this edition of the *IDF Diabetes Atlas*, the prevalence of diabetes and impaired glucose tolerance are estimated for the years 2015 and 2040. Data are provided for 220 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 the Western Pacific (WP).

A summary of the methodology behind the estimates can be found in Chapter 2. Full details of the methods used to generate the prevalence estimates for diabetes in adults and the proportion undiagnosed, including how the data sources were evaluated and processed, can be found in the journal *Diabetes Research and Clinical Practice*[8] and on the *IDF Diabetes Atlas* website: www.diabetesatlas.org.

Some 415 million people worldwide, or 8.8% of adults aged 20-79, are estimated to have diabetes. About 75% live in low- and middle-income countries. If these trends continue, by 2040 some 642 million people, or one adult in ten, will have diabetes. The largest increases will take place in the regions where economies are moving from low-income to middle-income levels.

Table 3.2 IDF regions ranked by age-adjusted prevalence (%) of diabetes (20-79 years), 2015 and 2040

		2015		2040	
		Age-adjusted comparative diabetes prevalence	Raw diabetes prevalence	Age-adjusted comparative diabetes prevalence	Raw diabetes prevalence
1	North America and Caribbean	11.5% (9.5-13.0%)	12.9% (10.8-14.5%)	12.0% (9.5-13.7%)	14.7% (11.8-16.7%)
2	Middle East and North Africa	10.7% (7.4-14.2%)	9.1% (6.3-12.2%)	11.1% (7.7-14.9%)	11.4% (7.8-15.1%)
3	South and Central America	9.6% (8.2-11.5%)	9.4% (8.0-11.3%)	9.7% (8.2-11.7%)	11.9% (10.1-14.3%)
4	Western Pacific	8.8% (7.7-10.8%)	9.3% (8.2-11.4%)	9.0% (8.0-11.2%)	11.9% (10.6-14.3%)
5	South-East Asia	8.8% (7.3-10.8%)	8.5% (6.8-10.8%)	9.1% (7.3-11.6%)	10.7% (8.5-13.7%)
6	Europe	7.3% (5.5-10.9%)	9.1% (6.8-13.0%)	7.6% (5.7-11.2%)	10.7% (8.2-14.9%)
7	Africa	3.8% (2.6-7.9%)	3.2% (2.1-6.7%)	4.2% (2.9-8.4%)	3.7% (2.6-7.3%)

Uncertainty

Intervals were produced to quantify the degree of uncertainty around the diabetes prevalence estimates. These intervals attempt to account for the uncertainty in the study selection process and the impact of data sampling errors in the data sources selected for generating diabetes prevalence estimates. They were produced using an iterative analysis of the sensitivity of the estimates to the study selection process and a simulation study to assess raw data uncertainty (see Chapter 2). Based on these analyses, the uncertainty interval around the global estimate of adults with diabetes was estimated to range from 7.2 to 11.4%.

Age distribution

There are 320.5 million people of working age (20-64 years) with diabetes and 94.2 million people aged 65-79 with diabetes.

Gender distribution

There is little gender difference in the global number of people with diabetes for 2015 or 2040. There are about 15.6 million more men than women with diabetes (215.2 million men vs 199.5 million women). This difference is expected to decrease to about 15.1 million more men than women (328.4 million men vs 313.3 million women) by 2040.

Urban and rural environments

Currently there are more people with diabetes in urban (269.7 million) than in rural (145.1 million) areas. In low- and middle-income countries, the number of people with diabetes in urban areas is 186.2 million while 126.7 million live in rural areas. By 2040, globally the difference is expected to widen, with 477.9 million people living in urban areas and 163.9 million in rural areas.

Table 3.3 Top ten countries/territories for number of people with diabetes (20-79 years), 2015 and 2040

Rank	Country/territory	2015 Number of people with diabetes
1	China	109.6 million (99.6-133.4)
2	India	69.2 million (56.2-84.8)
3	United States of America	29.3 million (27.6-30.9)
4	Brazil	14.3 million (12.9-15.8)
5	Russian Federation	12.1 million (6.2-17.0)
6	Mexico	11.5 million (6.2-13.7)
7	Indonesia	10.0 million (8.7-10.9)
8	Egypt	7.8 million (3.8-9.0)
9	Japan	7.2 million (6.1-9.6)
10	Bangladesh	7.1 million (5.3-12.0)

Rank	Country/territory	2040 Number of people with diabetes
1	China	150.7 million (138.0-179.4)
2	India	123.5 million (99.1-150.3)
3	United States of America	35.1 million (33.0-37.2)
4	Brazil	23.3 million (21.0-25.9)
5	Mexico	20.6 million (11.4-24.7)
6	Indonesia	16.2 million (14.3-17.7)
7	Egypt	15.1 million (7.3-17.3)
8	Pakistan	14.4 million (10.6-20.4)
9	Bangladesh	13.6 million (10.7-24.6)
10	Russian Federation	12.4 million (6.4-17.1)

Table 3.4 Age distribution of people with diabetes in 2015

Age range	2015 Number of people with diabetes	2040 Number of people with diabetes
20-64	320.5 million	441.3 million
65-79	94.2 million	200.5 million

Complications

Complications due to diabetes (see Chapter 1) are a major cause of disability, reduced quality of life and premature death. Diabetes complications can affect various parts of the body, manifesting in different ways in different people.

There are no internationally agreed standards for diagnosing and assessing diabetes complications. Due to the variety of methods of these studies, it is difficult to make comparisons between different populations. However, it is clear that diabetes complications are very common, with at least one present in a large proportion of people with diabetes (50% or more in some studies) at the time of diagnosis[9].

In this edition of the *IDF Diabetes Atlas*, estimates of complications were not included due to the lack of comparability of available data. International standards for measuring complications are essential to provide accurate estimates of this major cause of disability.

Figure 3.1 IDF regions by age-adjusted comparative prevalence (%) of diabetes (20-79 years), 2015 and 2040

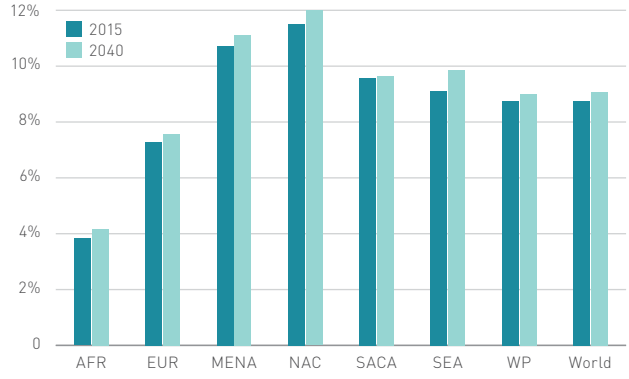
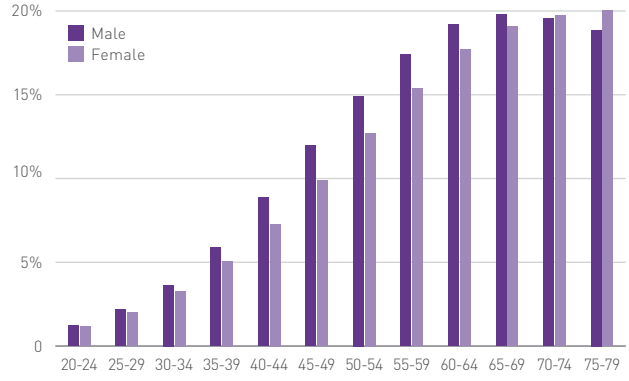
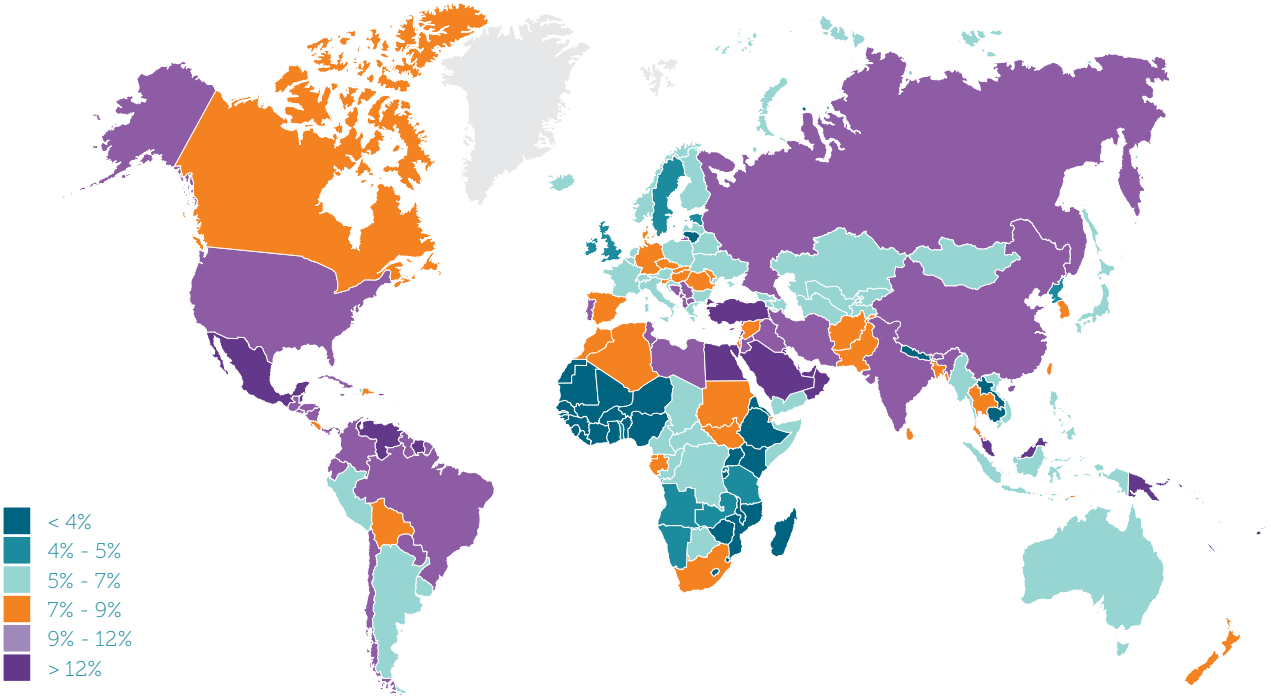


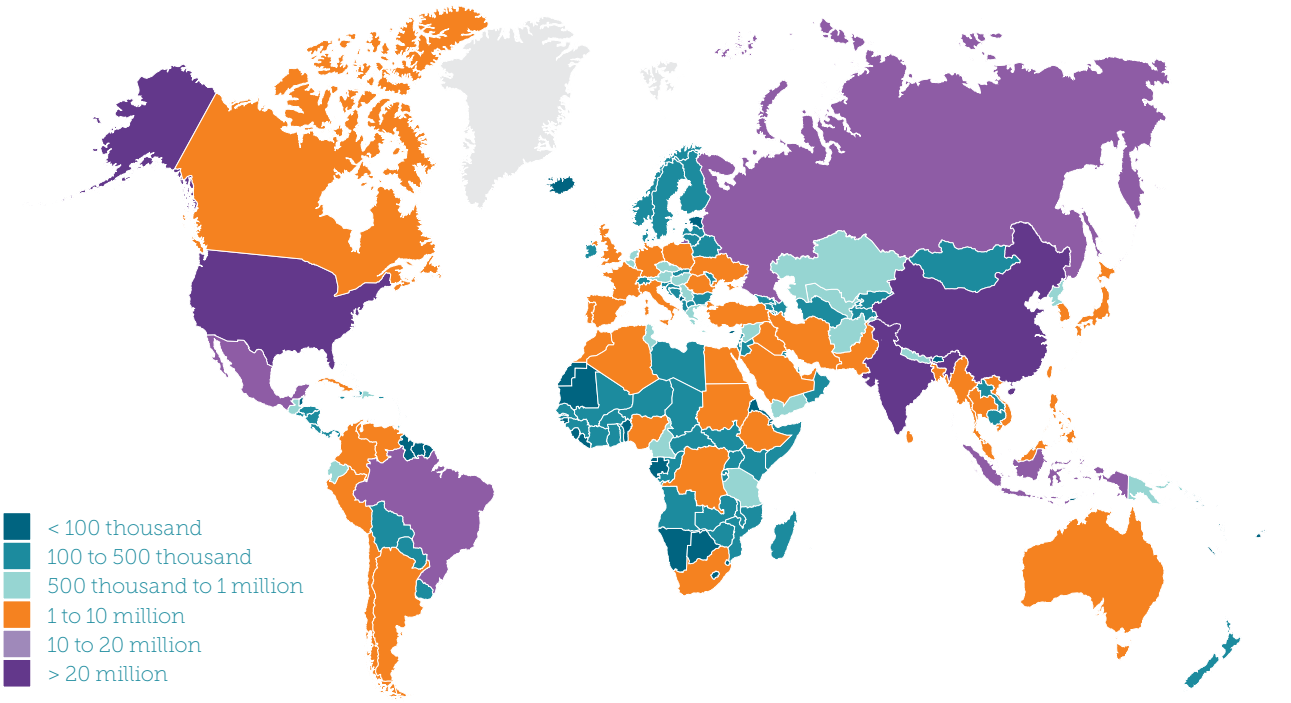
Figure 3.2 Prevalence of people with diabetes by age and sex, 2015



Map 3.1 Estimated age-adjusted prevalence of diabetes in adults (20-79), 2015



Map 3.2 Estimated total number of adults (20-79 years) living with diabetes, 2015



Diabetes in indigenous peoples

Indigenous communities comprise over 370 million people in 70 countries[10]. They are the owners of unique languages, knowledge systems and beliefs. They have a special relationship with their traditional land, which often has a fundamental importance for their culture. Many indigenous people strive for recognition of their identities and ways of life, as well as their right to their traditional lands.

Diabetes prevalence rates vary greatly between indigenous communities. In many cases, the prevalence is greater than the surrounding population, such as New Zealand Maori[11], Greenland Inuit[12], Indigenous Australians[13], and North American Sioux[14]. Some populations who still live a very traditional lifestyle have a relatively low prevalence, such as the Chilean Aymara[15] and the Orang Asli of Malaysia[16].

Gestational diabetes rates are also higher in some indigenous populations. For example, in Australia and Canada, indigenous women have at least two-fold higher rates of gestational diabetes compared to non-indigenous women[17-18].

An inevitable consequence of the higher prevalence of diabetes is a substantial rise in diabetes-related disability and death. In Australia, deaths caused by endocrine, metabolic and nutritional diseases (of which 90% are attributed to diabetes) were eight-fold higher in indigenous people compared to non-indigenous groups[19]. Among New Zealand Maori, renal complications and deaths from renal causes were significantly higher compared to people of European descent[20]. Canadian Metis and Inuit have higher rates of diabetes-related retinopathy, kidney disease, lower limb amputations and nervous system disorders. These complications also occur at an earlier stage of diabetes and tend to be more severe[21].

Undiagnosed diabetes

It has been estimated by IDF that globally as many as 193 million people, or close to half (46.5%) of all people with diabetes, are unaware

of their disease. Most of these cases are type 2 diabetes. The earlier a person is diagnosed and management initiated, the better the chances of preventing harmful and costly complications. There is an urgent need to screen, diagnose and provide appropriate care to people with diabetes.

Regional disparities

No country has diagnosed every person that has diabetes. In sub-Saharan Africa, where resources are often lacking and governments may not prioritise screening for diabetes, the average proportion of people with diabetes who are undiagnosed is 66.7%. Even in high-income countries, about 35.8% of people with diabetes have not been diagnosed. Globally, 81.1% of all people who are undiagnosed live in low- and middle-income countries.

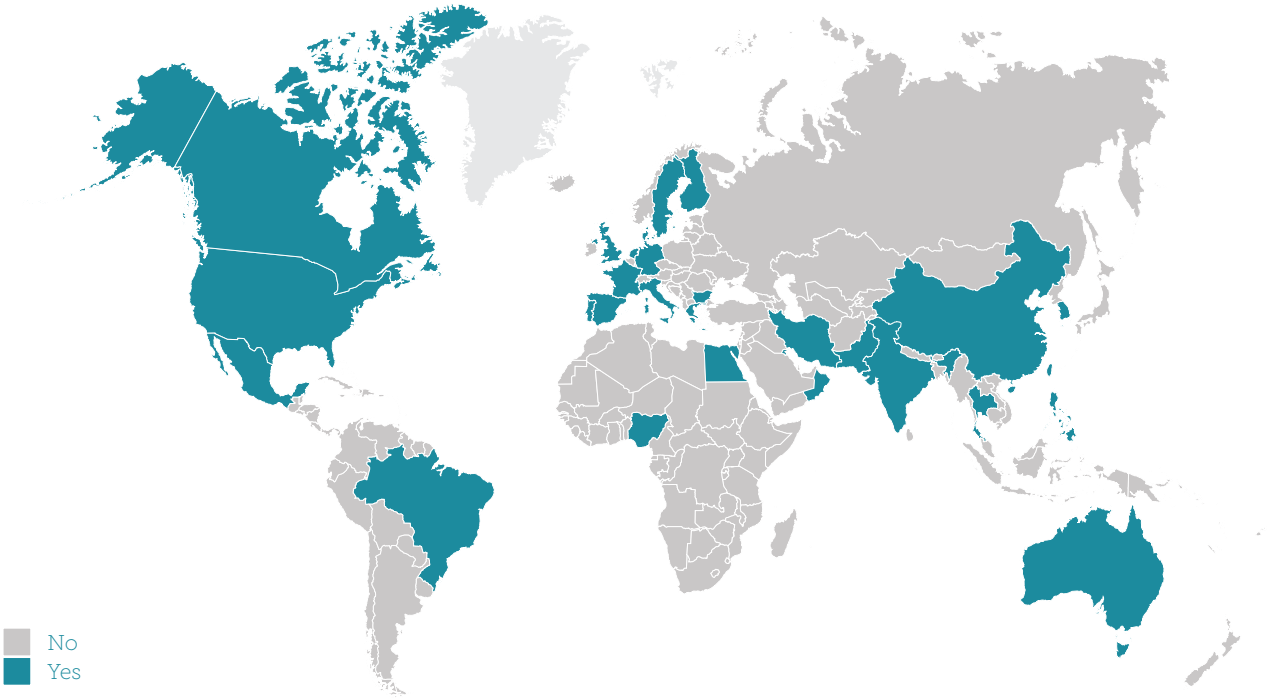
A person with type 2 diabetes can live for several years without showing any symptoms, during which time high blood glucose is silently damaging the body. The complications associated with diabetes are so varied that even when symptoms do exist, diabetes may not be thought to be the cause unless accurate and appropriate testing is carried out. Those who are undiagnosed will not be taking steps to manage their blood glucose levels or lifestyle. Many people with undiagnosed diabetes already have complications such as chronic kidney disease and heart failure, retinopathy and neuropathy[9,22,23].

Identifying people at risk of diabetes

Screening of people with risk factors for type 2 diabetes can be feasible and cost-effective in some situations[24]. With limited resources in many countries, diabetes risk scores can be a simple and cost-effective method of identifying people with undiagnosed type 2 diabetes or at risk of developing diabetes in the future.

Most currently available diabetes risk scores only work well in populations in which the risk scores were developed. Currently, risk scores have only been tested in 32 countries worldwide. Many low- and middle-income countries do not have the data required to develop diabetes risk prediction scores for their populations.

Map 3.3 Countries that have tested a risk score for type 2 diabetes



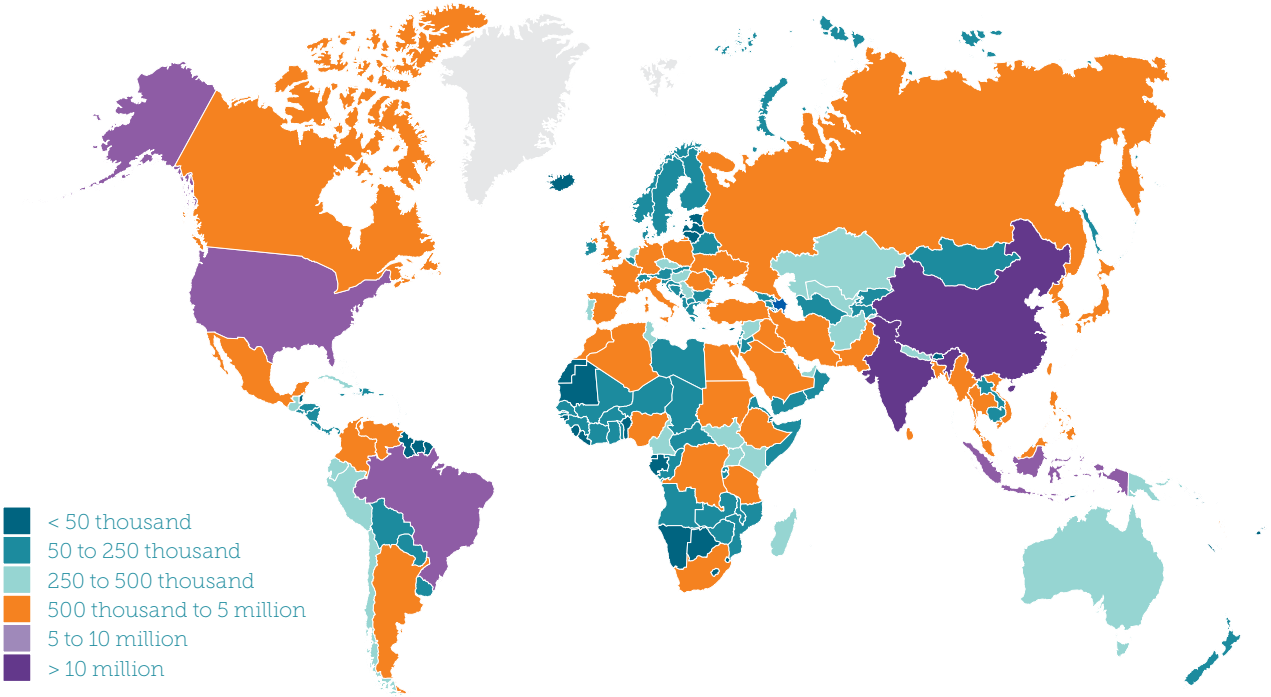
Estimating undiagnosed diabetes

Population-based studies provide the basis for estimating undiagnosed diabetes. A sample of people living in a particular area are all given a blood test for diabetes, which identifies both known and previously undiagnosed cases. The *IDF Diabetes Atlas* estimates the proportion of undiagnosed diabetes in each country by using studies that report the percentage of people with previously undiagnosed diabetes and applies this to similar countries.

Table 3.4 Proportion and number of people (20-79 years) living with diabetes who are undiagnosed, 2015

IDF region	Proportion undiagnosed	Number of undiagnosed people with diabetes
Africa	66.7%	9.5 million
Europe	39.3%	23.5 million
Middle East and North Africa	40.6%	14.4 million
North America and Caribbean	29.9%	13.3 million
South and Central America	39.0%	11.5 million
South-East Asia	52.1%	40.8 million
Western Pacific	52.1%	79.8 million
World	**46.5%**	**192.8 million**

Map 3.4 Number of people (20-79 years) living with diabetes who are undiagnosed, 2015



Mortality

Diabetes and its complications are major causes of early death in most countries. Cardiovascular disease (see Chapter 1) is one of the leading causes of death among people with diabetes and can account for 50% or more of deaths due to diabetes in some populations. Estimating the number of deaths due to diabetes is challenging because on the one hand more than a third of countries do not have any data on diabetes-related mortality; on the other hand existing routine health statistics underestimate the number of deaths due to diabetes[25]. To provide a more realistic estimate of mortality, the *IDF Diabetes Atlas* uses a modelling approach to estimate the number of deaths that can be attributed to diabetes, rather than relying on the cause of death written on death certificates (see Chapter 2).

Burden of mortality

Approximately 5.0 million people aged between 20 and 79 years died from diabetes in 2015, equivalent to one death every six seconds.

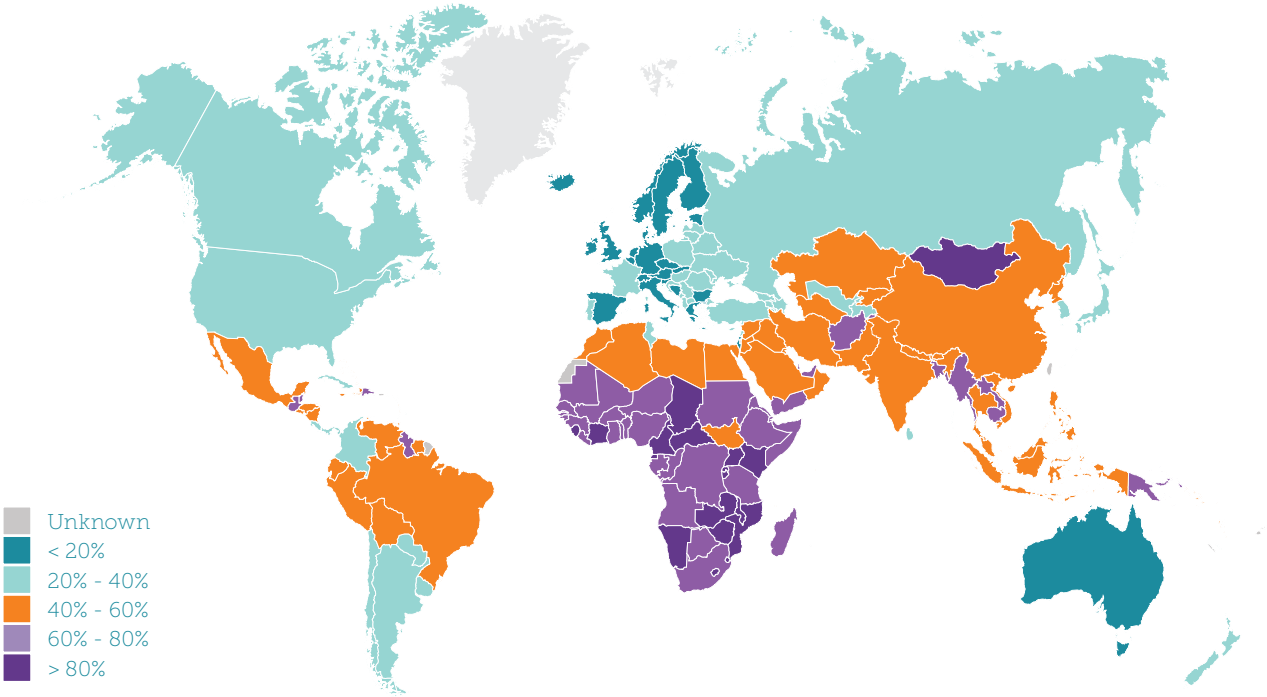
Diabetes accounted for 14.5% of global all-cause mortality among people in this age group. This is higher than the combined number of deaths from the infectious diseases (1.5 million deaths from HIV/AIDS, 1.5 million from tuberculosis and 0.6 million from malaria in 2013)[26]. Close to half (46.6%) of deaths due to diabetes are in people under the age of 60. The highest number of deaths due to diabetes occurred in countries with the largest numbers of people with diabetes: China, India, USA and the Russian Federation.

Gender distribution

There is very little difference between men and women in the total global number of deaths due to diabetes. However, there are important differences in the distribution of these deaths. In the North America and Caribbean and Western Pacific Regions, diabetes is responsible for a higher proportion of deaths in men than in women.

In the Africa, Europe, Middle East and North Africa, South-East Asia, and South and Central America Regions, diabetes accounts for a higher

Map 3.5 Proportion (%) of people who died from diabetes before the age of 60



proportion of deaths in women than in men, representing up to a quarter of all deaths in middle-aged women. This disparity is likely to be due to higher rates of mortality in men from other causes.

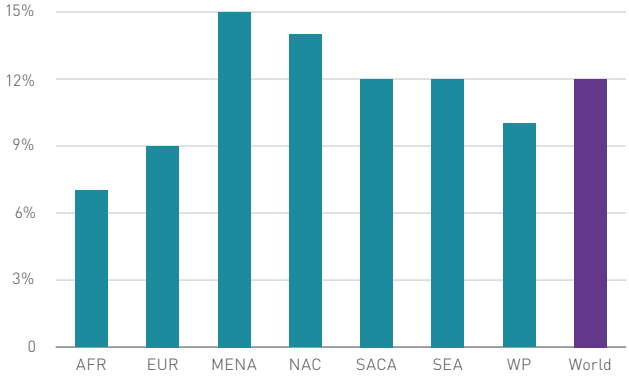
Accuracy of mortality data

The mortality estimates should be interpreted with caution. They are probably more realistic however, than estimates based on routine sources of health statistics, which consistently underestimate the burden of mortality from diabetes largely because diabetes is often omitted from death certificates as the cause of death. A substantial proportion of these deaths are potentially avoidable through public health action directed at population-based prevention of diabetes and its complications, and improvements in care for all people with diabetes[27].

Health expenditure

The costs associated with diabetes include increased use of health services, loss of productivity and disability. As a result, diabetes imposes a large economic burden on individuals and families, national health systems and countries; it therefore represents a significant obstacle to sustainable economic development.

Figure 3.3 Proportion of total health expenditure estimated to be spent on diabetes (20-79 years), R=2*, 2015



* The R=2 estimates assume that health care expenditures for people with diabetes are on average two-fold higher than people without diabetes.

Health care expenditures for people with diabetes have been found to be two- to three-fold higher than people without diabetes[28-33]. Two separate estimates of healthcare costs were produced for the *IDF Diabetes Atlas*. The 'R=2' estimates assume that health care expenditures for people with diabetes are on average two-fold higher than people without diabetes, and the 'R=3' estimates assume expenditures on average three-fold higher. Global estimates are presented in both United States Dollars (USD) and International Dollars (ID) (see Chapter 2).

The more conservative estimate (R=2) suggests that health spending on diabetes accounted for 11.6% of total health expenditure worldwide in 2015. Over 80% of the countries covered in this report dedicated between 5% and 20% of their total health expenditure to diabetes. Health expenditure includes the provision of health services (preventive and curative), family planning activities, nutrition activities and emergency aid designated for health. It includes both public and private health expenditures[34].

Global health expenditure

Global health spending to treat diabetes and prevent complications was estimated to range from USD673 billion (R=2) to USD1,197 billion (R=3) in 2015. By 2040, this number is projected to exceed USD802 billion to USD1,452 billion in today's dollars. Expressed in International Dollars (ID), which correct differences in purchasing power, global health spending on diabetes was estimated to be between ID795 billion and ID1,404 billion in 2015 and between ID997 billion and ID1,788 billion in 2040.

An estimated average of USD1,622 to USD2,886 (ID1,917 to ID3,385) per person with diabetes was spent globally on treating and managing the disease in 2015. Although there is likely to be a 1.5-fold increase in the number of people with diabetes by 2040, the predicted increase in diabetes cost is only 1.2-fold. This is because countries with high levels of predicted population growth (such as Madagascar, Guinea, and Niger) are often the countries with the lowest per capita spending on diabetes.

The more conservative estimate (R=2) shows that 75% of the global health expenditure on diabetes in 2015 was for people between the ages of 50 and 79 years, reflecting the greater prevalence of diabetes and of diabetes complications in this age group.

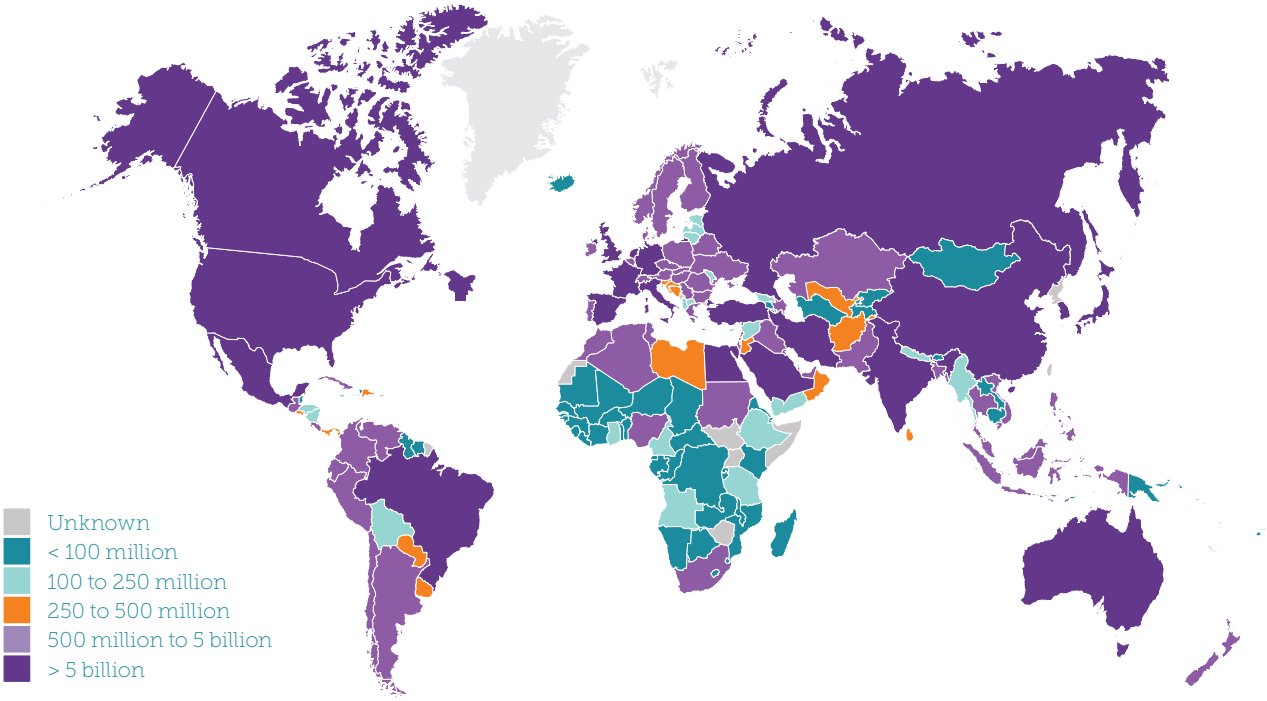
Table 3.5 Top ten countries/territories for diabetes-related health expenditure, 2015 and 2040

Rank	Country/ territory	2015 Diabetes-related health expenditure, R=2*	
		USD	ID
1	United States of America	320 billion	320 billion
2	China	51 billion	90 billion
3	Germany	35 billion	33 billion
4	Japan	29 billion	28 billion
5	Brazil	22 billion	29 billion
6	France	19 billion	17 billion
7	Canada	17 billion	14 billion
8	Russian Federation	14 billion	23 billion
9	United Kingdom	13 billion	12 billion
10	Italy	12 billion	12 billion

Rank	Country/ territory	2040 Diabetes-related health expenditure, R=2*	
		USD	ID
1	United States of America	349 billion	349 billion
2	China	72 billion	127 billion
3	Germany	36 billion	35 billion
4	Brazil	36 billion	48 billion
5	Japan	27 billion	25 billion
6	France	22 billion	19 billion
7	Canada	22 billion	18 billion
8	Mexico	19 billion	30 billion
9	Russian Federation	14 billion	23 billion
10	United Kingdom	14 billion	13 billion

USD = US Dollars
ID = International Dollars

Map 3.6 Total annual diabetes-related healthcare expenditures (20-79 years) (International Dollars), R=2*, 2015



* Healthcare expenditures for people with diabetes are assumed to be on average two-fold higher than people without diabetes.

Disparities in healthcare spending

There was a large disparity in health spending on diabetes between regions and countries. Only 19% of global health expenditure on diabetes was spent in low- and middle-income countries, where 75.4% of people with diabetes live. On average, the estimated health spending due to diabetes was estimated at USD5,374 to USD9,641 (ID5,458 to ID9,755) per person with diabetes in high-income countries, compared to USD401 to USD688 (ID765 to ID1,312) in low- and middle-income countries.

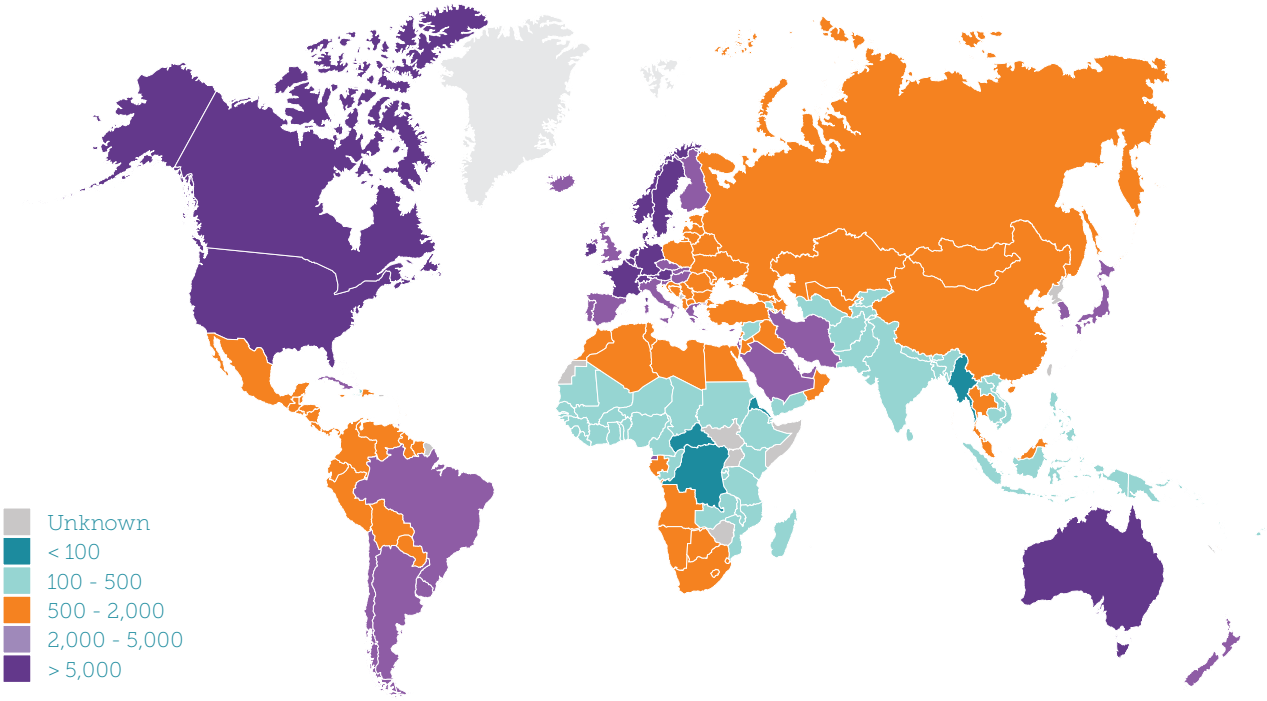
When total spending for all people with diabetes was examined, the Africa Region had the lowest total health expenditure among all regions (ID7 billion). The North America and Caribbean Region had the largest total spending on diabetes (ID352 billion) and spent twice as much on diabetes compared to the Europe Region (ID169 billion), which ranked second.

The combined spending of the three countries with the highest diabetes-related expenditure (USA, China and Germany) contributed 60% of the total global health expenditure on diabetes, though these three countries are home to only 35.1% of people with diabetes. Meanwhile, India, the country with the second-highest number of people living with diabetes, spent less than 3% of the global total (ID23 billion) expenditure on diabetes. Switzerland spent an average of ID7,244 on diabetes healthcare, per person with diabetes, while countries such as the Central African Republic, Myanmar and Eritrea spent less than ID70.

Economic burden

Compared with those living in high-income countries, people living in low- and middle-income countries pay a larger out-of-pocket share of health expenditure because they lack access to health insurance and publicly-available medical services. In Latin America, for instance, families pay between 40% and 60% of medical expenses from their own pockets[35]. In some of the poorest countries, people with diabetes and their families bear almost the total cost of medical care.

Map 3.7 Mean diabetes-related healthcare expenditures per person with diabetes (20-79 years) (International Dollars), R=2*, 2015



*Healthcare expenditures for people with diabetes are assumed to be on average two-fold higher than people without diabetes.

Lifestyle interventions can prevent or delay some cases of type 2 diabetes and thus reduce the huge economic burden of diabetes. Many of these interventions are cost-effective and/or cost-saving, even in developing countries[36-37]. Nonetheless, these interventions are not yet widely used.

Impaired glucose tolerance

Impaired glucose tolerance (also known as IGT) and impaired fasting glucose (also known as IFG) occur when blood glucose levels are higher than normal, but not high enough to be classified as diabetes (see Chapter 1). People with impaired glucose tolerance are at high risk of developing type 2 diabetes, although not all people with impaired glucose tolerance develop the disease.

Data on impaired glucose tolerance are included in this report because impaired glucose tolerance greatly increases the risk of developing type 2 diabetes[38] and is linked with the development of cardiovascular disease[39-40]. In addition, some of the best evidence on the prevention of type 2 diabetes comes from studies involving people with impaired glucose tolerance.

Figure 3.4 Number of people with impaired glucose tolerance by age group, 2015 and 2040

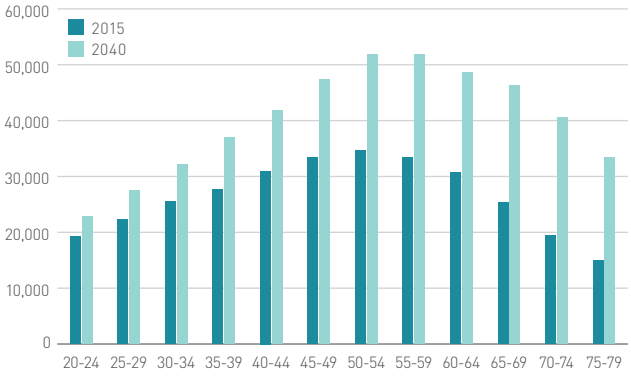
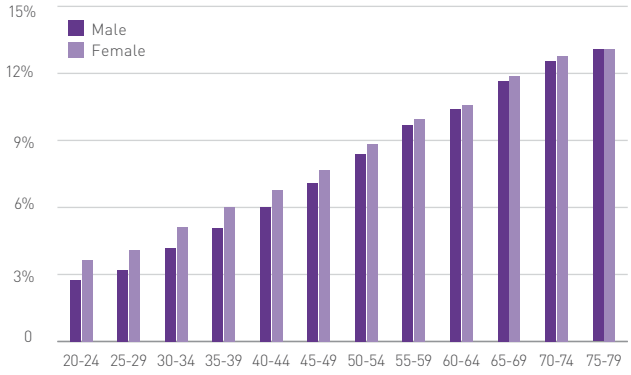
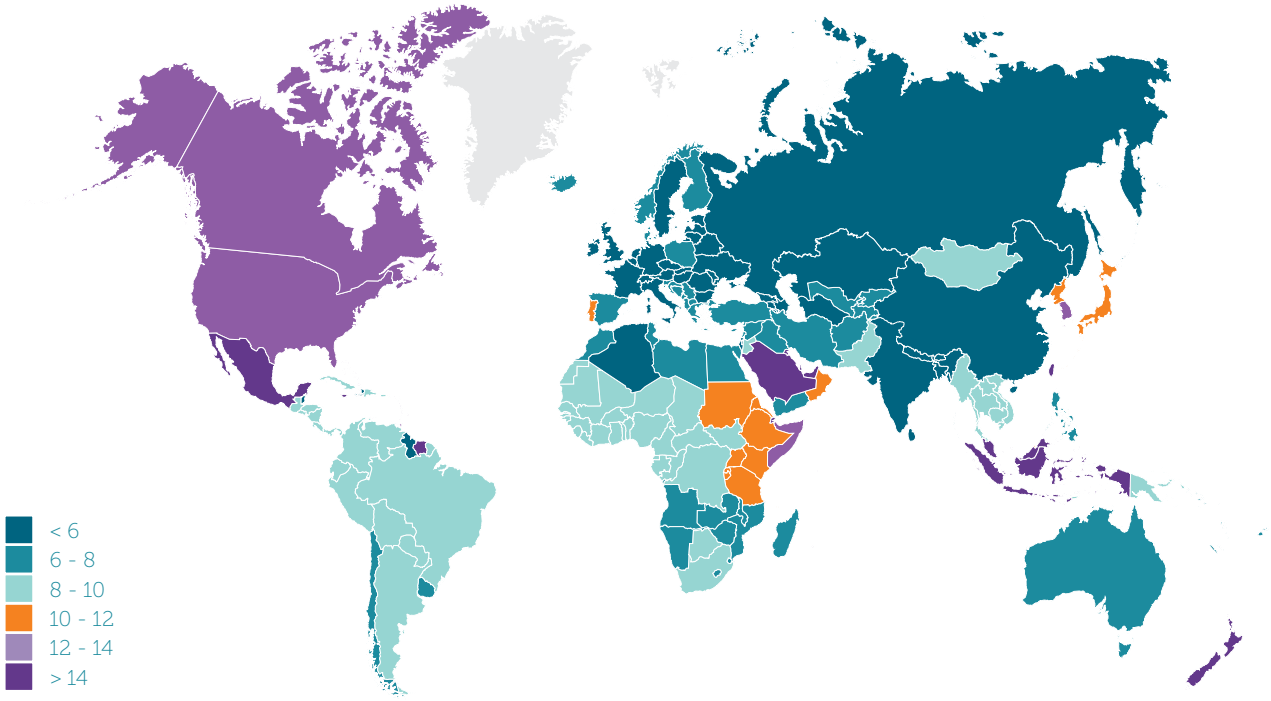


Figure 3.5 Prevalence (%) of impaired glucose tolerance (20-79 years) by age and sex, 2015



Map 3.8 Age-adjusted prevalence (%) impaired glucose tolerance (20-79 years), 2015



Prevalence

Some 318 million people worldwide, 6.7% of adults, are estimated to have impaired glucose tolerance. The vast majority (69.2%) of these people live in low- and middle-income countries. By 2040, the number of people with impaired glucose tolerance is projected to increase to 482 million, or 7.8% of the adult population.

Age distribution

Half (50.1%) of adults with impaired glucose tolerance are under the age of 50 (159 million) and, if left untreated, are at a high risk of progressing to type 2 diabetes later in life. This age group will continue to have the highest number of people with impaired glucose tolerance in 2040, rising to 209 million. It is important to note that nearly one-third (29.8%) of all those who currently have impaired glucose tolerance are in the 20 to 39 age group and are therefore likely to spend many years at high risk.

Regional distribution

The North America and Caribbean Region has the highest prevalence of impaired glucose tolerance (15.0% raw, 13.9% age-adjusted), while the Europe Region has the lowest prevalence (4.8% raw; 4.1% age-adjusted).

Hyperglycaemia in pregnancy

High blood glucose (hyperglycaemia) in pregnancy can be classified into three main types:

- Gestational diabetes
- Diabetes first detected in pregnancy
- Diabetes detected prior to pregnancy

When hyperglycaemia is first detected in pregnancy, women with slightly elevated blood glucose levels are classified as having gestational diabetes, and women with substantially elevated blood glucose levels are classified as having diabetes first detected in pregnancy (see Chapter 1). Women with unmanaged gestational diabetes are at greater risk of adverse pregnancy outcomes, and both mother and child are at increased risk of later development of type 2 diabetes[41]. In most cases of gestational diabetes, blood glucose levels can be controlled through a healthy diet, gentle exercise and blood glucose monitoring. In some cases, insulin or oral medication may also be prescribed (see Chapter 1).

Table 3.6 Top ten countries/territories for the number of people with impaired glucose tolerance (20-79 years), 2015 and 2040

Rank	Country/territory	2015 Number of people with impaired glucose tolerance
1	India	36.5 million
2	United States of America	35.8 million
3	Indonesia	29.0 million
4	China	26.7 million
5	Japan	11.9 million
6	Brazil	11.0 million
7	Mexico	10.7 million
8	Pakistan	7.9 million
9	Nigeria	6.3 million
10	Republic of Korea	5.2 million

Rank	Country/territory	2040 Number of people with impaired glucose tolerance
1	India	63.6 million
2	United States of America	42.8 million
3	Indonesia	36.8 million
4	China	34.6 million
5	Mexico	18.0 million
6	Brazil	16.7 million
7	Pakistan	15.1 million
8	Nigeria	12.9 million
9	Japan	10.7 million
10	Ethiopia	10.6 million

Prevalence

It is estimated by IDF that 20.9 million or 16.2% of live births to women in 2015 had some form of hyperglycaemia in pregnancy. An estimated 85.1% of those cases were due to gestational diabetes, 7.4% due to other types of diabetes first detected in pregnancy and 7.5% due to diabetes detected prior to pregnancy.

There are some regional differences in the prevalence of hyperglycaemia in pregnancy, with the South-East Asia Region having the highest prevalence at 24.2% compared to 10.5% in the Africa Region. The vast majority (87.6%) of cases of hyperglycaemia in pregnancy were in low- and middle-income countries, where access to maternal care is often limited.

Table 3.7 Global estimates of hyperglycaemia in pregnancy, 2015

Total live births to women aged 20-49 years	129.4 million
Hyperglycaemia in pregnancy	
Global prevalence	16.2% of live births
Number of live births affected	20.9 million
Proportion of cases due to gestational diabetes	85.1%
Proportion of cases due to other types of diabetes first detected in pregnancy	7.4%
Proportion of cases due to diabetes detected prior to pregnancy	7.5%

The prevalence of hyperglycaemia in pregnancy, as a proportion of all pregnancies, increases rapidly with age and is highest in women over the age of 45 (45.9%), although there are fewer pregnancies in that age group. Due to higher fertility rates in younger women, half of all cases of hyperglycaemia in pregnancy (10.4 million) occurred in women under the age of 30.

Diabetes in children

Type 1 diabetes is one of the most common endocrine and metabolic conditions in childhood. The number of children developing this form of diabetes is increasing every year.

The challenges

Insulin treatment is life-saving and lifelong. A person with type 1 diabetes needs to follow a structured self-management plan that includes insulin use, blood glucose monitoring, physical activity and a healthy diet. In many countries, access is limited to these medicines, supplies and self-management education. This can lead to severe health complications and early death in children with diabetes.

Many children and adolescents may find it difficult to cope emotionally with their disease. Diabetes can result in discrimination and may limit social relationships. It may also have an impact on a child's academic performance. The costs of treatment and monitoring equipment, combined with the daily needs of a child with diabetes, may place a significant financial and emotional burden on the whole family.

Table 3.8 Hyperglycaemia in pregnancy in women aged 20-49 years by IDF region, 2015

IDF region	Raw Prevalence	Age-adjusted prevalence	Number of live births affected
Africa	10.5%	9.5%	3.3 million
Europe	15.8%	13.7%	1.7 million
Middle East and North Africa	21.8%	17.7%	3.7 million
North America and Caribbean	14.9%	11.9%	1.0 million
South and Central America	13.2%	11.5%	0.9 million
South-East Asia	24.2%	26.3%	6.7 million
Western Pacific	12.4%	12.1%	3.7 million

Type 1 diabetes in children

Three international collaborative projects (*Diabetes Mondiale (DIAMOND)*[42], *Europe and Diabetes (EURODIAB)*[43], and *SEARCH for Diabetes in Youth*[44]) have been instrumental in monitoring trends in the number of children developing type 1 diabetes each year. These projects have used population-based regional or national registries with standardised definitions, data collection forms and methods for validation.

The incidence of type 1 diabetes among children is increasing in many countries, particularly in children under the age of 15 years. There are strong indications of geographic differences in trends but the overall annual increase is estimated to be around 3%[42-43]. The incidence is increasing more steeply in some Central and Eastern European countries, where the disease is less common. Also, several European studies have suggested that, in relative terms, increases are greatest among younger children.

Table 3.9 Global estimates of type 1 diabetes in children (<15 years) for 2015

Child population (< 15 years)	1.9 billion
Type 1 diabetes in children (< 15 years)	
Number of children with type 1 diabetes	542,000
Number of new type 1 diabetes cases per year	86,000
Annual increase in incidence	3%*

* Estimate from the *Diabetes Mondiale study (DIAMOND)*[24], the *Europe and Diabetes study (EURODIAB)*[25].

Figure 3.6 Estimated number of children (< 15 years) with type 1 diabetes by IDF region, 2015

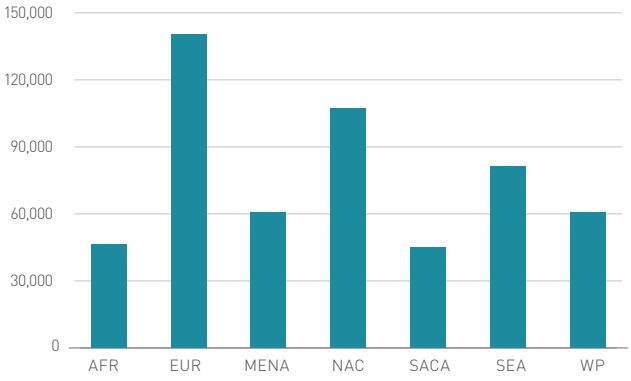


Table 3.10 Top ten countries/territories for number of children with type 1 diabetes (< 15 years), 2015

Rank	Country/territory	Number of children with type 1 diabetes
1	United States of America	84,100
2	India	70,200
3	Brazil	30,900
4	China	30,500
5	United Kingdom	19,800
6	Russian Federation	18,500
7	Saudi Arabia	16,200
8	Germany	15,800
9	Nigeria	14,400
10	Mexico	13,500

Table 3.11 Top ten countries/territories for number of new cases of type 1 diabetes (< 15 years) per 100,000 children per year, 2015

Rank	Country/territory	New cases per 100,000 population per year
1	Finland	62.3
2	Sweden	43.2
3	Kuwait	37.1
4	Norway	32.5
5	Saudi Arabia	31.4
6	United Kingdom	28.2
7	Ireland	26.8
8	Canada	25.9
9	Denmark	25.1
10	United States of America	23.7

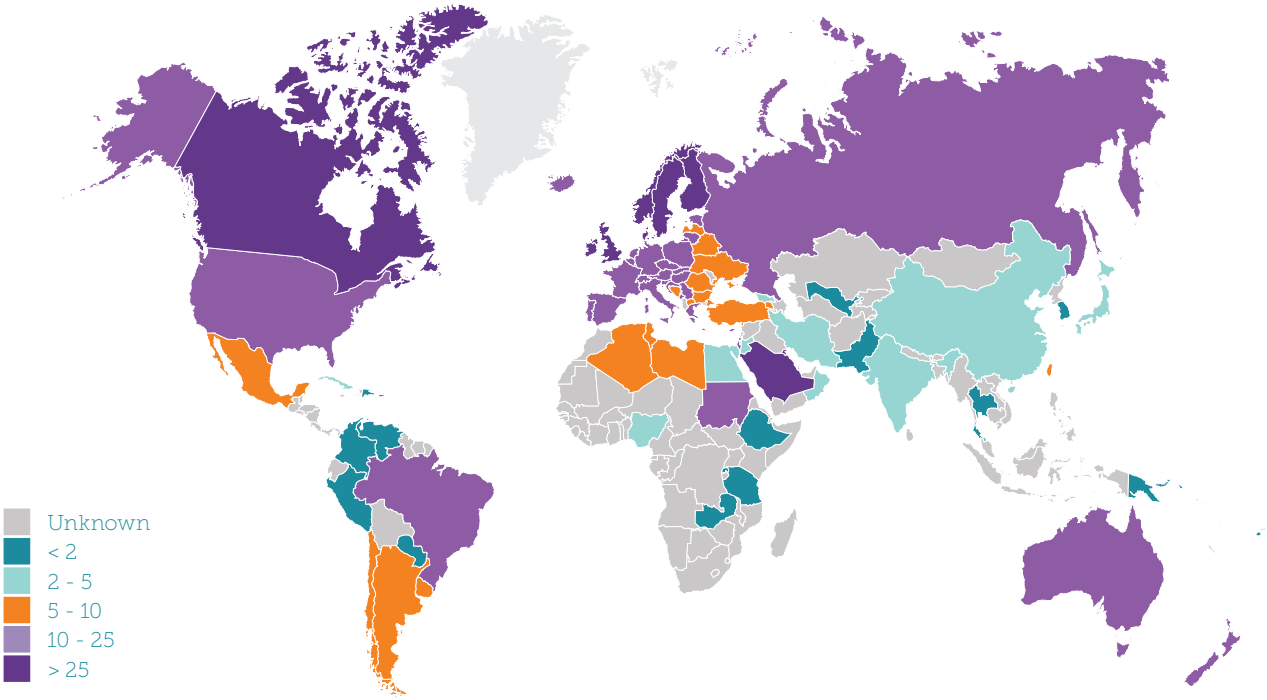
There is also evidence that similar trends exist in many other parts of the world, but in sub-Saharan Africa incidence data are sparse or non-existent. Special efforts must be made to collect more data, especially in those countries where diagnoses may be missed.

Some 86,000 children under 15 years are estimated to develop type 1 diabetes annually worldwide, with the highest incidence rates in Finland, Sweden and Kuwait. For the first time, the estimated number of children living with type 1 diabetes (542,000) exceeds half a million. One quarter live in the Europe Region, and one fifth live in the North America and Caribbean Region. In some countries, where there is limited access to insulin, life expectancy for a child with type 1 diabetes is very short. These estimates of the prevalence of type 1 diabetes do not take this into account and may be higher than the true prevalence rates in some low-resource countries.

Type 2 diabetes in children

There is evidence that type 2 diabetes in children and adolescents is increasing in some countries. However, reliable data are sparse[45]. As with type 1 diabetes, many children with type 2 diabetes risk developing complications in early adulthood, which would place a significant burden on the family and society. With increasing levels of obesity and physical inactivity among children in many countries, type 2 diabetes in childhood has the potential to become a global public health issue leading to serious health outcomes. More information about this aspect of the diabetes epidemic is needed urgently.

Map 3.9 Estimated new cases of type 1 diabetes (< 15 years) per 100,000 children per year, 2015



4 Diabetes by region

In 2015, IDF estimates that:

More than **two thirds** of people with diabetes in Africa are **undiagnosed**

One adult in eight in the North America and Caribbean Region has diabetes

Europe has the highest prevalence of **children** living with **type 1 diabetes**

In South East Asia, **one quarter** of all **births** are affected by **high blood glucose** in pregnancy

37% of all adults with diabetes live in the Western Pacific

In the Middle East and North Africa, **four out of ten** adults with diabetes are undiagnosed

By 2040, IDF estimates that:

In South and Central America, the number of people with diabetes will increase by **65%**

4.1 Africa

The IDF Africa Region includes 49 diverse sub-Saharan countries and territories. It ranges from Western Sahara to South Africa and from the island of Reunion to the archipelago of Cape Verde. South Sudan is now also included in the IDF Africa Region.

The only high-income countries in the region are Equatorial Guinea and Seychelles, which both have a gross national income of over ID22,000 per capita. The Central African Republic has the world's lowest gross national income at ID610 per capita[1]. Nevertheless, some of the world's highest rates of economic growth have recently occurred in African countries such as Ethiopia, Liberia and the Democratic Republic of Congo[2].

Prevalence

An estimated 14.2 (9.5-29.4‡) million adults aged 20-79 have diabetes in the Africa Region, representing a regional prevalence of 2.1-6.7%‡. The Africa Region has the highest proportion of undiagnosed diabetes; over two thirds (66.7%) of people with diabetes are unaware they have the disease. The majority (58.8%) of people with diabetes live in cities, even though the population in the region is predominantly (61.3%) rural.

Diabetes in adults is in general much higher on islands in the Africa Region, compared to the mainland. The highest prevalence is found in the Seychelles (17.4% age-adjusted comparative prevalence, 17.4% raw prevalence), followed by the island of Reunion (15.8% age-adjusted, 18.2% raw) and Comoros (9.9% age-adjusted, 7.5% raw).

Some of Africa's most populous countries have the highest numbers of people with diabetes, including South Africa (2.3 [1.2-4.6‡] million), Democratic Republic of Congo (1.8 [1.5-2.2‡] million), Nigeria (1.6 [1.2-3.8‡] million) and Ethiopia (1.3 [0.8-3.5‡] million). Nearly half of all adults with diabetes in the region live in these four countries.

At a glance	2015	2040
Adult population (20-79 years)	441 million	926 million
Diabetes (20-79 years)		
Regional prevalence	3.2% (2.1-6.7%‡)	3.7% (2.6-7.3%‡)
Age-adjusted comparative prevalence	3.8% (2.1-6.7%‡)	4.2% (2.6-7.3%‡)
Number of people with diabetes	14.2 million (9.5-29.4 million‡)	34.2 million (23.7-67.7 million‡)
Number of deaths due to diabetes	321,100	-
Health expenditure due to diabetes (20-79 years)		
Total health expenditure, R=2*, USD	3.4 billion	5.5 billion
Impaired glucose tolerance (20-79 years)		
Regional prevalence	7.9% (4.8-21.9%‡)	8.6% (5.2-24.1%‡)
Age-adjusted comparative prevalence	9.1% (5.4-23.3%‡)	9.4% (5.7-25.2%‡)
Number of people with impaired glucose tolerance	34.9 million (21.0-96.8 million‡)	79.0 million (48.3-222.3 million‡)
Type 1 diabetes (0-14 years)		
Number of children with type 1 diabetes	46,400	-
Number of newly diagnosed children each year	7,600	-

* See Glossary
‡ Uncertainty interval

As urbanisation increases and populations age, type 2 diabetes will pose an ever-growing threat. It is expected that by 2040 there will be 34.2 million adults in the region living with diabetes, more than double the number in 2015.

Similarly, the number of people with impaired glucose tolerance is expected to more than double between 2015 and 2040. The greater number of people at risk of diabetes in 2040 will likely contribute to a higher burden of future diabetes.

An estimated 46,400 children under the age of 15 are estimated to be living with type 1 diabetes. This estimate however, assumes the effects of mortality are minimal, which may not be accurate in this region. Many children lack access to insulin, glucose test-strips and appropriately-trained health professionals, which leads to poor glycaemic control and subsequent higher mortality in children with type 1 diabetes.

Mortality

In 2015 more than 321,100 deaths in the Africa Region could be attributed to diabetes. Furthermore, 79.0% of those deaths occurred in people under the age of 60, the highest proportion of any region. This highlights that investment, research and health systems are slow to respond to this burden in the Africa Region and remain focused primarily on infectious diseases.

Diabetes-attributable mortality is 1.7 times higher in women compared to men. This may be because men are more likely to succumb to death from other causes, such as armed conflict.

Health expenditure

The Africa Region accounts for 0.5% of the global health expenditure on diabetes. According to IDF estimates for the Africa Region, only USD3.4 billion (R=2*) to USD5.9 billion (R=3*) (ID6.6 billion to ID11.4 billion) was spent on diabetes healthcare in 2015, the lowest of any region. This is equivalent to 7% of the region's total health budget and USD243 to USD419 (ID466 to ID805) per person with diabetes per year.

Data sources

The number of data sources examining the prevalence of diabetes in adults in the region was very low. For this edition of the *IDF Diabetes Atlas*, a total of 13 sources from 12 countries were selected. More than three quarters of countries lack nationwide data. Togo and Tanzania had studies conducted within the past five years. Comoros, Kenya, Réunion, the Seychelles and South Africa had data sources based on oral glucose tolerance tests. Diabetes prevalence figures for other countries in the region were based on studies that used self-reports, fasting blood glucose, or were older than five years and may be underestimates.

The raw regional prevalence estimate changed from 4.8% in 2013 to 2.1-6.7%‡ in 2015. This does not reflect a true reduction in cases but is due to changes in the methodology used to generate estimates, particularly for countries for which no data were available. For such countries, estimates were based on extrapolations from similar countries. In 2013 the choice of which countries to use for extrapolation was primarily based on similarities in World Bank income levels. For 2015, countries were chosen for extrapolation on the basis of similar ethnicity, language, geography and World Bank income levels (see Map 2.4).

Data to estimate the numbers of children with type 1 diabetes remain very scarce. Estimates for type 1 diabetes in children were derived from studies in Ethiopia, Nigeria, Rwanda, United Republic of Tanzania and Zambia.

As the prevalence estimates for Africa were derived from a small number of studies, there is a high degree of uncertainty around them and, as a consequence, also around the estimates for mortality and expenditure. The regional estimate of 14.2 million is provided as a guide, and for Africa IDF recommends using the uncertainty range when describing the prevalence. There is an urgent need for further epidemiological research and improved data collection systems in the region.

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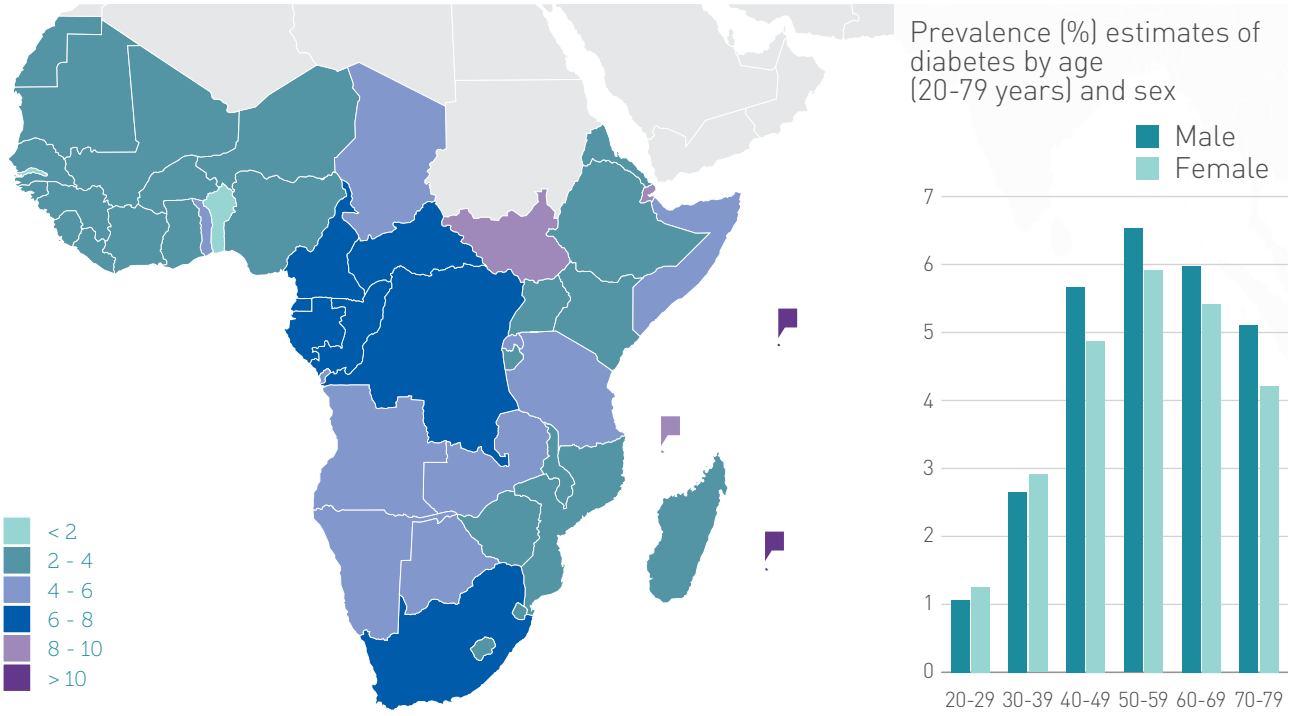
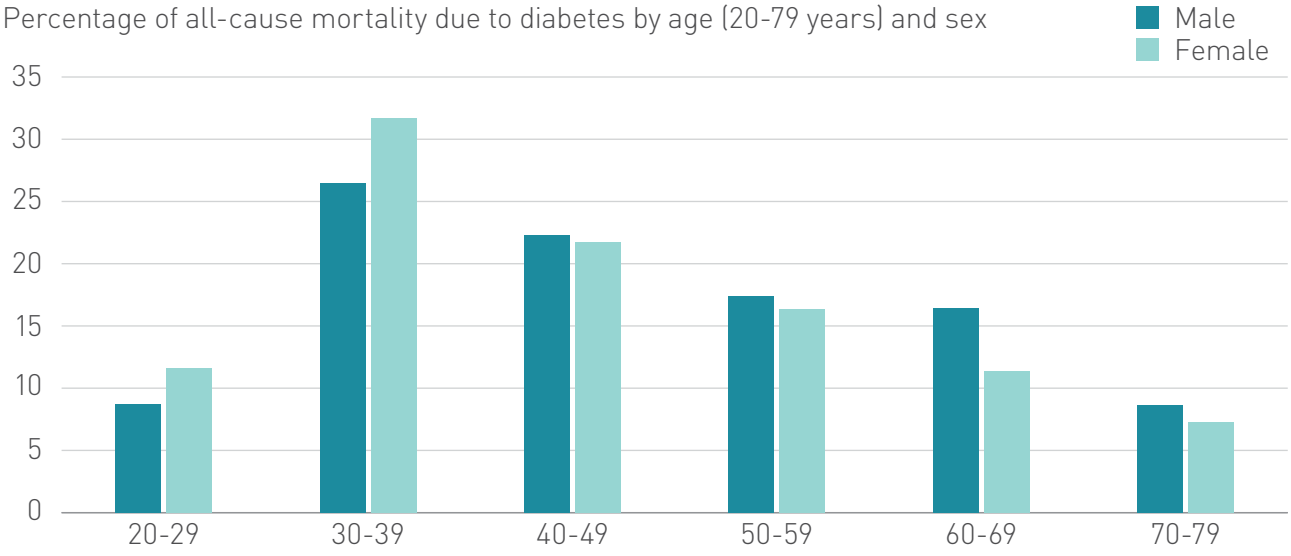
Map 4.1 Prevalence* (%) estimates of diabetes (20-79 years), 2015

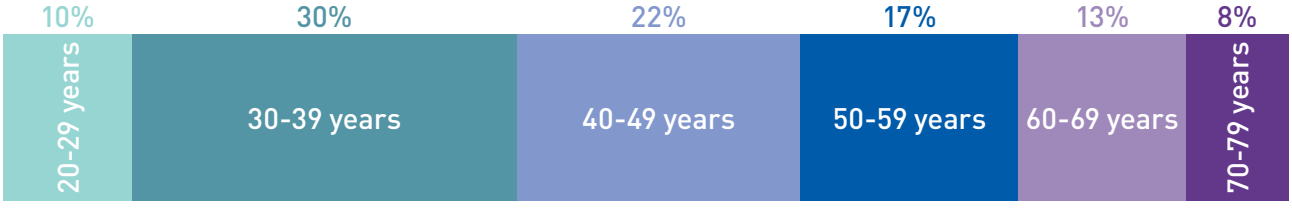


* comparative prevalence

Figure 4.1 Mortality due to diabetes, Africa Region, 2015



Death due to diabetes by age



79% under the age of 60

321,121 total deaths due to diabetes
(201,438 women, 119,683 men)

4.2 Europe

The 56 countries and territories in the IDF Europe Region comprise diverse populations, from Norway in the North, the Russian Federation in the East, Turkmenistan in the South and Iceland in the West. Gross national income varies from more than ID57,000 per capita in Norway, Switzerland and Luxembourg to less than ID10,500 per capita in Armenia, Moldova and Albania[1].

While the total adult population is predicted to remain steady until 2040, the ageing of the population will place increasing numbers of people at risk of diabetes and, consequently, place a greater cost burden on health systems.

Prevalence

The number of people with diabetes is estimated to be 59.8 (45.1-85.6‡) million (9.1% [6.8-13.0%‡] of the population aged 20-79), including 23.5 million undiagnosed cases. While the Europe Region has the second-lowest age-adjusted comparative diabetes prevalence rate of any IDF region (after the Africa Region) there are still many countries with relatively high diabetes prevalence rates.

Turkey has the highest age-adjusted comparative prevalence (12.8% comparative prevalence, 12.5% raw prevalence) and the third-highest number of people with diabetes in the Europe Region (6.3 [5.7-7.5‡] million), after Germany (6.5 [5.9-7.5‡] million) and the Russian Federation (12.1 [6.2-17.0‡] million).

At a glance	2015	2040
Adult population (20-79 years)	660 million	663 million
Diabetes (20-79 years)		
Regional prevalence	9.1% (6.8-13.0%‡)	10.7% (8.2-14.9%‡)
Age-adjusted comparative prevalence	7.3% (5.5-10.9%‡)	7.6% (5.7-11.2%‡)
Number of people with diabetes	59.8 million (45.1-85.6 million‡)	71.1 million (54.4-98.7 million‡)
Number of deaths due to diabetes	627,000	-
Health expenditure due to diabetes (20-79 years)		
Total health expenditure, R=2*, USD	156 billion	174 billion
Impaired glucose tolerance (20-79 years)		
Regional prevalence	4.8% (3.1-11.4%‡)	5.5% (3.6-11.9%‡)
Age-adjusted comparative prevalence	4.1% (2.6-10.6%‡)	4.3% (2.7-10.4%‡)
Number of people with impaired glucose tolerance	31.7 million (20.3-75.2 million‡)	36.6 million (23.9-79.1 million‡)
Type 1 diabetes (0-14 years)		
Number of children with type 1 diabetes	140,000	-
Number of newly diagnosed children each year	21,600	-

* See Glossary
‡ Uncertainty interval

A further 31.7 million people, 4.8% of adults aged 20-79, are estimated to be living with impaired glucose tolerance and are at increased risk of developing diabetes. Indeed, by 2040, it is predicted that there will be 71.1 million adults living with diabetes in the Europe Region.

Age is an important risk factor for type 2 diabetes. In the Europe Region, 30.8% of the general population are aged between 50 and 79 years in 2015 and this is expected to increase to 35.6% by 2040. To a large degree, the high prevalence of type 2 diabetes and impaired glucose tolerance are a consequence of the ageing of Europe's population.

Europe has the highest number of children with type 1 diabetes compared with the other IDF regions – approximately 140,000. The region also has one of the highest incidence rates of type 1 diabetes in children, with an estimated 21,600 new cases per year. It is also home to the country with the world's highest incidence of type 1 diabetes in children, Finland, which has 62.3 new cases per 100,000 children each year. The European countries making the largest contribution to the overall numbers in type 1 diabetes in children are the United Kingdom, the Russian Federation and Germany.

Mortality

Approximately 627,000 people aged 20-79 died from diabetes during 2015 in the Europe Region. About one quarter (26.3%) of these deaths were in people under the age of 60, which partly reflects the age distribution of the population, but also may be related to improved survival rates due to more responsive health systems. There were slightly more deaths due to diabetes in women compared to men (315,000 vs 312,000, respectively).

Health expenditure

Estimates indicate that diabetes was responsible for 9% of total health expenditure in the Europe Region for 2015, equivalent to USD156 billion (R=2*) to USD290 billion (R=3*) (ID169 billion to ID311 billion). This translates to USD2,610 to USD4,854 (ID2,821 to ID5,202) per person with diabetes per year.

Just as there are wide variations in the prevalence of diabetes across the region, the range between countries of average diabetes-related healthcare spending was also large – from USD10,083 (ID8,235) per person with diabetes in Luxembourg to just USD122 (ID296) per person with diabetes in Tajikistan.

Data sources

A total of 58 data sources from 33 countries were used to generate adult diabetes estimates for the 56 countries in the region. Estimates for Denmark, Germany, Israel, Portugal, Romania, Spain, Sweden and Turkey were based on studies conducted within the last five years. There was a lack of population-based nationwide data using oral glucose tolerance tests for screening in many countries. Only 14 countries in the region had nationwide studies based on oral glucose tolerance tests, and only Portugal and Turkey had conducted theirs within the last five years. Diabetes prevalence figures for the remaining countries may be underestimates.

Estimates for Denmark were based in part on age-stratified national registry data. The United Kingdom's 2015 National Health Service report of 3.3 million adults diagnosed with diabetes was not age-stratified, and thus was not able to be used in this edition of the *IDF Diabetes Atlas*.

The region had by far the most complete and reliable data for type 1 diabetes in children. A large proportion of countries have registries that are either nationwide or cover several different parts of a country.

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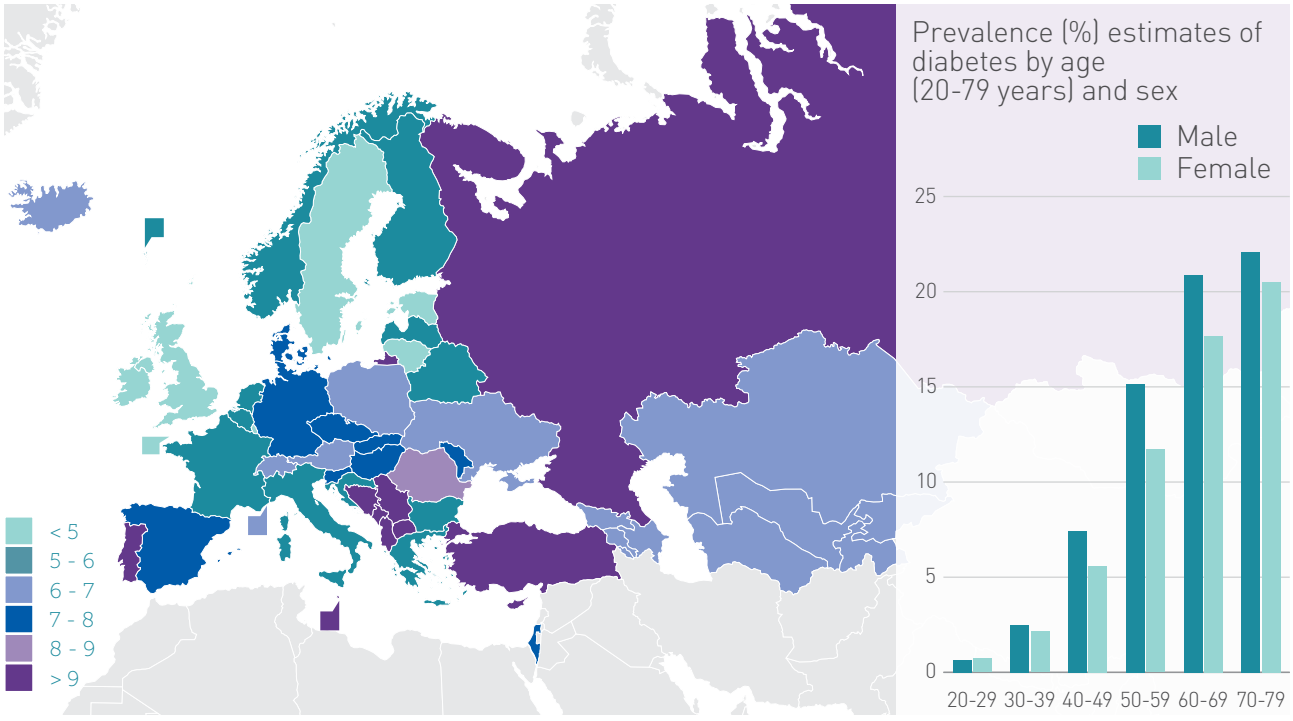
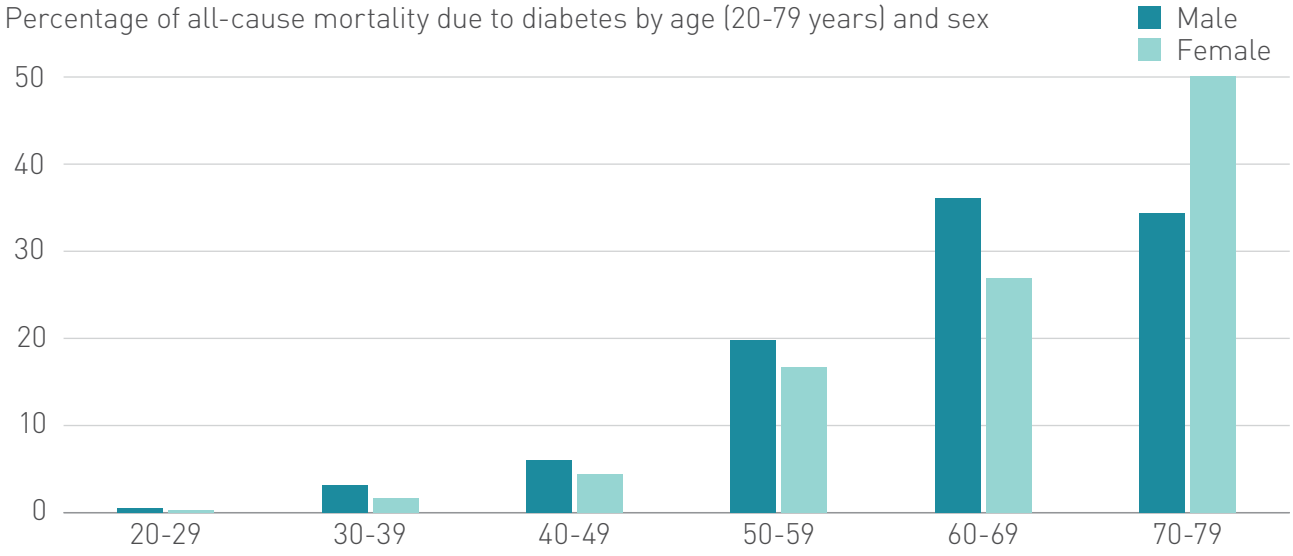
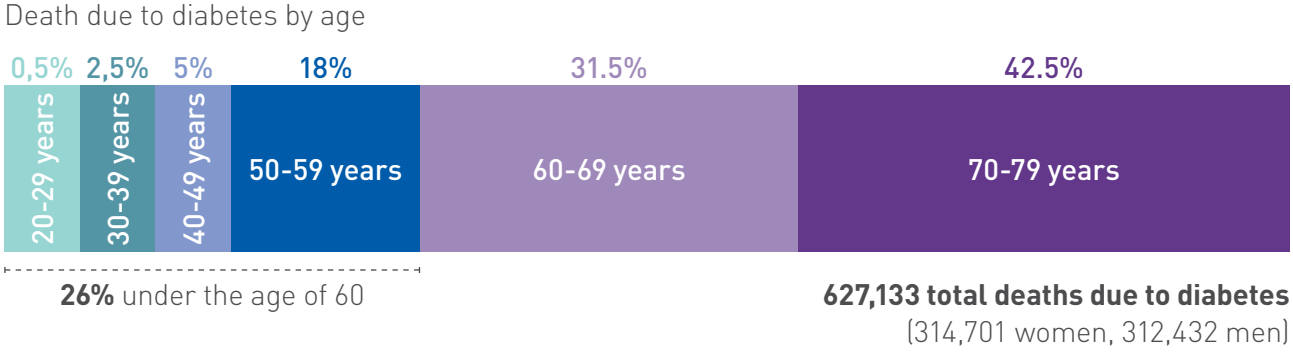
Map 4.2 Prevalence* (%) estimates of diabetes (20-79 years), 2015



* comparative prevalence

Figure 4.2 Mortality due to diabetes, Europe Region, 2015





26% under the age of 60

627,133 total deaths due to diabetes
(314,701 women, 312,432 men)

4.3 Middle East and North Africa

The IDF Middle East and North Africa Region ranges from Iran in the North, Pakistan in the East, Sudan in the South and Morocco in the West.

Over the past three decades, major social and economic changes have transformed many of the countries in the region. Some Gulf States have undergone rapid economic growth and urbanisation, associated with reduced infant mortality and increasing life expectancy. Other countries in the region have seen a decrease in economic growth due to dramatic political changes[2]. The region has the greatest disparity in gross national income per capita, ranging from ID133,850 in Qatar to ID1,980 in Afghanistan[1].

Prevalence

Approximately 35.4 (24.3–47.4‡) million people, or 9.1% (6.3–12.2%‡) of adults aged 20-79, are living with diabetes in the Middle East and North Africa Region in 2015. Over 40.6% of these are undiagnosed.

Although 54.9% of all adults in the region live in urban areas, 67.0% of people with diabetes live in urban environments. The vast majority (83.9%) of the people with diabetes in the region are living in low- or middle- income countries.

At a glance	2015	2040
Adult population (20-79 years)	387 million	635 million
Diabetes (20-79 years)		
Regional prevalence	9.1% (6.3–12.2%‡)	11.4% (7.8–15.1%‡)
Age-adjusted comparative prevalence	10.7% (7.4-14.2%‡)	11.1% (7.7-14.9%‡)
Number of people with diabetes	35.4 million (24.3–47.4 million‡)	72.1 million (49.7–96.0 million‡)
Number of deaths due to diabetes	342,000	-
Health expenditure due to diabetes (20-79 years)		
Total health expenditure, R=2*, USD	17.1 billion	31.0 billion
Impaired glucose tolerance (20-79 years)		
Regional prevalence	7.8% (4.4-12.6%‡)	8.9% (5.2-14.3%‡)
Age-adjusted comparative prevalence	8.6% (5.0-13.8%‡)	8.8% (5.1-14.1%‡)
Number of people with impaired glucose tolerance	30.2 million (17.1-48.6 million‡)	56.6 million (32.8-90.4 million‡)
Type 1 diabetes (0-14 years)		
Number of children with type 1 diabetes	60,700	-
Number of newly diagnosed children each year	10,200	-

* See Glossary
‡ Uncertainty interval

Countries with high diabetes prevalence include Saudi Arabia (raw diabetes prevalence of 17.6%) and Kuwait (14.3%). Due to their different population structures, these countries both have an age-adjusted comparative prevalence of 20.0%. The countries with the largest number of adults with diabetes are Egypt (7.8 [3.8-9.0‡] million), Pakistan (7.0 [5.1-10.0‡] million) and Iran (4.6 [3.6-6.3‡] million).

A further 30.2 million people in the region, or 7.8% of the adult population, are estimated to have impaired glucose tolerance and are therefore at high risk of developing diabetes. It is estimated that the number of people with diabetes in the region will double to 72.1 million by 2040.

Kuwait and Saudi Arabia also have some of the world's highest annual incidence rates of type 1 diabetes in children, with 37.1 and 31.4 new cases per 100,000 population, respectively. Saudi Arabia has 16,100 children with type 1 diabetes, by far the highest number in the region, and over a quarter of the region's total of 60,700.

Mortality

Diabetes was responsible for 342,000 deaths in 2015. Over half (51.3%) of all deaths from diabetes in the region occurred in people under 60. These early deaths may be the result of a combination of factors: the rapidly changing environments and lifestyles in the region, late diagnoses and health systems that are not equipped to provide optimal management to the increasing numbers of people with diabetes.

Health expenditure

Despite the high estimates of diabetes prevalence throughout the region, a total of only USD17.1 billion (R=2*) to USD27.7 billion (R=3*) (ID40.1 to ID65.6) was spent on diabetes healthcare in 2015. This is equivalent to approximately 15% of the total health budget. Health expenditure on diabetes in the region accounts for just 2.5% of global spending on the disease. This is expected to almost double by 2040 but will likely not be enough to adequately treat all people with the disease.

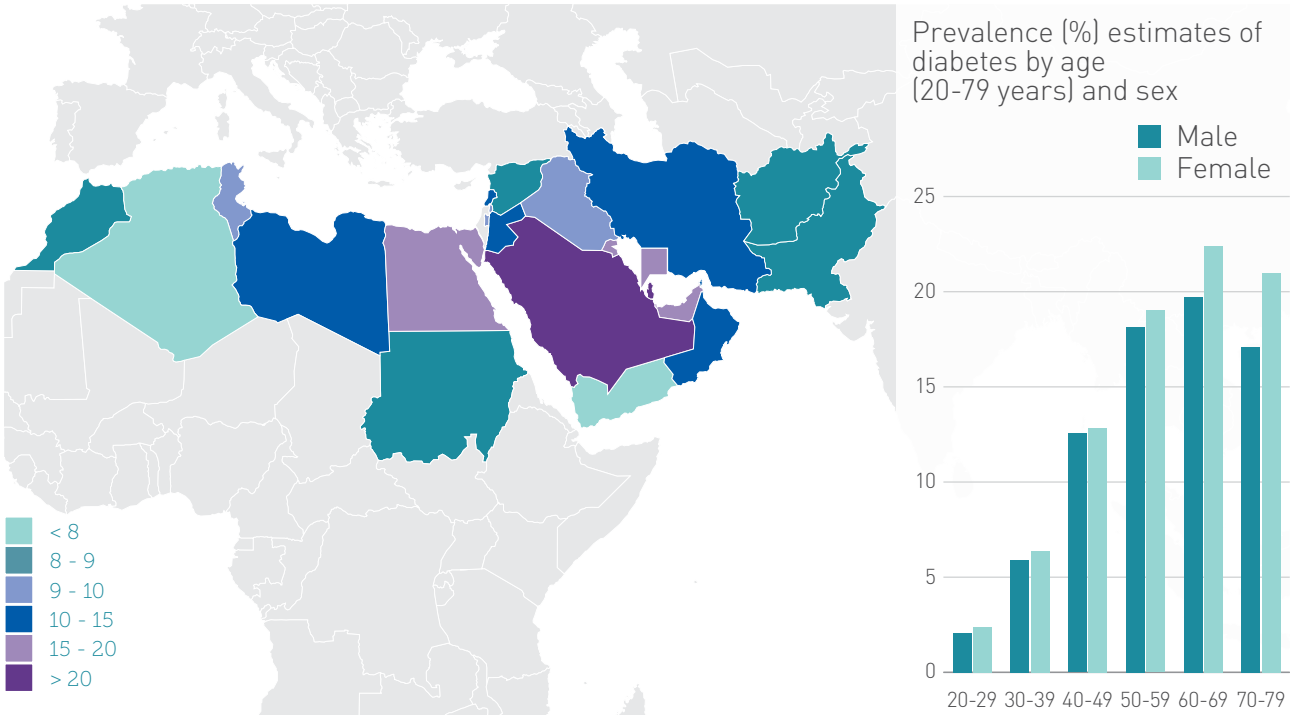
Data sources

A total of 30 sources from 16 countries were used to estimate diabetes prevalence in adults for the 21 countries in the region. Only Kuwait had a nationwide study conducted within the last five years. Algeria, Jordan, Oman, Pakistan, Saudi Arabia, the State of Palestine and the United Arab Emirates had estimates partly based on oral glucose tolerance tests. Diabetes prevalence figures for the remaining countries may be underestimates.

Estimates for type 1 diabetes in children were derived from studies in Algeria, Egypt, Islamic Republic of Iran, Jordan, Kuwait, Libya, Oman, Pakistan, Qatar, Saudi Arabia, Sudan and Tunisia.

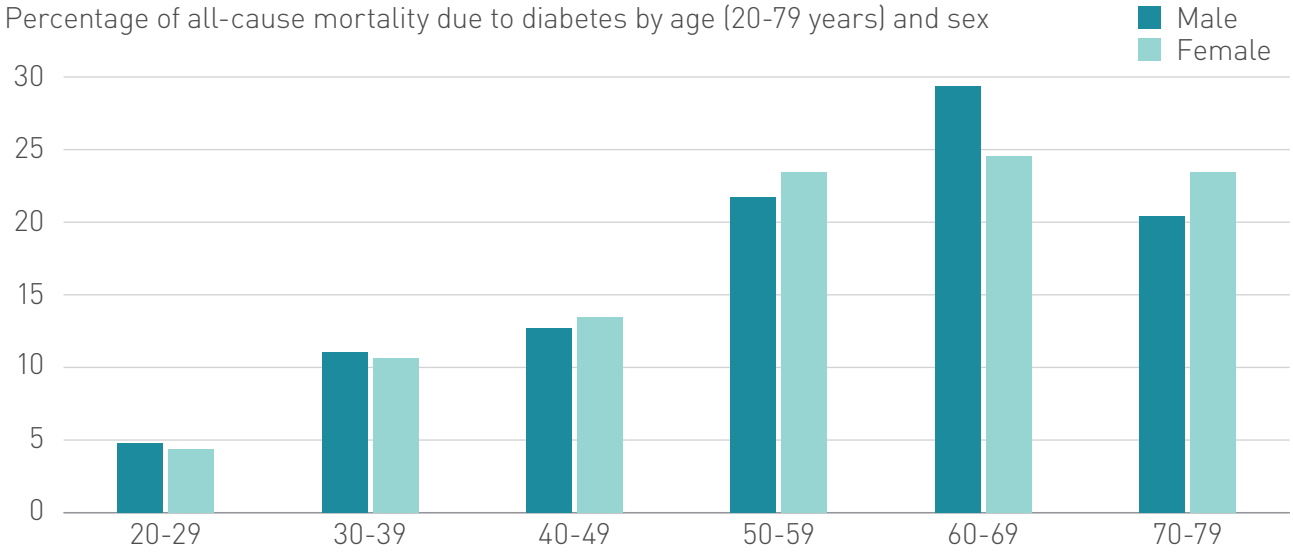
The Middle East and North Africa Region poses a particular challenge for estimating diabetes prevalence because a large proportion of the resident population in many countries consists of migrants and refugees. As a result, studies that include only national citizens can make only a limited contribution to the overall picture of diabetes for the whole country.

Map 4.3 Prevalence* (%) estimates of diabetes (20-79 years), 2015

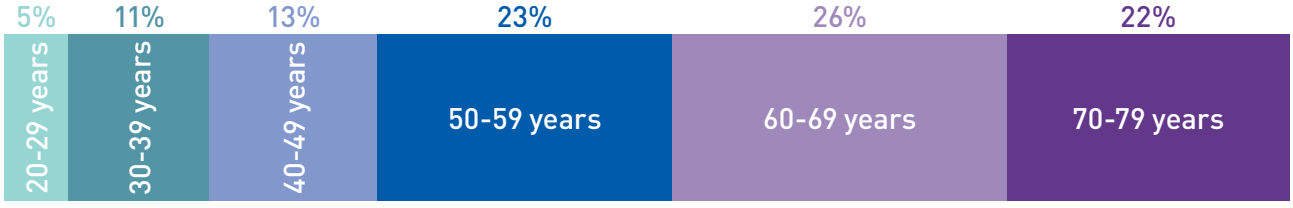


* comparative prevalence

Figure 4.3 Mortality due to diabetes, Middle East and North Africa Region, 2015



Death due to diabetes by age



52% under the age of 60

341,891 total deaths due to diabetes
(205,314 women, 136,577 men)

4.4 North America and Caribbean

The IDF North America and Caribbean Region consists of the USA, Mexico and Canada, as well as 25 Caribbean countries and territories. The gross national income per capita ranges from ID55,850 in the USA to ID1,750 in Haiti[1].

The adult population aged 20-79 is predicted to increase by 20% by 2040.

Prevalence

With 12.9% (10.8-14.5%‡) of the adult population affected, the North America and Caribbean Region has the highest prevalence of diabetes compared to the other IDF regions. An estimated 44.3 (37.1-49.9‡) million people with diabetes aged 20-79 live in the region in 2015, of which 13.3 million (29.9%) are undiagnosed. The vast majority of people with diabetes (82.6%) are living in urban areas.

Most of the people in the region live in the USA, Mexico and Canada, which also account for the large majority of the number of people with diabetes. Over 92% of the countries and territories in the region have an age-adjusted comparative diabetes prevalence rate above the global average (8.8%), with Canada and Haiti being the only exceptions at 7.4% and 6.9% respectively.

At a glance	2015	2040
Adult population (20-79 years)	344 million	413 million
Diabetes (20-79 years)		
Regional prevalence	12.9% (10.8-14.5%‡)	14.7% (11.8-16.7%‡)
Age-adjusted comparative prevalence	11.5% (9.5-13.0%‡)	12.0% (9.5-13.7%‡)
Number of people with diabetes	44.3 million (37.1-49.9 million‡)	60.5 million (48.7-69.2 million‡)
Number of deaths due to diabetes	324,000	-
Health expenditure due to diabetes (20-79 years)		
Total health expenditure, R=2*, USD	348 billion	390 billion
Impaired glucose tolerance (20-79 years)		
Regional prevalence	15.0% (12.8-17.4%‡)	16.3% (13.9-18.9%‡)
Age-adjusted comparative prevalence	13.9% (11.9-16.1%‡)	13.9% (12.0-16.1%‡)
Number of people with impaired glucose tolerance	51.8 million (44.2-59.7 million‡)	67.4 million (57.3-77.9 million‡)
Type 1 diabetes (0-14 years)		
Number of children with type 1 diabetes	107,300	-
Number of newly diagnosed children each year	16,500	-

* See Glossary
‡ Uncertainty interval

Belize (16.5% age-adjusted comparative prevalence, 14.2% raw prevalence), Mexico (15.8% age-adjusted, 14.7% raw) and the British Virgin Islands (14.5% age-adjusted, 14.7% raw) have the highest prevalence of diabetes. Meanwhile the USA, with 29.3 [27.6-30.9‡] million, has the highest number of people with diabetes, followed by Mexico (11.5 [6.2-13.7‡] million) and Canada (2.5 [2.4-3.5‡] million).

A further 51.8 million people, or 15.0% of adults aged 20-79 in the North America and Caribbean Region have impaired glucose tolerance, putting them at high risk of developing type 2 diabetes. By 2040 it is estimated that 60.5 million adults will be living with diabetes and a further 67.4 million will have impaired glucose tolerance.

There are an estimated 107,300 children living with type 1 diabetes in the North America and Caribbean Region, with 16,500 children newly diagnosed each year. The USA is home to the world's largest number of children with type 1 diabetes (84,100), and accounts for almost 78.3% of the total number of type 1 diabetes in children in the region.

Mortality

The total number of diabetes-attributable deaths was 324,000 in the region. Three-quarters (73.3%) of these deaths occurred in high income countries. More men (173,000) than women (151,000) died from diabetes-related causes in the region in 2015. Diabetes-related mortality in the North America and Caribbean Region was not limited to older age groups, with over one third (38.3%) of deaths occurring in adults under the age of 60. In the USA, more than 219,400 people died from diabetes, one of the highest numbers of deaths due to diabetes of any country in the world.

Health expenditure

The economic impact is also substantial, with healthcare expenditure due to diabetes estimated to range between USD348 billion (R=2*) and USD610 billion (R=3*) for 2015, the highest of all IDF regions. Nearly 14% of the region's total health budget is spent on diabetes. Health expenditure on diabetes in the region is estimated to account for more than half (51.7%) of the world's diabetes-related healthcare spending.

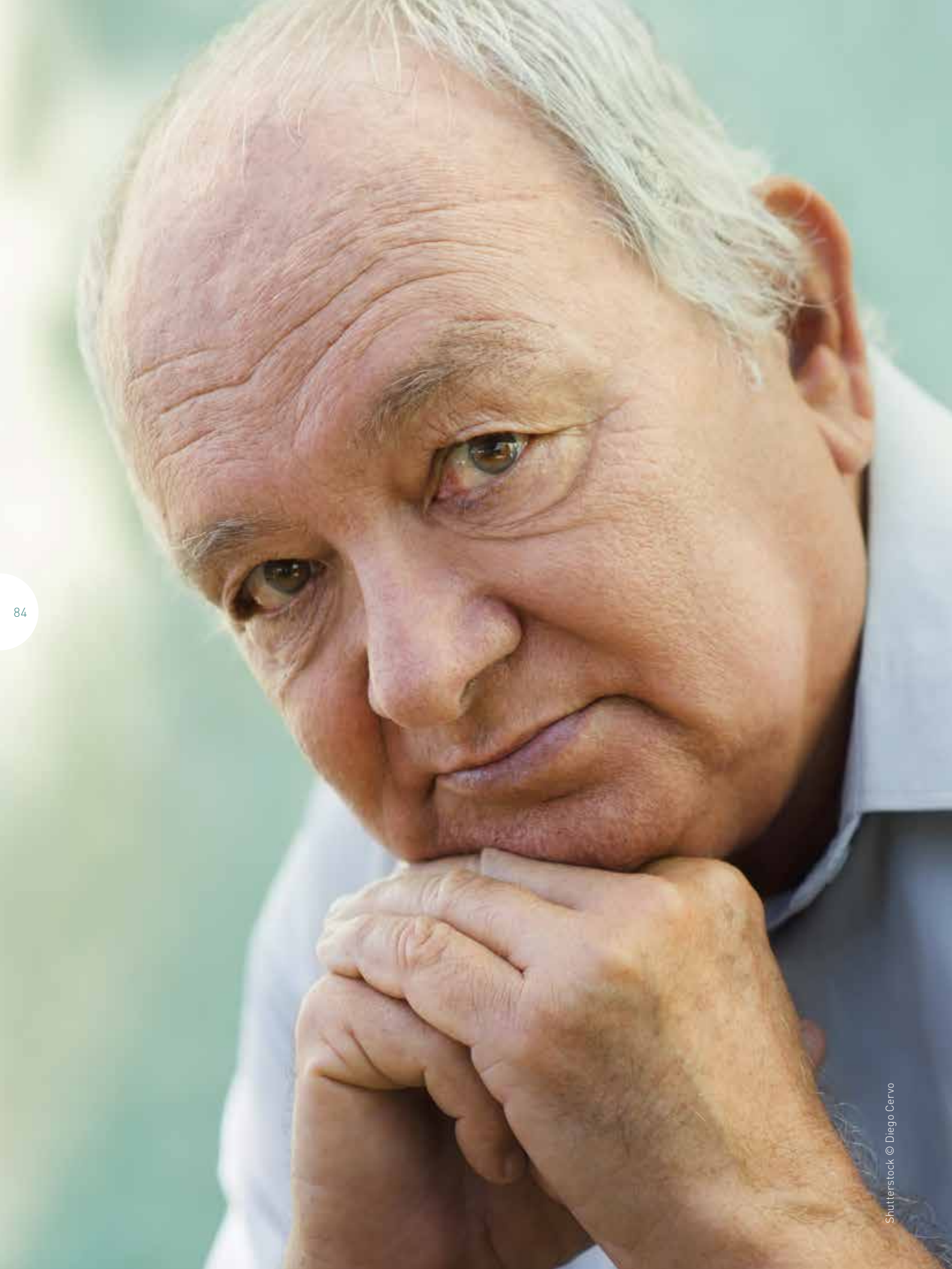
The USA alone accounted for most of the USD348 billion spent in the region in 2015. Apart from the USA (USD320 billion, ID320 billion) and Canada (USD17.1 billion, ID14.3 billion), the average diabetes-related spending per person with diabetes is low in almost every other country in the region. The majority of Caribbean islands spent less than USD2,000 (R=2*) on care per person with diabetes; Haiti spent just USD131 (ID275) per person per year. Healthcare spending due to diabetes is expected to increase by 12% by 2040, the smallest increase of any region.

Data sources

Estimates for diabetes in adults were taken from 19 data sources in the region, representing 11 of 28 countries. Barbados, Bermuda, the British Virgin Islands, Canada, Mexico and the USA had studies conducted within the last five years. Belize, Haiti, Mexico and the US Virgin Islands had studies that used oral glucose tolerance tests. Prevalence rates for other countries may be underestimates.

The estimates for most of the Caribbean countries were based on extrapolation from a small number of studies. Only eight out of the 24 Caribbean countries and territories had prevalence estimates based on data originating from studies conducted in the countries.

Estimates for type 1 diabetes in children were derived from studies in Antigua and Barbuda, Bahamas, Barbados, Canada, Dominica, Mexico, the USA and the US Virgin Islands.



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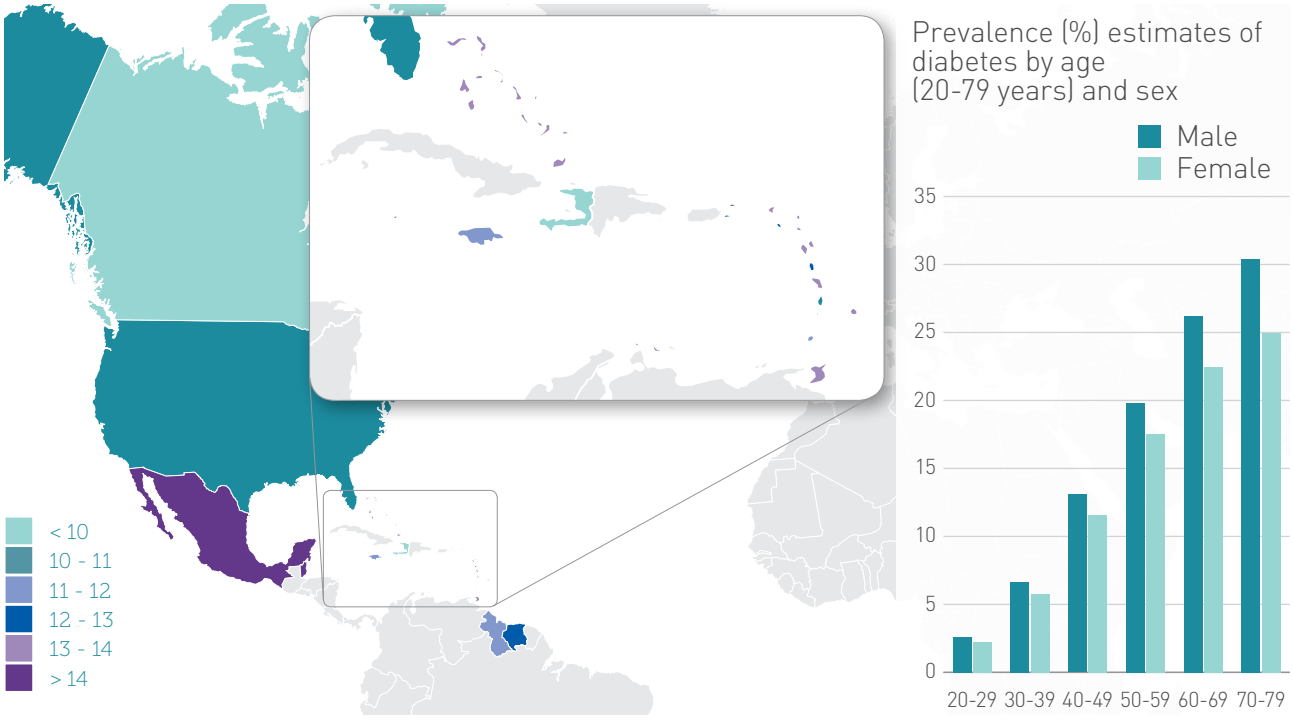
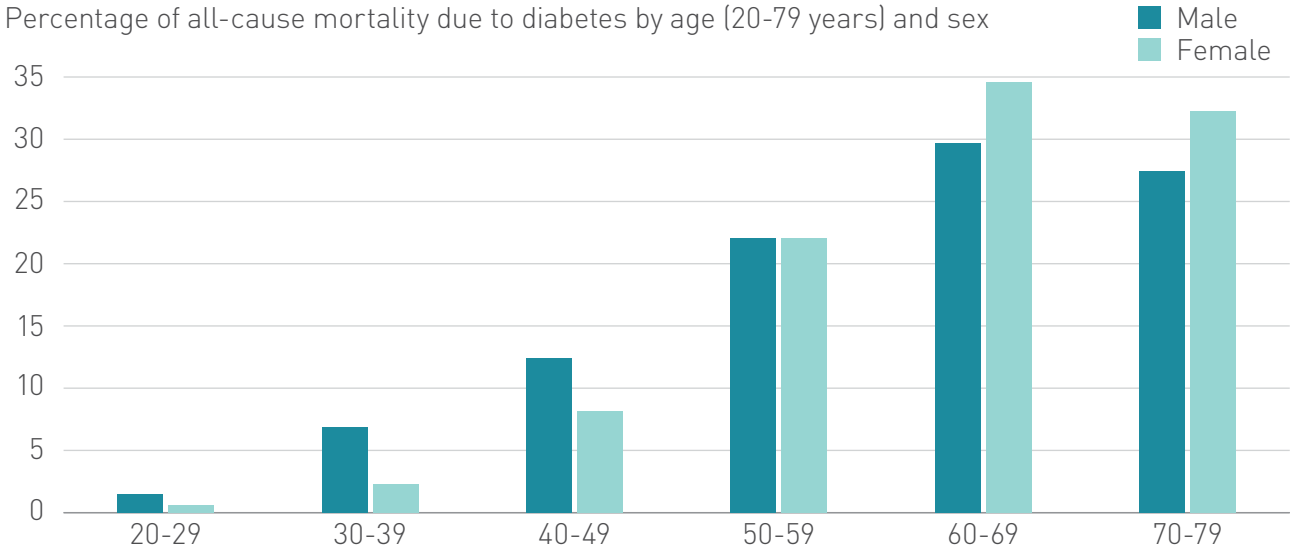
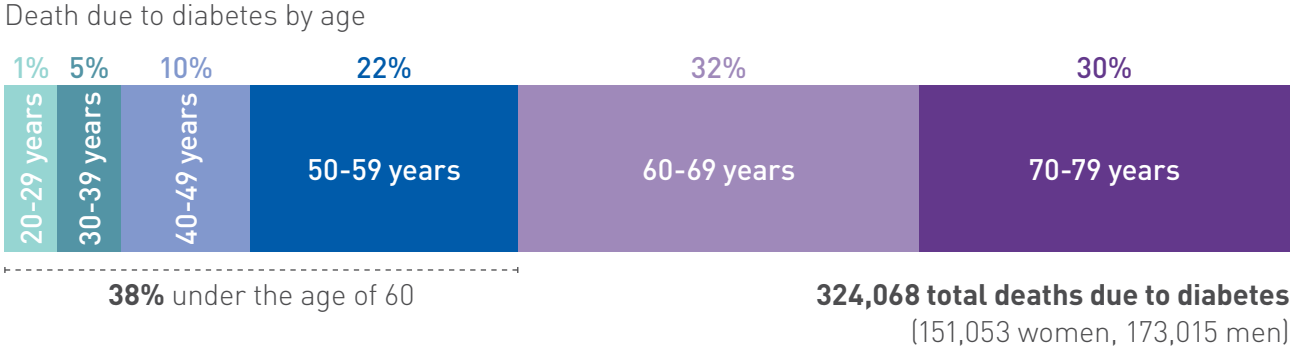
Map 4.4 Prevalence* (%) estimates of diabetes (20-79 years), 2015



* comparative prevalence

Figure 4.4 Mortality due to diabetes, North America and Caribbean Region, 2015





38% under the age of 60

324,068 total deaths due to diabetes
(151,053 women, 173,015 men)

4.5 South and Central America

The IDF South and Central America Region includes 20 countries and territories, from Cuba in the north, Brazil in the east, Chile and Argentina in the south and Guatemala in the west.

About 20.0% of the population is estimated to be between 50 and 79 years of age. This figure is expected to increase to 43.2% by 2040. The region has a markedly younger age distribution than most of North America. As urbanisation continues and populations grow older, diabetes will become an ever-greater public health priority.

The gross national income per capita ranges from ID4,120 in Honduras to ID21,570 in Chile[1]. Although the economic growth of Brazil and Argentina plateaued recently, most other countries in the region experienced substantial economic growth in 2015[2].

Prevalence

In the South and Central America Region, an estimated 29.6 (25.2-35.5‡) million people, or 9.4% (8.0-11.3%‡) of the adult population, have diabetes in 2015. Of these, 11.5 million (39.0%) are undiagnosed. Over 82% of people with diabetes live in urban environments and 81% of people with diabetes in the region are living in middle-income countries.

At a glance	2015	2040
Adult population (20-79 years)	315 million	411 million
Diabetes (20-79 years)		
Regional prevalence	9.4% (8.0-11.3%‡)	11.9% (10.1-14.3%‡)
Age-adjusted comparative prevalence	9.6% (8.2-11.5%‡)	9.7% (8.2-11.7%‡)
Number of people with diabetes	29.6 million (25.2-35.5 million‡)	48.8 million (41.5-58.7 million‡)
Number of deaths due to diabetes	247,000	-
Health expenditure due to diabetes (20-79 years)		
Total health expenditure, R=2*, USD	34.6 billion	55.6 billion
Impaired glucose tolerance (20-79 years)		
Regional prevalence	7.9% (6.5-9.8%‡)	9.4% (7.7-11.5%‡)
Age-adjusted comparative prevalence	8.0% (6.6-9.9%‡)	8.0% (6.6-9.9%‡)
Number of people with impaired glucose tolerance	42.2 million (20.7-60.2 million‡)	73.9 million (35.0-96.9 million‡)
Type 1 diabetes (0-14 years)		
Number of children with type 1 diabetes	45,100	-
Number of newly diagnosed children each year	7,300	-

* See Glossary
‡ Uncertainty interval

Puerto Rico has the highest prevalence of diabetes in adults (12.1% age-adjusted comparative prevalence, 14.2% raw prevalence) in the region. Brazil has the highest number of people with diabetes (14.3 [12.9-15.8‡] million).

Moreover, estimates indicate that another 24.8 million people, or 7.9% of the adult population, have impaired glucose tolerance in 2015. By 2040, the number of people with diabetes is expected to rise by over 60% to 48.8 million people.

An estimated 7,300 children developed type 1 diabetes in 2015. In the region as a whole, 45,100 children under the age of 15 have type 1 diabetes. Nearly 30,900 of these children live in Brazil, which makes it the country with the third highest number of children with type 1 diabetes in the world, after the USA and India.

Mortality

In 2015, 247,500 adults died as a result of diabetes (122,100 men and 125,400 women). Over 42.7% of these deaths occurred in people under the age of 60. Over half of the deaths in the region (130,700) occurred in Brazil.

Health expenditure

Diabetes healthcare spending in the region is estimated at between USD34.6 billion (R=2*) and USD59.9 billion (R=3*) (ID50.1 billion to ID86.9 billion), accounting for 5.0% of the global total. This expenditure is predicted to increase to USD55.6 billion to 98.6 billion (ID80.2 billion to 142.4 billion) by 2040. The region spends about 12% of its total healthcare budget on adults with diabetes. Brazil spent at least USD21.8 billion (ID29.2 billion) on people with diabetes, while Nicaragua spent approximately USD67 million (ID164 million).

The average health expenditure per person in the region ranged from USD1,169 (R=2*) to USD2,027 (R=3*) (ID1,693 to ID2,938). Country estimates ranged from ID2,488 in Argentina to ID596 in Nicaragua.

Data sources

For this region, 13 sources from nine countries were used to estimate adult diabetes prevalence for the 20 countries in the region. Costa Rica, the Dominican Republic and Peru had data sources from studies conducted in the last five years. Estimates for Argentina, Bolivia, Brazil and Guatemala were based on studies that used oral glucose tolerance tests. Diabetes prevalence figures for other countries may be underestimates.

The adult diabetes prevalence estimate for South and Central America is also particularly influenced by a systematic change in the method of handling missing age-group sample sizes. In the sixth edition, when the diabetes prevalence (%) in each age-group and total sample size were known, but the sample size of each age-group was unknown, the sample size of each age-group was assumed to be constant. In this seventh edition, if the age-group sample size was unknown, it was assumed to reflect the population structure of the country, and the sum of all age-group sample sizes was assumed to be equal to the total sample size. This change may account for some of the increases in prevalence estimates observed between 2013 and 2015.

Estimates of the number of children with type 1 diabetes were derived from studies in Argentina, Brazil, Chile, Colombia, Cuba, the Dominican Republic, Paraguay, Peru, Puerto Rico, Uruguay and Venezuela.

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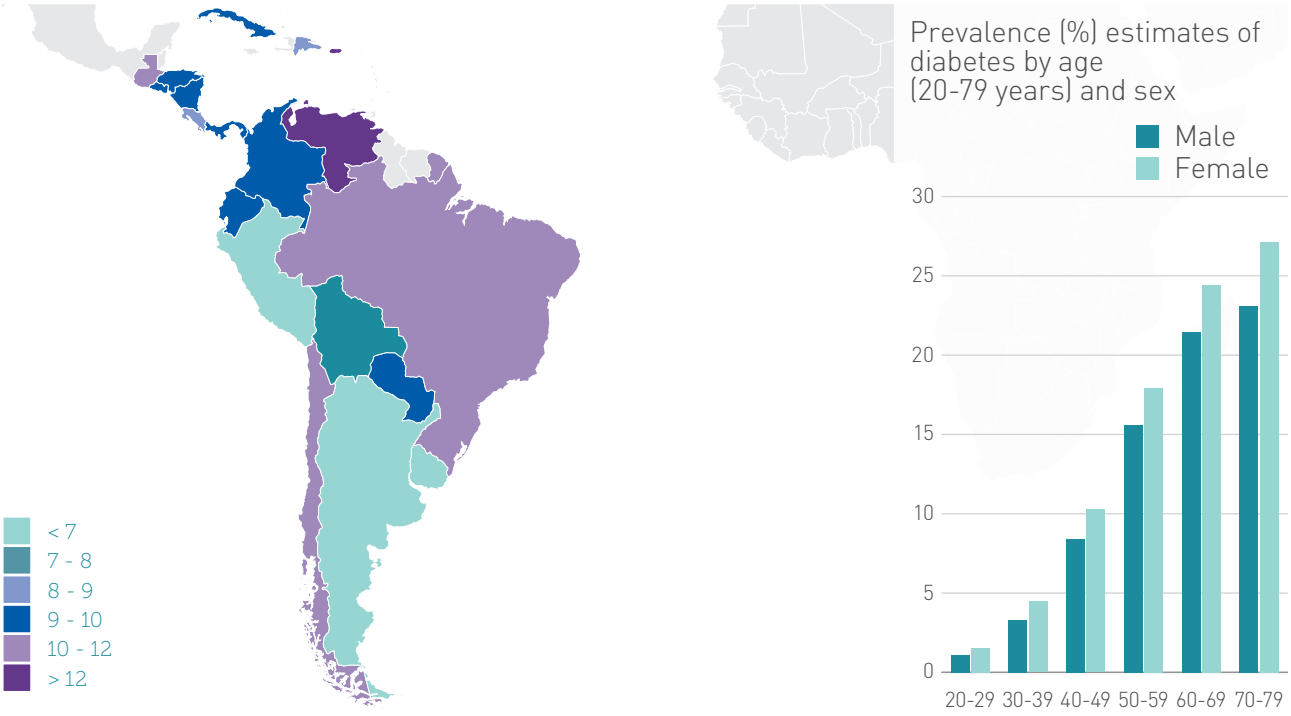
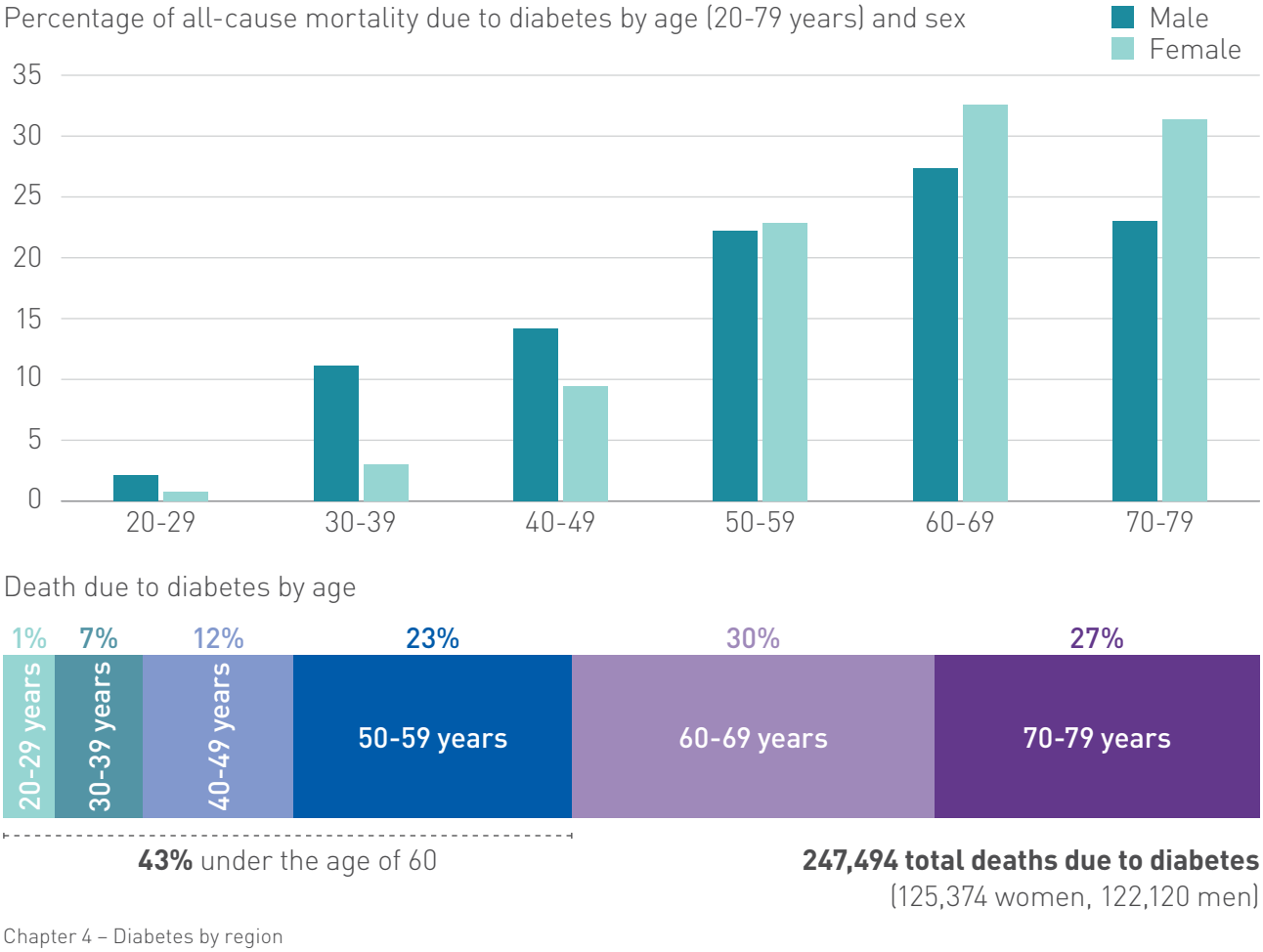
Map 4.5 Prevalence* (%) estimates of diabetes (20-79 years), 2015



* comparative prevalence

Figure 4.5 Mortality due to diabetes, South and Central America Region, 2015



4.6 South-East Asia

Although the South-East Asia Region comprises only seven countries (India, Bangladesh, Nepal, Sri Lanka, Mauritius, Bhutan and the Maldives), it is the second most populous IDF region, after the Western Pacific Region. Over 86% of the adults in the region live in India. While all of the countries in the region are classified by the World Bank as low- or middle- income in 2015, they also experienced an annual economic growth of over 3.5% during this year[2]. Mauritius has the highest gross national income per capita at ID18,290 and Nepal the lowest at ID2,420[1].

By 2040 the region is predicted to be home to over 1.3 billion adults aged 20-79.

Prevalence

Estimates in 2015 indicate that 8.5% (6.8-10.8%‡) of the adult population has diabetes. This is equivalent to 78.3 (62.9 to 100.4‡) million people living with diabetes. Over half (52.1%) of these are undiagnosed. Although only one third (32.5%) of adults in the South-East Asia Region live in urban areas in 2015, nearly half (47.5%) of all adults with diabetes can be found in cities.

At a glance	2015	2040
Adult population (20-79 years)	926 million	1.31 billion
Diabetes (20-79 years)		
Regional prevalence	8.5% (6.8-10.8%‡)	10.7% (8.5-13.7%‡)
Age-adjusted comparative prevalence	9.1% (7.3-11.6%‡)	9.9% (7.9-12.8%‡)
Number of people with diabetes	78 million (63-100 million‡)	140 million (112-180 million‡)
Number of deaths due to diabetes	1.2 million	-
Health expenditure due to diabetes (20-79 years)		
Total health expenditure, R=2*, USD	7.3 billion	12.9 billion
Impaired glucose tolerance (20-79 years)		
Regional prevalence	4.6% (2.2-6.5%‡)	5.6% (2.7-7.4%‡)
Age-adjusted comparative prevalence	4.7% (2.4-6.7%‡)	5.4% (2.5-7.2%‡)
Number of people with impaired glucose tolerance	42.2 million (20.7-60.2 million‡)	73.9 million (35.0-96.9 million‡)
Type 1 diabetes (0-14 years)		
Number of children with type 1 diabetes	81,400	-
Number of newly diagnosed children each year	13,100	-

* See Glossary
‡ Uncertainty interval

Mauritius has one of the highest adult diabetes prevalence rates in the world (22.3% age-adjusted comparative prevalence, 24.3% raw prevalence). The Maldives (9.2% age-adjusted, 7.5% raw) has the second-highest prevalence rate in the region. India is home to the second largest number of adults living with diabetes worldwide, after China. People with diabetes in India, Bangladesh, and Sri Lanka make up 99.0% of the region's total adult diabetes population.

A further 42.2 million people have impaired glucose tolerance and are at increased risk of developing type 2 diabetes in the future. The number of people with diabetes in the region is predicted to be 140 million by 2040 – 10.7% of the adult population aged 20-79. This increase is largely a consequence of ongoing urbanisation and increasing life expectancy.

There are an estimated 81,400 children under the age of 15 living with type 1 diabetes in the South-East Asia Region. Approximately 13,100 children developed type 1 diabetes in the region during 2015.

India is home to the second largest number of children with type 1 diabetes in the world (70,200), after the USA, and accounts for the majority of the children with type 1 diabetes in the region. The incidence rate for type 1 diabetes in India was used to extrapolate figures for other similar countries, and therefore plays a pivotal role in the regional and global estimates.

Mortality

With 1.2 million deaths in 2015, the region had the second highest number of deaths attributable to diabetes of any of the seven IDF regions, after the Western Pacific Region. More than half (53.2%) of these deaths occurred in people under 60 years of age. India was the largest contributor to regional mortality, with one million deaths attributable to diabetes.

Health expenditure

A total of USD7.3 billion (R=2*) to USD12.4 billion (R=3*) (ID24.9 billion to ID42.4 billion) was spent on the 78 million people living with diabetes in 2015, 12% of the health budget of the region. This accounts for 1% of the global health spending on diabetes. Compared to the other IDF regions, the South-East Asia Region had the lowest health expenditure per person with diabetes (USD93 to USD158, ID319 to ID542).

Data sources

All countries except Bhutan had primary data sources that were used to generate estimates for diabetes in adults in the region. A total of 13 data sources from six countries were used. Diabetes prevalence estimates for India, Nepal, Sri Lanka and Bhutan were based, in part, on data sources that were more than five years old and may be underestimates.

Estimates for type 1 diabetes in children were largely based on data from India, the Maldives and Mauritius.

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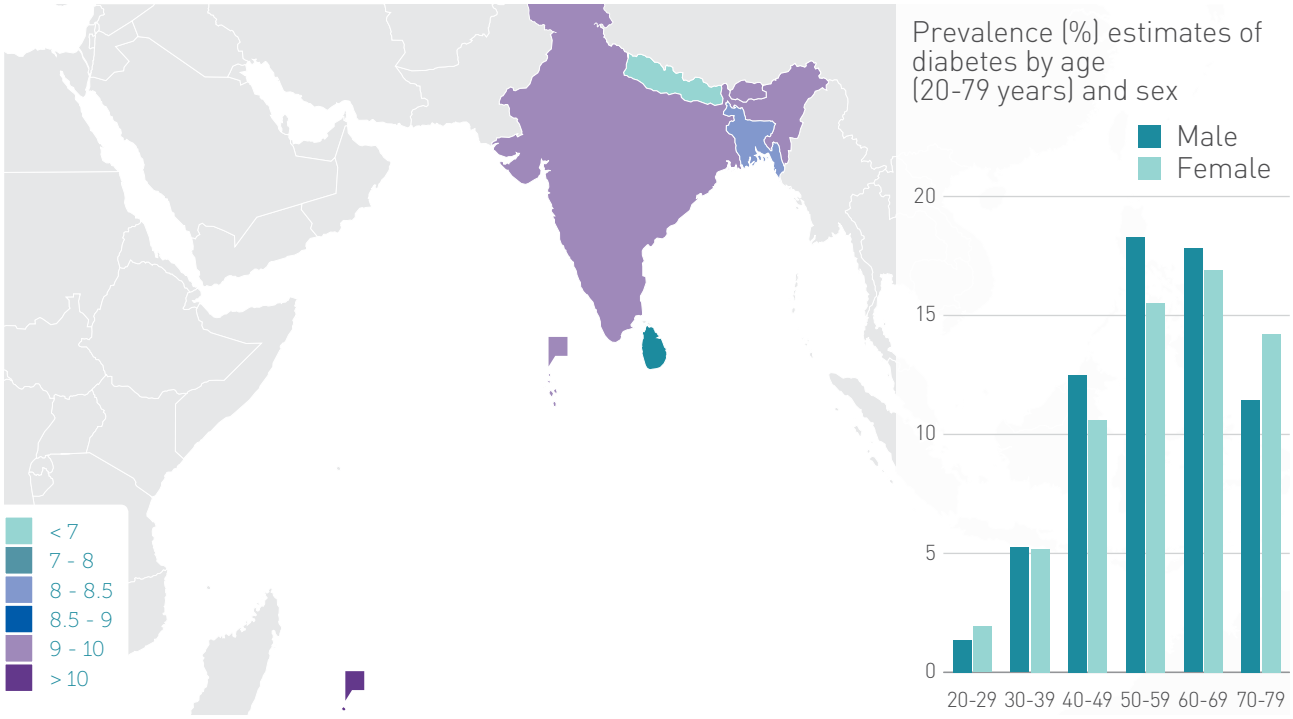
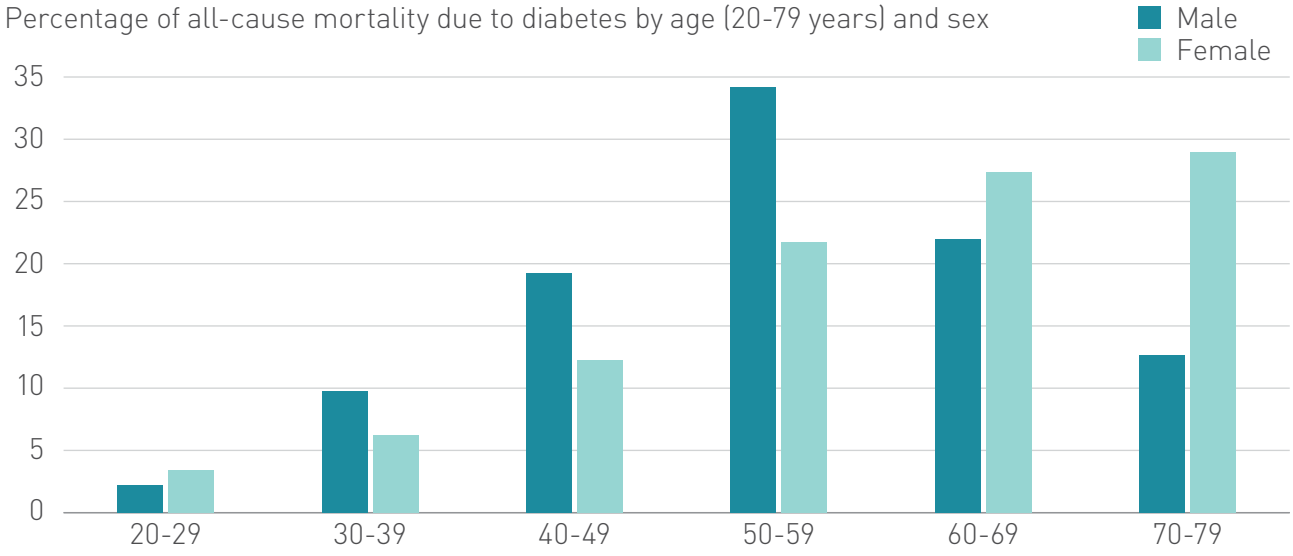
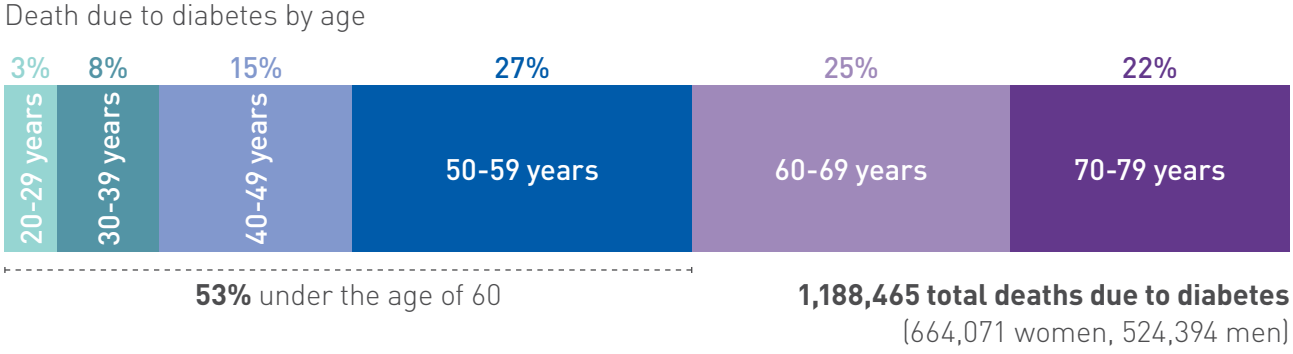
Map 4.6 Prevalence* (%) estimates of diabetes (20-79 years), 2015



* comparative prevalence

Figure 4.6 Mortality due to diabetes, South-East Asia Region, 2015





53% under the age of 60

1,188,465 total deaths due to diabetes
(664,071 women, 524,394 men)

4.7 Western Pacific

The world's most populous region, the Western Pacific, has 39 countries and territories. The region is home to the world's most populous country, China, as well as some of the least populous, such as the Pacific Islands of Tokelau and Niue. Over 63% of adults in the region live in China.

The economic profiles of countries vary from a gross national income per capita of ID56,570 in the Hong Kong Special Administrative Region to less than ID5,300 in Tonga and Tuvalu[1].

By 2040 the region is predicted to be home to over 1.8 billion adults aged 20-79.

Prevalence

In 2015, 9.3% (8.2-11.4%‡) of adults aged 20-79 are estimated to be living with diabetes. This is equivalent to 153 (135-188‡) million people. Over half (52.1%) of these are undiagnosed, 61.6% live in cities and 90.2% live in low- or middle-income countries. The Western Pacific Region is home to 36.9% of the total number of people with diabetes in the world.

At a glance	2015	2040
Adult population (20-79 years)	1.6 billion	1.8 billion
Diabetes (20-79 years)		
Regional prevalence	9.3% (8.2-11.4%‡)	11.9% (10.6-14.3%‡)
Age-adjusted comparative prevalence	8.8% (7.7-10.8%‡)	9.0% (8.0-11.2%‡)
Number of people with diabetes	153 million (135-188 million‡)	215 million (191-258 million‡)
Number of deaths due to diabetes	1.9 million	-
Health expenditure due to diabetes (20-79 years)		
Total health expenditure, R=2*, USD	106 billion	133 billion
Impaired glucose tolerance (20-79 years)		
Regional prevalence	6.2% (4.2-12.2%‡)	7.2% (4.9-13.4%‡)
Age-adjusted comparative prevalence	6.0% (4.0-11.8%‡)	6.4% (4.3-11.9%‡)
Number of people with impaired glucose tolerance	102 million (68-200 million‡)	130 million (88-242 million‡)
Type 1 diabetes (0-14 years)		
Number of children with type 1 diabetes	60,700	-
Number of newly diagnosed children each year	10,000	-

* See Glossary
‡ Uncertainty interval

There is a 12-fold range between the estimates for the prevalence of adult diabetes in the region: from the world's highest, in the Pacific Island nation of Tokelau (30.0% age-adjusted comparative prevalence; 29.7% raw prevalence), to one of the lowest, in Cambodia (3.0% age-adjusted; 2.6% raw). China had the highest number of people with diabetes (110 [99.6-133.4‡] million) in the world.

There are also 102 million adults with impaired glucose tolerance in the region, who are at increased risk of future diabetes. In 25 years it is predicted that there will be 215 million people with diabetes in the region, equivalent to 11.9% of the adult population.

An estimated 60,700 children under the age of 15 in the region have type 1 diabetes, with approximately 10,000 newly diagnosed in 2015. Over 30,000 of these children are in China.

Mortality

With 1.9 million deaths among adults, the Western Pacific had the highest number of deaths due to diabetes of all the IDF regions. Over 44.9% of diabetes deaths occurred in people under the age of 60. China alone had 1.3 million deaths due to diabetes in 2015, with 40.8% of those deaths occurring in people under 60.

Health expenditure

Approximately USD106 billion (R=2*) to USD191 billion (R=3*) (ID153 billion to ID271 billion) was spent on diabetes-related care in the region in 2015, approximately 10% of the region's total health budget. The average diabetes-related spending on healthcare per person was estimated to range from USD693 to USD1,246 (ID998 to ID1,770). Australia had the highest spending per person with diabetes (USD7,652 to USD14,498 / ID5,249 to ID9,945), and Myanmar had the lowest (USD23 to USD40 / ID59 to ID102).

Data sources

For this edition of the *IDF Diabetes Atlas*, 48 data sources from 24 countries were used to generate estimates of diabetes in adults for the 39 countries in the region. Estimates for Australia, China, French Polynesia, Indonesia, the Republic of Korea and Taiwan were based on studies conducted within the last five years. Only 12 countries in the region had nationwide studies based on oral glucose tolerance tests. Diabetes prevalence figures for other countries may be underestimates.

Estimates for type 1 diabetes in children were based on studies conducted in Australia, China, Fiji, Hong Kong, Japan, New Zealand, Papua New Guinea, the Republic of Korea, Singapore, Taiwan and Thailand.

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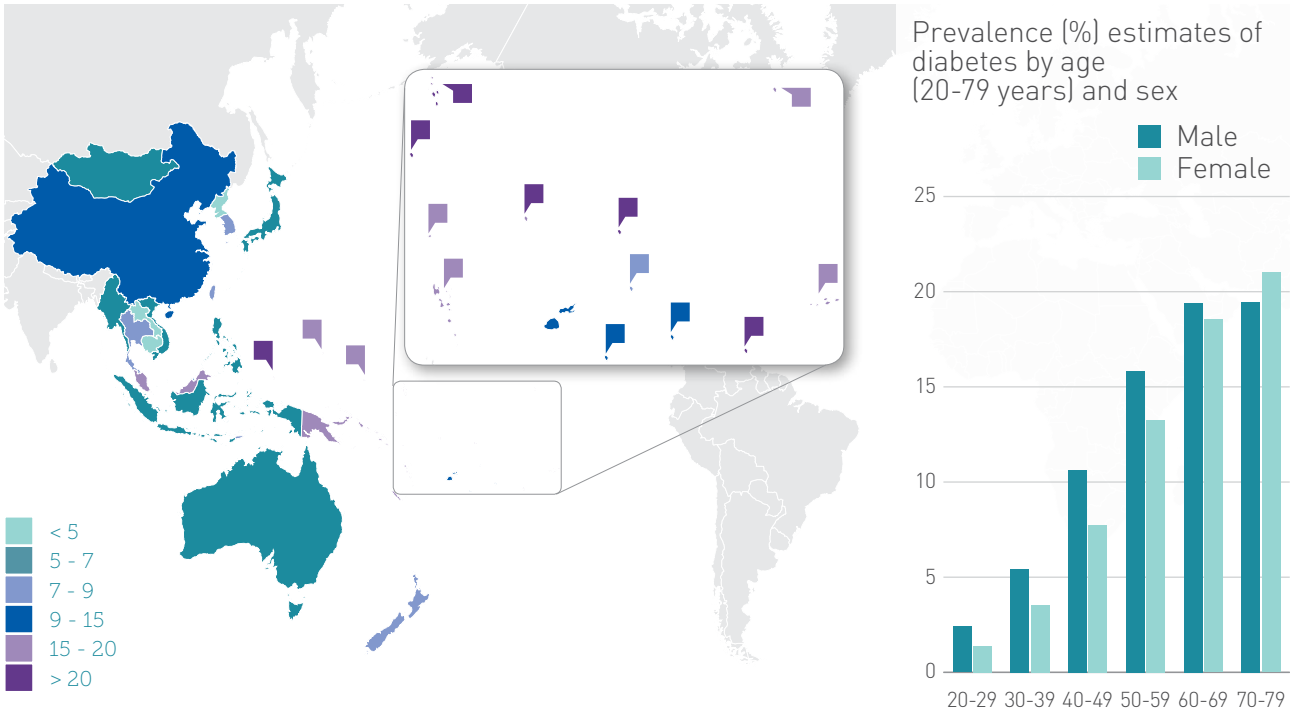
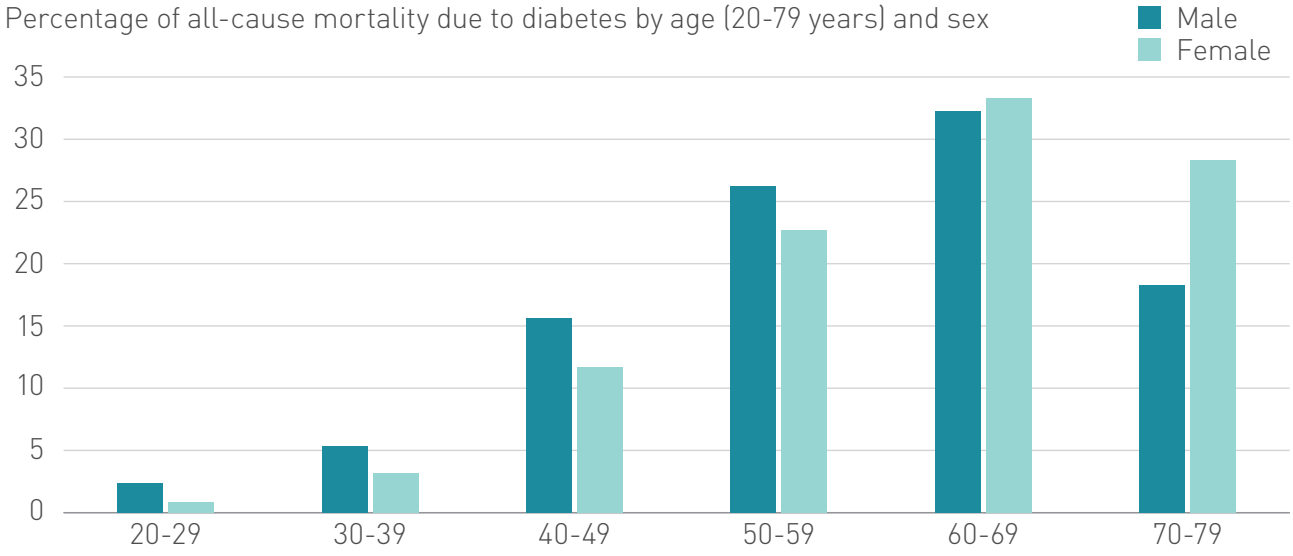
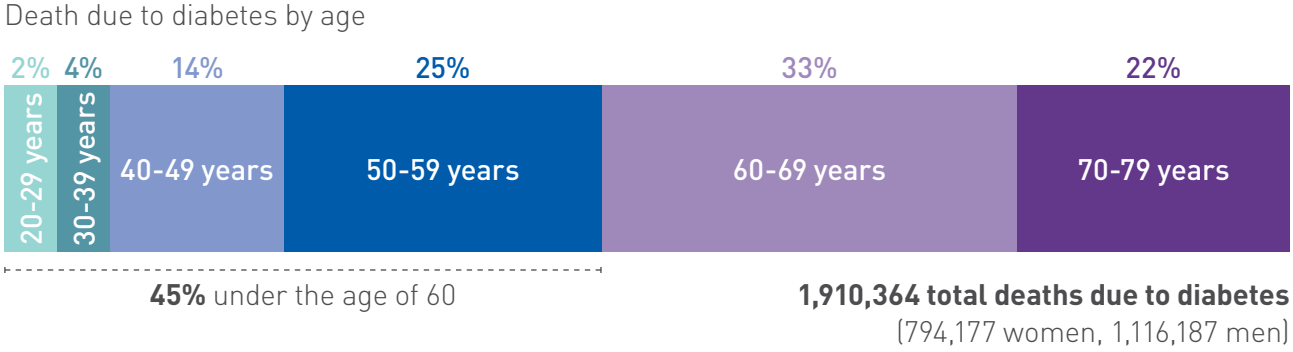
Map 4.7 Prevalence* (%) estimates of diabetes (20-79 years), 2015



* comparative prevalence

Figure 4.7 Mortality due to diabetes, Western Pacific Region, 2015





45% under the age of 60

1,910,364 total deaths due to diabetes
(794,177 women, 1,116,187 men)

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5 Action on diabetes

Healthy eating and increased physical activity can **reduce the risk** of type 2 diabetes

The **Life For A Child** programme supplies insulin to **17,000 children** living with diabetes

Ensuring the **health of future generations** is key to **sustainable development**

A collective approach involving civil society is essential for change

Policies limiting the intake of sugar, fat and salt as well as **taxation on sugar-rich foods are key** in the fight against rising rates of type 2 diabetes

Early detection is critical to prevent costly

IDF supports WHO's target of **80% access** to insulin and other essential medicines **by 2025**

5 Action on diabetes

The International Diabetes Federation (IDF) is an umbrella organisation of over 230 national diabetes associations in more than 170 countries and territories. It represents the interests of the growing number of people with diabetes or those at risk, and has been leading the global diabetes community since 1950.

The mission of IDF is to promote diabetes care, prevention and a cure worldwide. Its activities aim to influence policy, increase public awareness and encourage improvements in health.

In addition, IDF promotes the exchange of high-quality information about diabetes and the prevention of type 2 diabetes, and provides resources to support education for people with, or at risk of, diabetes and their healthcare providers.

The organisation is associated with the Department of Public Information of the United Nations and is in official relations with the World Health Organization (WHO) and the Pan American Health Organization (PAHO).

Setting the scene

Over the past eight years, IDF has made significant progress in building the global political recognition for diabetes and other non-communicable diseases. The *United Nations Resolution 61/225* for World Diabetes Day[1], the *United Nations Political Declaration* adopted at the United Nations High-Level Meeting on Non-Communicable Diseases[2] and the United Nations Conference on Sustainable Development[3] all affirmed that diabetes and other non-communicable diseases are leading threats to development in the 21st century and need to be addressed at a global scale.

Sustainable Development Goals (SDGs)
In September 2015, after more than three years of intensive work, the United Nations Member States in New York adopted the post-2015 Development Agenda and the Sustainable Development Goals (SDGs) at the United Nations Summit. This included a standalone target on non-communicable diseases and a number of non-communicable disease-related targets within the goal on health. The framework will set the direction for international sustainable development over the next 15 years.

Diabetes and other non-communicable diseases were absent from the previous Millennium Development Goals (MDGs), and this has been an obstacle to establishing political priority and resources needed for diabetes and other non-communicable diseases.

Inclusion of diabetes and other non-communicable diseases within the post-2015 agenda puts more pressure on governments to translate commitments into actions and harness new resources needed to address all health challenges.

IDF campaigns and projects

World Diabetes Day

World Diabetes Day (WDD) occurs each year on the 14th November. It was established in 1991 by IDF and the WHO in response to growing concerns about the escalating health threat posed by diabetes. WDD became an official United Nations Day in 2006 with the passage of United Nation Resolution 61/225.

WDD is the world's largest diabetes awareness campaign, reaching a global audience of over one billion people in more than 160 countries. The campaign draws attention to issues of paramount importance to the diabetes world and keeps diabetes firmly in the public and political spotlight.

In 2015, WDD became a year-long campaign to reflect the realities of people living with diabetes. The campaign focuses on healthy eating as one of the key factors in managing type 1 diabetes and preventing type 2 diabetes.

www.worlddiabetesday.org

IDF call to action to G7 governments

During the G7 Summit 2015 in Germany, IDF launched a call to action for G7 countries to develop and implement cost-effective policy options aiming to improve the health outcomes of people with diabetes and prevent the development of new cases.

The call to action was submitted by IDF to all Prime Ministers, Ministers of Finances and Ministers of Health of all G7 nations. In several cases, the letter was delivered personally by national parliamentarians belonging to IDF's Parliamentarians for Diabetes Global Network.

www.idf.org/action-on-diabetes

Global Diabetes Scorecard

The Global Diabetes Scorecard has been developed by IDF to track the progress of national governments in improving diabetes care and prevention. The Scorecard is an advocacy tool designed to help improve public health accountability, highlights good practices and identifies areas for improvement.

The Scorecard offers a comprehensive picture of the response to diabetes by governments in 104 countries. It reflects the knowledge and views of IDF members in those nations and sets the baseline for future monitoring.

The Scorecard shows differing degrees of progress within and between regions and indicates that, although some progress is being made, there are also many areas that require significant work. While health systems and provision of treatment was an area of relative strength in most countries, only half of the countries surveyed reported having a national diabetes plan in 2013. Over 40% of governments had taken no action to protect the rights of people with diabetes and one quarter of countries reported a lack of preventive nutrition policies.

www.idf.org/global-diabetes-scorecard

IDF Storybook against discrimination

A collection of stories from people with diabetes was collated and produced by IDF, ('Storybook'), and this narrative was transformed into a powerful social media campaign. The stories came from IDF members and IDF's, Young Leaders in Diabetes. Their powerful testimonies not only reveal the discrimination and stigma faced by people with diabetes, but the crucial role that fundamental rights play in ensuring people with diabetes can live full and active lives. These stories build awareness around the issue and educate key influencers on diabetes and discrimination.

www.idf.org/diabetes-storybook

Prevention of type 2 diabetes

As the figures in the 2015 *IDF Diabetes Atlas* demonstrate, the world is facing an unprecedented and sustained increase in the prevalence of diabetes, most of which are cases of type 2 diabetes. IDF is responding to this challenge in many different ways. While there are a number of factors that influence the development of type 2 diabetes, it is evident that the most influential are lifestyle behaviours commonly associated with urbanisation. These include consumption of processed foods, for example foods with a high fat content, sugar-sweetened beverages and highly refined carbohydrates. At the same time, modern lifestyles are characterised by physical inactivity and long sedentary periods. Together these behaviours are associated with an increased risk of being overweight or obese and the development of type 2 diabetes.

A number of prevention programmes have shown that modifying such behaviours, by eating healthier foods and increasing physical activity, can greatly reduce the risk of developing type 2 diabetes. In recent years, IDF has supported a number of projects for primary prevention of diabetes within its BRIDGES programme of translational research. Preliminary data suggest that such lifestyle interventions are effective in preventing progression of diabetes in those at high risk, when implemented in real-life settings in low resource countries. IDF will continue to promote the adoption of diabetes prevention programmes into national health systems.

However, in order to meet the 2025 target of no increase in diabetes, much more needs to be done. Whole populations must change their lifestyle behaviours by modifying diet and increasing physical activity levels. To support this, IDF has reviewed the evidence[4-8] on which types of food predispose to type 2 diabetes and has released nine recommendations for a healthy diet for the general population.

These recommendations will also help people with diabetes to achieve stable control.

A particular threat in terms of the associated risk of developing diabetes is the consumption of high sugar foods, particularly sugar-sweetened beverages. In 2014, the WHO issued new recommendations to limit sugar intake. IDF fully supports these recommendations and in response published the *IDF Framework for Action on Sugar*.

Recommendations for a healthy diet for the general population

1. Choosing water, coffee or tea instead of fruit juice, soda, or other sugar sweetened beverages
2. Eating at least three servings of vegetables every day, including green leafy vegetables
3. Eating up to three servings of fresh fruit every day
4. Choosing nuts, a piece of fresh fruit, or unsweetened yoghurt for a snack
5. Limiting alcohol intake to a maximum of two standard drinks per day
6. Choosing lean cuts of white meat, poultry or seafood instead of red or processed meat
7. Choosing peanut butter instead of chocolate spread or jam
8. Choosing whole-grain bread, rice, or pasta instead of white bread, rice, or pasta
9. Choosing unsaturated fats (olive oil, canola oil, corn oil, or sunflower oil) instead of saturated fats (butter, ghee, animal fat, coconut oil or palm oil)

IDF Framework for Action on Sugar

Global sugar consumption has increased drastically over the past fifty years. Sugar is present in a variety of processed food, especially in sugar-sweetened beverages. A strong association between consumption of sugar in general, and sugar-sweetened beverages (including fruit juice) in particular, and increased risk of type 2 diabetes has been suggested by a number of recent studies. Low-income areas are especially vulnerable as local retailers predominantly stock processed food.

In response to the growing prevalence of obesity and related health issues, the WHO has produced guidelines that recommend the daily intake of free sugars in adults and children be less than 10% of total energy intake.

The WHO further states that a reduction to 5% may be more beneficial[6], which is supported by IDF as a way to help curb the rise in type 2 diabetes. The following measures are advocated by IDF[12]:

1. Introduction of clear, front pack labelling stating total sugar content, including all types of sugar and their alternative names
2. Ban on the sale of sugar-sweetened beverages and high sugar food to children and adolescents
3. Revision of guidelines to reduce consumption of foods with naturally high sugar contents (e.g. certain fruits and fruit juices)
4. Ban on sponsorship of sporting events by manufacturers of sugar-sweetened beverages and high sugar foods
5. Ban on selling sugar-sweetened beverages and high sugar foods in canteens and vending machines in schools and policies to restrict access in workplace
6. Obligation to make clean drinking water freely available in schools, work places and open public spaces
7. Government incentives (including taxes) to reduce consumption of sugar-sweetened beverages and high sugar foods
8. Government incentives to promote production of leafy vegetables and fruit in preference to sugar
9. Government incentives to increase availability and affordability of fresh fruit, vegetables and clean drinking water
10. A regulatory framework for reformulation of processed foods to reduce sugar content
11. Public health campaigns to educate people about the health risks associated with excess sugar intake
12. Further research to be undertaken to establish links between sugar intake and diabetes

www.idf.org/sugar

Diabetes Prevention Score

The European Connected Health Alliance is working with IDF to create a global network of Diabetes Aware Cities. As part of this challenge, IDF has developed the Diabetes Prevention Score. Cities around the world can score their diabetes prevention efforts across a variety of sectors.

This enables local authorities and city stakeholders to assess how their city is currently performing in areas linked to the prevention of type 2 diabetes.

Cities undertaking the Diabetes Prevention Score will be assessed on six key dimensions:

1. Suitability of outdoor environment for sport
2. Access to healthy food
3. Access to drinkable water
4. Education on healthy choices in schools
5. Implemented prevention policies
6. Accessible information on healthy choices

The score has been piloted during 2015; IDF aims to issue an invitation to cities to submit data to calculate their score during 2016. The aim is that this will provide tangible evidence of how a city can improve its urban environment to support the prevention of type 2 diabetes in its communities.

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IDF Guidelines – setting the global standard for care

Management of type 1 diabetes

The Global IDF & International Society for Pediatric and Adolescent Diabetes Guideline for Diabetes in Childhood and Adolescence.

Many national guidelines address one group of people with diabetes in the context of one healthcare system. In the global context, the funding and expertise available for healthcare varies between countries. This guideline is resource-sensitive and offers different recommendations for different levels of care.

This guideline aims to assist health providers and caregivers in managing children and adolescents with their diabetes in a prompt, consistent and standardised manner. It is also designed to improve awareness among various stakeholders of the serious long-term implications of poorly managed diabetes and the essential resources that are needed to provide quality diabetes care[8,13].
www.idf.org/guideline-diabetes-childhood

Kids and Diabetes in Schools

The Kids and Diabetes in Schools (KiDS) project is designed to support the rights of children with diabetes, to ensure school days are happy days and encourage healthy behaviour among school-aged children. It was co-designed by IDF and the International Society for Pediatric and Adolescent Diabetes. The aim of KiDS is to increase awareness of the needs of children with diabetes in schools, to ensure school staff are appropriately trained in supporting children with diabetes and to counter discrimination against them.

This is an educational programme designed for school staff, school students, and parents. The KiDS information pack is available in nine languages (Arabic, Chinese, English, French, Greek, Hindi, Portuguese, Russian and Spanish) from the IDF website. An app in eight languages is also available for tablet computers.
www.idf.org/education/kids

Management of type 2 diabetes

IDF Global Guideline for Type 2 Diabetes

There is now extensive evidence that good management improves the immediate and long-term quality of life of those with type 2 diabetes. Unfortunately many countries around the world do not have the resources that are needed to develop diabetes guidelines. Published national guidelines come from relatively resource-rich countries and may be of limited practical use in less well-resourced countries.

Many national guidelines address one group of people with diabetes in the context of one healthcare system. Globally, although every health system has somewhat limited resources, the funding available for healthcare varies widely between regions. The *IDF Global Guideline for Type 2 Diabetes* is resource-sensitive and offers different recommendations for different levels of care[14].
www.idf.org/guideline-type-2-diabetes

Older People with Type 2 Diabetes

The *Guideline for Managing Older People with Type 2 Diabetes* addresses the key issues supporting the highest quality of diabetes care for older people. This Guideline is unique as it has been developed to provide the clinician with practical recommendations that assist in clinical management of a wide range of older adults. It includes recommendations for older adults who are functionally dependent due to frailty or dementia.

The Guideline covers areas such as cardiovascular risk, education, renal impairment, sexual health, and diabetic foot disease. Also included is a section of 'special consideration' where issues of pain and end of life care are addressed[10,15].

www.idf.org/guidelines-older-people-type-2-diabetes

IDF *in Action*

Parliamentarians for Diabetes Global Network (PDGN)
The Parliamentarians for Diabetes Global Network (PDGN) seeks to promote parliamentary champions for diabetes and ensures diabetes is acted upon through national legislatures. Parliamentary Champions in cooperation with IDF members have a powerful role in mobilising their local communities and national parliaments.

www.idf.org/advocacy/pdgn

Young Leaders in Diabetes
IDF's Young Leaders in Diabetes (YLD) programme aims to enhance the lives of young people living with diabetes and create leaders within the diabetes community. The programme is committed to raising awareness of diabetes by being a powerful voice for prevention, education, access to quality care, improved quality of life and ultimately ending discrimination.

www.idf.org/youngleaders

Improving access to insulin

Life For A Child
Lack of access to insulin remains the most common cause of death in a child with diabetes. The estimated life expectancy of a child who has just developed diabetes could be less than a year in some areas. Many die without a diagnosis having been made, others through lack of insulin or expert care. In some countries, care is available but resources are limited and so complications frequently lead to morbidity and early death.

The Life For A Child Programme was set up in 2000 to provide sufficient insulin and syringes, blood glucose monitoring equipment, appropriate clinical care and diabetes education, together with technical support for health professionals. The Life For A Child Programme is currently helping over 17,000 children and young people living with diabetes in 46 countries.

www.idf.org/lifeforachild

Training of health professionals

The increasing global prevalence of chronic diseases is placing enormous and growing demands and responsibilities on health systems. Preparing the health workforce to respond to the associated challenges is a crucial issue; health professionals play a critical role in improving access to and the quality of healthcare for people with diabetes.

Diabetes Education Network for Health Professionals (D-NET).
The Diabetes Education Network for Health Professionals (D-NET) is the first international forum for health professionals aimed at enhancing diabetes education and management. This online platform offers the opportunity to connect with diabetes professionals worldwide and share, learn and discuss the latest developments in diabetes care and education.

D-NET was launched by IDF in 2010. Since then, D-NET has grown into an online network of more than 2,500 members. D-NET provides its members with regular discussions led by international experts, an interactive library and a global event calendar.

d-net.idf.org

IDF Reference Centres for Diabetes Education
An IDF Reference Centre for Diabetes Education is an institution or organisation that has been recognised by IDF for excellence in the provision of diabetes education to both heath professional and people with diabetes. The aim of the Reference Centres is to strengthen regional capacity to respond to the diabetes challenge, advance education programmes, and improve health systems.

www.idf.org/centres-education

Management of gestational diabetes

The Women in India with Gestational Diabetes Strategy

The Women in India with Gestational Diabetes Strategy is a context-adapted low-resource model of care to improve gestational diabetes screening and management. The project seeks to improve the health outcomes of women with gestational diabetes and their babies, as well as to strengthen the capacity of health facilities. The project has been piloted in India and demonstrated favourable outcomes for mothers and infants. During 2016, IDF will be seeking support to disseminate the model of care to other low-resource settings.

The strategy has been developed through a partnership between IDF and the Madras Diabetes Research Foundation.

Convening the community

IDF World Diabetes Congress

The IDF World Diabetes Congress (WDC) is one of the world's largest health-related congresses for the dissemination and promotion of leading scientific advances and knowledge on practical aspects related to diabetes research, care, education and advocacy. The congress is targeted at health professionals and participants include physicians, scientists, nurses and educators.

www.wdc2015.org

Support

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Becton Dickinson	**Landmark Group**	**Sanofi Diabetes**
Boehringer Ingelheim	**LifeScan**	**Takeda**
Bupa	**Lilly Diabetes**	**Timesulin**
Diasend	**Medtronic**	**UTi Pharma**
Eastman Kodak	**Merck**	

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Appendices and references

Country summary table: estimates for 2015

Country/territory	Diabetes (20-79) national prevalence (%) [uncertainty range]	Diabetes age-adjusted (20-79) comparative prevalence (%) [uncertainty range]	Adults with diabetes (20-79) in 1,000s [uncertainty range]
WORLD	**8.8 [7.19 - 11.36]**	**8.8 [7.17 - 11.33]**	**414 725.6 [339,377.73 - 535,877.94]**
AFRICA	**3.2 [2.14 - 6.66]**	**3.8 [2.58 - 7.88]**	**14 201.0 [9,451.13 - 29,381.26]**
Angola	3.3 [2.1 - 5.5]	4.1 [2.6 - 6.8]	345.3 [216.2 - 566.1]
Benin	0.6 [0.5 - 2.5]	0.8 [0.6 - 2.8]	32.6 [24.2 - 125.1]
Botswana	4.0 [2.1 - 6.7]	5.6 [2.8 - 8.9]	52.0 [27.4 - 87.4]
Burkina Faso	1.8 [1.2 - 3.9]	2.2 [1.5 - 4.9]	137.7 [94.0 - 304.4]
Burundi	2.3 [1.3 - 6.8]	2.7 [1.5 - 8.4]	116.5 [64.8 - 343.2]
Cabo Verde	1.9 [1.6 - 5.1]	2.3 [1.9 - 6.1]	5.8 [4.8 - 15.5]
Cameroon	**5.3 [4.4 - 6.4]**	**6.5 [5.4 - 7.9]**	**567.3 [472.2 - 694.0]**
Central African Republic	5.2 [4.4 - 6.4]	6.3 [5.2 - 7.6]	127.0 [105.6 - 155.6]
Chad	4.5 [3.8 - 5.5]	5.7 [4.7 - 6.9]	258.6 [215.2 - 316.3]
Comoros	**7.5 [5.3 - 11.2]**	**9.9 [6.8 - 14.9]**	**29.0 [20.4 - 43.2]**
Congo	6.0 [5.0 - 7.3]	6.9 [5.8 - 8.5]	128.8 [107.5 - 157.0]
Côte d'Ivoire	1.9 [1.5 - 4.8]	2.3 [1.8 - 5.8]	201.6 [157.0 - 504.3]
Democratic Republic of the Congo	5.3 [4.4 - 6.5]	6.4 [5.3 - 7.8]	1 762.9 [1,470.2 - 2,152.3]
Djibouti	7.4 [4.8 - 12.0]	8.4 [5.5 - 13.5]	37.3 [24.4 - 60.3]
Equatorial Guinea	7.0 [5.9 - 8.5]	7.7 [6.4 - 9.3]	29.9 [25.2 - 36.0]
Eritrea	3.0 [1.8 - 7.4]	3.6 [2.2 - 9.2]	74.2 [43.5 - 182.5]
Ethiopia	2.9 [1.7 - 7.6]	3.4 [2.0 - 8.9]	1 333.2 [768.5 - 3,497.8]
Gabon	6.8 [5.6 - 8.3]	7.8 [6.6 - 9.6]	60.5 [50.3 - 74.2]
Gambia	1.6 [1.5 - 4.7]	2.0 [1.9 - 6.0]	13.4 [13.0 - 39.8]
Ghana	1.9 [1.5 - 4.7]	2.3 [1.8 - 5.7]	266.2 [209.2 - 657.5]
Guinea	1.9 [1.3 - 4.3]	2.2 [1.6 - 5.1]	110.1 [78.6 - 252.7]
Guinea Bissau	1.9 [1.4 - 4.6]	2.2 [1.7 - 5.5]	16.8 [12.8 - 41.1]
Kenya	**2.2 [1.2 - 10.2]**	**2.4 [1.3 - 13.0]**	**478.0 [260.0 - 2,214.2]**
Lesotho	2.9 [1.8 - 5.0]	3.9 [2.5 - 6.4]	32.3 [19.5 - 54.6]

World and Regional estimates
Adult diabetes estimate based on oral glucose tolerance tests
Adult diabetes estimate based on HbA1c, fasting blood glucose, or self-report
Adult diabetes estimate based on extrapolation from similar country

Adults with undiagnosed diabetes (20-79) in 1,000s [uncertainty range]	Mean diabetes-related expenditure per person with diabetes (R=2, USD)	Mean diabetes-related expenditure per person with diabetes (R=2, International Dollars)	Diabetes related deaths (20-79)	Number of children with type 1 diabetes (0-14) in 1,000s
192 797.8	**1 622.1**	**1 917.3**	**4 960 535.8**	**541.9**
9 467.5	**242.8**	**466.4**	**321 120.4**	**46.4**
211.3 [112.0 - 293.3]	542.2	721.2	6 533.7	-
23.3 [12.5 - 64.8]	73.0	162.6	611.1	-
31.6 [14.2 - 45.3]	644.4	1 380.3	1 487.4	-
98.2 [48.7 - 157.7]	91.0	217.2	3 419.8	-
83.1 [33.6 - 177.8]	41.8	120.5	2 921.5	-
3.5 [2.5 - 8.0]	272.8	462.2	56.8	-
344.4 [244.7 - 359.6]	**123.0**	**253.4**	**14 998.1**	**-**
90.6 [54.7 - 80.6]	23.2	41.9	3 717.3	-
184.5 [111.5 - 163.9]	73.6	146.3	7 155.7	-
20.6 [10.6 - 22.4]	**87.4**	**152.2**	**318.7**	**-**
78.2 [55.7 - 81.4]	236.3	437.0	2 758.1	-
122.4 [81.3 - 261.3]	167.6	331.8	4 551.6	-
1 257.9 [761.9 - 1,115.3]	30.5	50.2	32 417.3	-
22.6 [12.6 - 31.3]	221.0	396.9	634.5	-
16.5 [13.1 - 18.6]	1 229.8	2 015.5	564.0	-
52.9 [22.6 - 94.6]	31.6	69.3	1 194.0	-
951.3 [398.2 - 1,812.5]	46.4	129.8	23 145.2	0.6
36.8 [26.1 - 38.5]	730.0	1 215.0	1 005.0	-
9.6 [6.7 - 20.6]	57.5	197.2	193.2	-
189.9 [108.4 - 340.7]	180.6	388.8	4 790.1	-
78.6 [40.7 - 131.0]	47.3	112.6	1 910.9	-
12.0 [6.7 - 21.3]	59.5	147.0	376.2	-
287.7 [134.7 - 1,147.4]	**82.4**	**187.7**	**8 722.5**	**-**
19.6 [10.1 - 28.3]	224.0	538.7	1 535.0	-

Country summary table: estimates for 2015

Country/territory	Diabetes (20-79) national prevalence (%) [uncertainty range]	Diabetes age-adjusted (20-79) comparative prevalence (%) [uncertainty range]	Adults with diabetes (20-79) in 1,000s [uncertainty range]
Liberia	1.9 [1.5 - 4.6]	2.3 [1.7 - 5.6]	40.2 [30.8 - 97.4]
Madagascar	3.3 [2.0 - 5.2]	4.0 [2.5 - 6.3]	372.0 [230.4 - 593.2]
Malawi	2.7 [1.6 - 4.6]	3.6 [2.3 - 5.7]	203.0 [120.7 - 340.7]
Mali	1.8 [1.3 - 4.2]	2.2 [1.6 - 5.2]	130.9 [94.4 - 305.2]
Mauritania	2.0 [1.6 - 5.0]	2.3 [1.9 - 5.9]	39.2 [31.7 - 100.1]
Mozambique	2.3 [1.4 - 4.5]	2.6 [1.6 - 5.4]	274.7 [166.7 - 541.8]
Namibia	3.5 [2.2 - 5.8]	4.2 [2.7 - 7.0]	45.3 [28.6 - 74.1]
Niger	1.9 [1.2 - 3.9]	2.2 [1.4 - 4.6]	148.0 [94.0 - 302.8]
Nigeria	1.9 [1.4 - 4.6]	2.3 [1.7 - 5.5]	1 564.7 [1,184.2 - 3,794.2]
Réunion	**18.2 [15.1 - 24.9]**	**15.8 [13.0 - 21.6]**	**103.8 [86.2 - 142.5]**
Rwanda	3.5 [2.1 - 7.9]	4.1 [2.5 - 9.6]	194.3 [117.8 - 439.4]
Sao Tome and Principe	1.8 [1.5 - 4.9]	2.3 [1.9 - 6.1]	1.6 [1.3 - 4.3]
Senegal	1.8 [1.3 - 4.3]	2.2 [1.7 - 5.4]	122.7 [90.9 - 297.5]
Seychelles	**17.4 [11.7 - 23.7]**	**17.4 [11.5 - 23.7]**	**11.4 [7.7 - 15.5]**
Sierra Leone	1.8 [1.3 - 4.2]	2.2 [1.6 - 5.2]	55.1 [39.9 - 127.5]
Somalia	4.4 [2.7 - 9.0]	5.1 [3.2 - 10.5]	198.0 [122.6 - 405.5]
South Africa	**7.0 [3.6 - 14.1]**	**7.6 [3.9 - 14.7]**	**2 286.0 [1,163.7 - 4,620.6]**
South Sudan	6.6 [4.9 - 8.5]	8.1 [6.0 - 10.3]	376.6 [282.0 - 490.6]
Swaziland	2.8 [1.7 - 4.8]	3.8 [2.4 - 6.1]	18.4 [11.2 - 31.2]
Togo	4.0 [1.3 - 6.3]	4.8 [1.6 - 7.6]	138.2 [44.2 - 217.0]
Uganda	2.5 [1.4 - 7.0]	3.1 [1.8 - 8.7]	400.6 [225.2 - 1,102.6]
United Republic of Tanzania	3.5 [2.3 - 8.7]	4.1 [2.6 - 10.1]	822.8 [527.9 - 2,033.2]
Western Sahara	2.3 [2.1 - 5.9]	2.4 [2.1 - 6.7]	8.8 [7.9 - 22.4]
Zambia	3.1 [1.9 - 5.2]	4.1 [2.6 - 6.7]	218.2 [132.9 - 361.8]
Zimbabwe	2.9 [1.7 - 4.7]	3.9 [2.5 - 6.2]	209.8 [123.5 - 345.4]

World and Regional estimates
Adult diabetes estimate based on oral glucose tolerance tests
Adult diabetes estimate based on HbA1c, fasting blood glucose, or self-report
Adult diabetes estimate based on extrapolation from similar country

Adults with undiagnosed diabetes (20-79) in 1,000s [uncertainty range]	Mean diabetes-related expenditure per person with diabetes (R=2, USD)	Mean diabetes-related expenditure per person with diabetes (R=2, International Dollars)	Diabetes related deaths (20-79)	Number of children with type 1 diabetes (0-14) in 1,000s
28.7 [16.0 - 50.5]	84.4	167.2	768.2	-
265.4 [119.4 - 307.4]	37.6	111.4	5 580.2	-
144.8 [62.5 - 176.6]	52.5	180.6	8 211.2	-
93.4 [48.9 - 158.1]	107.7	247.2	2 412.4	-
23.8 [16.4 - 51.9]	89.6	254.8	580.6	-
196.7 [86.4 - 280.8]	80.1	141.2	9 716.5	-
27.5 [14.8 - 38.4]	757.6	1 343.6	1 049.3	-
105.6 [48.7 - 156.9]	56.2	124.2	3 263.8	-
949.9 [613.7 - 1,966.1]	212.3	400.9	40 815.1	14.4
62.5 [44.7 - 73.8]	**-**	**-**	**-**	**-**
138.6 [61.1 - 227.7]	131.4	301.4	4 476.4	0.2
1.0 [0.7 - 2.2]	210.6	384.1	21.8	-
74.5 [47.1 - 154.2]	87.6	185.4	1 934.2	-
6.2 [4.0 - 8.1]	**658.5**	**1 119.5**	**121.0**	**-**
39.3 [20.7 - 66.1]	184.4	439.1	1 590.3	-
141.3 [63.5 - 210.1]	-	-	4 087.8	-
1 396.8 [603.0 - 2,394.4]	**918.9**	**1 736.1**	**57 318.6**	**-**
268.7 [146.1 - 254.2]	-	-	6 405.4	-
11.2 [5.8 - 16.2]	473.0	1 041.2	1 115.7	-
98.6 [22.9 - 112.4]	97.9	213.8	2 355.7	-
285.8 [116.7 - 571.4]	-	-	11 341.4	-
591.5 [273.6 - 1,053.6]	95.5	243.9	17 698.4	0.7
6.3 [4.1 - 11.6]	-	-		-
132.5 [68.9 - 187.5]	186.6	385.5	8 282.5	0.4
149.7 [64.0 - 179.0]	-	-	6 956.3	-

Country summary table: estimates for 2015

Country/territory	Diabetes (20-79) national prevalence (%) [uncertainty range]	Diabetes age-adjusted (20-79) comparative prevalence (%) [uncertainty range]	Adults with diabetes (20-79) in 1,000s [uncertainty range]
EUROPE	**9.1 [6.83 - 12.97]**	**7.3 [5.46 - 10.93]**	**59 800.9 [45,082.22 - 85,563.76]**
Albania	12.0 [10.5 - 13.6]	10.3 [9.0 - 11.8]	243.6 [213.2 - 275.6]
Andorra	11.9 [10.2 - 15.4]	8.5 [7.3 - 11.6]	6.2 [5.4 - 8.1]
Armenia	7.2 [4.8 - 13.4]	6.4 [4.3 - 12.3]	158.0 [106.2 - 294.8]
Austria	9.5 [8.1 - 10.8]	6.9 [5.9 - 8.0]	611.4 [518.9 - 697.9]
Azerbaijan	6.3 [4.3 - 11.8]	6.5 [4.4 - 12.2]	428.6 [291.8 - 801.8]
Belarus	6.5 [5.6 - 13.5]	5.3 [4.5 - 13.1]	467.6 [402.4 - 970.0]
Belgium	6.7 [5.9 - 8.5]	5.1 [4.4 - 6.4]	543.1 [481.2 - 688.4]
Bosnia and Herzegovina	12.3 [10.9 - 13.9]	9.9 [8.6 - 11.2]	363.6 [319.8 - 409.9]
Bulgaria	**8.4 [6.5 - 11.7]**	**5.9 [4.5 - 8.7]**	**459.2 [356.5 - 644.7]**
Channel Islands	5.7 [5.0 - 7.9]	4.3 [3.8 - 6.3]	7.1 [6.2 - 9.7]
Croatia	6.8 [5.3 - 14.4]	5.6 [4.4 - 11.0]	216.0 [168.1 - 454.3]
Cyprus	**10.4 [7.2 - 17.2]**	**9.6 [6.6 - 15.9]**	**89.7 [62.2 - 148.2]**
Czech Republic	9.9 [7.8 - 13.0]	7.4 [5.8 - 10.1]	799.3 [631.0 - 1,045.6]
Denmark	9.9 [8.5 - 11.1]	7.2 [6.3 - 8.1]	405.5 [350.2 - 455.0]
Estonia	6.0 [4.3 - 11.6]	4.4 [3.2 - 9.3]	59.0 [42.1 - 113.3]
Faroe Islands	7.4 [6.0 - 9.0]	5.5 [4.4 - 7.0]	2.6 [2.1 - 3.1]
Finland	**9.0 [6.7 - 11.0]**	**6.0 [4.3 - 7.8]**	**360.0 [270.4 - 442.4]**
France	7.4 [6.1 - 9.1]	5.3 [4.4 - 6.6]	3 304.3 [2,712.2 - 4,072.7]
Georgia	7.5 [5.0 - 13.9]	6.4 [4.3 - 12.1]	218.9 [146.5 - 405.2]
Germany	**10.6 [9.5 - 12.1]**	**7.4 [6.4 - 8.6]**	**6 537.2 [5,886.8 - 7,462.4]**
Greece	7.5 [6.1 - 15.8]	5.2 [4.2 - 12.2]	608.8 [495.1 - 1,285.7]
Hungary	9.3 [7.0 - 16.9]	7.3 [5.7 - 14.9]	694.7 [525.5 - 1,262.0]
Iceland	7.6 [5.7 - 9.5]	6.1 [4.5 - 7.9]	17.2 [12.9 - 21.6]
Ireland	5.3 [4.2 - 6.8]	4.4 [3.4 - 6.0]	171.8 [135.8 - 222.9]
Israel	8.5 [6.8 - 14.3]	7.5 [6.0 - 12.6]	420.2 [337.2 - 705.2]
Italy	**7.9 [7.1 - 9.2]**	**5.1 [4.6 - 6.2]**	**3 507.7 [3,185.8 - 4,103.3]**
Kazakhstan	6.2 [4.2 - 11.8]	6.4 [4.3 - 12.0]	717.5 [484.2 - 1,362.3]
Kyrgyzstan	5.2 [3.7 - 10.4]	6.3 [4.4 - 12.3]	180.2 [128.6 - 363.3]

World and Regional estimates
Adult diabetes estimate based on oral glucose tolerance tests
Adult diabetes estimate based on HbA1c, fasting blood glucose, or self-report
Adult diabetes estimate based on extrapolation from similar country

Adults with undiagnosed diabetes (20-79) in 1,000s [uncertainty range]	Mean diabetes-related expenditure per person with diabetes (R=2, USD)	Mean diabetes-related expenditure per person with diabetes (R=2, International Dollars)	Diabetes related deaths (20-79)	Number of children with type 1 diabetes (0-14) in 1,000s
23 523.4	**2 609.8**	**2 821.3**	**627 133.1**	**140.3**
105.7 [110.5 - 142.8]	304.0	684.3	2 908.0	-
2.4 [2.8 - 4.2]	3 156.3	3 573.9	44.5	-
68.6 [55.1 - 152.8]	195.6	433.2	2 178.2	0.2
230.8 [268.9 - 361.7]	6 080.5	5 472.6	4 499.3	1.5
186.0 [151.2 - 415.5]	601.5	1 319.6	5 033.1	-
203.0 [208.5 - 502.7]	583.0	1 361.9	7 699.9	0.5
205.1 [249.3 - 356.7]	6 114.6	5 434.4	4 269.3	1.9
157.8 [165.7 - 212.4]	520.4	1 076.6	3 501.5	0.3
199.0 [184.8 - 334.1]	**647.2**	**1 413.9**	**7 014.0**	**0.6**
2.7 [3.2 - 5.0]	-	-	-	-
81.7 [87.1 - 235.4]	1 146.6	1 771.5	2 068.9	0.7
33.8 [32.2 - 76.8]	**2 207.5**	**2 574.1**	**489.9**	**0.2**
301.8 [327.0 - 541.8]	1 552.1	2 250.1	7 908.0	2.0
154.8 [181.5 - 235.8]	7 272.4	5 280.6	3 645.4	1.5
22.3 [21.8 - 58.7]	1 288.6	1 746.8	770.0	0.3
1.0 [1.1 - 1.6]	-	-	-	-
138.9 [140.1 - 229.3]	**5 043.4**	**4 085.5**	**2 878.4**	**4.1**
1 246.9 [1,405.5 - 2,110.5]	5 781.7	5 151.7	26 371.6	10.1
95.0 [75.9 - 210.0]	414.7	826.1	2 799.6	0.2
2 498.2 [3,050.5 - 3,867.0]	**5 314.6**	**5 107.9**	**55 059.1**	**15.8**
229.3 [256.5 - 666.3]	2 425.4	2 839.5	4 936.3	1.3
259.8 [272.3 - 654.0]	1 208.0	2 104.2	9 139.8	1.8
6.5 [6.7 - 11.2]	5 259.1	4 647.5	105.1	0.1
64.8 [70.4 - 115.5]	5 732.4	5 237.1	1 187.5	1.8
158.6 [174.7 - 365.4]	3 546.9	3 214.2	2 805.9	2.0
1 324.3 [1,650.9 - 2,126.3]	**3 450.1**	**3 418.6**	**22 226.5**	**6.8**
311.4 [250.9 - 706.0]	834.9	1 473.1	10 610.3	-
97.4 [66.7 - 188.2]	139.7	355.1	2 560.3	-

Country summary table: estimates for 2015

Country/territory	Diabetes (20-79) national prevalence (%) [uncertainty range]	Diabetes age-adjusted (20-79) comparative prevalence (%) [uncertainty range]	Adults with diabetes (20-79) in 1,000s [uncertainty range]
Latvia	7.3 [5.8 - 9.1]	5.4 [4.2 - 7.0]	109.6 [87.4 - 136.6]
Liechtenstein	8.9 [8.1 - 9.8]	6.4 [5.7 - 7.1]	2.4 [2.2 - 2.7]
Lithuania	5.5 [4.8 - 7.7]	4.0 [3.5 - 5.8]	116.9 [104.0 - 165.5]
Luxembourg	5.7 [3.8 - 9.9]	4.7 [3.2 - 8.7]	23.7 [15.9 - 41.3]
Malta	13.9 [7.9 - 17.1]	9.9 [5.4 - 12.8]	44.1 [25.1 - 54.2]
Monaco	8.1 [6.7 - 9.7]	5.7 [4.7 - 6.9]	2.2 [1.9 - 2.7]
Montenegro	12.8 [11.2 - 14.5]	10.5 [9.2 - 12.0]	57.4 [50.2 - 64.9]
Netherlands	**7.9 [5.9 - 9.7]**	**5.5 [4.0 - 7.1]**	**973.5 [724.6 - 1,195.5]**
Norway	7.8 [5.9 - 9.7]	6.0 [4.5 - 7.7]	289.6 [221.0 - 359.9]
Poland	**7.6 [5.6 - 21.5]**	**6.2 [4.4 - 22.0]**	**2 229.9 [1,637.6 - 6,290.6]**
Portugal	**13.6 [10.2 - 17.0]**	**9.9 [7.1 - 13.3]**	**1 049.8 [788.1 - 1,311.8]**
Moldova	7.7 [6.7 - 11.0]	7.1 [6.1 - 10.4]	238.5 [206.6 - 339.5]
Romania	10.6 [6.0 - 15.6]	8.4 [4.5 - 13.7]	1 544.1 [883.5 - 2,284.3]
Russian Federation	**11.1 [5.7 - 15.7]**	**9.2 [4.7 - 13.3]**	**12 088.2 [6,235.4 - 17,026.9]**
San Marino	9.0 [7.8 - 10.4]	6.3 [5.3 - 7.5]	2.1 [1.8 - 2.5]
Serbia	13.2 [11.6 - 14.9]	10.3 [9.0 - 11.7]	863.8 [758.2 - 973.8]
Slovakia	9.9 [5.9 - 11.5]	7.8 [4.8 - 9.3]	409.2 [246.9 - 479.6]
Slovenia	10.7 [7.2 - 13.8]	7.8 [5.5 - 10.2]	168.2 [112.7 - 215.5]
Spain	**10.4 [8.2 - 14.7]**	**7.7 [6.1 - 11.3]**	**3 576.1 [2,815.7 - 5,045.8]**
Sweden	**6.3 [5.2 - 9.5]**	**4.7 [3.9 - 7.6]**	**446.9 [368.9 - 676.0]**
Switzerland	7.7 [7.4 - 9.8]	6.1 [5.7 - 7.6]	480.7 [461.7 - 607.4]
Tajikistan	4.5 [3.3 - 9.0]	6.4 [4.6 - 12.0]	207.7 [150.3 - 413.1]
Macedonia	12.0 [10.5 - 13.6]	10.3 [9.0 - 11.8]	185.6 [162.3 - 209.9]
Turkey	**12.5 [11.2 - 14.9]**	**12.8 [11.5 - 15.3]**	**6 339.0 [5,680.4 - 7,547.5]**
Turkmenistan	5.2 [3.5 - 10.0]	6.4 [4.4 - 12.0]	173.3 [118.2 - 335.6]
Ukraine	8.0 [5.3 - 15.1]	6.5 [4.3 - 12.6]	2 756.7 [1,819.9 - 5,204.4]
United Kingdom	**6.2 [5.4 - 8.5]**	**4.7 [4.1 - 6.9]**	**2 858.6 [2,499.3 - 3,940.1]**
Uzbekistan	**5.2 [3.4 - 10.4]**	**6.6 [4.2 - 12.5]**	**963.9 [624.0 - 1,906.7]**

World and Regional estimates
Adult diabetes estimate based on oral glucose tolerance tests
Adult diabetes estimate based on HbA1c, fasting blood glucose, or self-report
Adult diabetes estimate based on extrapolation from similar country

Adults with undiagnosed diabetes (20-79) in 1,000s [uncertainty range]	Mean diabetes-related expenditure per person with diabetes (R=2, USD)	Mean diabetes-related expenditure per person with diabetes (R=2, International Dollars)	Diabetes related deaths (20-79)	Number of children with type 1 diabetes (0-14) in 1,000s
41.4 [45.3 - 70.8]	1 027.8	1 540.4	1 305.5	0.1
0.9 [1.2 - 1.4]	-	-	15.0	-
44.1 [53.9 - 85.8]	1 168.1	1 909.9	1 740.5	0.4
9.0 [8.2 - 21.4]	10 082.9	8 235.2	169.9	0.1
16.6 [13.0 - 28.1]	2 173.6	2 882.7	326.5	0.1
0.8 [1.0 - 1.4]	7 940.8	6 953.7	14.8	-
24.9 [26.0 - 33.6]	-	-	682.4	0.1
367.5 [375.5 - 619.5]	**7 307.9**	**6 661.2**	**7 574.4**	**3.9**
109.3 [114.5 - 186.5]	11 851.1	7 694.9	1 952.1	1.9
847.5 [848.6 - 3,259.8]	**1 094.5**	**1 896.6**	**21 483.0**	**6.4**
397.9 [408.4 - 679.8]	**2 100.9**	**2 586.7**	**7 896.0**	**1.4**
103.5 [107.1 - 175.9]	342.7	720.5	3 659.2	-
670.2 [457.8 - 1,183.7]	579.1	1 135.7	18 919.9	1.6
4 563.7 [3,231.2 - 8,823.4]	**1 145.7**	**1 899.7**	**186 123.9**	**18.5**
0.8 [1.0 - 1.3]	4 262.0	4 107.6	14.9	-
375.0 [392.9 - 504.6]	551.3	1 146.1	10 615.7	1.2
153.6 [127.9 - 248.5]	1 766.9	2 608.3	5 042.7	0.7
63.5 [58.4 - 111.7]	2 316.6	2 884.0	1 487.0	0.3
1 336.7 [1,459.1 - 2,614.7]	**2 848.4**	**3 140.5**	**22 308.8**	**8.8**
168.7 [191.2 - 350.3]	**6 776.0**	**5 062.5**	**3 076.7**	**4.4**
181.5 [239.3 - 314.7]	10 862.0	7 244.1	2 691.1	1.1
90.1 [77.9 - 214.1]	122.2	296.0	2 390.9	-
80.6 [84.1 - 108.8]	386.3	938.3	2 034.1	0.2
2 731.0 [2,943.6 - 3,911.1]	**846.0**	**1 466.6**	**52 094.7**	**9.5**
75.2 [61.3 - 173.9]	245.9	431.0	2 831.4	-
1 196.6 [943.1 - 2,696.9]	355.7	781.2	42 919.6	3.4
1 068.9 [1,295.2 - 2,041.7]	**4 372.9**	**4 023.8**	**22 778.4**	**19.8**
416.2 [323.3 - 988.0]	**186.3**	**512.9**	**12 273.6**	**0.6**

Country summary table: estimates for 2015

Country/territory	Diabetes (20-79) national prevalence (%) [uncertainty range]	Diabetes age-adjusted (20-79) comparative prevalence (%) [uncertainty range]	Adults with diabetes (20-79) in 1,000s [uncertainty range]
MIDDLE EAST AND NORTH AFRICA	**9.1 [6.29 - 12.24]**	**10.7 [7.39 - 14.20]**	**35 381.2 [24,318.55 - 47,366.10]**
Afghanistan	6.6 [5.2 - 9.1]	8.8 [6.9 - 12.0]	935.8 [741.3 - 1,295.8]
Algeria	**6.8 [4.7 - 9.5]**	**7.5 [5.1 - 10.3]**	**1 679.5 [1,157.6 - 2,359.5]**
Bahrain	15.6 [14.3 - 17.3]	19.6 [17.9 - 21.6]	154.3 [141.6 - 170.4]
Egypt	14.9 [7.2 - 17.1]	16.7 [8.1 - 19.2]	7 809.7 [3,759.2 - 8,972.4]
Iran [Islamic Republic of]	8.5 [6.6 - 11.5]	10.1 [7.7 - 13.5]	4 602.2 [3,571.6 - 6,256.6]
Iraq	7.2 [4.9 - 9.5]	9.3 [6.6 - 12.0]	1 261.9 [857.5 - 1,665.0]
Jordan	**9.1 [7.5 - 15.6]**	**11.7 [9.8 - 19.1]**	**374.1 [307.6 - 641.3]**
Kuwait	14.3 [11.7 - 19.4]	20.0 [15.7 - 28.0]	399.9 [325.8 - 541.2]
Lebanon	12.2 [10.0 - 15.2]	13.0 [10.6 - 16.1]	464.2 [378.2 - 579.0]
Libya	9.2 [6.4 - 11.9]	10.4 [7.2 - 13.3]	354.0 [247.9 - 456.5]
Morocco	7.7 [6.0 - 11.5]	8.1 [6.3 - 12.1]	1 671.4 [1,291.3 - 2,495.5]
Oman	**9.9 [7.4 - 12.2]**	**14.8 [10.9 - 18.1]**	**325.9 [243.9 - 402.3]**
Pakistan	**6.9 [5.0 - 9.8]**	**8.1 [6.1 - 11.3]**	**7 028.1 [5,141.3 - 10,034.2]**
Qatar	13.5 [12.4 - 15.0]	20.0 [18.4 - 22.1]	239.1 [220.3 - 265.8]
Saudi Arabia	**17.6 [13.5 - 19.6]**	**20.0 [15.7 - 22.5]**	**3 487.3 [2,682.2 - 3,897.5]**
State of Palestine	**6.5 [3.6 - 13.8]**	**9.4 [5.1 - 19.3]**	**146.7 [81.6 - 309.1]**
Sudan	**7.7 [4.2 - 15.6]**	**8.9 [5.0 - 17.6]**	**1 490.4 [815.4 - 3,030.4]**
Syrian Arab Republic	7.0 [5.7 - 9.3]	8.1 [6.5 - 10.7]	652.8 [530.0 - 867.9]
Tunisia	9.5 [6.3 - 13.4]	9.6 [6.4 - 13.6]	725.9 [477.0 - 1,023.1]
United Arab Emirates	**14.6 [13.0 - 17.1]**	**19.3 [16.9 - 22.4]**	**1 086.3 [966.3 - 1,270.5]**
Yemen	3.8 [3.0 - 6.4]	5.1 [3.9 - 8.8]	491.8 [381.3 - 831.9]

World and Regional estimates
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Adult diabetes estimate based on extrapolation from similar country

Adults with undiagnosed diabetes (20-79) in 1,000s [uncertainty range]	Mean diabetes-related expenditure per person with diabetes (R=2, USD)	Mean diabetes-related expenditure per person with diabetes (R=2, International Dollars)	Diabetes related deaths (20-79)	Number of children with type 1 diabetes (0-14) in 1,000s
14 377.6	**483.0**	**1 133.2**	**341 891.1**	**60.7**
484.9 [384.2 - 671.5]	106.2	311.4	19 698.0	-
693.8 [599.8 - 1,222.7]	**468.1**	**1 161.7**	**14 067.7**	**4.9**
54.8 [73.4 - 88.3]	1 473.5	2 623.6	782.4	-
3 217.8 [1,948.0 - 4,649.5]	218.8	779.8	78 184.3	5.8
1 881.1 [1,850.8 - 3,242.2]	636.0	2 081.2	37 075.4	3.1
519.6 [444.3 - 862.8]	549.6	1 251.6	16 893.4	-
153.6 [159.4 - 332.3]	**563.1**	**1 275.5**	**3 075.7**	**0.5**
140.6 [168.8 - 280.5]	2 040.0	3 213.9	1 142.4	2.0
191.1 [196.0 - 300.0]	870.2	1 505.0	5 723.8	-
145.8 [128.5 - 236.6]	672.3	1 187.3	2 699.8	0.8
688.2 [669.2 - 1,293.2]	281.0	650.8	9 473.8	-
116.8 [126.4 - 208.5]	**1 003.3**	**1 178.1**	**1 235.9**	**0.1**
2 927.7 [2,664.2 - 5,199.7]	**61.5**	**210.5**	**86 364.8**	**1.6**
84.9 [114.2 - 137.8]	2 868.1	4 046.5	553.3	0.2
1 244.3 [1,389.9 - 2,019.7]	**1 145.3**	**2 382.6**	**23 420.8**	**16.1**
59.5 [42.3 - 160.2]	**-**	**-**	**-**	**-**
613.6 [422.5 - 1,570.3]	**199.1**	**383.5**	**22 371.1**	**10.2**
268.8 [274.6 - 449.7]	76.4	301.8	7 002.0	-
302.8 [247.2 - 530.2]	431.6	1 105.9	5 092.8	1.0
387.2 [500.7 - 658.4]	**2 155.9**	**3 068.8**	**1 384.8**	**-**
200.6 [197.6 - 431.1]	141.5	380.3	5 648.8	-

Country summary table: estimates for 2015

Country/territory	Diabetes (20-79) national prevalence (%) [uncertainty range]	Diabetes age-adjusted (20-79) comparative prevalence (%) [uncertainty range]	Adults with diabetes (20-79) in 1,000s [uncertainty range]
NORTH AMERICA AND CARIBBEAN	**12.9 [10.77 - 14.51]**	**11.5 [9.53 - 13.04]**	**44 303.6 [37,059.65 - 49,948.36]**
Anguilla	14.0 [11.1 - 17.4]	13.6 [10.7 - 17.0]	1.3 [1.0 - 1.6]
Antigua and Barbuda	13.7 [12.2 - 16.1]	13.6 [12.0 - 16.0]	8.3 [7.3 - 9.7]
Aruba	14.3 [11.8 - 17.7]	11.7 [9.5 - 15.1]	10.7 [8.9 - 13.3]
Bahamas	13.3 [11.3 - 15.9]	13.2 [11.2 - 15.8]	36.0 [30.7 - 43.0]
Barbados	17.0 [14.4 - 20.4]	13.6 [11.4 - 16.8]	34.1 [29.0 - 41.0]
Belize	**14.2 [12.4 - 16.4]**	**16.5 [14.5 - 19.0]**	**28.7 [24.9 - 33.1]**
Bermuda	15.1 [12.8 - 17.8]	13.1 [10.9 - 15.7]	6.7 [5.7 - 7.8]
British Virgin Islands	14.7 [9.5 - 19.0]	14.5 [9.3 - 18.8]	2.8 [1.8 - 3.7]
Canada	9.5 [9.0 - 13.1]	7.4 [7.0 - 10.8]	2 512.0 [2,399.8 - 3,479.5]
Cayman Islands	13.4 [11.2 - 16.0]	13.1 [10.9 - 15.7]	5.2 [4.3 - 6.2]
Curaçao	16.3 [13.3 - 19.7]	13.3 [10.5 - 16.7]	18.3 [14.9 - 22.1]
Dominica	12.9 [10.4 - 16.3]	12.6 [10.1 - 16.0]	6.0 [4.8 - 7.6]
Grenada	10.3 [8.3 - 13.6]	11.4 [9.3 - 14.8]	6.9 [5.6 - 9.1]
Guadeloupe	16.6 [13.6 - 20.0]	13.6 [10.7 - 17.0]	52.2 [42.7 - 62.9]
Guyana	11.2 [9.3 - 14.5]	11.2 [9.2 - 14.6]	49.8 [41.4 - 64.7]
Haiti	**5.6 [3.8 - 16.7]**	**6.9 [4.7 - 19.3]**	**332.2 [222.9 - 984.6]**
Jamaica	11.3 [9.0 - 14.2]	11.5 [9.2 - 14.5]	202.6 [160.7 - 255.0]
Martinique	17.6 [14.6 - 21.1]	13.3 [10.5 - 16.6]	49.8 [41.1 - 59.5]
Mexico	**14.7 [7.9 - 17.6]**	**15.8 [8.6 - 18.9]**	**11 463.8 [6,174.5 - 13,710.1]**
Montserrat	14.0 [12.5 - 16.4]	13.6 [12.2 - 15.9]	0.5 [0.4 - 0.5]
Saint Kitts and Nevis	13.4 [9.8 - 18.4]	13.0 [9.5 - 17.9]	4.8 [3.5 - 6.6]
Saint Lucia	10.9 [9.0 - 14.3]	10.9 [9.0 - 14.2]	13.3 [11.0 - 17.4]
Saint Vincent and the Grenadines	11.7 [9.5 - 15.1]	11.9 [9.6 - 15.3]	8.3 [6.7 - 10.7]
Sint Maarten [Dutch part]	13.4 [11.2 - 16.0]	13.1 [10.9 - 15.7]	3.3 [2.8 - 4.0]
Suriname	12.2 [9.8 - 15.6]	12.5 [10.0 - 15.9]	41.9 [33.7 - 53.4]
Trinidad and Tobago	14.5 [13.0 - 16.8]	13.6 [12.2 - 15.9]	140.3 [125.6 - 162.8]
United States of America	**12.8 [12.1 - 13.5]**	**10.8 [10.2 - 11.3]**	**29 251.6 [27,643.7 - 30,864.4]**
United States Virgin Islands	**16.3 [13.7 - 19.0]**	**12.3 [10.2 - 14.4]**	**12.2 [10.2 - 14.1]**

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Adults with undiagnosed diabetes (20-79) in 1,000s [uncertainty range]	Mean diabetes-related expenditure per person with diabetes (R=2, USD)	Mean diabetes-related expenditure per person with diabetes (R=2, International Dollars)	Diabetes related deaths (20-79)	Number of children with type 1 diabetes (0-14) in 1,000s
13 253.2	**7 858.7**	**7 941.2**	**324 067.9**	**107.3**
0.4 [0.5 - 0.8]	-	-	-	-
2.3 [3.8 - 5.0]	901.1	1 382.0	95.0	0.0
3.0 [4.6 - 6.9]	-	-	-	-
10.1 [15.9 - 22.3]	2 129.3	2 218.1	334.5	0.1
9.6 [15.0 - 21.2]	1 162.1	1 223.3	290.8	0.0
9.7 [12.9 - 17.1]	**406.9**	**710.7**	**290.2**	**-**
1.9 [2.9 - 4.1]	-	-	-	-
1.0 [1.0 - 1.9]	-	-	-	-
705.5 [1,243.6 - 1,803.1]	6 824.4	5 680.2	15 685.5	9.2
1.4 [2.2 - 3.2]	-	-	-	-
5.1 [7.7 - 11.5]	-	-	-	-
2.0 [2.5 - 3.9]	564.6	808.0	52.4	0.0
2.3 [2.9 - 4.7]	729.0	1 063.0	98.3	-
17.6 [22.1 - 32.6]	-	-	-	-
16.8 [21.5 - 33.5]	394.9	672.6	867.7	-
146.7 [115.5 - 510.2]	**131.4**	**275.1**	**6 310.6**	**-**
67.7 [83.3 - 132.1]	419.9	705.7	1 952.1	-
14.0 [21.3 - 30.8]	-	-	-	-
3 884.6 [3,199.6 - 7,104.6]	**911.3**	**1 455.6**	**76 298.8**	**13.5**
0.1 [0.2 - 0.3]	-	-	-	-
1.3 [1.8 - 3.4]	1 174.2	1 792.6	60.8	-
4.5 [5.7 - 9.0]	855.0	1 235.1	117.1	-
2.8 [3.5 - 5.5]	486.0	781.9	99.1	-
0.9 [1.5 - 2.1]	-	-	-	-
14.1 [17.5 - 27.7]	635.7	1 063.4	507.9	-
39.4 [65.1 - 84.3]	1 263.2	2 110.4	1 593.7	-
8 284.6 [14,325.0 - 15,993.9]	**10 941.7**	**10 941.7**	**219 413.2**	**84.1**
3.4 [5.3 - 7.3]	**-**	**-**	**-**	**0.0**

Country summary table: estimates for 2015

Country/territory	Diabetes (20-79) national prevalence (%) [uncertainty range]	Diabetes age-adjusted (20-79) comparative prevalence (%) [uncertainty range]	Adults with diabetes (20-79) in 1,000s [uncertainty range]
SOUTH AND CENTRAL AMERICA	**9.4 [8.00 - 11.26]**	**9.6 [8.18 - 11.51]**	**29 573.4 [25,232.02 - 35,525.11]**
Argentina	**6.2 [4.6 - 9.0]**	**6.0 [4.5 - 8.6]**	**1 723.9 [1,292.0 - 2,502.1]**
Bolivia [Plurinational State of]	**6.5 [5.4 - 10.3]**	**7.5 [6.2 - 11.6]**	**389.0 [322.3 - 620.2]**
Brazil	**10.2 [9.3 - 11.3]**	**10.4 [9.4 - 11.5]**	**14 250.8 [12,910.8 - 15,752.4]**
Chile	11.0 [9.3 - 13.6]	10.0 [8.5 - 12.5]	1 372.7 [1,166.3 - 1,697.0]
Colombia	9.6 [8.6 - 10.7]	10.0 [8.9 - 11.1]	3 048.7 [2,722.4 - 3,395.9]
Costa Rica	8.6 [7.0 - 10.2]	8.5 [6.9 - 10.2]	278.9 [228.3 - 332.4]
Cuba	12.1 [10.8 - 13.5]	10.0 [8.9 - 11.1]	1 020.0 [913.1 - 1,135.8]
Dominican Republic	8.1 [5.3 - 10.8]	8.8 [5.8 - 11.6]	505.7 [330.4 - 672.2]
Ecuador	8.5 [6.6 - 11.7]	9.2 [7.1 - 12.5]	830.1 [639.2 - 1,136.2]
El Salvador	8.8 [6.7 - 12.0]	9.2 [7.2 - 12.5]	325.9 [250.6 - 446.6]
French Guiana	9.2 [8.3 - 10.3]	10.1 [9.0 - 11.2]	13.9 [12.5 - 15.4]
Guatemala	**9.1 [5.4 - 13.5]**	**11.1 [6.8 - 16.2]**	**761.5 [450.0 - 1,130.6]**
Honduras	7.4 [5.6 - 10.3]	9.2 [7.1 - 12.5]	334.5 [254.2 - 464.5]
Nicaragua	7.7 [5.9 - 10.6]	9.2 [7.1 - 12.5]	275.9 [210.4 - 380.9]
Panama	9.4 [8.3 - 10.6]	9.8 [8.7 - 11.0]	230.6 [204.2 - 258.4]
Paraguay	8.4 [7.3 - 9.4]	9.7 [8.5 - 10.9]	324.1 [284.1 - 365.7]
Peru	6.4 [4.5 - 10.0]	6.9 [4.9 - 10.8]	1 231.2 [868.4 - 1,934.8]
Puerto Rico	14.2 [11.7 - 17.0]	12.1 [9.9 - 14.6]	365.1 [301.6 - 438.1]
Uruguay	6.9 [5.2 - 11.3]	6.1 [4.6 - 9.9]	157.6 [118.6 - 258.3]
Venezuela [Bolivarian Republic of]	11.1 [9.1 - 13.5]	12.0 [9.9 - 14.5]	2 133.4 [1,752.8 - 2,587.6]

World and Regional estimates
Adult diabetes estimate based on oral glucose tolerance tests
Adult diabetes estimate based on HbA1c, fasting blood glucose, or self-report
Adult diabetes estimate based on extrapolation from similar country

Adults with undiagnosed diabetes (20-79) in 1,000s [uncertainty range]	Mean diabetes-related expenditure per person with diabetes (R=2, USD)	Mean diabetes-related expenditure per person with diabetes (R=2, International Dollars)	Diabetes related deaths (20-79)	Number of children with type 1 diabetes (0-14) in 1,000s
11 531.9	**1 169.3**	**1 693.5**	**247 494.6**	**45.1**
592.6 [669.5 - 1,296.6]	**1 549.5**	**2 488.0**	**16 291.2**	**4.6**
154.9 [167.0 - 321.4]	**281.0**	**600.5**	**4 649.6**	**-**
5 724.4 [6,690.4 - 8,162.9]	**1 527.4**	**2 047.5**	**130 712.1**	**30.9**
470.8 [604.4 - 879.4]	1 557.7	2 170.7	8 464.2	1.4
1 220.3 [1,410.8 - 1,759.8]	772.9	1 221.9	19 802.1	1.0
111.7 [118.3 - 172.3]	1 420.6	1 935.0	1 571.1	-
408.3 [473.1 - 588.6]	722.4	2 189.2	7 954.8	0.3
202.4 [171.2 - 348.3]	490.4	984.4	6 014.9	0.1
332.3 [331.2 - 588.8]	647.5	1 185.1	7 284.2	-
130.5 [129.9 - 231.4]	392.8	796.9	2 930.4	-
5.6 [6.5 - 8.0]	-	-	-	-
305.9 [233.2 - 585.9]	**365.7**	**767.1**	**8 043.7**	**-**
133.9 [131.7 - 240.7]	325.9	664.3	2 276.6	-
110.4 [109.0 - 197.4]	241.4	596.1	2 423.3	-
92.3 [105.8 - 133.9]	1 102.6	1 102.6	1 546.6	-
129.7 [147.2 - 189.5]	574.6	1 053.7	3 089.5	0.1
492.8 [450.0 - 1,002.6]	540.1	954.7	7 768.8	0.3
125.5 [156.3 - 227.0]	-	-	-	0.7
54.2 [61.5 - 133.8]	1 889.6	2 263.9	1 115.3	0.4
733.4 [908.3 - 1,340.9]	766.2	967.0	15 555.9	0.1

Country summary table: estimates for 2015

Country/territory	Diabetes (20-79) national prevalence (%) [uncertainty range]	Diabetes age-adjusted (20-79) comparative prevalence (%) [uncertainty range]	Adults with diabetes (20-79) in 1,000s [uncertainty range]
SOUTH EAST ASIA	**8.5 [6.79 - 10.84]**	**9.1 [7.34 - 11.63]**	**78 290.7 [62,914.62 - 100,411.78]**
Bangladesh	7.4 [5.5 - 12.5]	8.3 [6.3 - 13.8]	7 138.9 [5,319.3 - 12,009.6]
Bhutan	7.9 [7.0 - 9.3]	9.3 [8.4 - 10.8]	38.4 [34.2 - 45.3]
India	**8.7 [7.0 - 10.6]**	**9.3 [7.6 - 11.4]**	**69 188.6 [56,168.5 - 84,819.5]**
Maldives	7.5 [6.1 - 9.9]	9.2 [7.3 - 12.0]	17.1 [13.8 - 22.6]
Mauritius	**24.3 [21.1 - 28.0]**	**22.3 [19.2 - 25.9]**	**220.0 [191.3 - 253.7]**
Nepal	**3.3 [2.3 - 9.5]**	**3.7 [2.5 - 9.9]**	**526.0 [356.9 - 1,498.0]**
Sri Lanka	**8.5 [6.1 - 12.9]**	**8.0 [5.7 - 12.2]**	**1 161.7 [830.5 - 1,763.0]**
WESTERN PACIFIC	**9.3 [8.23 - 11.42]**	**8.8 [7.72 - 10.84]**	**153 174.8 [135,319.54 - 187,681.58]**
Australia	**6.3 [4.9 - 7.6]**	**5.1 [4.0 - 6.1]**	**1 079.6 [840.7 - 1,301.4]**
Brunei Darussalam	12.9 [10.6 - 15.8]	13.7 [11.2 - 16.8]	37.0 [30.4 - 45.4]
Cambodia	2.6 [2.5 - 2.8]	3.0 [2.9 - 3.4]	230.8 [221.0 - 252.3]
China	**10.6 [9.6 - 12.9]**	**9.8 [8.9 - 12.1]**	**109 649.1 [99,641.2 - 133,417.4]**
China, Hong Kong SAR	**10.2 [9.0 - 12.0]**	**8.0 [7.0 - 9.6]**	**582.5 [515.8 - 686.5]**
China, Macao SAR	8.5 [7.5 - 10.1]	8.0 [7.0 - 9.6]	39.9 [35.3 - 47.5]
Cook Islands	21.1 [12.7 - 26.7]	21.5 [12.8 - 27.2]	2.6 [1.6 - 3.3]
Dem. People's Republic of Korea	4.7 [4.5 - 5.2]	4.4 [4.2 - 4.8]	817.9 [783.8 - 906.9]
Fiji	13.4 [8.9 - 19.7]	13.8 [9.2 - 20.3]	74.0 [49.3 - 108.9]
French Polynesia	19.6 [16.4 - 23.0]	19.4 [16.3 - 22.8]	37.7 [31.6 - 44.3]
Guam	19.7 [15.7 - 24.9]	18.7 [14.9 - 23.9]	21.5 [17.2 - 27.2]
Indonesia	**6.2 [5.4 - 6.7]**	**6.5 [5.7 - 7.1]**	**10 021.4 [8,736.6 - 10,882.8]**
Japan	7.6 [6.5 - 10.1]	5.7 [4.7 - 8.7]	7 202.2 [6,105.2 - 9,555.9]
Kiribati	16.3 [12.1 - 21.2]	18.6 [13.6 - 24.1]	9.9 [7.3 - 12.9]
Lao People's Democratic Republic	2.9 [2.8 - 3.2]	3.6 [3.5 - 4.0]	106.4 [101.8 - 116.5]
Malaysia	**16.6 [14.9 - 19.1]**	**17.9 [16.2 - 20.5]**	**3 303.0 [2,969.0 - 3,801.9]**
Marshall Islands	21.1 [15.1 - 26.7]	21.3 [15.0 - 27.0]	6.7 [4.8 - 8.4]
Micronesia [Fed. States of]	13.6 [10.4 - 18.5]	16.3 [12.4 - 21.7]	7.5 [5.7 - 10.2]
Mongolia	**5.1 [1.7 - 9.2]**	**5.4 [1.9 - 9.6]**	**96.0 [31.1 - 171.6]**

World and Regional estimates
Adult diabetes estimate based on oral glucose tolerance tests
Adult diabetes estimate based on HbA1c, fasting blood glucose, or self-report
Adult diabetes estimate based on extrapolation from similar country

Adults with undiagnosed diabetes (20-79) in 1,000s [uncertainty range]	Mean diabetes-related expenditure per person with diabetes (R=2, USD)	Mean diabetes-related expenditure per person with diabetes (R=2, International Dollars)	Diabetes related deaths (20-79)	Number of children with type 1 diabetes (0-14) in 1,000s
40 814.6	**92.9**	**318.5**	**1 188 464.8**	**81.4**
3 689.8 [2,756.5 - 6,223.4]	51.0	153.6	129 312.9	-
19.8 [17.7 - 23.5]	141.1	433.3	176.8	-
36 061.1 [29,106.5 - 43,953.5]	**94.9**	**331.9**	**1 027 911.6**	**70.2**
8.8 [7.2 - 11.7]	1 135.3	1 984.5	112.2	0.0
113.1 [99.1 - 131.5]	**500.2**	**934.3**	**2 932.1**	**0.0**
326.7 [185.0 - 776.3]	**68.5**	**236.2**	**11 700.5**	**-**
595.2 [430.3 - 913.6]	**144.6**	**429.2**	**16 318.7**	**-**
79 829.7	**692.6**	**998.0**	**1 910 363.9**	**60.7**
493.9 [435.6 - 674.4]	**7 652.1**	**5 249.0**	**6 342.3**	**6.3**
17.2 [15.7 - 23.5]	1 329.0	2 473.0	282.1	-
145.1 [114.5 - 130.7]	134.5	406.0	5 432.3	-
57 813.6 [51,634.1 - 69,136.9]	**466.0**	**820.1**	**1 299 670.8**	**30.5**
273.5 [267.3 - 355.7]	**-**	**-**	**-**	**0.1**
18.6 [18.3 - 24.6]	-	-	-	-
1.2 [0.8 - 1.7]	685.1	669.8	9.7	-
514.2 [406.2 - 470.0]	-	-	19 466.3	-
38.6 [25.5 - 56.4]	270.9	471.2	1 203.2	0.0
17.6 [16.4 - 23.0]	-	-	-	-
10.0 [8.9 - 14.1]	-	-	-	-
5 286.2 [4,527.3 - 5,639.5]	**171.1**	**470.6**	**184 985.4**	**-**
3 353.8 [3,163.7 - 4,951.8]	4 084.5	3 853.6	61 076.0	2.5
5.2 [3.8 - 6.7]	248.7	279.1	113.6	-
66.9 [52.8 - 60.3]	59.7	175.2	2 764.4	-
1 716.2 [1,538.5 - 1,970.2]	**565.8**	**1 253.8**	**34 576.1**	**-**
3.5 [2.5 - 4.4]	832.6	928.5	169.1	-
3.9 [3.0 - 5.3]	640.9	704.7	103.3	-
50.3 [16.1 - 88.9]	**368.7**	**857.6**	**2 254.4**	**-**

Country summary table: estimates for 2015

Country/territory	Diabetes (20-79) national prevalence (%) [uncertainty range]	Diabetes age-adjusted (20-79) comparative prevalence (%) [uncertainty range]	Adults with diabetes (20-79) in 1,000s [uncertainty range]
Myanmar	**6.5 [4.9 - 9.2]**	**6.8 [5.1 - 9.6]**	**2 172.9 [1,661.8 - 3,085.6]**
Nauru	23.8 [16.5 - 29.4]	24.1 [16.5 - 29.9]	1.4 [1.0 - 1.8]
New Caledonia	20.3 [18.2 - 23.0]	19.6 [17.6 - 22.1]	36.5 [32.6 - 41.2]
New Zealand	9.1 [7.6 - 10.8]	7.3 [6.2 - 8.8]	285.9 [239.3 - 340.1]
Niue	14.7 [8.3 - 23.7]	14.9 [8.4 - 24.0]	0.1 [0.1 - 0.2]
Palau	20.8 [10.7 - 35.6]	20.9 [10.5 - 35.9]	2.6 [1.4 - 4.5]
Papua New Guinea	12.9 [10.1 - 17.6]	15.3 [11.9 - 20.7]	507.9 [400.0 - 694.0]
Philippines	**6.1 [4.7 - 7.9]**	**6.9 [5.3 - 8.9]**	**3 506.5 [2,702.3 - 4,584.6]**
Republic of Korea	8.7 [6.9 - 11.2]	7.2 [5.6 - 9.5]	3 369.0 [2,666.9 - 4,334.7]
Samoa	**7.2 [5.2 - 16.9]**	**7.9 [5.6 - 17.9]**	**7.1 [5.2 - 16.6]**
Singapore	**12.8 [11.0 - 14.5]**	**10.5 [9.0 - 12.1]**	**541.6 [466.4 - 613.3]**
Solomon Islands	13.6 [8.7 - 20.0]	16.4 [10.3 - 23.9]	39.2 [25.1 - 57.4]
Taiwan	10.0 [7.8 - 12.9]	8.4 [6.5 - 11.0]	1 781.1 [1,386.6 - 2,293.8]
Thailand	8.0 [5.9 - 9.3]	7.1 [5.3 - 8.2]	4 025.1 [2,965.6 - 4,633.2]
Timor-Leste	6.3 [5.8 - 6.9]	7.2 [6.6 - 7.9]	34.5 [31.8 - 38.0]
Tokelau	29.7 [8.3 - 37.7]	30.0 [8.4 - 38.3]	0.2 [0.1 - 0.3]
Tonga	**12.6 [10.2 - 19.8]**	**13.7 [11.1 - 21.3]**	**6.8 [5.5 - 10.7]**
Tuvalu	17.0 [9.1 - 28.3]	17.3 [9.2 - 28.8]	1.0 [0.5 - 1.7]
Vanuatu	14.4 [11.0 - 19.4]	16.6 [12.6 - 22.1]	20.3 [15.4 - 27.3]
Viet Nam	**5.6 [4.1 - 8.7]**	**6.0 [4.4 - 9.4]**	**3 509.1 [2,582.5 - 5,501.2]**

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Adults with undiagnosed diabetes (20-79) in 1,000s [uncertainty range]	Mean diabetes-related expenditure per person with diabetes (R=2, USD)	Mean diabetes-related expenditure per person with diabetes (R=2, International Dollars)	Diabetes related deaths (20-79)	Number of children with type 1 diabetes (0-14) in 1,000s
1 134.6 [861.2 - 1,599.0]	**23.0**	**58.6**	**63 044.6**	**-**
0.8 [0.5 - 0.9]	918.1	828.3	21.9	-
17.0 [16.9 - 21.4]	-	-	-	-
132.2 [124.0 - 176.2]	4 961.7	4 158.1	1 778.2	1.0
0.1 [0.0 - 0.1]	1 792.5	1 362.3	0.7	-
1.4 [0.7 - 2.3]	1 300.6	1 663.5	25.2	-
265.2 [207.3 - 359.6]	117.9	143.3	9 176.8	0.0
1 840.6 [1,400.3 - 2,375.8]	**204.2**	**482.6**	**51 127.3**	**-**
1 559.0 [1,382.0 - 2,246.2]	2 294.2	2 926.8	31 898.3	0.4
3.7 [2.7 - 8.6]	**471.8**	**661.4**	**152.4**	**-**
253.8 [241.7 - 317.8]	**2 932.9**	**4 185.1**	**3 815.3**	**0.2**
20.4 [13.0 - 29.8]	160.1	169.6	457.2	-
828.3 [718.6 - 1,188.7]	-	-	-	1.3
2 077.9 [1,536.8 - 2,400.9]	350.7	873.2	75 994.5	0.4
18.0 [16.5 - 19.7]	112.1	183.0	587.7	-
0.1 [0.0 - 0.1]	-	-	-	-
3.6 [2.9 - 5.6]	**315.5**	**387.4**	**103.1**	**-**
0.5 [0.3 - 0.9]	951.0	890.9	15.5	-
10.6 [8.0 - 14.1]	189.3	177.0	258.5	-
1 832.4 [1,338.3 - 2,850.7]	**162.7**	**451.1**	**53 457.8**	**-**

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Abbreviations and acronyms

A **AFR**
Africa

C **CVD**
Cardiovascular disease

D **DIAMOND**
Diabetes Mondiale study

DM
diabetes mellitus

D-NET
Diabetes Education Network for Health Professionals

E **EUR**
Europe

EURODIAB
Europe and Diabetes study

F **FBG**
fasting blood glucose

G **G7**
Group of 7 countries

GDM
gestational diabetes mellitus

GDP
gross domestic product

GNI
gross national income

H **HbA1c**
glycosylated haemoglobin A1c

HIV/AIDS
human immunodeficiency virus/acquired immune deficiency syndrome

I **ID**
international dollars

IDF
International Diabetes Federation

IFG
impaired fasting glucose

IGT
impaired glucose tolerance

K **KiDS**
IDF Kids and Diabetes in Schools project

L **LMICs**
low- and middle-income countries

M **MDGs**
United Nations Millennium Development Goals

MENA
Middle East and North Africa

N **N/A**
not available

NAC
North America and Caribbean

NCDs
non-communicable diseases

NGO
non-governmental organisation

O **OGTT**
oral glucose tolerance test

P **PDGN**
IDF Parliamentarians for Diabetes Global Network

PPP
purchasing power parity

R **R**
diabetes cost ratio

S **SACA**
South and Central America

SEA
South-East Asia

SDGs
United Nations Sustainable Development Goals

U **UK**
United Kingdom

UN
United Nations

USA
United States of America

USD
United States Dollars

W **WDC**
IDF World Diabetes Congress

WDD
World Diabetes Day

WHO
World Health Organization

WP
Western Pacific

Y **YLD**
IDF Young Leaders in Diabetes

Glossary

A **Age-adjusted comparative prevalence**
See prevalence

B **Beta cells**
Cells are found in the pancreas that produce and release insulin.

C **Cardiovascular disease**
Diseases and injuries of the circulatory system: the heart, the blood vessels of the heart and the system of blood vessels throughout the body and to (and in) the brain. Stroke is the result of a blood flow problem within, or leading to, the brain and is considered a form of cardiovascular diseases.

Comparative prevalence
See prevalence

Country prevalence
See prevalence

D **Diabetes complications**
Acute and chronic conditions caused by diabetes. Chronic complications include retinopathy (eye disease), nephropathy (kidney disease), neuropathy (nerve disease), cardiovascular disease (disease of the circulatory system), periodontitis (inflammation of the tissue surrounding the tooth), foot ulceration and amputation. See Chapter 1 for more details.

Diabetes
A condition that arises when the pancreas does not produce enough insulin or when the body cannot effectively use insulin. The three most common forms of diabetes are: type 1, type 2, and gestational. See Chapter 1 for more details.

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

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

G **Group of 7**
A governmental political forum that currently includes Canada, France, Germany, Italy, Japan, Russia (suspended), United Kingdom, United States, and the European Union.

Gross domestic product
A measure of the size of a country's economy. It is the sum of the products produced within a country's borders, including products produced by foreign-owned enterprises.

Gross national income
A measure of the size of a country's economy. It is the sum of the products produced by enterprises owned by a country's citizens, excluding products produced by foreign-owned enterprises.

Gestational diabetes mellitus
When hyperglycaemia (high blood glucose) is first detected in pregnancy, women with slightly elevated blood glucose levels are classified as having gestational diabetes, and women with substantially elevated blood glucose levels are classified as having diabetes first detected in pregnancy. See Chapter 1 for more details.

Glucose
Also called dextrose. The main sugar the body produces to store energy from proteins, fats and carbohydrates. 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 help of insulin. See Chapter 1 for more details.

Glycosylated haemoglobin A1c (HbA1c)
Haemoglobin to which glucose is bound. Glycosylated haemoglobin is tested to determine the average level of blood glucose over the past two to three months.

Glycogen
A form of glucose that is used for storing energy in the liver and muscles. If blood glucose levels decrease, the hormone glucagon triggers the body to convert glycogen to glucose and release it into the blood stream. See Chapter 1 for more details.

Glucagon
A hormone produced in the pancreas. If blood glucose levels decrease, it triggers the body to release stored glucose into the blood stream. See Chapter 1 for more details.

H

High Income Country
A country defined by the World Bank to have a gross national income per capita of $12,736 or more in 2014.

Hyperglycaemia
A raised level 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 and need to urinate often.

Hypoglycaemia
A lowered level of glucose in the blood. This occurs when a person with diabetes has injected too much insulin, eaten too little food, or has exercised without extra food. A person with hypoglycaemia may feel nervous, shaky, weak, or sweaty, and have a headache, blurred vision and hunger.

I

Impaired fasting glucose
Blood glucose that is higher than normal blood glucose, but below the diagnostic threshold for diabetes after fasting (typically after an overnight fast). See Chapter 1 for more details.

Impaired glucose tolerance
Blood glucose that is higher than normal blood glucose, but below the diagnostic threshold for diabetes after ingesting a standard amount of glucose during an oral glucose tolerance test. See Chapter 1 for more details.

Incidence
The number of new cases of a disease among a certain group of people for a certain period of time. For example, the number of new cases of type 1 diabetes in children under 15 in one year.

Insulin
A hormone produced in the pancreas. If blood glucose levels increase, it triggers cells to take up glucose from the blood stream and convert it to energy, and the liver to take up glucose from the blood stream and store it as glycogen. See Chapter 1 for more details.

International Dollar
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, which are taken from studies of prices for the same basket of goods and services in different countries. Internationals Dollars can be used to compare expenditures between different countries or regions.

L

Liver
A vital organ located below the diaphragm. It has a wide range of functions, including storing glucose as glycogen when triggered by insulin, and releasing glucose into the blood when triggered by glucagon.

Low Income Country
A country defined by the World Bank to have a gross national income per capita of $1,045 or less in 2014.

M

Middle Income Country
A country defined by the World Bank to have a gross national income per capita of more than $1,045 and less than $12,736 in 2014.

Monogenic diabetes
A less common type of diabetes, which arises as a result of a genetic mutation. Examples include Maturity-Onset Diabetes of the Young and Neonatal Diabetes Mellitus.

N

National prevalence
See prevalence

Nephropathy
Damage, disease, or dysfunction of the kidney, which can cause the kidneys to be less efficient or to fail altogether.

Neuropathy
Damage, disease, or dysfunction of the peripheral nerves, which can cause numbness or weakness.

R

Regional prevalence
See prevalence

P

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

Prevalence
The proportion or number of individuals in a population that has a disease or condition at a particular time (be it a point in time or time period). For example, the proportion of adults aged 20-79 with diabetes in 2015. Prevalence is a proportion or number and not a rate.

Age-adjusted comparative prevalence
Also simply called comparative prevalence. The age-adjusted **comparative prevalence** in the *IDF Diabetes Atlas* has been calculated by assuming that every country and region has the same age profile (the age profile of the world population in 2001 has been used). This reduces the effect of the differences of age between countries and regions, and makes this estimate appropriate for making comparisons. The comparative prevalence estimate should not be used for calculating the number of people within a country or region who have diabetes. See Chapter 2 for more details.

Raw Prevalence
Also called **country, national, or regional prevalence**. The number of percentage of each country's or region's population that has diabetes. It is appropriate for assessing the impact of diabetes for each country or region. See Chapter 2 for more details.

Purchasing power parity
A technique used to determine the relative value of different currencies, calculated from studies of prices for the same basket of goods and services in different countries. Used to convert a local currency into the hypothetical currency of International Dollars.

Periodontitis
Also known as pyorrhoea. Inflammatory diseases that affect the tissues that surround and support the teeth.

R

R (from health expenditure estimates)
The diabetes cost ratio, which is the ratio of health expenditures for persons with diabetes to health expenditures for age- and sex-matched persons who do not have diabetes. By comparing the total costs of matched persons with and without diabetes, the costs that diabetes causes can be isolated. The R=2 estimates assume that health care expenditures for people with diabetes are on average two-fold higher than people without diabetes, and the R=3 estimates assume that health care expenditures for people with diabetes are on average three-fold higher than people without diabetes. See Chapter 2 for more details.

Raw prevalence
See prevalence

Retinopathy
A disease of the retina of the eye which may cause visual impairment and blindness.

S

Secondary diabetes
A less common type of diabetes, which arises as a complication of other diseases (e.g. hormone disturbances or diseases of the pancreas).

T

Type 1 diabetes
People with type 1 diabetes cannot produce insulin. The disease can affect people of any age, but onset usually occurs in children or young adults. See Chapter 1 for more details.

Type 2 diabetes
People with type 2 diabetes cannot use insulin to turn glucose into energy. Type 2 diabetes mellitus is much more common than type 1, and occurs mainly in adults although it is now also increasingly found in children and young adults. See Chapter 1 for more details.

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