International
Diabetes
Federation

IDF **DIABETES** ATLAS

FOURTH EDITION

The mission of the International Diabetes Federation is to
promote diabetes care, prevention and a cure worldwide

world diabetes day

14 November

CONTENTS

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Diabetes is a chronic, debilitating and costly disease associated with severe complications, which poses severe risks for the entire world.

FOREWORD

The International Diabetes Federation is proud to release the fourth edition of the *IDF Diabetes Atlas* at the 20th World Diabetes Congress in October 2009 in Montreal. The *IDF Diabetes Atlas* aims to provide healthcare professionals, scientists, health economists, policy makers, national and international governmental agencies with evidence-based information and projections on the current and future magnitude of the diabetes epidemic.

Testament to the acceptance of the previous edition of the *IDF Diabetes Atlas* (3rd edition, 2006) has been the use of its data and projections in publications from the World Health Organization, The World Bank, Organisation for Economic Co-operation and Development and the World Economic Forum.

It is interesting to reflect that in the first edition of the *IDF Diabetes Atlas*, released in 2000, the estimated global diabetes prevalence was 151 million. In this newest edition, the estimated diabetes prevalence for 2010 has risen to 285 million, representing 6.6% of the world's adult population, with a prediction that by 2030 the number of people with diabetes will have risen to 438 million. Far from being a disease of higher income nations, diabetes is very much a disease associated with poverty, with the major burden borne by low- and middle-income countries and disproportionately affecting lower socio-economic groups, the disadvantaged and the minorities in richer countries.

The potential impact of diabetes as a development issue was recognized by the United Nations in 2006 in Resolution 61/225 when it stated that "diabetes is a chronic, debilitating and costly disease associated with severe complications, which poses severe risks for families, Member States and the entire world and serious challenges to the achievement of internationally agreed development goals including the Millennium Development Goals".

In the words of Mr Ban Ki-Moon, UN Secretary-General, "Cancer, diabetes, heart diseases are no longer the diseases of the wealthy. Today, they hamper the people and the economies of the poorest populations, even more than infectious diseases. This represents a public health emergency in slow motion."

The World Economic Forum 2009 Global Risks Landscape assessment report identified chronic diseases as one of the most significant risks facing the global economies, exceeded only by the risks posed by sudden oil/gas price rises, retrenchment from globalization, asset price collapse and a slowing of the Chinese economy.

Yet, despite these statements, the International Diabetes Federation recognizes that the global community still has not fully appreciated the urgent need to increase funding for non-communicable diseases (NCDs), to make essential NCD medicines available for all and to include the treatment of diabetes and other NCDs into strengthened primary healthcare systems. The evidence for the need to act will soon be overwhelming and this edition of the *IDF Diabetes Atlas* has more detailed data on diabetes, co-morbidities and costs than ever.

On behalf of the 'diabetes world', the International Diabetes Federation expresses its gratitude to all who contributed so generously with their time and talents to this edition and to the sponsors for their financial support. It represents an enormous body of work from a very large number of dedicated experts and staff. It is a state-of-the-art document summarizing the best available evidence-based information on diabetes from around the world and presents it in a more concise fashion than in previous editions. It is complemented by a CD-ROM as well as an online interactive web-based version which will allow readers to download graphs, data tables and background papers.

Martin Silink
President
International Diabetes Federation
2006—2009

We cannot afford to remain a bystander. It is time to give diabetes and other non-communicable diseases the attention they deserve.

INTRODUCTION

Today, diabetes and other noncommunicable diseases (NCDs) that share the same risk factors represent a leading threat to health and human development. An estimated 8 to 14 million people die prematurely every year in developing countries due to preventable NCDs — mainly cardiovascular diseases, diabetes, cancers, and chronic respiratory diseases. These people are dying too young as a result of increased exposure to the common risk factors for NCDs: unhealthy diets, physical inactivity, tobacco use and the harmful use of alcohol.

Unless addressed, the mortality and disease burden from diabetes and other NCDs will continue to increase. WHO projects that globally, deaths caused by these health problems will increase by 17% over the next decade, with the greatest increase in low- and middle-income countries, mainly in the African (27%) and Eastern Mediterranean (25%) regions. An estimated 80% of mortality from NCDs occurs in developing countries. Similarly, and as the *IDF Diabetes Atlas* illustrates, the highest rates of diabetes occur in economically developing populations.

We have the right vision and knowledge to address diabetes. Although cost-effective strategies exist, high-level commitment and concrete action are still sorely needed at the global and national level. Despite imposing a heavy burden on health as well as socio-economic development, the prevention of diabetes and other NCDs remains dramatically underfunded.

Working closely with Member States, WHO has, therefore, developed an Action Plan, based on the Global Strategy for the Prevention and Control of Noncommunicable Diseases. The Plan was endorsed by all Member States in May 2008. It provides a six-year road map for addressing this global challenge by raising the priority accorded to diabetes in development work at global and national levels, and integrating its prevention into policies across all government departments. The Plan also aims to establish and strengthen national policies and plans, and promote interventions to reduce the main modifiable risk factors. A coordinated agenda for research is essential. WHO is currently working with the International Diabetes Federation and other partners to establish such an agenda and to enhance international collaboration to promote and support the multi-dimensional and multi-sectoral research needed to strengthen the evidence base for prevention.

Once people develop diabetes, health services in many developing countries are unable to provide effective care to control it and prevent its complications and premature death. Available data indicate that a substantial proportion of household income among poor populations is spent on healthcare for a family member affected by diabetes. Integrating diabetes care into primary healthcare and ensuring universal coverage for basic health interventions should therefore be given top priority.

Despite the enormity of the diabetes problem, requests from developing countries for technical assistance to prevent it remain largely unanswered by the international community mainly because diabetes and other NCDs are beyond those targeted by the Millennium Development Goals (MDGs).

We cannot afford to remain a bystander. It is time to give diabetes and other NCDs the attention they deserve. The Ministerial Declaration adopted at the 2009 session of the High-level Segment of the United Nations Economic and Social Council recognized the need to address this important health problem. It is hoped that the Declaration will mark the beginning of intensive work to integrate the prevention of diabetes and other NCDs into the global development agenda. The Declaration also called for urgent action to implement the Global Strategy and its Action Plan.

Diabetes has many faces — but very few voices. And that is why I am so grateful to the International Diabetes Federation for taking such a strong leadership role in giving a voice to the challenges faced by the millions of people with diabetes.

I hope that governments, civil society, national associations, international and regional bodies, and the global development community will find the *IDF Diabetes Atlas* a useful tool for advocacy and for motivating a serious discussion about one of the major challenges for development in the twenty-first century.

Ala Alwan
Assistant Director-General
World Health Organization

United Nations Resolution 61/225

United Nations A/RES/61/225

General Assembly

Distr.: General
18 January 2007

Sixty-first session
Agenda item 113

Resolution adopted by the General Assembly

[*without reference to a Main Committee (A/61/L.39/Rev.1 and Add.1)*]

61/225. World Diabetes Day

The General Assembly,

Recalling the 2005 World Summit Outcome [1] and the United Nations Millennium Declaration,[2] as well as the outcomes of the major United Nations conferences and summits in the economic, social and related fields, in particular the health-related development goals set out therein, and its resolutions 58/3 of 27 October 2003, 60/35 of 30 November 2005 and 60/265 of 30 June 2006,

Recognizing that strengthening public-health and health-care delivery systems is critical to achieving internationally agreed development goals, including the Millennium Development Goals,

Recognizing also that diabetes is a chronic, debilitating and costly disease associated with severe complications, which poses severe risks for families, Member States and the entire world and serious challenges to the achievement of internationally agreed development goals, including the Millennium Development Goals,

Recalling World Health Assembly resolutions WHA42.36 of 19 May 1989 on the prevention and control of diabetes mellitus[3] and WHA57.17 of 22 May 2004 on a global strategy on diet, physical activity and health,[4]

Welcoming the fact that the International Diabetes Federation has been observing 14 November as World Diabetes Day at a global level since 1991, with co-sponsorship of the World Health Organization,

Recognizing the urgent need to pursue multilateral efforts to promote and improve human health, and provide access to treatment and health-care education,

1. *Decides* to designate 14 November, the current World Diabetes Day, as a United Nations Day, to be observed every year beginning in 2007;

2. *Invites* all Member States, relevant organizations of the United Nations system and other international organizations, as well as civil society, including non-governmental organizations and the private sector, to observe World Diabetes Day in an appropriate manner, in order to raise public awareness of diabetes and related complications, as well as its prevention and care, including through education and the mass media;

3. *Encourages* Member States to develop national policies for the prevention, treatment and care of diabetes in line with the sustainable development of their health-care systems, taking into account the internationally agreed development goals, including the Millennium Development Goals;

4. *Requests* the Secretary-General to bring the present resolution to the attention of all Member States and organizations of the United Nations system.

83rd plenary meeting
20 December 2006

[2] See resolution 55/2.

[3] See World Health Organization, *Forty-second World Health Assembly, Geneva, 8–19 May 1989, Resolutions and Decisions, Annexes* (WHA42/1989/REC/1).

[4] Ibid., *Fifty-seventh World Health Assembly, Geneva, 17–22 May 2004, Resolutions and Decisions, Annexes* (WHA57/2004/REC/1).

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EXECUTIVE SUMMARY

This edition of the *IDF Diabetes Atlas* marks a watershed in the prevention and care of diabetes. United Nations Resolution 61/225, adopted unanimously in 2006, recognizes diabetes as a serious and costly disease that poses a threat to individual well-being and economic progress, especially in low- and middle-income countries (LMCs). The Resolution provides a catalyst for governments to invest in programmes for the prevention of diabetes, and to strengthen healthcare systems to cope with the already large numbers of people with diabetes in all countries.

The *IDF Diabetes Atlas*, fourth edition, therefore aims to highlight the evidence base needed for governments, civil society, international health organizations and the health community to make informed decisions on prevention and care strategies. It also aims to stimulate action on the gaps in knowledge about diabetes and the extent of its impact in low- and middle-income countries, where most people with diabetes live. Pressing issues that require immediate attention from governments are also highlighted in this edition.

The content of this edition of the *IDF Diabetes Atlas* is based on five key messages:

- The diabetes epidemic is here and threatens to overwhelm health systems if left unchecked.
- The majority of type 2 diabetes cases can be prevented — prevention costs governments far less than treating diabetes and its complications.
- The non-preventable forms of diabetes can be treated — lives can be saved but people in low- and middle-income countries need access to essential diabetes medicines.
- Diagnosis, treatment, management and prevention of diabetes and other non-communicable diseases require integrated health systems, delivery of care down to primary care level, and supportive policies outside the health sector.
- Diabetes is a development issue — the epicentres of the epidemic are in low- and middle-income countries and it is a threat to the health and economic prosperity of nations.

This publication is a concise version of the *IDF Diabetes Atlas*, fourth edition, which summarizes the main issues in each of the topics addressed. A summary table of country estimates of the key data is provided in Appendix 1. Background papers on which the summaries have been based are available in the accompanying CD-ROM and the website, www.eatlas.idf.org. Tables with more detailed estimates of the prevalence of diabetes and impaired glucose tolerance (IGT), mortality and healthcare expenditure are also available on the electronic media.

Chapter 1 defines diabetes mellitus and briefly describes the different types of diabetes and related major chronic complications.

The continuing escalation of diabetes prevalence worldwide and the burden it imposes on the individual, society and economy is captured in Chapter 2. This chapter looks at the extent of the diabetes epidemic and its bearing on morbidity and mortality as well as the economic impact of the disease. Chapter 2 also highlights the challenges of diabetes in the young, and the issue of diabetes and depression, which requires greater attention than it has received so far.

The global figures on the prevalence of diabetes and IGT in Chapter 2 are based on estimates for 216 countries and territories for 2010 and 2030 (see map on page 13). The estimates of diabetes-related mortality show that the number of deaths is considerable and of a similar or greater magnitude to that caused by several infectious diseases that receive considerably more attention from policy makers, researchers, donors and the public. At the same time, the projections for health expenditures for each person with diabetes show that there is a wide variation of spending between countries, and that more resources should be invested in cost-effective interventions, particularly in the low- and middle-income countries where the great majority of persons with diabetes live.

Chapter 3 provides an overview of the diabetes situation in each of the seven IDF Regions. The overviews show that the burden of diabetes will continue to be greatest in the economically

developing countries, and that much remains to be done to lift them out of the epidemic.

Chapter 4 emphasizes the urgent need for governments to make investments in prevention programmes and in healthcare systems to improve the well-being of the millions affected by diabetes. It discusses some of the evidence that confirms that there are effective strategies for the prevention and management of type 2 diabetes. It also looks at the need for further investment in diabetes education, a cornerstone of effective self-management.

Chapter 5 reviews the response of policy-makers and health systems to the challenges of the diabetes epidemic. It summarizes the results of a survey of IDF member associations on national diabetes programmes (NDPs), and examines the broader picture of providing optimal care for people who require insulin by looking at results from assessments in a number of low-income countries. Chapter 5 also looks at global efforts to monitor the quality of diabetes care and identifies the issues that hinder such monitoring.

Chapter 6 highlights action taken at the international level to assist countries to strengthen their healthcare systems to tackle the growing problem of diabetes and other non-communicable diseases (NCDs). This chapter also specifies the direction that the International Diabetes Federation (IDF) will take to win the battle against diabetes. It emphasizes the Federation's call to the international community to fund essential medicines and technology, and to meet requests from low- and middle-income countries to improve their healthcare systems.

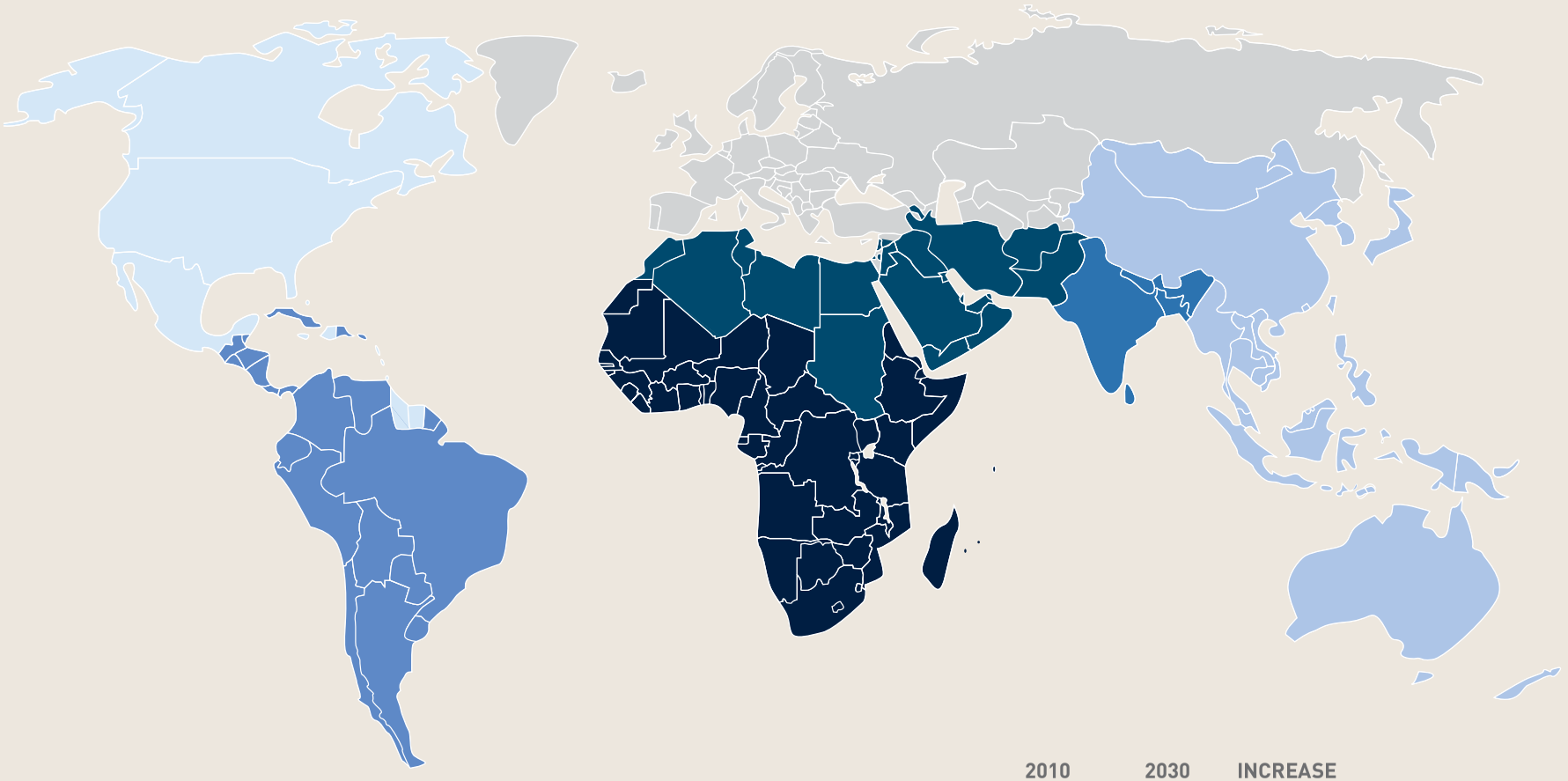
Chapter 7 provides useful resources and web links, and includes a list of the International Diabetes Federation's position statements on topical issues.

Estimates of key data on the prevalence of diabetes and IGT, incidence rate of type 1 diabetes in children, mortality, national diabetes programmes and mean health expenditure are provided in Appendix 1. Two sets of prevalence figures, national and comparative, for diabetes and IGT are provided. The national, or crude, prevalence indicates the percentage of each country's population that has diabetes, and is appropriate for assessing the burden of diabetes for each country. The comparative prevalence has been calculated by assuming that every country has the same age profile (the age profile of the world population has been used), which makes this figure appropriate for making comparisons.

Top 10: Number of people with diabetes (20-79 years), 2010 and 2030

	COUNTRY/TERRITORY	2010 MILLIONS		COUNTRY/TERRITORY	2030 MILLIONS
1	India	50.8	1	India	87.0
2	China	43.2	2	China	62.6
3	United States of America	26.8	3	United States of America	36.0
4	Russian Federation	9.6	4	Pakistan	13.8
5	Brazil	7.6	5	Brazil	12.7
6	Germany	7.5	6	Indonesia	12.0
7	Pakistan	7.1	7	Mexico	11.9
8	Japan	7.1	8	Bangladesh	10.4
9	Indonesia	7.0	9	Russian Federation	10.3
10	Mexico	6.8	10	Egypt	8.6

IDF Regions and global projections for the number of people with diabetes (20-79 years), 2010-2030



REGION	2010 Millions	2030 Millions	INCREASE %
Africa	12.1	23.9	98%
Middle East and North Africa	26.6	51.7	94%
South-East Asia	58.7	101.0	72%
South and Central America	18.0	29.6	65%
Western Pacific	76.7	112.8	47%
North America and Caribbean	37.4	53.2	42%
Europe	55.2	66.2	20%
World	284.6	438.4	54%

The non-preventable forms of diabetes can be treated while the majority of type 2 diabetes cases can be prevented.

WHAT IS DIABETES?

Diabetes is recognized as a group of heterogeneous disorders with the common elements of hyperglycaemia and glucose intolerance, due to insulin deficiency, impaired effectiveness of insulin action, or both[1]. Diabetes mellitus is classified on the basis of aetiology and clinical presentation of the disorder into four types.

- type 1 diabetes,
- type 2 diabetes,
- gestational diabetes mellitus (GDM), and
- other specific types.

TYPE 1 DIABETES

Type 1 diabetes is sometimes called insulin-dependent, immune-mediated or juvenile-onset diabetes. It is caused by destruction of the insulin-producing cells of the pancreas, typically due to an auto-immune reaction, where they are attacked by the body's defence system. The beta cells of the pancreas therefore produce little or no insulin, the hormone that allows glucose to enter body cells. The reason why this occurs is not fully understood.

The disease can affect people of any age, but usually occurs in children or young adults. Type 1 diabetes is one of the most common endocrine and metabolic conditions in childhood. People with type 1 diabetes need injections of insulin every day in order to control the levels of glucose in their blood. Without insulin, people with type 1 diabetes will die.

The onset of type 1 diabetes is often sudden and dramatic and can include symptoms such as:

- abnormal thirst and a dry mouth
- frequent urination
- extreme tiredness/lack of energy
- constant hunger
- sudden weight loss
- slow-healing wounds
- recurrent infections
- blurred vision

The incidence of type 1 diabetes is increasing, the reasons for which are unclear but are likely to be mainly due to changes in environmental risk factors. Environmental risk factors, increased height and weight development, increased maternal age at delivery, and possibly some aspects of diet and exposure to some viral infections may initiate autoimmunity or accelerate an already ongoing beta cell destruction.

TYPE 2 DIABETES

Type 2 diabetes is characterized by insulin resistance and relative insulin deficiency, either of which may be present at the time that diabetes becomes clinically manifest. The diagnosis of type 2 diabetes usually occurs after the age of 40 years but could occur earlier, especially in populations with high diabetes prevalence. There are increasing reports of children developing type 2 diabetes. Type 2 diabetes can remain undetected, i.e. asymptomatic, for many years and the diagnosis is often made from associated complications or incidentally through an abnormal blood or urine glucose test.

Type 2 diabetes is often, but not always, associated with obesity, which itself can cause insulin resistance and lead to elevated blood glucose levels. It is strongly familial, but major susceptibility genes have not yet been identified. There are several possible factors in the development of type 2 diabetes. These include:

- Obesity, diet and physical inactivity
- Increasing age
- Insulin resistance
- Family history of diabetes
- Less than optimum intrauterine environment
- Ethnicity

In contrast to type 1 diabetes, people with type 2 diabetes are not dependent on exogenous insulin and are not ketosis-prone, but may require insulin for control of hyperglycaemia if this is not achieved with diet alone or with oral hypoglycaemic agents.

The rising prevalence of type 2 diabetes is associated with rapid cultural and social changes, ageing populations, increasing urbanization, dietary changes, reduced physical activity and other unhealthy lifestyle and behavioural patterns [2].

GESTATIONAL DIABETES

Gestational diabetes mellitus (GDM) is a glucose intolerance of varying degrees of severity which starts or is first recognized during pregnancy. The definition applies regardless of whether insulin is used for treatment or if the condition persists after pregnancy.

Maintaining control of blood glucose levels significantly reduces the risk to the baby as an increased maternal glucose level could result in complications in the baby including large size at birth, birth trauma, hypoglycaemia, and jaundice. Women who have had GDM have an increased risk of developing type 2 diabetes in later years. GDM is also associated with increased risk of obesity and abnormal glucose metabolism during childhood and adult life in the offspring.

DIABETES COMPLICATIONS

In virtually every high-income country, diabetes is ranked among the leading causes of blindness, renal failure and lower limb amputation. Diabetes is also now one of the leading causes of death, largely because of a markedly increased risk of coronary heart disease and stroke (cardiovascular disease). In addition to the human suffering that diabetes-related complications cause, to those with diabetes but also to their carers, their economic costs are huge. Costs include those for healthcare, loss of earnings, and economic costs to the wider society in loss of productivity and associated lost opportunities for economic development.

Chronic elevation of blood glucose, even when no symptoms are present to alert the individual to the presence of diabetes, will eventually lead to tissue damage, with consequent, and often serious, disease. Whilst evidence of tissue damage can be found in many organ systems, it is the kidneys, eyes, peripheral nerves and vascular tree, which manifest the most significant, and sometimes fatal, diabetes complications (see Figure 1.1).

Unsatisfactory metabolic control in children can result in stunted growth, and exposure to both severe hypoglycaemia and chronic hyperglycaemia can adversely affect neurological development. Children are more sensitive to a lack of insulin than adults and are at a higher risk of a rapid and dramatic development of diabetic ketoacidosis (diabetic coma).

The mechanism by which diabetes leads to these complications is complex, and not yet fully understood, but involves the direct toxic effects of high glucose levels, along with the impact of elevated blood pressure, abnormal lipid levels and both functional and structural abnormalities of small blood vessels.

The major chronic complications of diabetes are:

- cardiovascular disease (CVD);
- nephropathy;
- neuropathy;
- amputation; and
- retinopathy.

Cardiovascular disease

Cardiovascular disease is the major cause of death in diabetes in most populations, accounting for 50% or more of all diabetes fatalities, and much disability. The kinds of CVD that accompany diabetes include angina, myocardial infarction (heart attack), stroke, peripheral artery disease, and congestive heart failure (CHF).

Nephropathy

Diabetes is an increasingly important cause of renal failure, and indeed has now become the single most common cause of end stage renal disease, i.e. that which requires either dialysis or kidney transplantation, in the USA[3], and in other countries.

Neuropathy

When blood glucose and blood pressure are not controlled, diabetes can harm the nerves. Problems with digestion and urination, impotence, and many other functions can result, but the most commonly affected area is the feet and legs. Nerve damage in these areas is called peripheral neuropathy and could manifest in many ways including loss of feeling in the feet and toes. Loss of feeling is a particular risk because it can allow foot injuries to escape notice and treatment, leading to major infections and amputation.

Amputation

Through effects on peripheral nerves and arteries, diabetes can lead to foot ulceration, infection and the need for amputation. People with diabetes carry a risk of amputation that may be more than 25 times greater than that seen in those without diabetes[4].

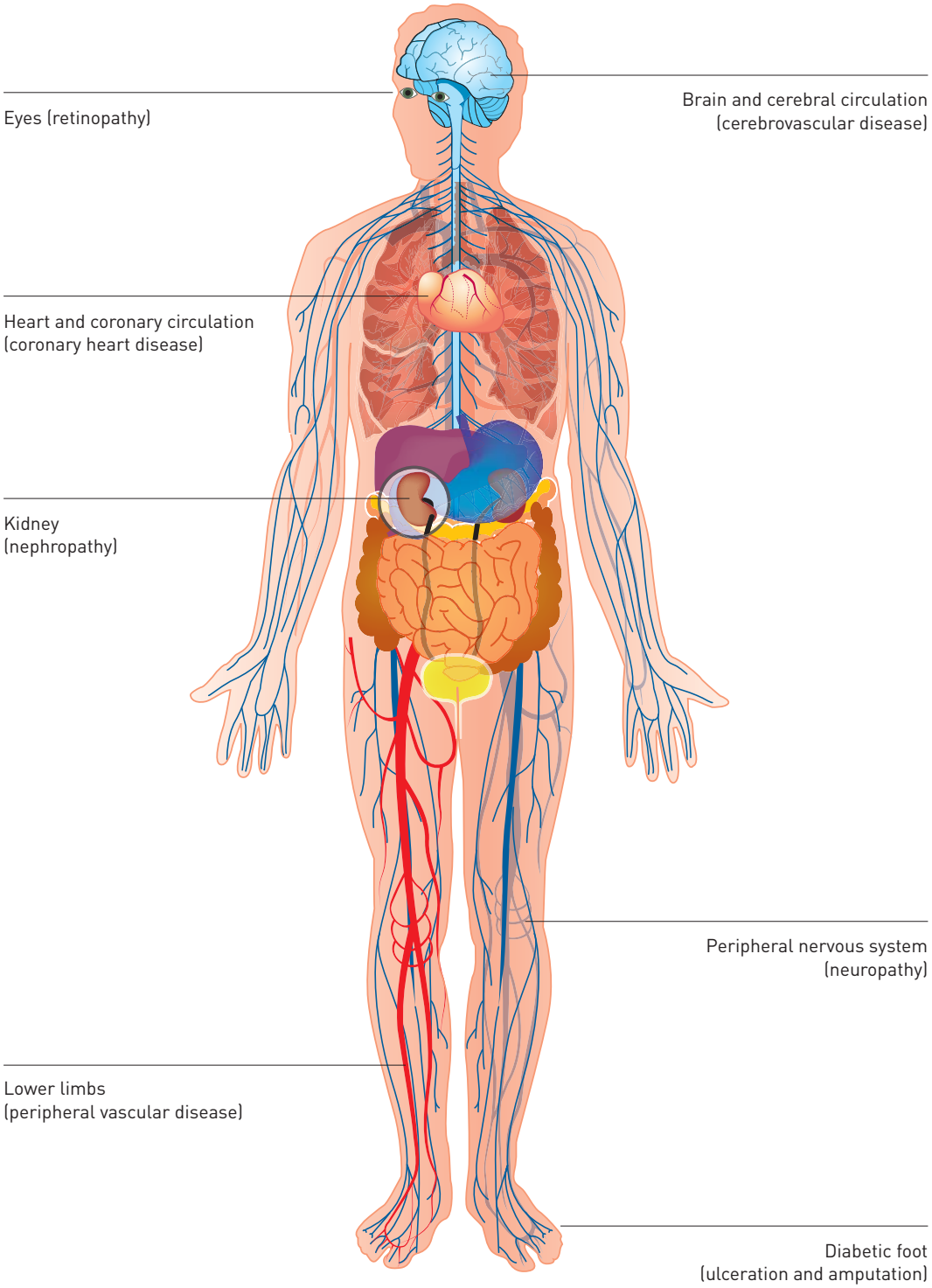
Retinopathy

Diabetes can harm sight and cause blindness in several ways. The most common cause of blindness in diabetes is macular oedema, caused by fluid build-up behind the retina of the eye. A more common complication is background and proliferative retinopathy, which can cause blindness as a result of repeated haemorrhages at the back of the eye. Diabetes also increases the risk of cataracts and glaucoma.

IMPAIRED GLUCOSE TOLERANCE

Impaired glucose tolerance (IGT) is an asymptomatic condition defined by elevated (though not diabetic) levels of blood glucose two hours after a 75g oral glucose challenge. Along with impaired fasting glucose (IFG), it is now recognized as being a stage in the transition from normality to diabetes. Not surprisingly, IGT shares many characteristics with type 2 diabetes, being associated with obesity, advancing age, insulin resistance and an insulin secretory defect.

FIGURE 1.1 The major diabetes complications



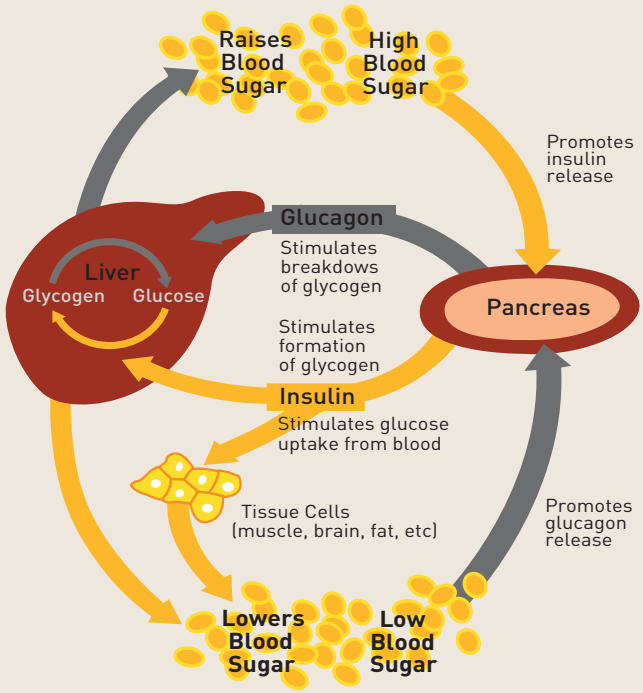
BOX 1.1 **INSULIN**

Insulin is the internal secretion of the pancreas formed by groups of cells called the islets of Langerhans. It is the hormone needed to enable glucose to enter the cells and provide energy. Insulin is also important in keeping blood glucose levels within acceptable limits.

Insulin is injected into the body by people with type 1 diabetes in whom the cells that produce insulin have been destroyed. This is the most common form of diabetes in children and young adults, and they depend on insulin for survival. Insulin may also be used by people with type 2 diabetes. In type 2 diabetes, the body needs more insulin than it can produce.

Since the landmark discovery of insulin by Frederick Banting and Charles Best in 1921, huge steps forward have been made in research and development in creating genetically engineered human insulin. Until relatively recently insulin was derived from a limited resource of the pancreas of cattle and pigs.

FIGURE 1.2 Insulin production and action



Insulin is a hormone produced by the pancreas that is necessary for cells to be able to use blood glucose. In response to high levels of glucose in the blood, the insulin-producing cells in the pancreas secrete the hormone insulin. Type 1 diabetes occurs when these cells are destroyed by the body's own immune system.


Some 285 million
people worldwide
will live with
diabetes in 2010.

THE GLOBAL BURDEN

It is now recognized that it is the low- and middle-income countries that face the greatest burden of diabetes. However, many governments and public health planners still remain largely unaware of the current magnitude, or, more importantly, the future potential for increases in diabetes and its serious complications in their own countries.

This chapter of the *IDF Diabetes Atlas* looks at the global burden of diabetes. It points out the consequences of inaction by revealing the mortality caused by diabetes as well as the mounting health expenditures in countries around the world.

Section 2.1 presents estimates of the prevalence of diabetes mellitus and impaired glucose tolerance for 216 countries and territories for the years 2010 and 2030; it also looks at the global trends in diabetes in the young and provides estimates for type 1 diabetes in children and adolescents.

Diabetes can lead to complications, the consequences of which can include blindness, kidney damage, and foot ulcers that can result in amputation. There is no single definition for each type of complication (e.g. retinopathy, neuropathy or nephropathy) so studies of the occurence of diabetes complications are often hard to compare. There have been relatively few studies and a review of most of these studies is available in the *Diabetes Atlas*, third edition[1]. However, this edition addresses depression, an important condition that is common in people with diabetes. A survey on national diabetes programmes, reported in Chapter 5.1, found that psychological and behavioural issues received less attention than other aspects of diabetes care. Section 2.2 summarizes a review of studies of diabetes and depression, and shows the significance of depression in affecting both the quality of life of people with diabetes and how well diabetes is controlled.

In Section 2.3 estimates of the mortality burden related to diabetes for 2010 are presented, deaths that are largely preventable through public health action directed at primary prevention of diabetes in the population and improvement of care for all people with diabetes.

Finally section 2.4 examines the economic impact of diabetes and estimates national health expenditures to treat and prevent diabetes and its complications for the years 2010 and 2030. The results show that more than 80% of expenditures for medical care for diabetes are made in the world's economically richest countries, not in the low and middle-income countries where over 70% of people with diabetes live. In the world's poorest countries, not enough is spent to provide even the least expensive life-saving diabetes drugs.

Background papers on which the summaries of this chapter are based are available in the complementary CD-ROM.

2.1 EPIDEMIOLOGY AND MORBIDITY

2.1.1 DIABETES AND IMPAIRED GLUCOSE TOLERANCE

PREVALENCE AND PROJECTIONS, 2010 AND 2030

Diabetes mellitus (DM) is now one of the most common non-communicable diseases globally. It is the fourth or fifth leading cause of death in most high-income countries and there is substantial evidence that it is epidemic in many economically developing and newly industrialized nations. Complications from diabetes, such as coronary artery and peripheral vascular disease, stroke, diabetic neuropathy, amputations, renal failure and blindness are resulting in increasing disability, reduced life expectancy and enormous health costs for virtually every society. Diabetes is undoubtedly one of the most challenging health problems in the 21st century.

The number of studies describing the epidemiology of diabetes over the last 20 years has been extraordinary. It is now recognized that it is the low- and middle-income countries that face the greatest burden of diabetes. However, many governments and public health planners still remain largely unaware of the current magnitude, or, more importantly, the future potential for increases in diabetes and its serious complications in their own countries.

It has been a consistent finding of population-based diabetes studies that a substantial proportion of all people found to have diabetes had not been previously diagnosed. The uncovering of new cases when mass blood testing is undertaken is primarily because of the lack of symptoms associated with the early years of type 2 diabetes, meaning that those with diabetes may be unaware of their condition and therefore not seek medical attention for it.

In addition to diabetes, the condition of impaired glucose tolerance also constitutes a major public health problem, both because of its association with diabetes incidence and its own association with an increased risk of cardiovascular disease.

In this edition of the *IDF Diabetes Atlas*, the prevalence of diabetes mellitus and IGT has been estimated for each country for the years 2010 and 2030. Data are provided for 216 countries and territories, which have been allocated into one of 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)*.

The data presented for adults are for types 1 and 2 diabetes combined, and IGT. Only adults aged from 20 to 79 years of age are considered because the majority of all people who have diabetes and IGT are adults. Estimates for type 1 diabetes in children and adolescents (0-14 years) are presented in Section 2.1.2.

Two sets of prevalence figures have been provided in this report: the national, regional or global prevalence (the crude prevalence) and the comparative prevalence. The national, regional or global prevalence indicates the percentage of a particular population that has diabetes. It is appropriate for assessing the burden of diabetes for each country or region. The comparative prevalence has been calculated by assuming that every country and region has the same age profile (the age profile of the world population has been used). This reduces the effect of the differences of age between countries and regions, and makes this figure appropriate for making comparisons.

The data presented here should be interpreted cautiously as general indicators of diabetes frequency, and the estimates will need to be revised as new and better epidemiological information becomes available. Comparison of country, regional, and even global rates from one report to the next should be performed with caution. Large changes in the prevalence or numbers of people with diabetes from one edition of the *IDF Diabetes Atlas* to another are usually due to the use of a more recent study rather than a change in the profile of diabetes within that country. Data sources for this edition include 34 new studies. Thus, the inclusion of recent, and more reliable research brings us closer to the actual prevalence of diabetes, but these limitations need to be always considered. The key purpose of reports such as these is to stimulate action in the form of preventive and management programmes, as well as further research.

* Country by country estimates of diabetes prevalence are provided in the Country Summary Table in Appendix 1. More detailed estimates of diabetes and IGT for each country and region are available in the data tables in the CD-ROM provided with this publication and online (www.idf.org).

AT A GLANCE

	2010	2030
Total world population (billions)	7.0	8.4
Adult population (20-79 years, billions)	4.3	5.6
DIABETES AND IGT (20-79 years)		
Diabetes		
Global prevalence (%)	6.6	7.8
Comparative prevalence (%)	6.4	7.7
Number of people with diabetes (millions)	285	438
IGT		
Global prevalence (%)	7.9	8.4
Comparative prevalence (%)	7.8	8.4
Number of people with IGT (millions)	344	472

TABLE 2.1 Top 10: Prevalence* (%) of diabetes (20-79 years), 2010 and 2030

	COUNTRY/TERRITORY	2010 PREVALENCE (%)		COUNTRY/TERRITORY	2030 PREVALENCE (%)
1	Nauru	30.9	1	Nauru	33.4
2	United Arab Emirates	18.7	2	United Arab Emirates	21.4
3	Saudi Arabia	16.8	3	Mauritius	19.8
4	Mauritius	16.2	4	Saudi Arabia	18.9
5	Bahrain	15.4	5	Réunion	18.1
6	Réunion	15.3	6	Bahrain	17.3
7	Kuwait	14.6	7	Kuwait	16.9
8	Oman	13.4	8	Tonga	15.7
9	Tonga	13.4	9	Oman	14.9
10	Malaysia	11.6	10	Malaysia	13.8

Includes only countries/territories where surveys with glucose testing were undertaken for that country/territory

* comparative prevalence

DIABETES

Diabetes mellitus can be found in almost every population in the world and epidemiological evidence suggests that, without effective prevention and control programmes, diabetes will likely continue to increase globally[1].

Type 1 diabetes usually accounts for only a minority of the total burden of diabetes in a population but is increasing in incidence in both poor and rich countries. It is the predominant form of the disease in younger age groups in most high-income countries (see Section 2.1.2).

Type 2 diabetes constitutes about 85 to 95% of all diabetes in high-income countries[1] and may account for an even higher percentage in low- and middle-income countries. Type 2 diabetes is now a common and serious global health problem, which, for most countries, has evolved in association with rapid cultural and social changes, ageing populations, increasing urbanization, dietary changes, reduced physical activity and other unhealthy lifestyle and behavioural patterns[1].

Gestational diabetes mellitus is common and, like obesity and type 2 diabetes that are related conditions, is increasing in frequency throughout the world. The risk of developing diabetes after GDM is very high. As the prevalence of type 2 diabetes increases within a population so will the prevalence of GDM[2]. The reported prevalence of GDM has varied widely among different populations around the world. Much of the variability is due to differences in diagnostic criteria and detection methods used in different centres. However, it has not been possible to estimate the prevalence of GDM separately as there are very limited population-based studies on GDM. It is recognized that the challenges of GDM have to be addressed and further research is required in this area.

The methods used here to estimate the prevalence of diabetes are conservative and are mostly based on changes in population size and age structure. It has not been possible in these projections to take any account of trends in obesity although the projections for LMCs do take into account trends in urbanization. If levels of obesity continue to increase it is possible that the prevalence of diabetes will be even greater than reported here.

Prevalence

It is estimated that approximately 285 million people worldwide, or 6.6% in the age group 20-79, will have diabetes in 2010, some 70% of whom live in low- and middle-income countries. This number is expected to increase by more than 50% in the next 20 years if preventive programmes are not put in place. By 2030, some 438 million people, or 7.8% of the adult population, are projected to have diabetes. The largest increases will take place in the regions dominated by developing economies (see Figure 2.1).

Age distribution

The 40-59 age group currently has the greatest number of people with diabetes with some 132 million in 2010, more than 75% of whom live in low- and middle-income countries.

By 2030, it is projected that there will be 188 million people with diabetes aged 40-59 years. More than 80% will be found in newly developed or developing countries. There will be even more people in the 60-79 age group, at some 196 million (see Figure 2.2).

Gender distribution

The estimates for both 2010 and 2030 showed little gender difference in the number of people with diabetes. For 2010 there are expected to be about one million more women than men with diabetes (143 million women vs 142 million men). However, this difference is expected to increase to six million by 2030 (222 million women vs 216 million men).

Urban/rural distribution

There are more people with diabetes living in urban than in rural areas. In the LMCs, estimates put the number of people with diabetes in urban areas to be 113 million in 2010, compared to 78 million in rural areas. By 2030 it is expected that this discrepancy will increase to 228 million people with diabetes in urban areas and 99 million in rural communities.

FIGURE 2.1 Prevalence* (%) estimates of diabetes (20-79 years) by region, 2010 and 2030

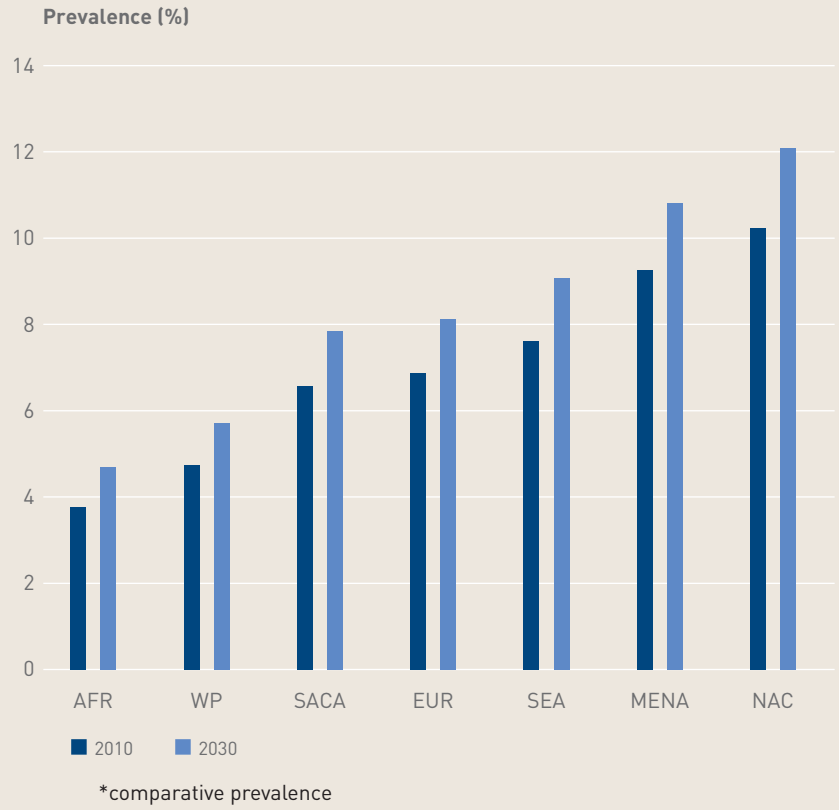
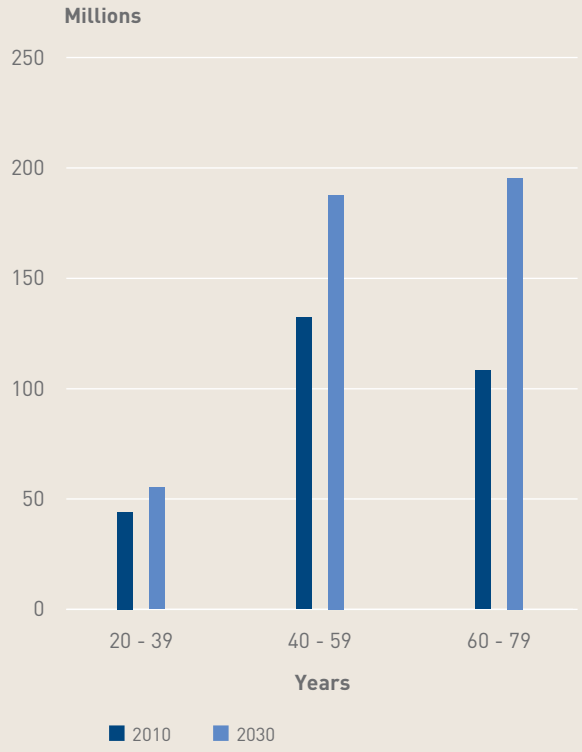
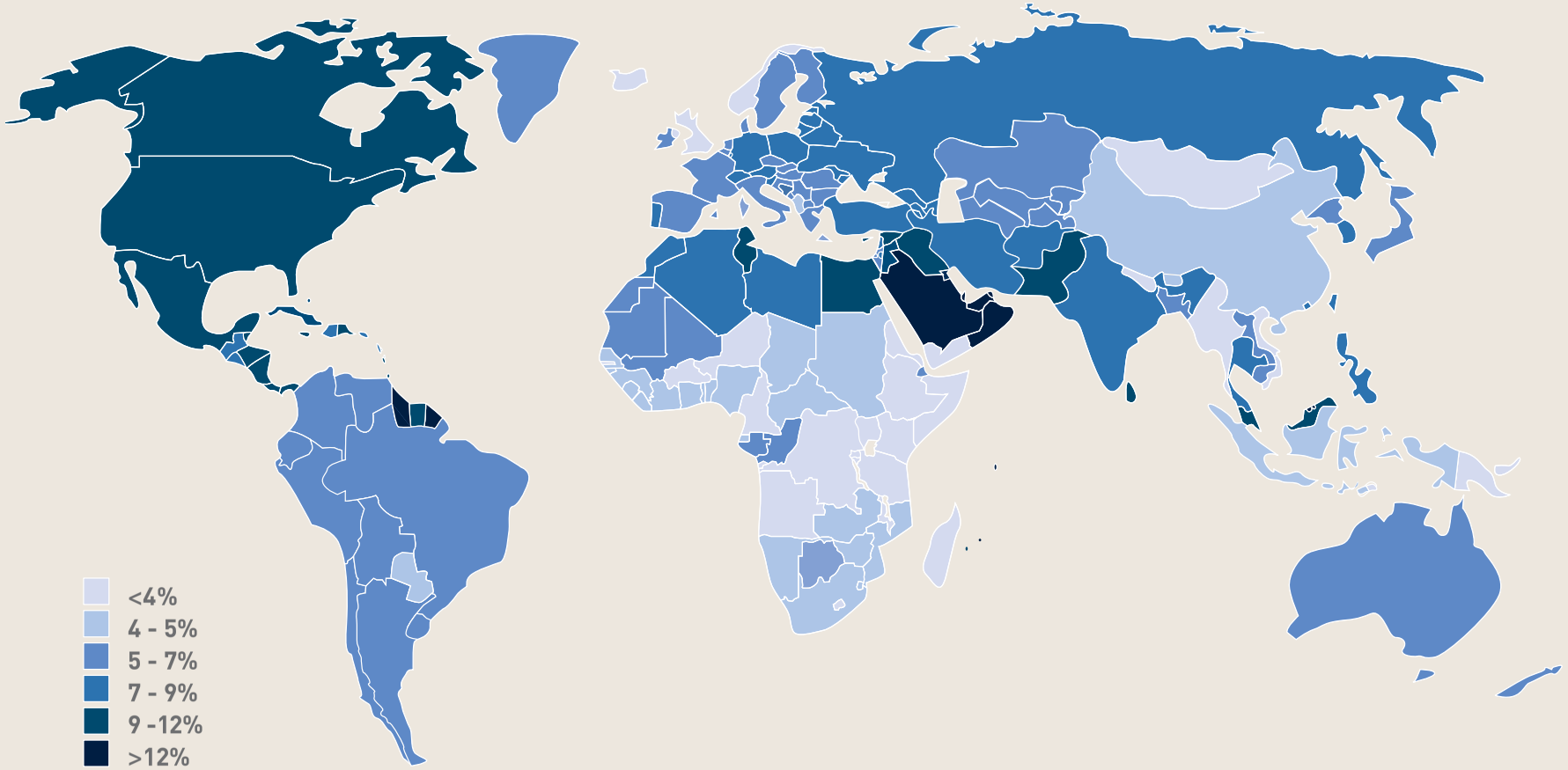


FIGURE 2.2 Number of people with diabetes by age group, 2010 and 2030

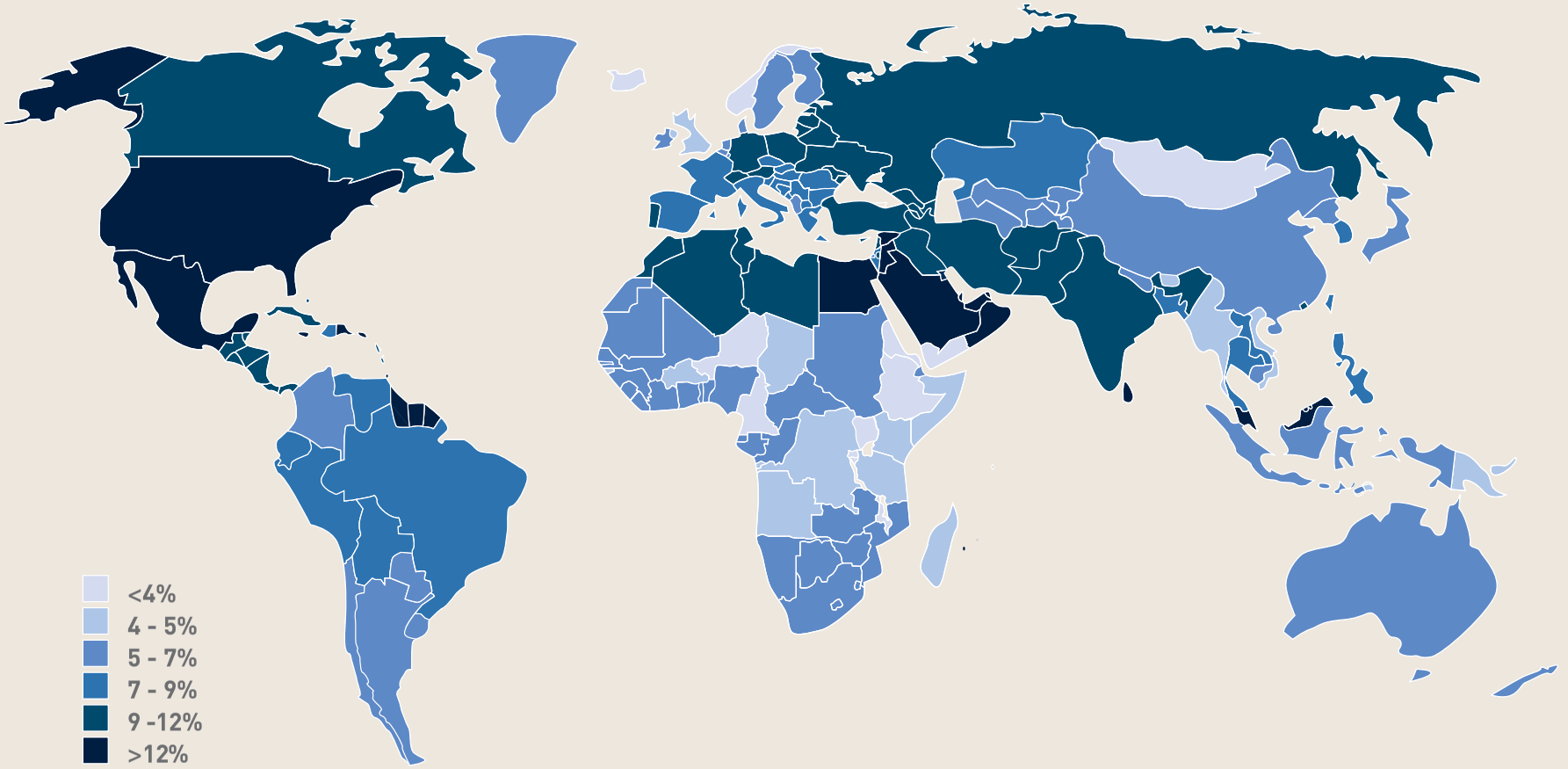


MAP 2.1 Prevalence* (%) estimates of diabetes (20-79 years), 2010



* comparative prevalence

MAP 2.2 Prevalence* (%) estimates of diabetes (20-79 years), 2030



* comparative prevalence

IMPAIRED GLUCOSE TOLERANCE

Impaired glucose tolerance, along with impaired fasting glucose (IFG), is recognized as being a stage in the transition from normality to diabetes. Thus, individuals with IGT are at high risk of progressing to type 2 diabetes, although such progression is not inevitable, and probably over 30% of individuals with IGT will return to normal glucose tolerance over a period of several years.

The decision to include data on IGT was based on two major factors associated with its presence: it greatly increases the risk of developing diabetes[3], and it is associated with the development of cardiovascular disease[4,5]. In addition, some of the best evidence we have on the prevention of type 2 diabetes comes from studies in people with IGT.

Prevalence

It is estimated that some 344 million people worldwide, or 7.9% in the age group 20–79, will have IGT in 2010, the vast majority of whom live in low- and middle-income countries. By 2030 the number of people with IGT is projected to increase to 472 million, or 8.4% of the adult population.

Age distribution

As with diabetes, the 40-59 age group is expected to have the greatest number of people with IGT with 138 million for 2010, and this will remain true in 2030 with 186 million as shown in Figure 2.3. It is also of note that nearly one-third of all those who will have IGT for 2010 are in the 20-39 age group (see Figure 2.3).

The prevalence of IGT is generally similar to that of diabetes, but somewhat higher for the African and Western Pacific Regions, and slightly lower in the North America and Caribbean Region.

FIGURE 2.3 Number of people with impaired glucose tolerance by age group, 2010 and 2030

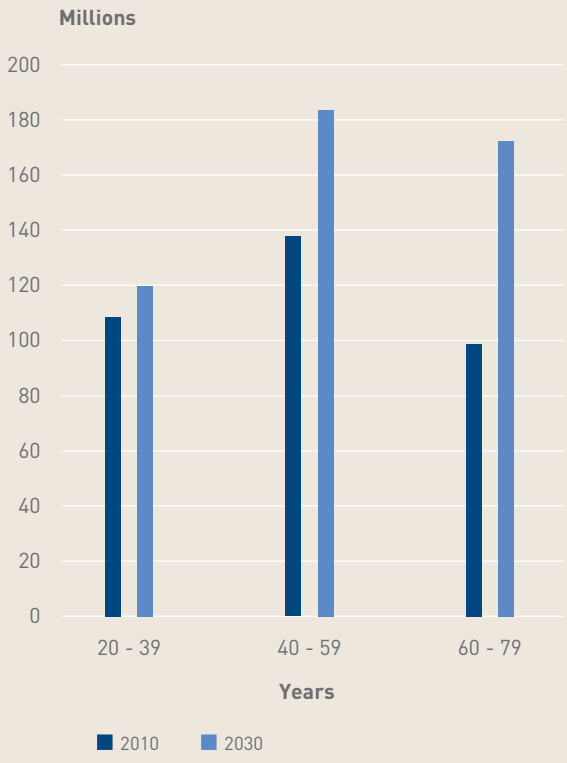


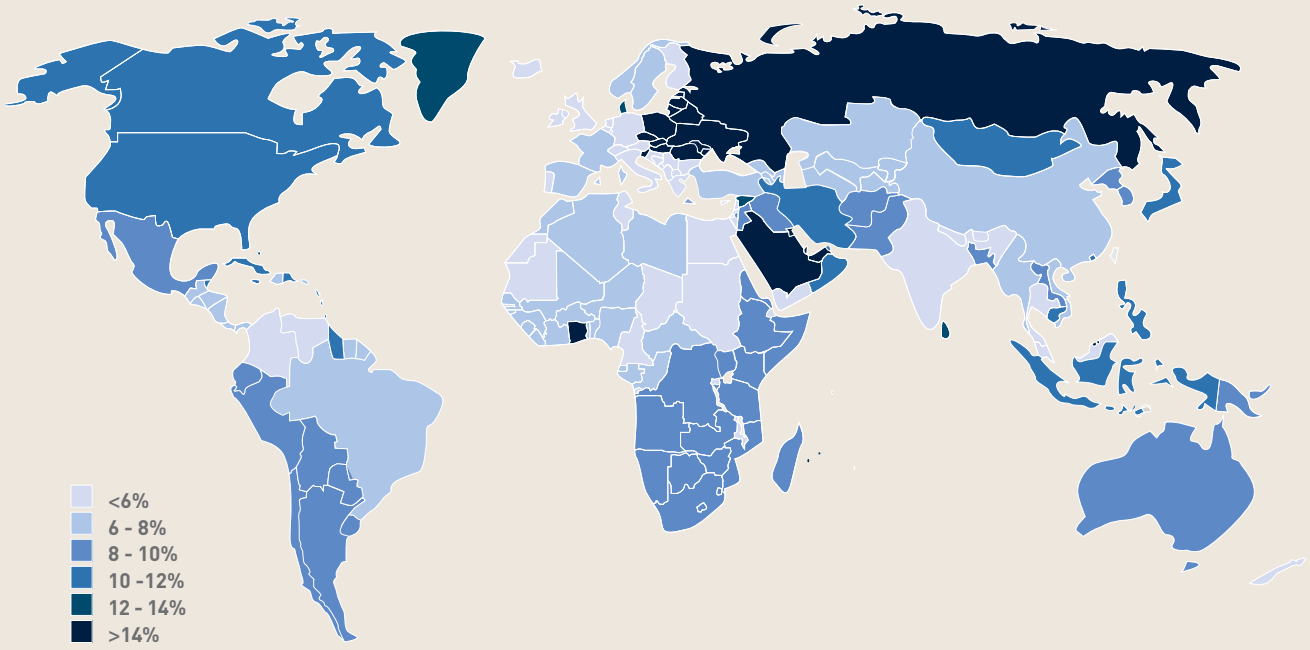
TABLE 2.2 Top 10: Prevalence* (%) of impaired glucose tolerance (20-79 years), 2010 and 2030

	COUNTRY/TERRITORY	2010 PREVALENCE (%)	COUNTRY/TERRITORY	2030 PREVALENCE (%)
1	Nauru	20.4	Nauru	21.5
2	Singapore	18.8	Bahrain	20.1
3	Bahrain	18.8	United Arab Emirates	20.1
4	United Arab Emirates	18.8	Singapore	19.8
5	Kiribati	17.3	Kiribati	18.3
6	Poland	15.3	Poland	16.5
7	Ghana	14.1	Syrian Arab Republic	15.3
8	Mauritius	13.5	Mauritius	14.0
9	Tonga	13.1	Tonga	14.0
10	Syrian Arab Republic	13.0	Denmark	13.8

Includes only countries/territories where surveys with glucose testing were undertaken for that country/territories

* comparative prevalence

MAP 2.3 Prevalence* (%) estimates of impaired glucose tolerance (20-79 years), 2010



* comparative prevalence

2.1.2 DIABETES IN THE YOUNG: A GLOBAL PERSPECTIVE

Type 1 diabetes is rapidly increasing in children and adolescents in many countries, and evidence suggests that in a growing number of countries type 2 diabetes is now also being diagnosed in childhood.

CHALLENGES OF TYPE 1 DIABETES IN CHILDREN

Type 1 diabetes is one of the most common endocrine and metabolic conditions in childhood, and incidence is rapidly increasing especially among the youngest children. Insulin treatment is life-saving and lifelong. Self-discipline and adherence to a balanced diet are necessary if the disease is to be well managed. In many countries, especially in less privileged families, access to self-care tools and also to insulin is limited and this may lead to severe handicap and early death in children with diabetes.

Many children and adolescents find it difficult to cope emotionally with their condition. Diabetes causes them embarrassment, results in discrimination and limits social relationships. It may impact on school performance, and family functioning. The financial burden may be aggravated by the costs of treatment and monitoring equipment.

TRENDS IN INCIDENCE

Two international collaborative projects, the Diabetes Mondiale study (DiaMond[1]) and the Europe and Diabetes study (EURODIAB[2]) have been instrumental in monitoring trends in incidence through the establishment of population-based regional or national registries using standardized definitions, data collection forms and methods for validation.

The incidence of childhood onset type 1 diabetes is increasing in many countries in the world, at least in the under 15-year age group. There are strong indications of geographic differences in trends but the overall annual increase is estimated to be around 3%. There is evidence that incidence is increasing more steeply in some of the low prevalence countries such as those in central and eastern Europe. Moreover, several European studies have suggested that, in relative terms, increases are greatest in young children. There are clear indications 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 data, especially in those countries where diagnosis may be missed or neglected and, as a result, children die because they do not receive insulin.

PREVALENCE OF TYPE 1 DIABETES IN CHILDREN

It is estimated that annually some 76,000 children aged under 15 years develop type 1 diabetes worldwide. Of the estimated 480,000 children with type 1 diabetes, 24% come from the South-East Asian Region, but the European Region, where the most reliable and up-to-date estimates of incidence are available, comes a close second (23%) (see Figure 2.4).

The continued mapping of global trends in incidence and prevalence of type 1 diabetes in all age groups, through use of data from existing and new registries, is thus important, and in conjunction with other scientific research may provide a logical basis for intervention studies and future primary prevention strategies which must be the ultimate goal.

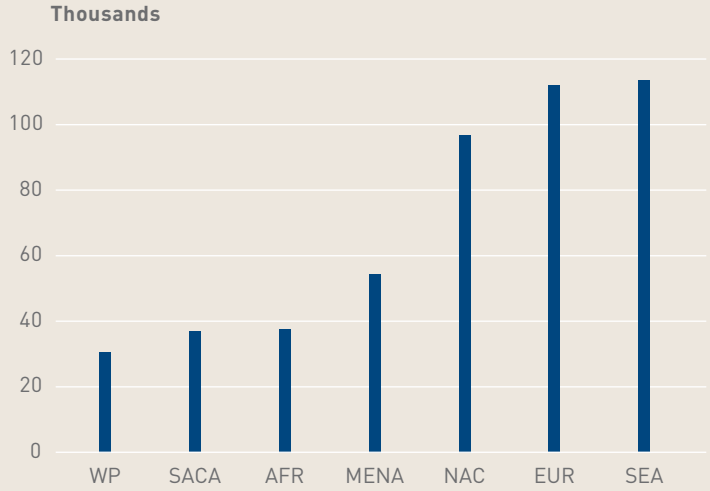
TYPE 2 DIABETES IN THE YOUNG

Type 2 diabetes in children and adolescents is on the increase in all countries, whether rich or poor. As with type 1 diabetes, many children with type 2 diabetes risk developing complications at an early age, which would place a significant burden on the family and society. There is growing recognition that type 2 diabetes in the young is becoming a global public health issue with a potentially serious health outcome[3], in spite of the paucity of information in this area. A review of studies on type 2 diabetes in the young is available in the *Diabetes Atlas*, third edition[4].

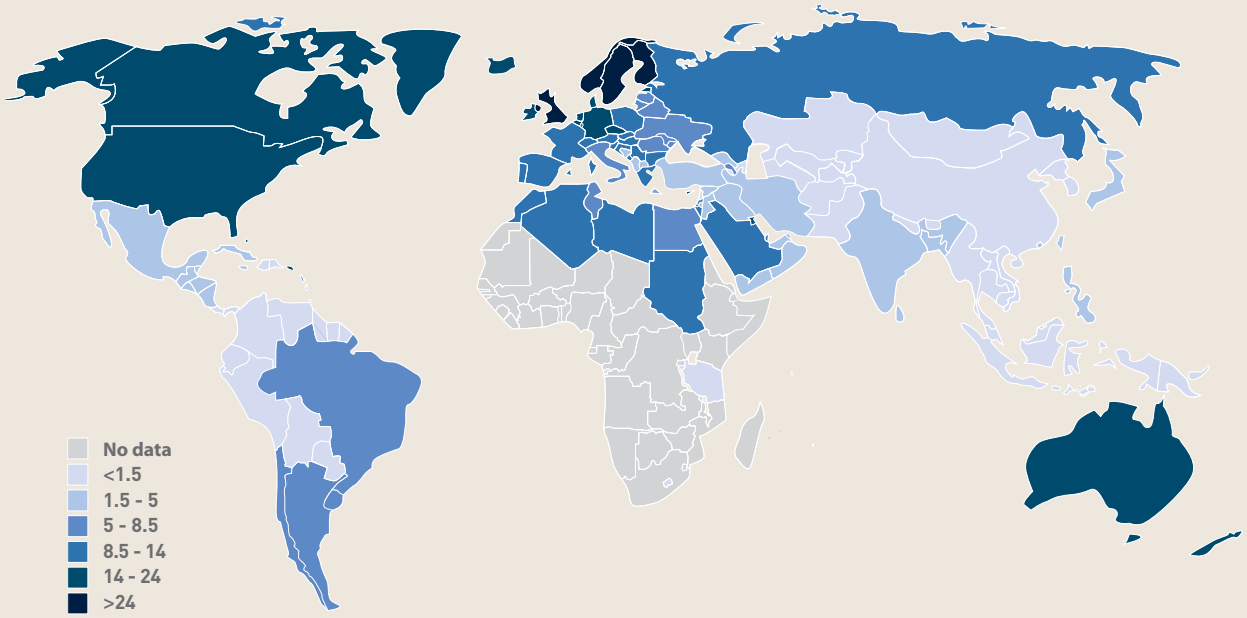
AT A GLANCE

	2010
Total child population (0-14 years, billions)	1.9
TYPE 1 DIABETES IN CHILDREN (0-14 YEARS)	
Number of children with type 1 diabetes (thousands)	479.6
Number of newly-diagnosed cases per year (thousands)	75.8
Annual increase in incidence (%)	3.0

FIGURE 2.4 Estimated number of prevalent cases of type 1 diabetes in children, 0-14 years, by region, 2010



MAP 2.4 New cases of type 1 diabetes in children, 0-14 years (cases per 100,000 aged 0-14 years per year), 2010



2.2 DIABETES AND DEPRESSION

Diabetes and depression are chronic debilitating conditions that are associated with high rates of complications and death, and increased healthcare costs. People with diabetes who have depression often find it more difficult to follow diabetes treatment recommendations, and have poor metabolic control, higher complication rates, increased healthcare use and costs, increased disability and lost productivity, lower quality of life as well as increased risk of death. Coordinated strategies for clinical care are necessary to improve the health of people with diabetes and depression, and to reduce the burden of illness.

PREVALENCE OF DEPRESSION IN PEOPLE WITH DIABETES

Worldwide estimates of depression prevalence among people with diabetes appear to vary by diabetes type and among poor and rich nations. Studies have shown that people with diabetes are more likely to have depression than individuals who do not have diabetes. However the mechanisms linking these conditions are not entirely clear. A review of studies found that depression was associated with a 60% increase of type 2 diabetes while type 2 diabetes was only associated with a moderate (15%) increase in risk of depression[1].

EFFECTS OF DEPRESSION

People with diabetes need to successfully manage their disease to avoid complications. Studies have shown a significant relationship between depression and poor adherence to self-management guidelines, which is confirmed by the higher rate of diabetes complications among those who have depression.

People with diabetes and depression are at greater risk of disability, reduced work productivity and lower quality of life. They are also at greater risk of death, as shown in a study that found the coexistence of diabetes and depression is associated with significantly higher risk of death, beyond that due to having either diabetes or depression alone[2] (See Figure 2.5).

HEALTHCARE AND TREATMENT

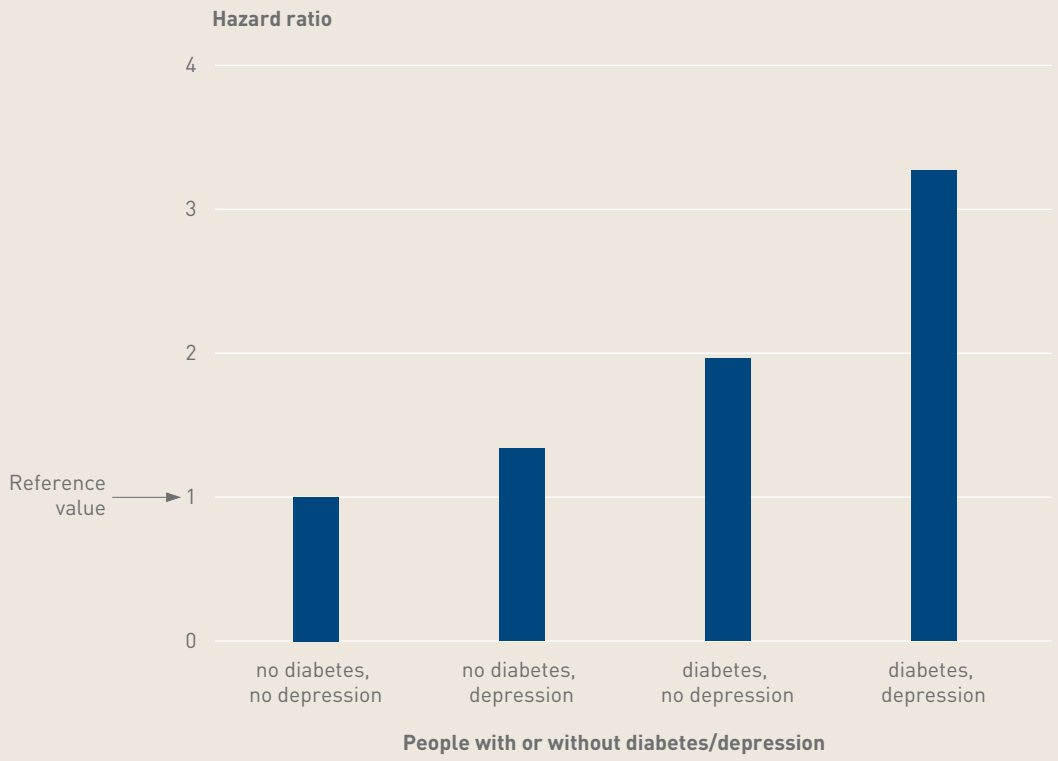
As would be expected healthcare costs are higher for people with diabetes and coexisting depression. In the USA, people with diabetes and depression had higher diabetes-related medical costs (USD3,264) than those with diabetes alone (USD1,297)[3]. However, evidence suggests that treatment of depression in people with diabetes is both efficacious and cost effective and can result in improved overall diabetes outcomes.

Many people with diabetes and depression are treated in primary care settings, but studies indicate that consistent recognition and treatment of depression is less than optimal in primary care settings[4]. One barrier to early recognition and treatment of depression is the difficulty in separating the symptoms of depression from the symptoms of poor control of diabetes.

The challenges of treating people with diabetes and depression are influenced by both the individual and the healthcare system. Factors such as stigma and poor provider knowledge have limited the chances of people with diabetes and depression receiving optimal quality care.

Effective management of people with diabetes and depression requires a multidisciplinary approach. In many clinical settings, care for the person with diabetes is fragmented and requires referral to practitioners in the different disciplines, who in many cases are located at a distance from each other. Coordinated clinical care requires the implementation of effective strategies to increase the recognition of depression, the adoption of evidence-based interventions, and the integration of quality measures for the management of depression into diabetes clinical guidelines.

FIGURE 2.5 Effect of depression on all-cause mortality in people with diabetes



Source: Egede et al, 2005[2]

2.3 MORBIDITY AND MORTALITY

Diabetes is one of the major causes of premature illness and death in most countries. Cardiovascular disease, resulting from damage to large blood vessels, causes the death of 50 % or more of people with diabetes, depending on the population. Damage to small blood vessels (microvascular disease) can affect many parts of the body (see Chapter 1). Due to different methods of assessing the presence of these complications it is difficult to make comparisons between different populations. However, it is clear that they are very common, with at least one complication present in a large proportion of people (50% or more in some studies) at the time of diagnosis. Figure 2.6 shows the range of percentages of people with diabetes who have complications, based on the studies that were summarized in the *Diabetes Atlas*, third edition[1].

MORBIDITY

Diabetes complications are frequently the cause of death in people with diabetes. Estimating the mortality burden has been challenging because more than a third of countries of the world do not have any data on diabetes-related mortality and also because existing routine health statistics have been shown to underestimate mortality from diabetes[2]. To provide a more realistic estimate of mortality, a modelling approach has been used to estimate the number of deaths attributable to diabetes in the year 2010.

BURDEN OF MORTALITY DUE TO DIABETES

Close to four million deaths in the 20-79 age group may be attributable to diabetes in 2010, accounting for 6.8% of global all-cause mortality in this age group. This estimated number of premature deaths is similar in magnitude to deaths in this age group from several infectious diseases. The highest number of deaths due to diabetes is expected to occur in countries with large populations as they have the largest numbers of people with diabetes — India, China, United States of America and the Russian Federation (See Appendix 1). More women than men are expected to die from diabetes-related deaths, and diabetes makes for a higher proportion of all deaths in women than in men, reaching up to a quarter of all deaths in middle-aged women in some regions (see Chapter 3). In most age groups women with diabetes, compared to those without, have a higher relative risk of death than men with diabetes. It is this that accounts for diabetes making a proportionately greater contribution to female mortality.

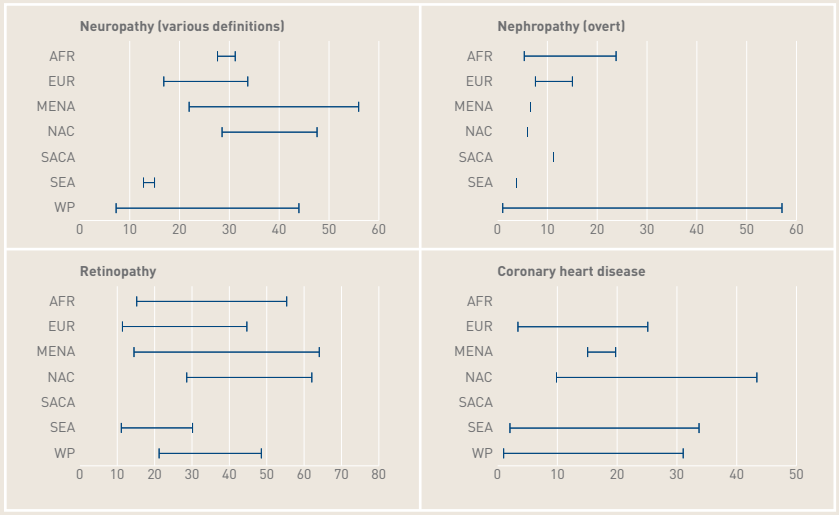
The number of deaths attributable to diabetes in 2010 shows a 5.5% increase over the estimates for the year 2007[1]. This increase is largely due to a 29% increase in the number of deaths due to diabetes in the NAC Region, a 12% increase in the SEA Region and an 11% increase in the WP Region. These increases can be explained by a rise in diabetes prevalence in some highly populated countries in each region, particularly in women.

While there has been a documented decline in the morbidity and mortality of a few chronic non-communicable diseases in some countries[3], no such decline has been reported for diabetes. Although some high-income countries have documented an improved survival of persons with diabetes, the increased prevalence is most likely due to a rise in incidence rather than improved survival[4].

LACK OF ACCURATE DATA

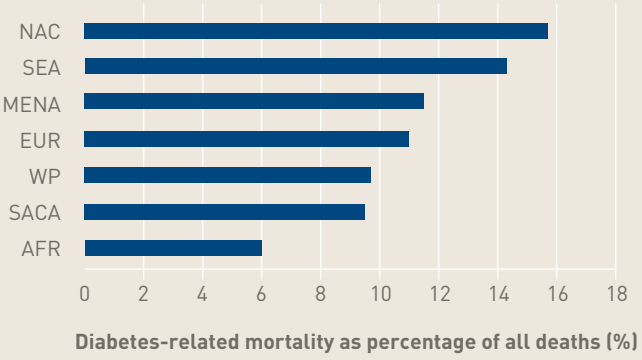
Accurate estimates of mortality attributable to diabetes are difficult to obtain with currently available data, and any attempt will be based on a set of assumptions. The mortality estimates in this report should be interpreted with caution. However, they are probably more realistic than estimates derived from routine sources of health statistics which systematically underestimate the burden of mortality due to diabetes, largely because diabetes is often omitted on death certificates as contributing to death. A substantial proportion of these premature deaths are potentially preventable through public health action directed at primary prevention of diabetes in the population and improvement of care for all people with diabetes[5].

FIGURE 2.6 Summary of prevalence (%) ranges of diabetes complications (all diabetes) found in different studies

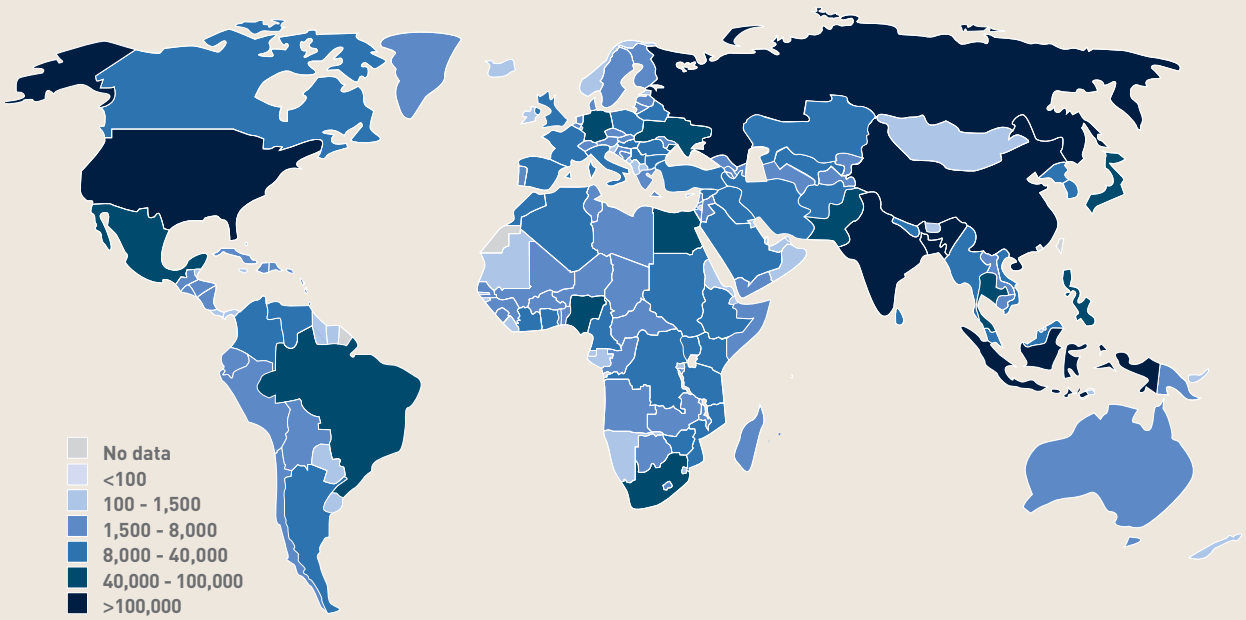


Source: *Diabetes Atlas*, third edition, 2006[1]

FIGURE 2.7 Deaths attributable to diabetes as percentage of all deaths (20-79 years) by region, 2010



MAP 2.5 Number of deaths attributable to diabetes (20-79 years), 2010



2.4 THE ECONOMIC IMPACTS OF DIABETES

Diabetes imposes a large economic burden on the individual, national healthcare system, and economy. Healthcare expenditures on diabetes are expected to account for 11.6% of the total healthcare expenditure in the world in 2010. About 80% of the countries covered in this report are predicted to spend between 5% and 13% of their total healthcare dollars on diabetes.

GLOBAL HEALTHCARE EXPENDITURE

Estimated global healthcare expenditures to treat and prevent diabetes and its complications are expected to total at least US Dollar (USD) 376 billion in 2010. By 2030, this number is projected to exceed some USD490 billion. Expressed in International Dollars (ID), which correct for differences in purchasing power, estimated global expenditures on diabetes will be at least ID418 billion in 2010, and at least ID561 billion in 2030. An estimated average of USD703 (ID878) per person will be spent on diabetes in 2010 globally (see Appendix 1).

Expenditures spent on diabetes care is not evenly distributed across age and gender groups. The estimates show that more than three-quarters of the global expenditure in 2010 will be used for persons who are between 50 and 80 years of age. Also, more money is expected to be spent on diabetes care for women than for men.

DISPARITIES IN HEALTHCARE SPENDING

There is a large disparity in healthcare spending on diabetes between regions and countries. More than 80% of the estimated global expenditures on diabetes are made in the world's economically richest countries, not in the low- and middle-income countries where over 70% of people with diabetes live.

One country, the United States of America, is projected to spend USD198 billion or 52.7% of global expenditure in 2010, while India, the country with the largest population of people living with diabetes, is expected to spend an estimated USD2.8 billion, or less than 1% of the global total. An estimated average of USD7,383 per person with diabetes is expected to be spent on diabetes-related care in the USA but less than USD10 per person will be spent in Burundi, Côte d'Ivoire and Myanmar in 2010.

The financial burden borne by people with diabetes and their families as a result of their disease depends on their economic status and the social insurance policies of their countries. Those living in low-income countries pay a larger share of the expenditure because of less organized systems of medical care insurance and/or lack of public medical services. In Latin America, for instance, families pay 40-60% of medical care expenditures from their own pockets. In the poorest countries, people with diabetes and their families bear almost the whole cost of the medical care they can afford.

ACCURACY OF ESTIMATES

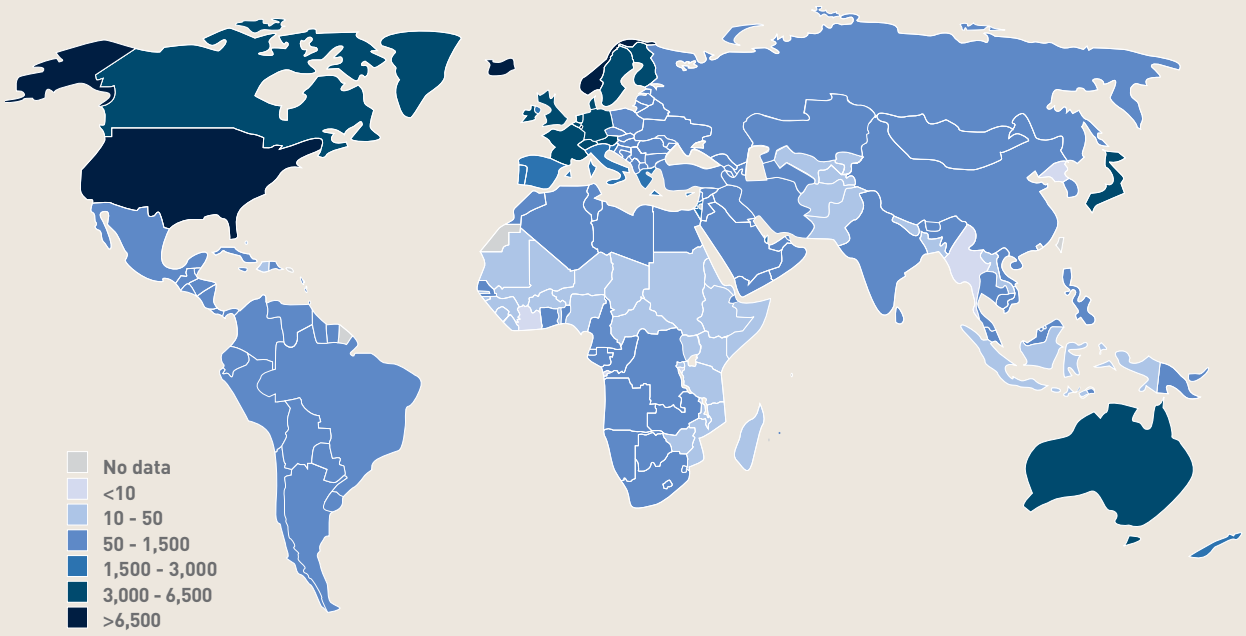
A relatively simple formula to derive the country estimates in this report was used. The accuracy of these estimates is subject to how well assumptions used in the formula fit the situation of each individual country. The estimated per capita expenditure on diabetes was compared with independent estimates obtained from industrialized countries where direct studies of diabetes costs have been conducted, and found to be reasonably accurate. In general, these estimates are less accurate for LMCs because of relatively poor quality data, underlining the need for well-designed health economic studies to understand the true impact of diabetes.

BOX 2.1 IMPACT ON THE ECONOMY

Besides excess healthcare expenditure, diabetes also imposes large economic burdens in the form of lost productivity and foregone economic growth. The American Diabetes Association estimated that the US economy lost USD58 billion, equivalent to about half of the direct healthcare expenditure on diabetes in 2007, as a result of lost earnings due to lost work days, restricted activity days, lower productivity at work, mortality and permanent disability caused by diabetes. Such losses are perhaps relatively larger in poorer countries because premature death due to diabetes occurs at much younger ages. The World Health Organization (WHO) predicted net losses in national income from diabetes and cardiovascular disease of ID557.7 billion in China, ID303.2 billion in the Russian Federation, ID336.6 billion in India, ID49.2 billion in Brazil and ID2.5 billion in Tanzania (2005 ID), between 2005 and 2015.

The largest economic burden caused by diabetes, therefore, is the monetary value associated with disability and loss of life as a result of the disease itself and its related complications. This economic burden, however, can be reduced by implementing many inexpensive, easy-to-use interventions, most of which are cost-effective or cost-saving, even in the poorest countries. Nonetheless, these interventions are not widely used in low- and middle-income countries.

MAP 2.6 Mean health expenditure per person with diabetes (USD), R=2*, 2010



* R is the diabetes cost ratio, which is the ratio of all medical care costs for persons with diabetes to all medical care costs for age- and sex-matched persons who do not have diabetes. As R varies from country to country and over time, the map shows results for a likely lower estimate of R, R=2

Diabetes is a development issue, and it is a threat to the health and economic properity of nations.

REGIONAL OVERVIEW

Most people with diabetes live in the economically less developed regions of the world, and even in the region with the lowest prevalence (Africa) it is estimated that around 330,000 deaths will be attributable to diabetes in 2010. In addition, people with diabetes in these regions receive less than 20% of global spending on diabetes, reflecting the huge disparities between regions and countries.

An overview of each of the seven IDF regions is presented here to allow for a better understanding of the diabetes burden and its consequences. Each region is highly diverse not only in socio-economic and geographical terms but also in diabetes prevalence, mortality and healthcare.

DIABETES AND IGT PREVALENCE

The WP Region will have the largest number of people with diabetes with 77 million while the African Region the smallest number with 12 million in 2010. However, the region that will have the highest comparative prevalence* will be the NAC Region with 10.2% of those aged 20 to 79 years affected by diabetes, followed by the MENA Region with 9.3%. The prevalence of the WP Region is significantly lower at 4.7% (see Table 3.1).

The picture is similar for IGT in which the WP Region is expected to have the greatest number of people with some 120 million in 2010, although the NAC Region will have the highest comparative prevalence with 10.4% of the adult population affected by IGT. Overall, the prevalence of IGT is generally similar to that of diabetes, but somewhat higher for the African and WP Regions, and slightly lower in the NAC Region.

MORTALITY

Excess mortality attributable to diabetes range from 6.0% of all deaths in the 20-79 age group in the African Region to 15.7% in the NAC Region. Beyond 49 years of age, diabetes constituted a higher proportion of all deaths in women than in men in all regions, reaching over 25% of all deaths in some regions and age groups (see Chapter 2.3). These estimates suggest that diabetes is a considerable cause of death and investing in reducing this burden is justified and necessary.

HEALTHCARE EXPENDITURE

The disparities between the regions can clearly be seen in healthcare expenditures for diabetes. The NAC Region is expected to spend about USD214 billion, or 57% of total global healthcare expenditure for diabetes in 2010 while the European Region is projected to spend 53% of the amount spent by the NAC Region. At the same time, the WP Region is estimated to spend slightly more than one-third the European total. The MENA, SACA and SEA Regions are expected to each spend less than 2% of the global total whereas the African Region may account for only 0.4%.

NATIONAL DIABETES PROGRAMMES

A cross sectional survey of IDF member associations was conducted in 2008 to obtain information on the existence and implementation of NDPs worldwide (see Chapter 5.1). Slightly more than half of the 89 respondent countries indicated the existence of a national diabetes programme.

* See Glossary.

TABLE 3.1 Regional estimates for diabetes (20-79 years), 2010 and 2030

	2010			2030			2010/2030
	POPULATION (20-79 YEARS)	NO. OF PEOPLE WITH DIABETES	COMPARATIVE DIABETES PREVALENCE	POPULATION (20-79 YEARS)	NO. OF PEOPLE WITH DIABETES	COMPARATIVE DIABETES PREVALENCE	INCREASE IN THE NO. OF PEOPLE WITH DIABETES
Region	Millions	Millions	%	Millions	Millions	%	%
NAC	320	37.4	10.2	390	53.2	12.1	42.4%
MENA	344	26.6	9.3	533	51.7	10.8	93.9%
SEA	838	58.7	7.6	1.200	101.0	9.1	72.1%
EUR	646	55.2	6.9	659	66.2	8.1	20.0%
SACA	287	18.0	6.6	382	29.6	7.8	65.1%
WP	1,531	76.7	4.7	1.772	112.8	5.7	47.0%
AFR	379	12.1	3.8	653	23.9	4.7	98.1%
Total	4,345	284.6	6.4	5.589	438.4	7.7	54.0%

3.1 AFRICA

The health landscape of sub-Saharan Africa is dominated by poverty and a high burden of infectious diseases, including HIV/AIDS and malaria. The continuing high burden of infectious disease tends to dominate the health policy agenda, despite growing evidence of the increasing impact of diabetes and other chronic non-communicable diseases in Africa. This is particularly the case within urban areas where the age-specific prevalences of diabetes, obesity and hypertension often approach or exceed those in richer parts of the world. As urbanization continues and populations age, diabetes is set to become one of the major health problems of the region. Even now it is estimated that at least 1 in 20 deaths of those aged 20 to 79 years is due to diabetes. The evidence suggests that children with type 1 diabetes often go undiagnosed, or if diagnosed do not have access to insulin, and die as a result. In 2009 the IDF African Region launched its action plan to tackle the escalating threat from diabetes.

DIABETES AND IGT PREVALENCE

There will be an estimated 12.1 million people, or 3.2% of the adult population, with diabetes in the African Region. There are marked differences between the rates of diabetes prevalence among different communities in sub-Saharan Africa. The highest prevalences are among the ethnic Indian population of Tanzania[1] and South Africa[2]. There is also a marked urban/rural difference in diabetes prevalence, with consequent likely increases as more people move to urban areas.

The availability of prevalence and incidence data for sub-Saharan Africa is very limited, with the result that data had to be extrapolated from distant and probably dissimilar countries and populations. There is, therefore, a great need for further epidemiological investigation in the region. Such a need can also be linked with the high proportion of diabetes that has not been previously detected, but found only at the time of surveying. Undiagnosed diabetes accounted for 85% of those with diabetes in studies from South Africa[3], 80% in Cameroon[4], 70% in Ghana[5] and over 80% in Tanzania[6].

The impact of type 2 diabetes is bound to continue if nothing is done to curb the rising prevalence of impaired glucose tolerance, which now varies between 0.9% and 14.7% of the adult population. According to estimates today, the number of people with diabetes is expected to double in the next 20 years to 23.9 million in 2030.

MORTALITY

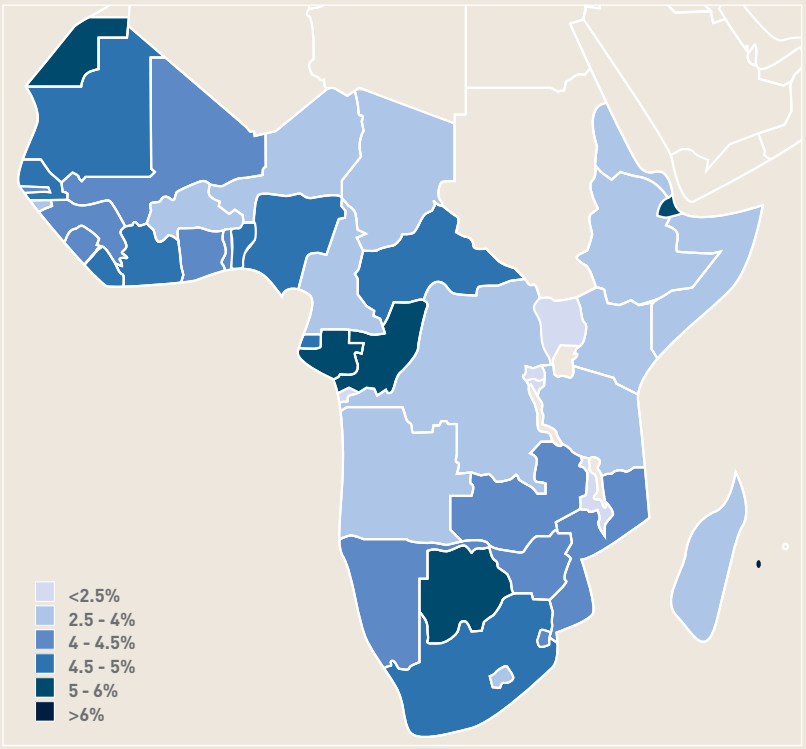
More than 330,000 people are expected to die from diabetes-related causes in this region, accounting for 6% of all deaths in the 20-79 age group in 2010. It is significant to note that people in the 30-39 age group will account for the highest number at about 78,000 deaths. This age group will also have the highest percentage of deaths due to diabetes compared to other age groups (see Figure 3.1).

HEALTHCARE EXPENDITURE

Estimates for the African Region indicate that about USD1.4 billion is expected to be spent on healthcare for diabetes in 2010, which would only account for 0.4% of the global total expenditure. It is projected that almost 60% of this amount will be spent on women. In general, this region is expected to spend the least on healthcare for diabetes compared with the other regions.

NATIONAL DIABETES PROGRAMMES

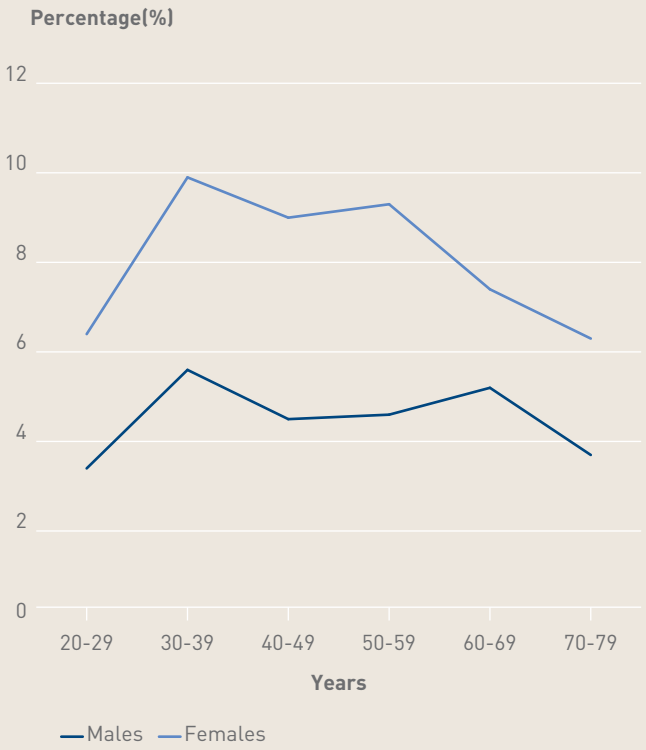
Less than half of the countries that responded to the IDF member association survey had a national diabetes programme, and of these, only one-third had implemented the programme. Important areas that NDPs focused on included routine clinical care, community awareness, essential medication and supplies, and secondary prevention of complications.



MAP 3.1
Prevalence* (%) estimates of diabetes (20-79 years), 2010, African Region

* comparative prevalence

FIGURE 3.1
Percentage of all-cause mortality attributable to diabetes by age and sex, 2010, African Region



AFRICA AT A GLANCE

	2010	2030
Total population (millions)	825	1,249
Adult population (20-79 years) (millions)	379	653
Diabetes (20-79 years)		
Regional prevalence (%)	3.2	3.7
Comparative prevalence (%)	3.8	4.7
Number of people with diabetes (millions)	12.1	23.9
IGT (20-79 years)		
Regional prevalence (%)	7.1	7.2
Comparative prevalence (%)	8.1	8.6
Number of people with IGT (millions)	26.9	47.3
Type 1 diabetes (0-14 years)		
Number of children with type 1 diabetes (thousands)	35.7	
Number of newly-diagnosed cases per year (thousands)	5.8	
Diabetes mortality (20-79 years)		
Number of deaths, male (thousands)	122.2	
Number of deaths, female (thousands)	210.4	
Health expenditure for diabetes (USD)		
Total health expenditure, R=2*, (billions)	1.4	2.0

*see Glossary

3.2 EUROPE

There exists a great diversity of populations and affluence among the 54 countries and territories in the European Region, with gross domestic product (GDP) varying from over USD85,000 per capita for Luxembourg to less than USD2,000 for several countries in eastern Europe[1].

DIABETES AND IGT PREVALENCE

The number of adults with diabetes in this region is expected to reach 55.2 million, accounting for 8.5% of the adult population in 2010. National prevalence rates for diabetes show a wide variation from 2.1% in Iceland to 12.0% in Germany. Abnormal glucose tolerance in this region shows little association with affluence, and there was no evidence that any difference in urban/rural prevalence existed except in a few countries.

There is a paucity of good data for diabetes in the adult population from many of the more affluent countries of the region. Much of the data is based on surveys establishing the prevalence of 'known diabetes'. Although there is a lack of data from several of the eastern European countries, available data[2-4] suggest high levels of diabetes currently, and such high levels of IGT that the diabetes prevalence will almost certainly increase by 2030 to levels above those projected.

This region, however, had by far the most complete and reliable data for type 1 diabetes in children, compared with other regions, with a large proportion of countries having registries that were either nationwide or cover several different parts of the country. About 112,000 children and adolescents are estimated to have type 1 diabetes in the region. The countries making the largest contribution to the overall numbers in type 1 diabetes in the young are the United Kingdom, Russia and Germany.

To a large degree the high prevalence of abnormal glucose tolerance in the adult population is a consequence of the relatively elderly population, such that in 2010 a third of the population is predicted to be over 50 years of age, and this is expected to increase to over 40% by 2030. This will place an increasing financial burden on the declining working-age population to provide resources to deal with the consequences of rising diabetes prevalence.

HEALTHCARE EXPENDITURES

Estimates indicate that at least USD106 billion will be spent on healthcare for diabetes in the European Region in 2010, accounting for 28% of global expenditure. As with the wide variation in diabetes prevalence, the range of spending between countries is expected to be huge, from more than USD7,000 per person in Luxembourg to under USD15 per person in Montenegro (see Appendix 1).

MORTALITY

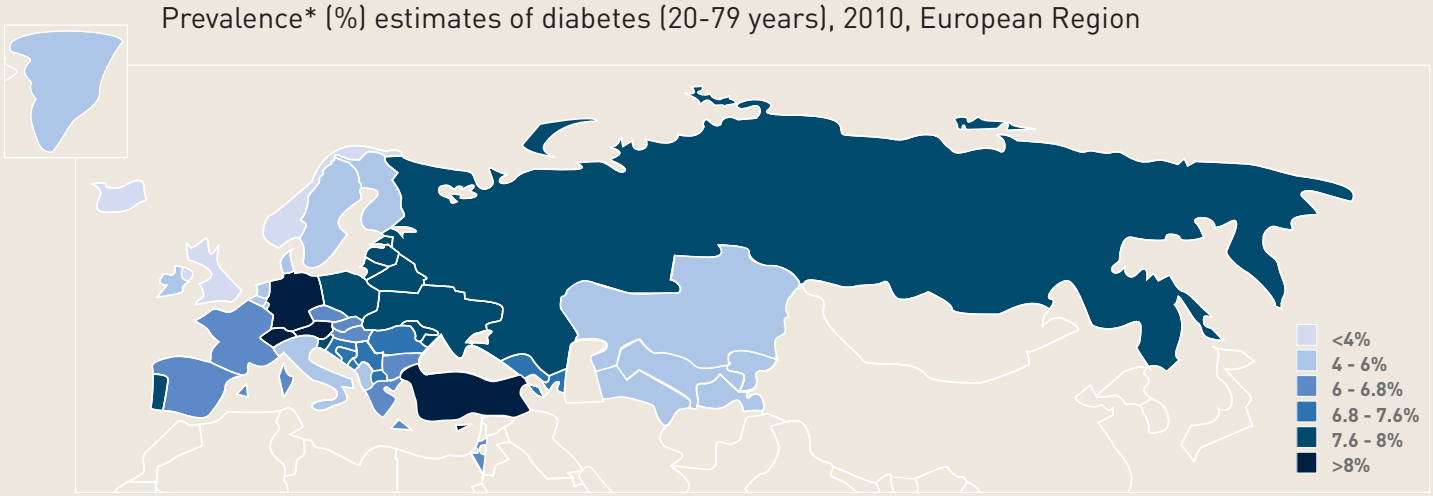
More than 630,000 people are expected to die from diabetes-related causes in 2010. This will account for 11% of all deaths in the 20-79 age group. Although more men than women die of diabetes-related causes below the age of 70, the percentage of diabetes-related deaths in women is markedly higher after 40 years of age (see Fig 3.2)

NATIONAL DIABETES PROGRAMMES

More than 60% of countries that responded to the IDF member association survey indicated that there was a national diabetes programme in their country. Routine clinical care and secondary prevention of diabetes complications were among the important topics addressed by NDPs. Significant aspects of the diabetes burden that were monitored included essential medications and supplies, and prevalence and incidence of the disease.

MAP 3.2

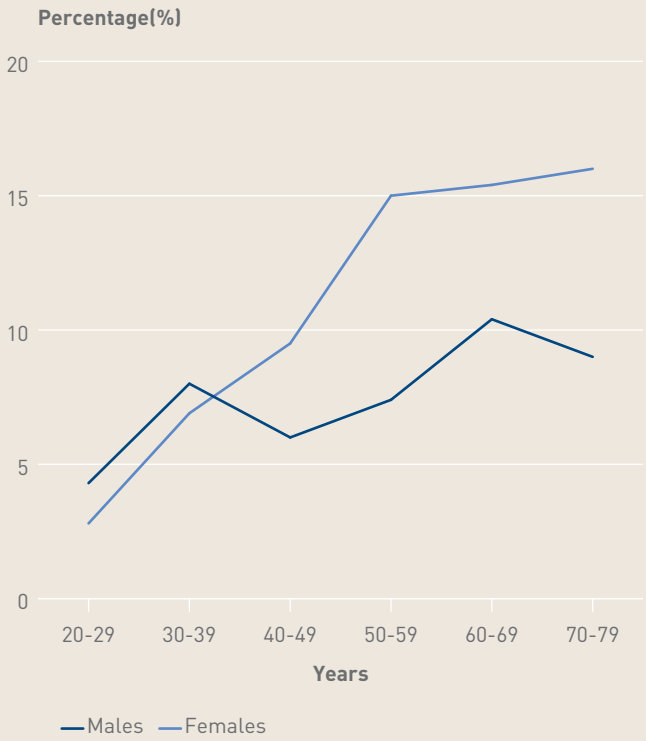
Prevalence* (%) estimates of diabetes (20-79 years), 2010, European Region



* comparative prevalence

FIGURE 3.2

Percentage of all-cause mortality attributable to diabetes by age and sex, 2010, European Region



EUROPE AT A GLANCE

	2010	2030
Total population (millions)	891	897
Adult population (20-79 years) (millions)	646	659
Diabetes (20-79 years)		
Regional prevalence (%)	8.5	10.0
Comparative prevalence (%)	6.9	8.1
Number of people with diabetes (millions)	55.2	66.2
IGT (20-79 years)		
Regional prevalence (%)	10.2	11.0
Comparative prevalence (%)	8.9	9.5
Number of people with IGT (millions)	66.0	72.2
Type 1 diabetes (0-14 years)		
Number of children with type 1 diabetes (thousands)	112.0	
Number of newly-diagnosed cases per year (thousands)	17.1	
Diabetes mortality (20-79 years)		
Number of deaths, male (thousands)	297.6	
Number of deaths, female (thousands)	336.5	
Health expenditure for diabetes (USD)		
Total health expenditure, R=2*, (billions)	105.5	124.6

*see Glossary

3.3 MIDDLE EAST AND NORTH AFRICA

Six countries in the Middle East and North African Region are among the world's 10 highest for diabetes prevalence and a similar situation applies for the IGT prevalence. These countries are Bahrain, Egypt, Kuwait, Oman, Saudi Arabia and United Arab Emirates. The ageing of populations, together with socio-economic and lifestyle changes, has resulted in the dramatic increase in diabetes prevalence.

Over the past three decades, major social and economic changes have occurred in the majority of these nations. These include progressive urbanization, decreasing infant mortality and increasing life expectancy. Rapid economic development, especially among the more wealthy oil-producing countries, has been associated with tremendous modification in lifestyle towards the westernized pattern reflected by changes in nutrition, less physical activity, tendency to increased obesity and more smoking[1,2].

DIABETES AND IGT PREVALENCE

The explosion of diabetes in the MENA Region is mainly due to type 2 diabetes. As with many other countries with high diabetes prevalence, the onset of type 2 diabetes tends to occur at a relatively young age. An estimated 26.6 million people, or 7.7% of the adult population, will have diabetes in 2010, with the number expected to nearly double in the next 20 years. Similarly, the number of people with IGT is also expected to rise markedly by 2030, raising the likelihood of further increases in the prevalence of diabetes as the century proceeds.

Reliable data for type 1 diabetes in children were also available in a number of countries in this region. By far the largest contribution to the total number of children with type 1 diabetes comes from Egypt whose estimates accounts for almost a quarter of the region's total of 54,000 cases. The range of reported incidence varies from 22.3 per 100,000 aged 0-14 years per year in Kuwait to less than 1 per 100,000 aged 0-14 years in Pakistan (see Appendix 1).

MORTALITY

Diabetes is the expected cause of some 290,000 deaths in this region, which will account for 11.5% of all deaths in the 20-79 age group in 2010. More women than men are expected to die from diabetes-related causes. In the 50-59 age group, mortality attributable to diabetes in women accounts for more than 20% of all deaths (see Figure 3.3).

HEALTHCARE EXPENDITURE

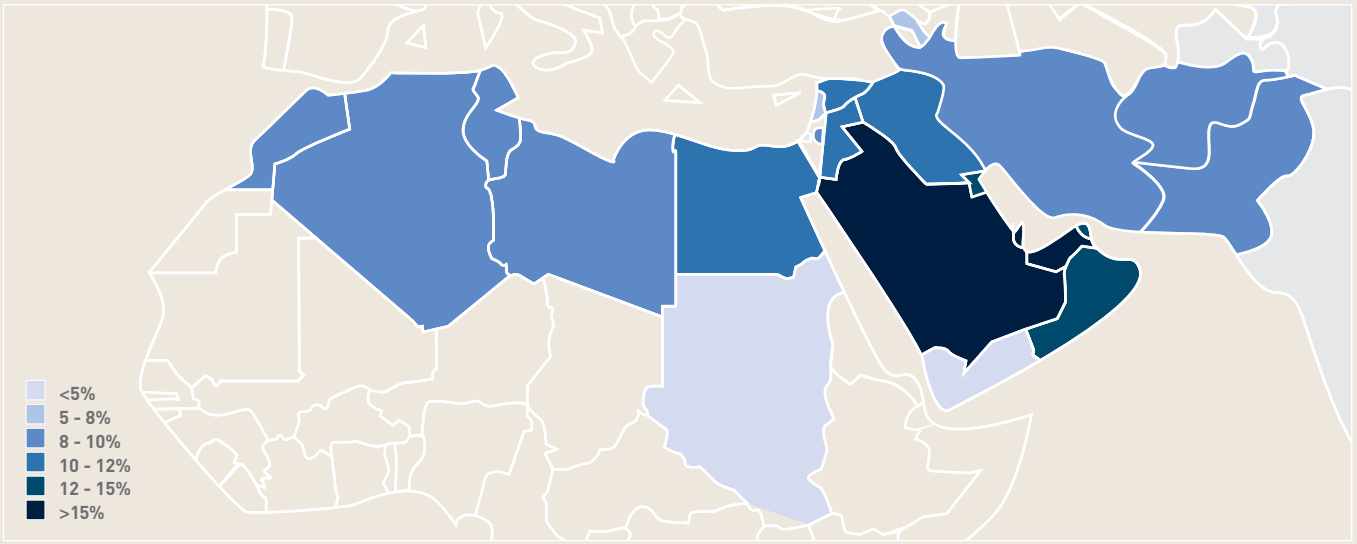
In spite of the high estimates of diabetes prevalence in the MENA Region, the total healthcare expenditure for diabetes is expected to be only USD5.6 billion for the whole region. This is projected to account for only 1.5% of global spending. People with diabetes in the 50-59 age group are expected to incur the highest costs.

NATIONAL DIABETES PROGRAMMES

A high percentage (80%) of countries that responded to the IDF member association survey indicated the existence of a national diabetes programme. In the majority of these countries, the NDP had been implemented. Primary prevention as well as screening and early diagnosis are important areas of focus in many of the NDPs in this region of extremely high diabetes prevalence. At the same time, NDPs monitored community awareness, and the prevalence and incidence of diabetes in their efforts to deal with the diabetes burden.

MAP 3.3

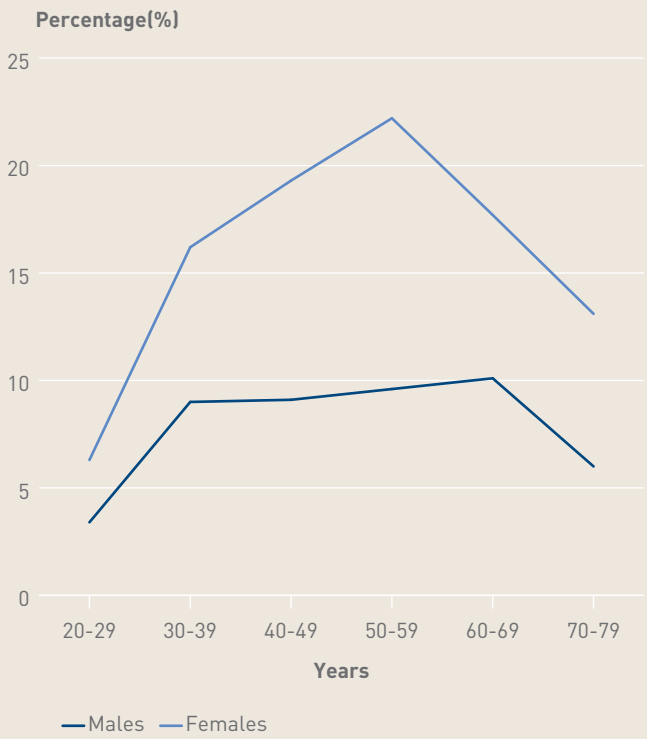
Prevalence* (%) estimates of diabetes (20-79 years) 2010, Middle East and North African Region



* comparative prevalence

FIGURE 3.3

Percentage of all-cause mortality attributable to diabetes by age and sex, 2010, Middle East and North African Region



MIDDLE EAST AND NORTH AFRICA AT A GLANCE	2010	2030
Total population (millions)	617	848
Adult population (20-79 years) (millions)	344	533
Diabetes (20-79 years)		
Regional prevalence (%)	7.7	9.7
Comparative prevalence (%)	9.3	10.8
Number of people with diabetes (millions)	26.6	51.7
IGT (20-79 years)		
Regional prevalence (%)	7.1	8.1
Comparative prevalence (%)	8.2	8.9
Number of people with IGT (millions)	24.4	43.1
Type 1 diabetes (0-14 years)		
Number of children with type 1 diabetes (thousands)	54.4	
Number of newly-diagnosed cases per year (thousands)	9.1	
Diabetes mortality (20-79 years)		
Number of deaths, male (thousands)	117.0	
Number of deaths, female (thousands)	177.0	
Health expenditure for diabetes (USD)		
Total health expenditure, R=2*, (billions)	5.6	11.4

*see Glossary

3.4 NORTH AMERICA AND CARIBBEAN

The North America and Caribbean Region has the highest comparative prevalence of diabetes among the IDF regions with 10.2% in the adult population affected by the disease. The majority of the population in this region lives in the United States of America, Mexico and Canada. Although the region comprises 26 countries and territories, 68% of the adult population currently reside in the USA, with a further 21% living in Mexico and 8% in Canada, so that only 3% of the region's adult population reside in the other 23 smaller nations.

DIABETES AND IGT PREVALENCE

An estimated 37.4 million people with diabetes live in this region, and the number is expected to increase by more than 40% to 53.2 million in 2030. The NAC Region is expected to continue to have the highest comparative prevalence in 2030 when 12.1% of adults are anticipated to have diabetes.

The high prevalence of abnormal glucose tolerance in the adult population for Canada and the USA are very much a consequence of their older age distribution, such that in 2010, 32% of their population will be over 50 years of age, and this is expected to rise to 36% by 2030[1]. This is in contrast to 18% of the Mexican population and 16% of the Caribbean population being over 50 years of age, increasing to 24% and 19%, respectively, by 2030.

As all the Caribbean islands other than Barbados, Guadeloupe, Haiti and Martinique had their estimates extrapolated from Jamaican data[2], the differences in prevalence between these countries are a consequence only of their different age distributions.

There are an estimated 97,000 children with type 1 diabetes in the region. The USA estimate accounts for almost 90% of the region's total, and to a lesser extent, the estimate for Canada predominates (see Appendix 1).

There also has been a marked increase in the estimate of the number of adults with IGT for this region, indicating an urgent need for diabetes prevention programmes.

MORTALITY

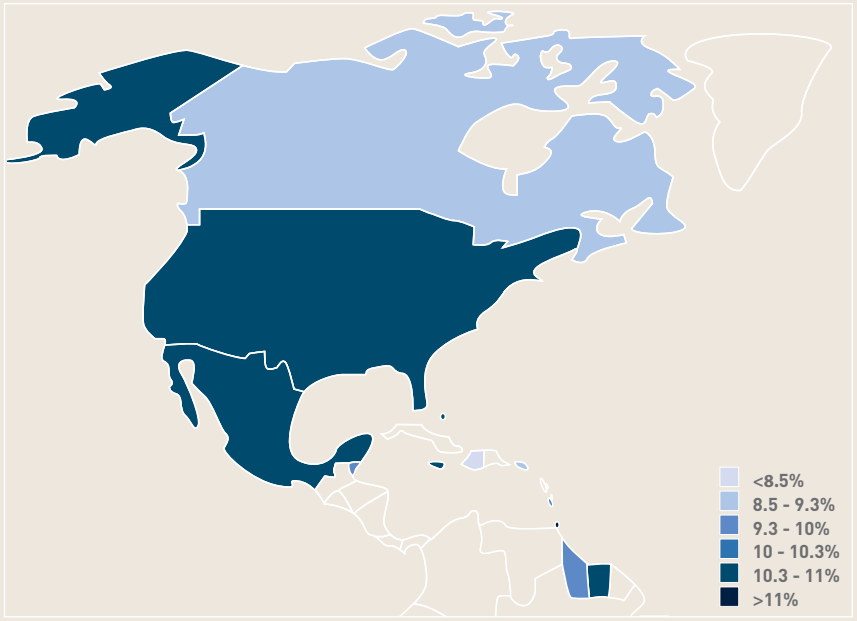
More than 15% of all deaths in the 20-79 age group may be attributed to diabetes in the NAC Region in 2010. This amounts to more than 300,000 deaths. Diabetes-related events are expected to cause significantly more deaths in middle-aged women than men, and account for almost 30% of all deaths in women in the 50-59 age group (see Figure 3.4).

HEALTHCARE EXPENDITURE

Healthcare expenditure for diabetes in the NAC Region is predicted to account for 57% of global spending. The USA alone will account for most of the USD214 billion expected to be spent in the region. Healthcare spending in this region is not significantly higher for women than for men, even though more deaths related to diabetes are thought to occur for middle-aged women than men in the same age group.

NATIONAL DIABETES PROGRAMMES

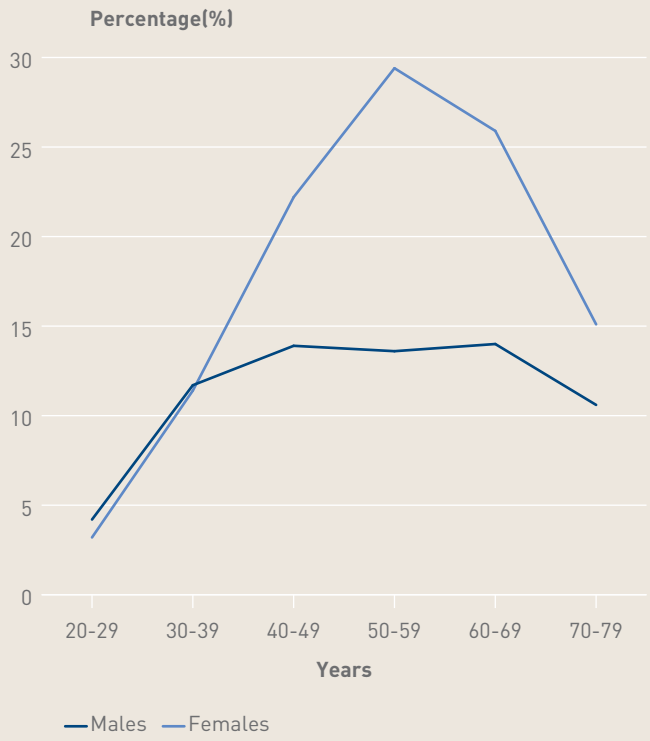
The NAC Region had a relatively low response rate to the IDF member association survey on national diabetes programmes, with only one-third responding. Of these, slightly more than half reported having a NDP. Primary and secondary prevention as well psychological and behavioural issues were some of the important topics addressed by the NDPs. Several critical issues such as cost to the health system and individual, and prevalence and incidence of the disease were monitored by the NDPs in this region.



MAP 3.4
Prevalence* (%) estimates of diabetes (20-79 years), 2010, North America and Caribbean Region

* comparative prevalence

FIGURE 3.4
Percentage of all-cause mortality attributable to diabetes by age and sex, 2010, North America and Caribbean Region



NORTH AMERICA AND CARIBBEAN AT A GLANCE	2010	2030
Total population (millions)	477	555
Adult population (20-79 years) (millions)	320	390
Diabetes (20-79 years)		
Regional prevalence (%)	11.7	13.6
Comparative prevalence (%)	10.2	12.1
Number of people with diabetes (millions)	37.4	53.2
IGT (20-79 years)		
Regional prevalence (%)	11.4	12.6
Comparative prevalence (%)	10.4	11.6
Number of people with IGT (millions)	36.6	49.1
Type 1 diabetes (0-14 years)		
Number of children with type 1 diabetes (thousands)	96.7	
Number of newly-diagnosed cases per year (thousands)	14.7	
Diabetes mortality (20-79 years)		
Number of deaths, male (thousands)	141.0	
Number of deaths, female (thousands)	172.2	
Health expenditure for diabetes (USD)		
Total health expenditure, R=2*, (billions)	214.2	288.7

*see Glossary

3.5 SOUTH AND CENTRAL AMERICA

The South and Central American Region encompasses 20 countries and territories, most of which are still developing economically. South America and Central America have similar age distribution profiles to each other. About 20% of the population will be older than 50 years in 2010, with this figure likely to increase to 28% by 2030. Thus the region has a markedly younger age distribution than most of North America. As urbanization continues and populations age diabetes will become an even greater public priority in this region.

DIABETES AND IGT PREVALENCE

An estimated 18 million people, or 6.3% of the adult population, will have diabetes in 2010. In the following 20 years, the number of people with diabetes is expected to rise by more than 60% to almost 30 million. In addition, current estimates indicate a further 21.2 million people, or 7.4 % of the adult population, will have IGT in 2010. There is a need for further epidemiological studies in this region as considerable extrapolation to obtain prevalence estimates was required. Only seven countries have any epidemiological data from which prevalence estimates could be derived.

Although the incidence of type 1 diabetes in children in the SACA Region is generally low, there are some sharp contrasts between the rates in neighbouring countries (see Appendix 1). A strong inverse ecological correlation has been reported in this region between a country's incidence rate and the proportion of its population that is Amerindian (indigenous). This has influenced the selection of countries to use for extrapolation, but the choice still can make a considerable difference to the resulting estimate. The Brazilian estimate accounts for 70% of the region's total of some 37,000 children.

MORTALITY

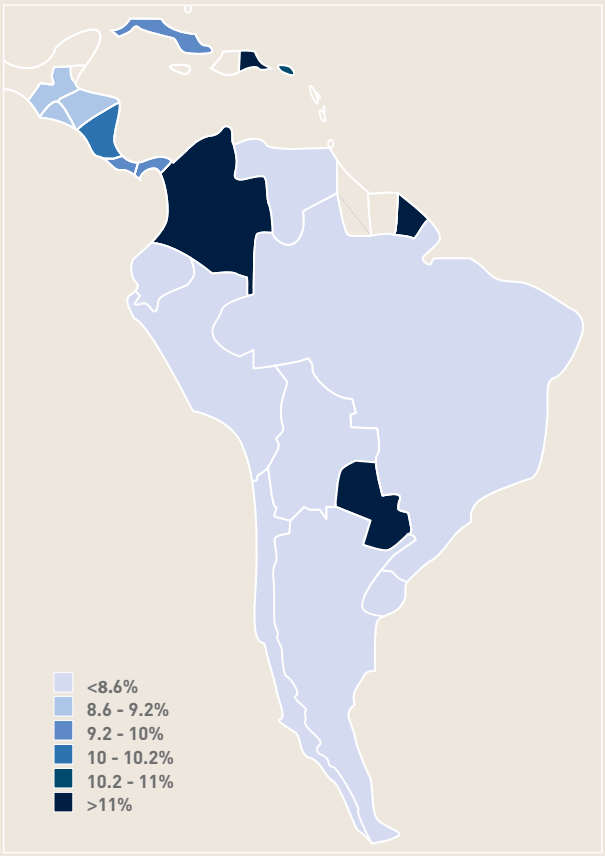
Although the number of excess deaths due to diabetes is lowest in this region compared to other regions, it nonetheless accounts for 9.5% of all deaths in the 20-79 age group. More than 170,000 men and women are expected to die from diabetes-related causes in 2010. Diabetes-related events are expected to be the cause of death in about 17% of all deaths in women in the 50-59 age group (See Figure 3.5).

HEALTHCARE EXPENDITURE

Expenditure on diabetes and its complications is estimated at USD8.1 billion in the SACA Region, accounting for about 2% of the global total. Almost 30% of that spending is expected to be for people with diabetes in the 50-59 age group.

NATIONAL DIABETES PROGRAMMES

More than half of the countries that responded to the IDF member association survey on national diabetes programmes reported that they had a NDP. All of these countries also indicated that it was being implemented. Screening and early diagnosis as well coronary vascular disease complications were among the important topics addressed by the NDPs. The programmes were also concerned with community awareness of diabetes, and essential medicines and supplies.



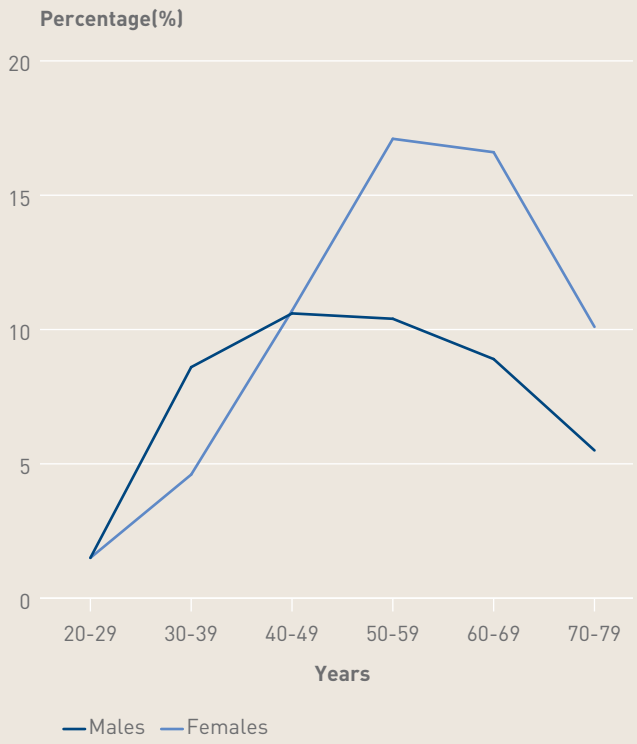
* comparative prevalence

MAP 3.5

Prevalence* (%) estimates of diabetes (20-79 years), 2010, South and Central American Region

FIGURE 3.5

Percentage of all-cause mortality attributable to diabetes by age and sex, 2010, South and Central American Region



SOUTH AND CENTRAL AMERICA AT A GLANCE

	2010	2030
Total population (millions)	465	563
Adult population (20-79 years) (millions)	287	382
Diabetes (20-79 years)		
Regional prevalence (%)	6.3	7.8
Comparative prevalence (%)	6.6	7.8
Number of people with diabetes (millions)	18.0	29.6
IGT (20-79 years)		
Regional prevalence (%)	7.4	8.2
Comparative prevalence (%)	7.5	8.2
Number of people with IGT (millions)	21.2	31.3
Type 1 diabetes (0-14 years)		
Number of children with type 1 diabetes (thousands)	36.9	
Number of newly-diagnosed cases per year (thousands)	5.8	
Diabetes mortality (20-79 years)		
Number of deaths, male (thousands)	83.5	
Number of deaths, female (thousands)	87.8	
Health expenditure for diabetes (USD)		
Total health expenditure, R=2*, (billions)	8.1	13.2

*see Glossary

3.6 SOUTH-EAST ASIA

Although the South-East Asian Region comprises only seven countries, it is one of the most populous regions in the world. The adult population of India will account for 85% of the region's total population in 2010. There is a wide gap in per capita GDP with Mauritius having the highest at USD12,400, while the other countries all have less than USD5,000, although India which has had an annual growth of 7.3% was experiencing economic development at a faster pace than almost anywhere in the world, except its neighbour, China[1].

DIABETES AND IGT PREVALENCE

Current estimates show that 7.0% of the adult population, or 58.7 million people, will have diabetes in 2010. Studies[2,3] indicate that diabetes prevalence in smaller urban centres (100,000 – 1,000,000 inhabitants) tends to be about half of the larger cities, but still twice that of rural areas (less than 100,000 people).

The anticipated increase in regional diabetes prevalence to 8.4% in 2030 is very much a consequence of the increasing life expectancy in India (the proportion of the population over 50 years is expected to increase from 16% to 23% between 2010 and 2030), and of the urbanization of the population (the proportion living in urban settings will increase from 33% to 46%). Evidence suggests that in more affluent parts of the country, the rural prevalence is higher than in less affluent rural areas[4], indicating that increasing economic growth will raise diabetes prevalence in India even more than these possibly conservative estimates have indicated. With regard to IGT, the same pattern as for diabetes emerged, with large cities having twice the prevalence of smaller cities, for which the prevalence is twice that of rural areas.

Mauritius, the second smallest country of the region, highlights the extent to which people of Indian origin appear predisposed to diabetes, when exposed to more affluent economic circumstances. This island has one of the world's highest diabetes prevalence rates with 17% of the adult population affected by diabetes.

India accounts for most of the estimated 114,000 cases of type 1 diabetes in children in the region. The incidence rate for India was frequently used in extrapolation for other countries in the region and therefore plays a pivotal role in the estimates. The large childhood population in India and the widespread use of the Indian data for extrapolation have important consequences not only for the regional total but also for the worldwide estimate. This region contributes more than any other to the worldwide total. Diabetes-associated mortality in children is also likely to play an important role in this region, but unfortunately there is inadequate information to address these issues.

MORTALITY

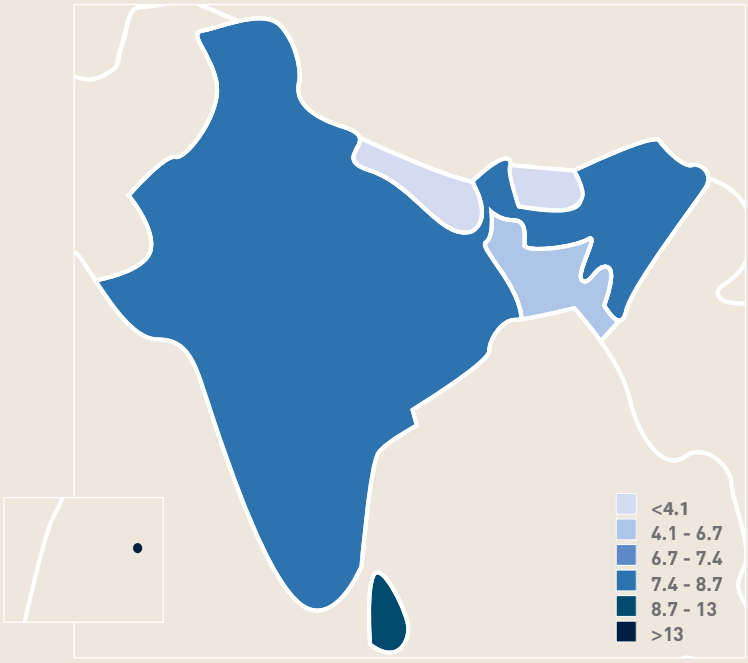
The SEA Region is projected to have the highest number of deaths due to diabetes of all the regions in 2010. An estimated 1.1 million adults is expected to die from diabetes-related causes, accounting for 14.3% of all deaths in the 20-79 age group. Mortality due to diabetes may account for almost a quarter of all deaths in women in the 50-59 age group and 15% of deaths in men in the same age group (see Figure 3.6).

HEALTHCARE EXPENDITURE

In spite of the large number of people with diabetes in the SEA Region, spending on healthcare for diabetes is expected to be only USD3.1 billion for the region, accounting for less than 1% of the global total. Most of the estimated spending is predicted to occur in India.

NATIONAL DIABETES PROGRAMME

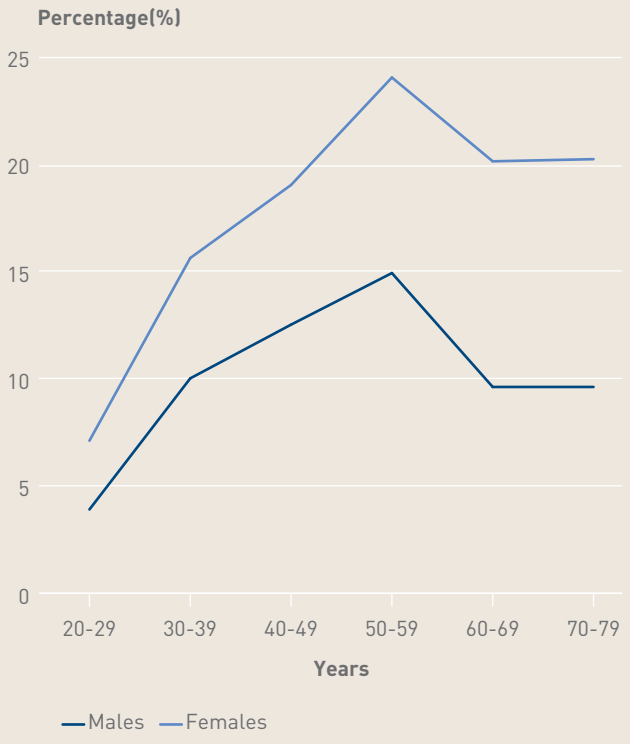
Only one-third of countries in this region responded to the IDF member association survey. According to survey responses, national diabetes programmes have yet to be implemented in this region.



MAP 3.6
Prevalence* (%) estimates of diabetes (20-79 years), 2010, South-East Asian Region

* comparative prevalence

FIGURE 3.6
Percentage of all-cause mortality attributable to diabetes by age group, 2010, South-East Asian Region



SOUTH-EAST ASIA AT A GLANCE	2010	2030
Total population (millions)	1,439	1,788
Adult population (20-79 years) (millions)	838	1,200
Diabetes (20-79 years)		
Regional prevalence (%)	7.0	8.4
Comparative prevalence (%)	7.6	9.1
Number of people with diabetes (millions)	58.7	101.0
IGT (20-79 years)		
Regional prevalence (%)	5.8	6.4
Comparative prevalence (%)	6.2	6.9
Number of people with IGT (millions)	48.6	76.4
Type 1 diabetes (0-14 years)		
Number of children with type 1 diabetes (thousands)	113.5	
Number of newly-diagnosed cases per year (thousands)	18.3	
Diabetes mortality (20-79 years)		
Number of deaths, male (thousands)	476.9	
Number of deaths, female (thousands)	666.0	
Health expenditure for diabetes (USD)		
Total health expenditure, R=2*, (billions)	3.1	5.3

*see Glossary

3.7 WESTERN PACIFIC

The world's most populous region, the Western Pacific, contains 39 disparate countries and territories with predicted populations for 2010 ranging from 1.4 billion for China to less than 5,000 in the smallest Pacific island nations of Niue and Tokelau. Similarly the economic profile varies from per capita GDPs of over USD35,000 for Australia, Hong Kong, Japan and Singapore to less than USD3,000 in one-third of the other countries[1].

Countries with limited resources struggle with the double burden of managing infectious diseases and the diabetes epidemic. Many also face a lack of government awareness of the seriousness of the diabetes threat to their populations.

DIABETES AND IGT PREVALENCE

Some 76.7 million people, or 5% of the adult population, are projected to have diabetes in 2010. In the next 20 years, the number of people with diabetes is expected to increase by almost 50% to 112.8 million. There is a great range in the prevalence of diabetes in the region from the world's highest found in the Micronesian population of Nauru with 31% of the adult population affected by diabetes to Mongolia with 1.6%.

The diabetes epidemic has the greatest potential to explode in China, simply because of its population size. Although the current prevalence there of 4.2% is among the region's lowest, the high prevalence among Chinese populations in the more urbanized and affluent cities of Hong Kong and Singapore indicate what may develop as China rapidly urbanizes and expands economically (see Appendix 1). The data indicated for 2030 are likely to represent an underestimate of China's diabetes problem if it continues to develop economically faster than almost any other country in the world.

Only some 6% of children with type 1 diabetes worldwide come from the WP Region, despite it having the largest childhood population. About 31,000 children are expected to have type 1 diabetes in 2010. With the exception of Australia and New Zealand, the incidence rates for type 1 diabetes in children in this region appear uniformly low. Despite its very low incidence, China accounts for almost 30% of the region's total.

MORTALITY

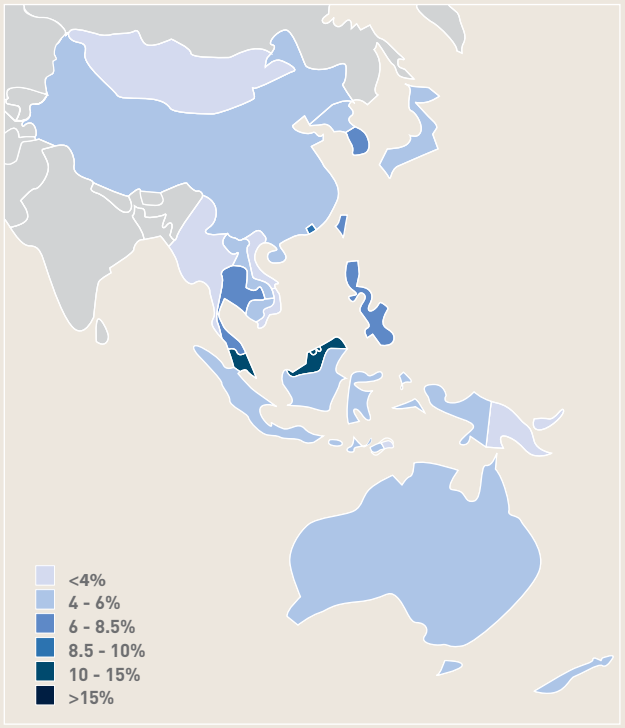
Current estimates suggest that more than one million adults in the WP Region will die of diabetes-related causes in 2010, which will account for almost 10% of all deaths in the 20-79 age group. More men than women in the younger age groups are expected to die from causes attributable to diabetes. However, as in the other regions, diabetes will account for a higher percentage of deaths in middle-aged women than it will for middle-aged men (see Figure 3.7).

HEALTHCARE EXPENDITURE

Expenditure on healthcare for diabetes in this populous region accounts for about 10% of the global total. At least USD38 billion is expected to be spent on healthcare for diabetes. The amount spent on healthcare per person is thought to vary greatly between countries, ranging from more than USD3,000 in Australia and Japan to less than USD10 in the Democratic Republic of Korea and Myanmar (see Appendix 1).

NATIONAL DIABETES PROGRAMMES

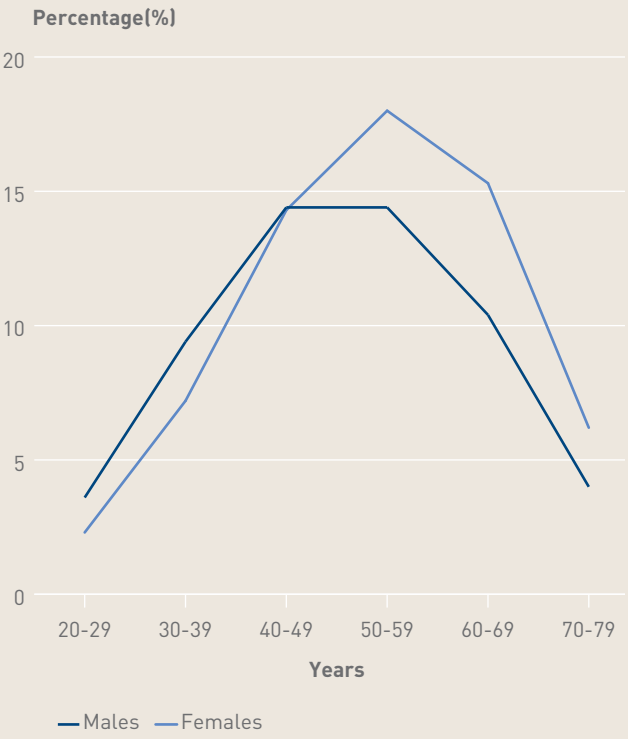
More than half the countries which responded to the IDF member association survey reported that they had a national diabetes programme, most of which had been implemented. Screening and early diagnosis, and routine clinical care were among those topics most frequently addressed by NDPs. Critical aspects of the diabetes burden such as essential medications and supplies, and total cases of treatment were also monitored by NDPs.



MAP 3.7
Prevalence* (%) estimates of diabetes (20-79 years), 2010, Western Pacific Region

* comparative prevalence

FIGURE 3.7
Percentage of all-cause mortality attributable to diabetes by age and sex, 2010, Western Pacific Region



WESTERN PACIFIC AT A GLANCE

	2010	2030
Total population (millions)	2,237	2,444
Adult population (20-79 years) (millions)	1,531	1,772
Diabetes (20-79 years)		
Regional prevalence (%)	5.0	6.4
Comparative prevalence (%)	4.7	5.7
Number of people with diabetes (millions)	76.7	112.8
IGT (20-79 years)		
Regional prevalence (%)	7.8	8.6
Comparative prevalence (%)	7.7	8.1
Number of people with IGT (millions)	119.9	152.6
Type 1 diabetes (0-14 years)		
Number of children with type 1 diabetes (thousands)	30.5	
Number of newly-diagnosed cases per year (thousands)	4.9	
Diabetes mortality (20-79 years)		
Number of deaths, male (thousands)	588.3	
Number of deaths, female (thousands)	486.7	
Health expenditure for diabetes (USD)		
Total health expenditure, R=2*, (billions)	38.2	44.8

*see Glossary

The UN Resolution on diabetes recognizes "the urgent need to pursue multilateral efforts to promote and improve human health, and provide access to treatment and healthcare education".

THE URGENT NEED: PREVENTION AND MANAGEMENT

There is an urgent need for governments to face the challenge of translating the evidence on preventive initiatives into affordable and feasible programmes in order to curb the diabetes epidemic. At the same time, investments must be made in diabetes care and management, including diabetes education, to enable the millions of people with diabetes to lead full and productive lives.

A substantial proportion of type 2 diabetes is preventable, while the prevention of type 1 diabetes remains a critical area for research. Section 4.1 of this chapter looks at some of the evidence that confirms that there are effective measures to prevent or delay the onset of type 2 diabetes. Such measures include supporting changes in behaviour to reduce overweight and increase physical activity, and the use of certain glucose lowering drugs. This section raises the challenge of how to translate the evidence from well-resourced research studies into initiatives that are affordable and feasible, whether in richer or poorer parts of the world. It is clear that what is needed are not only initiatives to identify people at high risk of developing type 2 diabetes, for whom appropriate preventive measures can be provided, but also measures that will lower the risk across the entire population. Population-wide measures will need to include approaches to increasing physical activity and promoting healthier diets. Such measures require actions outside the health sector. For example, measures may include policy initiatives in areas such as transport, urban planning, food pricing, food advertising and education. In short, a sector-wide approach is needed.

Section 4.2 examines the challenges of diabetes for the individual and society, with a particular emphasis on type 2 diabetes. For those who have diabetes many of the complications can be prevented or delayed with access to the right support and healthcare. Good control of blood glucose, lipids and blood pressure, high quality foot care and retinal screening are examples of measures that are known to be effective. Even in low-resource settings there is much that can be done to improve the lives of people with diabetes.

Providing good diabetes care for a population requires coordination across three levels of organization. At the micro level, and at the centre of all care, are people with diabetes, their families and their immediate carers. At the meso level is the community and healthcare organizations within which care is delivered. At the macro level are the supporting policy and financing frameworks. The World Health Organization's Innovative Care for Chronic Conditions Framework provides guidance on the relationships between, and the contents of, these three levels. This framework can be used to help repair the fragmentation of health services across the range of needs that people with diabetes have, and to provide links to broader population interventions, such as those for the prevention of diabetes.

The person with diabetes is the key member of the diabetes management team, as on a day to day basis they make most decisions that affect their care. Section 4.3 looks at the urgent need to invest in diabetes education, the cornerstone of self-care management, in all healthcare systems. Investment must be made not only to ensure specialized diabetes education is accessible to healthcare personnel and people with diabetes but also to ensure both groups are trained in how to implement change.

Background papers on which the summaries of this chapter are based are available in the complementary CD-ROM.

4.1 THE PREVENTION OF TYPE 2 DIABETES

There is excellent evidence that type 2 diabetes can be prevented, or at least its onset delayed, in individuals at high risk. Most of the evidence is from studies that have included people with IGT. Behavioural modification and pharmacological interventions have both been shown to be effective, and to reduce the onset of new diabetes by up to 60% or more. Overall the evidence suggests that lifestyle counselling to support behavioural change, such as losing weight (for those overweight), increasing physical activity, and eating a healthy diet is more effective than pharmacological interventions[1]. For example, for around every six people at high risk treated with lifestyle counselling one new case of diabetes will be prevented over five years, whereas to prevent one new case with an oral diabetes drug, around 11 people will need to be treated. There is evidence that the lower risk of diabetes from lifestyle counselling persists long after its discontinuation, with results from a study in China showing that the benefits were still apparent 20 years later.

TRANSLATING FINDINGS FROM PREVENTION TRIALS INTO THE COMMUNITY

The challenge now is to translate the findings from the well resourced research studies into diabetes prevention initiatives that are affordable and feasible in both low- and high-income countries. The challenge includes finding the most efficient and cost-effective ways to identify people at high risk of developing diabetes, and then providing an effective intervention that is feasible and affordable within the local setting. While there are examples of such initiatives they have tended to be small and poorly evaluated. It is also clear that an initiative developed for one population or group may not be appropriate for another population or group. Thus, community initiatives aimed at the prevention of type 2 diabetes in individuals at high risk need to be developed and evaluated for the specific settings in which they will be used.

NATIONAL EFFORTS TO PREVENT DIABETES

It is acknowledged that while it is important to identify individuals at high risk of developing diabetes for preventive efforts, this will have a limited impact on the rate of diabetes at a national level. What are also needed are measures that reduce the risk across the whole population. Evidence suggests that relatively small improvements in nutrition, reductions in obesity and increases in physical activity if applied across a whole population can have a large impact on the rates of diabetes, and other chronic diseases that share the same risk factors (such as cardiovascular disease and many cancers). Much more attention needs to be given as to how to achieve such population-wide changes. The DEHKO project in Finland[2] provides an example of a comprehensive approach to diabetes prevention and management, which aims to improve nutrition and physical activity across the population, identify and provide individualized support to those at high risk of diabetes and assist with the early detection and management of those who actually have diabetes (see Box 4.2).

COST EFFECTIVENESS OF PREVENTION

Economic evaluations of approaches to identifying and providing preventive measures to people at high risk of diabetes generally suggest that these are cost effective. However, most evaluations contain many uncertainties and there is a need for further work to examine the cost effectiveness of interventions in everyday practice. There is an even greater challenge in assessing the cost effectiveness of population-wide measures.

BOX 4.1 NATIONAL DIABETES PREVENTION PLANS[3]

Government initiatives should include:

- Advocacy
  - Supporting national associations and non-government organizations
  - Promoting the economic case for prevention
- Community support
  - Providing education in schools on nutrition and physical activity
  - Promoting opportunities for physical activity through urban design (e.g. to encourage cycling and walking)
  - Supporting sports facilities for the general population
- Fiscal and legislative
  - Examining food pricing, labelling and advertising
  - Enforcing environmental and infrastructure regulation (e.g. urban planning and transportation policy to enhance physical activity)
- Engagement of private sector
  - Promoting health in the workplace
  - Ensuring healthy food policies in food industry
- Media communication
  - Improving level of knowledge and motivation of the population (press, TV and radio)

BOX 4.2 EXAMPLES OF PREVENTION PROGRAMMES

FINLAND

The Development Programme for the Prevention and Care of Diabetes in Finland (DEHKO 2000–2010) was the first national diabetes programme to implement strategies for the prevention of type 2 diabetes on a population-wide scale. It is now in its final phase after nearly a decade of activity, but there are further plans for the future. DEHKO is a programme that is widely watched for the comprehensiveness in which it has worked towards reducing the incidence of type 2 diabetes in a population and, at the same time, raising the quality of diabetes care.

The FIN-D2D Project (2003–2008) within DEHKO and the follow-up project to D2D are specifically tasked with the implementation of the prevention programme for type 2 diabetes. The FIN-D2D Project has also developed new models for prevention to be disseminated to all primary healthcare centres and occupational healthcare units in Finland. The effectiveness and the cost-effectiveness of these new prevention and care practices are being evaluated. The project is now working towards making the prevention of diabetes and cardiovascular disease part of healthcare routine. More information on DEHKO, which is coordinated by the Finnish Diabetes Association, is available at www.diabetes.fi.

Source: Finnish Diabetes Association [2]

LATIN AMERICA

A project to reduce the burden of type 2 diabetes by education and lifestyle interventions in people at high risk is currently underway in Latin America. The LATIN_PLAN project will implement an intervention programme at primary healthcare level in Argentina, Brazil, Colombia, Ecuador, Peru, Uruguay and Venezuela.

The project is based on current evidence and best practice in the prevention of type 2 diabetes, especially those found in the European diabetes prevention projects (DE-PLAN and IMAGE projects). It also will develop and implement a curriculum for training diabetes prevention managers in Latin America, who will provide a basis for long-term activities at population level, and guarantee sustainability and continuity at the community level. The project is coordinated by the Research Unit of the Hospital Universitario La Paz in Madrid, Spain. More information is available from de_plan@ceiis.e.telefonica.net.

4.2 THE CHALLENGES OF TYPE 2 DIABETES

The ultimate goal of diabetes therapy is to prevent diabetes complications, such as kidney and heart diseases, in order to improve quality of life and life expectancy. There is excellent evidence that the development of complications can be significantly reduced and their progress and impact limited once they have developed[1].

TAILORING APPROACHES TO THE PERSON WITH DIABETES

On a day to day basis most decisions that affect the risk of complications are made by people with diabetes themselves, not by health professionals. Therefore, structured diabetes education, to empower people with diabetes, and their carers to manage their condition is crucial (see Section 4.3). Lifestyle measures such as eating healthily, maintaining a normal weight, regular physical activity, and not smoking are central to diabetes management, and could lead to improvements in blood glucose, lipids and blood pressure and a reduced risk of complications. In addition, medication often has an important role to play, particularly for the control of blood glucose, lipids and blood pressure.

GLUCOSE LOWERING ORAL DRUGS AND INSULIN

The *IDF Global Guideline for Type 2 Diabetes*[1] provides an evidence-based framework for setting targets for glucose, blood pressure and lipids, and titrating treatment in order to achieve them. Oral glucose lowering medication is prescribed when lifestyle measures are insufficient to achieve blood glucose control. For most people metformin, which increases sensitivity to insulin, is the drug of first choice followed by a sulfonylurea, which stimulates insulin release. These drugs have been used in the management of diabetes for decades. If these drugs fail to control blood glucose then other options include thiazolidinediones (increase sensitivity to insulin) and alpha glucosidase inhibitors (decrease rate of glucose absorption from the gut). Newer options include the so-called GLP-1 (glucagon-like peptide) mimetics and DPP-4 (dipeptidyl peptidase 4) inhibitors, both of which increase insulin release. At this time experience with these newer agents is limited but they may have a more prominent role in the future.

Overtime the insulin-producing cells within the pancreas of people with type 2 diabetes deteriorate and eventually in most people insulin is needed as other measures are not sufficient to control blood glucose. Insulin analogues may offer some advantages, particularly with respect to hypoglycaemia and weight gain. The introduction of insulin requires close cooperation between the person with diabetes and health carers.

TAILORING APPROACHES TO THE RESOURCES AVAILABLE

Diabetes care does not need to be expensive to be highly effective. In work carried out for the World Bank and World Health Organization[2] interventions for diabetes were classified into three levels based on an assessment of their feasibility and cost effectiveness in developing country settings. Interventions in the first level were found to be highly cost effective or even cost saving, and included moderate blood glucose and blood pressure control and foot care. Recognizing that most people with diabetes live in developing countries, the *IDF Global Guideline* provides guidance appropriate to three different levels of resource availability.

SCREENING FOR UNDETECTED DIABETES

Type 2 diabetes has a long asymptomatic phase, which frequently goes undetected but during which diabetes complications are developing, and can be present in half or more people with diabetes at diagnosis. Thus, early detection and treatment could help reduce the burden of diabetes complications, and evidence suggests that earlier intensive treatment is indeed effective. However, issues such as who to screen, and what to do with those found to be at high risk of developing diabetes are unresolved. The solutions to these issues will differ between countries, dependent on factors that include the prevalence of undiagnosed diabetes, and the available healthcare resources.

BOX 4.3 AREAS OF INDIVIDUAL DIABETES CARE REQUIRING REGULAR REVIEW

Assessment topic

- Self-care knowledge and beliefs
- Lifestyle adaptation and wishes (including nutrition, physical activity, smoking)
- Psychological status
- Self-monitoring skills and equipment
- Body weight trends
- Blood glucose control
- Blood pressure control
- Blood lipid control
- Cardiovascular risk
- Neuropathy
- Erectile dysfunction
- Foot condition
- Eyes
- Kidneys
- Pre-pregnancy advice (as appropriate)
- Medication review

BOX 4.4 LIVING WITH DIABETES: ZAHIDA KHAN

Architect-trained Zahida Khan was diagnosed with type 2 diabetes as an adult, and has continued to live a full and active life, free of complications, through careful management of the disease.

Zahida Khan, 44, was diagnosed with type 2 diabetes in 1996 at the age of 31. As both parents and her only sister had diabetes, it did not come as a surprise. Her husband, Naeem, gave her the support she needed to change her life to live with diabetes. With good management of her diabetes, Zahida gave birth to their daughter, Zara, in 1999 making the family complete.

Zahida has struck a good balance between work at a school, family responsibilities, and the management of her diabetes. Being motivated, she reads up on diabetes self-management, lives a healthy life, and enjoys interesting discussions with her doctor. She is constantly busy in her daily life with work, household chores and helping Zara with her school work. The family takes a walk every evening.

Oral diabetes tablets were prescribed at the beginning of her treatment, but she has recently started insulin therapy with two daily injections. Zahida regularly monitors her blood glucose at home and has good glycaemic control. She feels energetic and has no diabetes complications, for which she undergoes an annual screening. The secret of good health despite diabetes, reveals Zahida, is to make health the top most priority, maintain discipline in life, have family support and most of all keep a positive and optimistic outlook in life.

4.3 DIABETES EDUCATION

Although guidelines for best practice in diabetes care are readily available, including the *IDF Global Guideline on Type 2 Diabetes*, and there are several frameworks to guide their implementation, it remains a challenge in all countries to bridge the gap between actual and optimal care.

INVESTMENTS IN EDUCATION AND CHANGE

One important part of any solution is education. Diabetes-specific education is required for healthcare personnel and people with diabetes; and in addition training is needed to help them integrate new knowledge and transform old practices. The latter is essential if clinical outcomes for people with diabetes are to be improved. It has been shown that without a purposeful, planned method of changing clinical or personal behaviour, very little happens. Investment must be made not only to ensure specialized diabetes education is accessible to healthcare personnel and people with diabetes but also to ensure both groups are trained in how to implement change[1,2].

Ministries of Health and health administrators need to recognize and give support to the special healthcare needs of people with diabetes[1], and this includes designing health systems that facilitate best practice[2]. Providing good diabetes care for a population requires the coordination of the health systems across three levels. At the centre of all care is the person with diabetes, their family and their immediate carers. At the middle level is the community and healthcare organizations within which care is delivered. Effective functioning across the providers needed to care for people with diabetes requires supporting policy and financial frameworks. The World Health Organisation's Innovative Care for Chronic Conditions Framework[1] provides guidance on the relationships between, and the contents of, these three levels. This framework was designed to be helpful within different resource settings, rich to poor, and has been developed with suggested methods of quality improvement to incrementally strengthen health systems for diabetes and other chronic diseases (see Chapter 5.2).

Modern improvement processes have had positive results in many countries, including Canada, USA, United Kingdom, Ghana, Malawi, South Africa, Russia and Peru. A critical factor in their success is that they develop and implement solutions specific to the realities of their settings[2]. Reorganization of current resources or addition of new resources may be required to fill overt gaps in care, such as interdisciplinary teams specially trained to provide diabetes self-management education and follow-up or access to essential medicines packaged with education to support their use. The advancement of diabetes care relies not only on increased knowledge and behaviour change but also on using proven methods to advance health systems to support best practice[3].

SELF-MANAGEMENT EDUCATION AND SUPPORT

"Diabetes self-management education (DSME) and ongoing self-management support are critical components of effective diabetes care, and significant contributors to metabolic and psychological outcomes[4]." In many areas of the world people with diabetes cannot access this essential treatment. Interactive DSME is essential for people with diabetes to understand their condition, protect themselves from harm and make lifestyle changes to optimize their health. To design an accessible programme, funding needs to be provided for healthcare personnel with specialized training in DSME. Programmes must be locally affordable, offered in areas accessible to the target population, delivered at appropriate literacy levels and be culturally relevant. Diabetes self-management education and diabetes self-management support must be available and accessible for people with diabetes if optimal outcomes are to be achieved[4].

People with diabetes have the right to understand their disease, make informed choices and receive care based on best practice. They must be part of the team that manages their condition.This can only be achieved if interdisciplinary teams and people with diabetes have the information and tools to make changes based on best practice and recognized improvement strategies are used to support meaningful system change.

BOX 4.5 SURVEY ON DIABETES EDUCATION PRACTICES

A survey was carried out by the IDF Consultative Section on Diabetes Education in 2008 to gain a deeper appreciation for diabetes education practices worldwide and to provide a preliminary look at diabetes education in specific areas. The purpose of the survey was to capture responses from providers regarding practice setting, descriptions of diabetes teams, resources for diabetes education, community services and barriers to diabetes education.

The survey questionnaire was based on the structural and process standards for diabetes health education defined in the IDF's *International Consensus Standards for Diabetes Education*[5], which provides a benchmark against which the quality of DSME programmes can be evaluated.

The surveys were completed by healthcare professionals selected to participate in train-the-trainer sessions. The survey respondents represented healthcare institutions in the IDF African, European, Middle East and North African, North America and Caribbean, and South and Central American Regions.

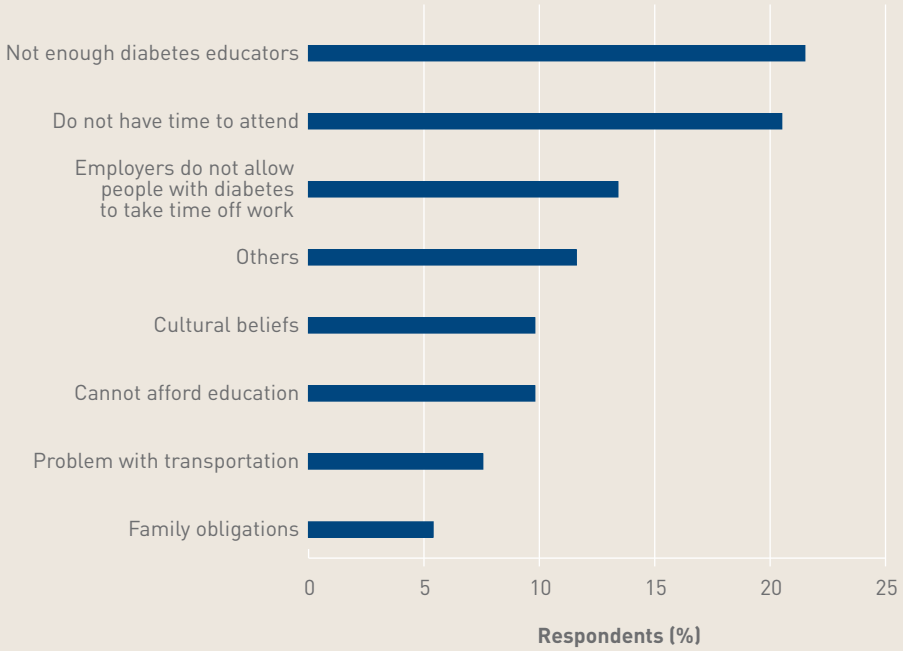
SURVEY RESULTS

The survey results provide preliminary data on the status of diabetes education in the different regions. Forty-five out of 55 participants responded, giving a response rate of 82%. Respondents represented 26 countries in the five regions.

The results indicated that diabetes education was integrated into national diabetes programmes in two-thirds of the countries which had such a programme. The results also showed that diabetes education was practised in a variety of settings by many different healthcare providers. When asked about the most significant barriers to diabetes education, lack of resources in terms of the number of diabetes educators from the systems perspective was most often cited (see Figure 4.1). Another important barrier was that people with diabetes did not have time or support from employers to pursue diabetes education. The results also confirm that despite the presence of national diabetes programmes, people with diabetes may not have access to adequate education and care.

These data are limited by the sample chosen to participate and should not be considered statistically representative. However, the respondents do provide insight into their perception of diabetes education in their country. Despite the limitations of the survey, the results demonstrate a clear need for increased numbers of diabetes educators and support for diabetes self-management education for people with diabetes.

FIGURE 4.1 Perceived barriers to diabetes education



The UN Resolution on diabetes recognizes that strengthening public health and healthcare delivery systems is critical to achieving internationally agreed development goals including the Millennium Development Goals.

TAKING ACTION: DIABETES POLICY AND HEALTHCARE RESPONSE

System-level changes are an important part of the response to the increasing diabetes burden. This means improving the way that diabetes is planned for at a national level, improving the political and organizational environment within which diabetes care is provided and establishing standards for reporting that help us to monitor progress.

Previous chapters have shown the magnitude of the burden of diabetes, and summarized what we know about the prevention and management of diabetes. The prevalence of diabetes is increasing globally, as are the economic costs both to countries and individuals. There is increasing evidence that prevention strategies do work to prevent type 2 diabetes, and that education of healthcare workers and people with diabetes needs to play a key role in improving outcomes. These efforts are most likely to be effective if undertaken within a comprehensive framework that includes society, the health system and a supportive policy environment.

This chapter examines aspects of the response of policy-makers and health systems. The macro level of the World Health Organization's Innovative Care for Chronic Conditions Framework[1] provides guidance to governments regarding the content of health systems for diabetes care. National diabetes programmes are an important method of providing a co-ordinated and supportive policy and financial environment. The existence and content of national diabetes programmes can be seen as indicators of national commitment to preventing diabetes and caring for people with diabetes. Section 5.1 examines the status and content of national diabetes programmes as reported by IDF member associations.

Section 5.2 builds on the issues of access to insulin covered in the third edition of the *IDF Diabetes Atlas*[1] and examines the broader picture of what is needed to provide care for people who require insulin. Results from assessments conducted in a number of low-income countries show that simply making affordable insulin available is not sufficient and that other factors, many outside of the health sector, such as the policy environment, have a major impact on the quality of care for people with diabetes who require insulin.

Finally Section 5.3 reviews the medical literature on global efforts to monitor the quality of diabetes care and identifies issues that inhibit the most basic monitoring at a global level. These issues appear to be relatively simple to solve and yet have so far proven to be intractable.

Taken together these sections demonstrate that at the level of policy and healthcare systems action is being taken to improve care for people with diabetes; however, they also show that there is considerable room for improvement.

Background papers on which the summaries of this chapter are based are available in the complementary CD-ROM.

5.1 NATIONAL DIABETES PROGRAMMES

Diabetes has been recognized at the highest international levels as being a serious threat to health and to economic development[1,2]. In 1989 the 42nd World Health Assembly passed a global call to action on the prevention and control of diabetes in the form of Resolution WHA42.36[1] and in response five regional declarations were adopted. The St. Vincent Declaration[3] in Europe brought immeasurable benefits globally by providing leadership, inspiration, motivation, and a role model on advocacy and action for diabetes which had a worldwide influence. It was followed in 1994 by the Declaration of the Americas, in 2000 by the Western Pacific Diabetes Declaration and Plan of Action, in 2006 by the Declaration and Diabetes Strategy for Sub-Saharan Africa and in 2008 by the Kathmandu Declaration.

Resolution WHA42.36 also provided the mandate for the development of national diabetes programmes. NDPs are the means by which countries explicitly allocate resources to prevent diabetes and care for people with diabetes, and therefore can be seen as an indicator of the commitment of countries to dealing with diabetes.

In 2006 there was a second landmark resolution: UN Resolution 61/225[2] on diabetes contained three core messages, the third of which called for:

"...Member States to develop national policies for the prevention, treatment and care of diabetes in line with the sustainable development of their health care systems, taking into account the internationally agreed development goals including the Millennium Development Goals"

SURVEY OF NATIONAL DIABETES PROGRAMMES

Given the pivotal role that NDPs would need to play in answering the call of the UN Resolution, the IDF Task Force on National Diabetes Policy and Action surveyed the 202 IDF member associations in 2008 to determine the existence, content and implementation status of NDPs in their countries.

Just under half of the associations responded, and almost two-thirds (61%) of the 89 respondents reported that their country had a National Diabetes Plan. Overall three-quarters of the plans were being implemented. The status of NDPs in each country can be seen in Map 5.1.

In two-thirds of countries with an NDP, the NDP functions as an integrated component of a national non-communicable disease strategy. One-third of countries reported that there was funding dedicated solely to the NDP.

The content of the NDPs were varied, however there were some themes that were consistently represented in the goals and objectives of most of the programmes (see Box 5.1). The survey demonstrated that there is a strong core of cohesive national activity on diabetes around the world. However, it also illustrates the need for a concerted effort to encourage and support countries without NDPs, and those whose NDPs are inactive, to develop and implement comprehensive prevention and care plans aimed at reducing the personal, family and societal burden of diabetes.

NDP TOOLBOX

To assist countries that need to design an NDP IDF is developing an 'NDP Toolbox'. This will set out considerations and provide source material for developing and implementing NDPs. Topics will include measuring the problem (disease prevalence, morbidity and cost), intervening to mitigate the problem (prevention, early diagnosis, services and care of people with diabetes) and evaluating the impact of the interventions.

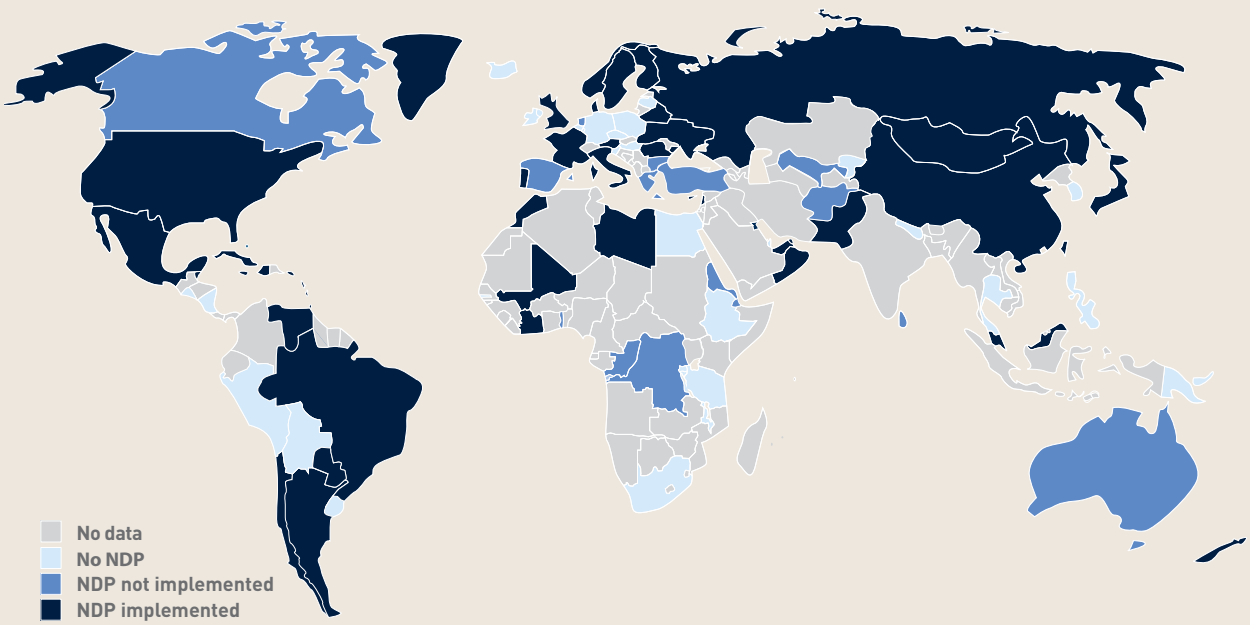
Inevitably the success or otherwise of broad public health policy and advocacy interventions such as NDPs ultimately centre on the question of whether or not they are sustainable. It is now clear that the movement that started 20 years ago with WHO Resolution WHA42.36, and is currently being re-invigorated by UN Resolution 61/225, is durable and has the capacity to mount a robust, sustained and successful battle against diabetes.

BOX 5.1 NATIONAL DIABETES PROGRAMMES GOALS AND OBJECTIVES

The following themes consistently appeared in the respondents' specification of their country's NDP goals:

- Raising public awareness – national promotion, information and education
- Prevention: primary (reduce diabetes incidence), secondary (early diagnosis and behaviour change), tertiary (reduce complications, mortality, minimize impact)
- Improve quality of diabetes treatment and care: accessible, community-based, multi-disciplinary teams, patient-centred approach
- Ongoing professional development/training for diabetes care personnel (health workers)
- Development of national clinical guidelines for diabetes
- Support for research into diabetes
- Establish a diabetes register (type 1 diabetes)

MAP 5.1 National Diabetes Programmes (NDP)*



* Based on a survey of IDF member associations.

5.2 BEYOND ACCESS TO INSULIN

Insulin is vital for the survival of people with type 1 diabetes and often ultimately required by people with type 2 diabetes. Even though insulin's indispensible nature is recognized by its inclusion in the World Health Organization's (WHO) Essential Medicines List[1] insulin is still not available on an uninterrupted basis in many parts of the developing world[2]. The natural and obvious solution for those who require insulin would therefore appear to be to improve the availability of affordable insulin.

While an important step, however, improving the supply of insulin alone is not sufficient to deliver good diabetes care for people in resource-poor settings. Basic diabetes care for people who require insulin also includes monitoring equipment and consummables, education, informed healthcare workers, and a policy environment that supports these.

In order to assess these issues, the International Insulin Foundation (IIF) developed the Rapid Assessment Protocol for Insulin Access (RAPIA) to examine the supply path of insulin and determine the importance of issues related to other diabetes-related supplies[3]. RAPIA surveys have now been conducted in five countries between 2003 and 2008: in Mali, Mozambique, Nicaragua, Vietnam and Zambia.

BARRIERS TO DIABETES CARE

These surveys found various barriers to good care, including price and availability of insulin, syringes, and diagnostic and monitoring devices and consummables (see Figure 5.1). The price of insulin varied as a result of government policies on health insurance, taxation, tendering procedures, and charges for storage and transportation. It also varied between different parts of the health system, and between private and public facilities.

Insulin cannot be used without syringes to inject it. Syringes were not readily available in the public sector in any country surveyed, and all countries except for Nicaragua charged value added tax (VAT) on syringes.

While the cost of insulin can be a significant factor in low- and middle-income settings it is by no means the only important cost in the management of insulin-requiring diabetes. In many resource-poor settings diabetes care is delivered at secondary or tertiary healthcare facilities, rather than through primary healthcare. This means that people often need to travel long distances to attend clinic and travel costs can become a significant proportion of the total costs faced by families (Table 5.1).

KEY ELEMENTS OF GOOD CARE

Insulin supply is thus an essential element of care for people with insulin-requiring diabetes, but alone it is insufficient to provide good care. A complete package is required, the key elements of which are described in the World Health Organization's Innovative Care for Chronic Conditions Framework (ICCCF)[4]. The ICCCF contains eight elements:

- Support a paradigm shift (from a focus on acute, episodic care to one that also includes chronic conditions);
- Manage the political environment;
- Build integrated healthcare;
- Align sectoral policies for health;
- Use healthcare personnel more effectively;
- Centre care on the patient and family;
- Support patients in their communities;
- Emphasize prevention (primary prevention is relevant to type 2 diabetes, while prevention of complications is relevant to both type 1 and type 2 diabetes).

The ICCCF considers the health environment at macro (policy and financing), meso (healthcare organization and community) and micro (patient and family) levels. The framework recognizes the partnership required between the patient, the healthcare team and the community, a partnership that exists within the context of organized and well-equipped healthcare teams and a positive policy environment.

Using RAPIA can provide the information required to assess the current ability of the health system and its supporting environment to provide care for those who require insulin. The implementation of care for people with diabetes needs to be developed within the framework of a national diabetes (or non-communicable diseases) programme. However, as shown in Section 5.1 many countries do not have an NDP or have not implemented their plan.

FIGURE 5.1 Affordability and availability of insulin

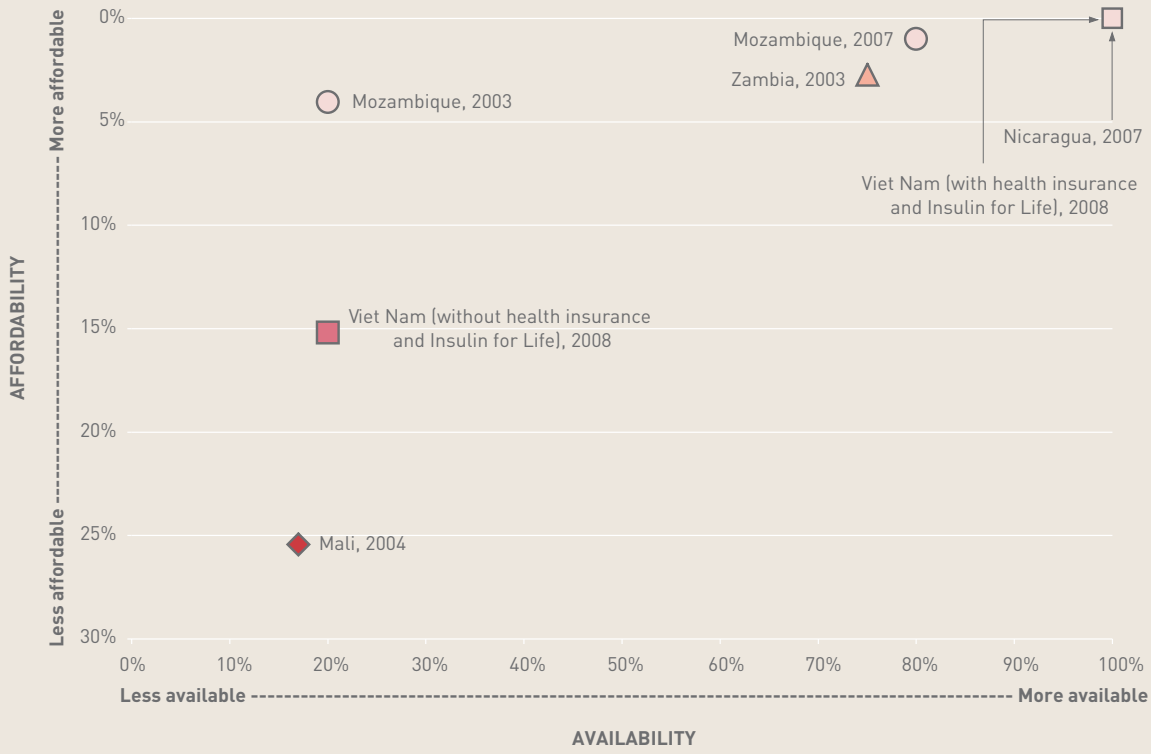


Figure 5.1 summarizes the results of several RAPIA studies. The top-right region of the Figure is where insulin is regularly available and affordable; the bottom-left of the Figure is where insulin is rarely available and even when available it is relatively expensive. Each mark represents an application of the RAPIA tools. For example, two studies were conducted in Mozambique. At the time of the first survey (2003) insulin was relatively affordable, but rarely available. As a result of this survey, changes were made to the supply of insulin and in the subsequent survey (2007) insulin was found to be available most of the time and even more affordable. In Viet Nam, affordability and availability were very different for those who did or did not have health insurance or support from the Insulin for Life programme.

TABLE 5.1 Cost of diabetes care

	Insulin	Testing	Syringes	Consultation	Travel	Total per year (USD)	Percentage of per capita income
Viet Nam (2008)	39%	8%	5%	3%	46%	$427.0	51%
Mali (2004)	38%	34%	8%	7%	12%	$339.4	61%
Mozambique (2003)	5%	24%	1%	9%	61%	$273.6	75%
Zambia (2003)	12%	63%	6%	6%	12%	$199.1	21%
Nicaragua (2007)	0%	73%	0%	0%	27%	$74.4	7%

Assumptions:

1. 1 vial of insulin per month
2. 1 syringe per day
3. 1 blood glucose test per month
4. 1 consultation per month
5. Travel for 1 consultation per month
6. 'income' defined as per capita gross domestic product (GDP)

5.3 GLOBAL MONITORING OF QUALITY OF DIABETES CARE

The maps of diabetes prevalence and mortality shown earlier in this volume provide a useful overview of the burden of diabetes around the world. To understand how well we are responding to this burden globally it would be useful to have an equivalent set of maps to monitor the quality of diabetes care. The prevalence maps are created by applying models to data taken from published journal articles and an equivalent process that provides equally valid, representative and comparable data on indicators of quality of care is required. This section investigates what international comparisons of quality of care have already been made, and considers the factors that facilitate or hinder such international comparisons.

A search of published medical literature was made covering the five-year period 2004—2008 to look for studies that referred to diabetes quality of care. Out of over 1,500 publications there were many multi-site (within the same country) and single-setting studies, but only three attempts to compare quality of diabetes care across countries, each of which were limited to comparisons of data from just two countries and only one that compared national data. Reviewing a 50% sample of literature from 1999—2003 found an additional five references. These were based on data from the 1990s, and may not represent current quality of care.

So, why is it that there is a large number of studies of diabetes care within countries, many based on multiple sites, yet so few international comparisons? The simple answer is lack of consistently applied standards that would enable international comparisons. Standard systems and definitions, applied to comparable populations result in data that can be collected and compared relatively easily. The more unified systems are, the easier these comparisons become.

STANDARD INDICATORS

Standard indicators need to be defined and then used for reporting. This includes standard definitions of diabetes complications. For example, there is broad agreement regarding the diagnosis of diabetes, but complications, such as 'neuropathy', can be defined in many ways, limiting the ability to compare them in a meaningful way.

The Diabetes Quality Improvement Project developed such a set of standard measures for use in the USA[1], and these informed the OECD Health Care Quality Indicators (HCQI) Project[2,3] when it selected nine indicators for diabetes (See Box 5.2). The selection of these indicators was based on a number of criteria, including the feasibility of collecting these data. Even so, until now HCQI has only been able to report on two of these indicators: annual eye examination and lower-extremity amputation rate.

STANDARDIZED DATA SYSTEMS

Data systems are required to manage the data collected by health facilities and to report on indicators of quality of care. Many solutions have been developed to manage health data and systems differ between countries (and often within countries), heterogeneity that arises from local needs. Integrating the data from these different systems therefore requires an additional data system, or changes to local systems to provide outputs that conform to an agreed standard format.

STANDARDIZED OR COMPARABLE POPULATIONS

If comparisons of quality of care are to be meaningful the data need to come from groups of people with diabetes that are either directly comparable or can be standardized to make them comparable. For example, when making comparisons of care between countries it would not be appropriate to compare the quality of care from a single health facility in one country with data from one in another country, unless it can be shown that the selected facilities are representative of their country. It would, however, be reasonable to compare complete national data or data from an appropriately selected sample.

CONCLUSION

Lack of standardization in the definition of indicators and the systems to provide such indicators in representative groups of people with diabetes limits our ability to monitor quality of care globally.

BOX 5.2 OECD HEALTHCARE QUALITY INDICATORS FOR DIABETES

AREA	INDICATOR NAME
Process of care	Annual HbA1c testing
	Annual LDL cholesterol testing
	Annual screening for nephropathy
	Annual eye examination
Proximal outcomes	HbA1c control
	LDL cholesterol control
Distal outcomes	Lower-extremity amputation rates
	Kidney disease in persons with diabetes
	Cardiovascular mortality in persons with diabetes

BOX 5.3 CASE STUDY: EUROPEAN INITIATIVES

DIABCARE/QUALIDIAB, EUCID, BIRO, EUBIROD

There are several examples, mainly from Europe, of projects that have promoted meaningful international comparisons of the quality of diabetes care. DIABCARE/QUALIDIAB was established after the St. Vincent Declaration by WHO with a data system, DIABCARE Q-Net[4]. More recently the European Core Indicators in Diabetes (EUCID) project gathered data from 19 European countries. The recently completed BIRO project learned from the experiences of DIABCARE, the OECD indicators and EUCID project and has developed a set of indicators and data system. This data system is now being rolled out to sites in 22 European countries. While these initiatives have managed to report on quality of care to a varying extent, they have yet to result in the systematic and sustainable reporting of diabetes quality of care information.

Non-communicable diseases are an under-appreciated cause of poverty and now present a serious barrier to economic development.

FROM VISION TO ACTION

The International Diabetes Federation calls on the international community to fund essential diabetes medicines and technology and respond to the requests from low- and middle-income countries for support to strengthen their healthcare systems, in keeping with the goals of UN Resolution 61/225.

In spite of the adoption of UN Resolution 61/225, and the growing recognition worldwide that diabetes is epidemic and a serious barrier to economic development, diabetes programmes for prevention and care in many countries remain grossly underfunded. This chapter looks at action taken at the international level to assist countries meet the challenges of providing a healthcare system that could tackle the burgeoning problem of diabetes and other non-communicable diseases.

Section 6.1 puts diabetes within the framework of non-communicable diseases and points out that 60% of all deaths worldwide is caused by diabetes, cardiovascular disease, cancer and chronic respiratory disease. It underlines the need for public and private partnerships that could save millions of lives through cost-effective solutions that exist. It highlights the support of the International Diabetes Federation and other international health organizations for the WHO Action Plan for the Global Strategy for the Prevention and Control of Noncommunicable Diseases, and their call to the international community to take specific measures.

Section 6.2 identifies the direction and steps that the International Diabetes Federation will take in the next three years to win the battle against diabetes. It emphasizes the Federation's call to the international community to fund essential medicines and technology, and to meet requests from low- and middle-income countries to strengthen their healthcare systems. It describes a series of programmes that the Federation will continue to undertake to assist governments, civil society and the healthcare community to fully implement the goals of UN Resolution 61/225.

6.1 THE NEXT HEALTH TSUNAMI: NON-COMMUNICABLE DISEASES

The emerging epidemic of non-communicable diseases is threatening to overwhelm healthcare systems worldwide unless action is taken now. Diabetes, cardiovascular disease, cancer and chronic respiratory diseases cause 60% of all deaths worldwide, with four in every five of these deaths occurring in low- and middle-income countries. NCDs are an under-appreciated cause of poverty and now present a serious barrier to economic development. They are estimated to reduce gross domestic product (GDP) by up to 5% in many low- and middle-income countries, dealing a double blow to fragile economies struggling in the global recession and its aftermath.

NCDs threaten all sectors of society and have been recognized as a serious and increasing global risk by the World Economic Forum (see Figure 6.1). NCDs hit workers in LMCs in their most productive years and if unchecked, will decimate the workforce in particular countries with catastrophic impact for both economic growth and the well-being of families.

Although diabetes and the other NCDs account for 35 million deaths annually, they are seriously under-resourced. Most bilateral and multilateral funding organizations of Overseas Development Assistance (ODA) to low-income countries have little or no funding for NCD programmes. The International Diabetes Federation strongly supports the UN Millennium Development Goals (MDGs) which include targets on maternal health, child health, and HIV/AIDS, tuberculosis and malaria. But the MDGs need indicators to measure progress on NCDs before the NCD burden undermines progress made on economic and human development.

PUBLIC AND PRIVATE PARTNERSHIPS

The World Health Organization (WHO), in its 2008—2013 Action Plan for the Global Strategy for the Prevention and Control of Noncommunicable Diseases, identifies international partnerships as paramount in the global struggle against NCDs. The WHO Action Plan calls for concerted action on a global scale from governments, non-governmental organizations, the international community and private sector.

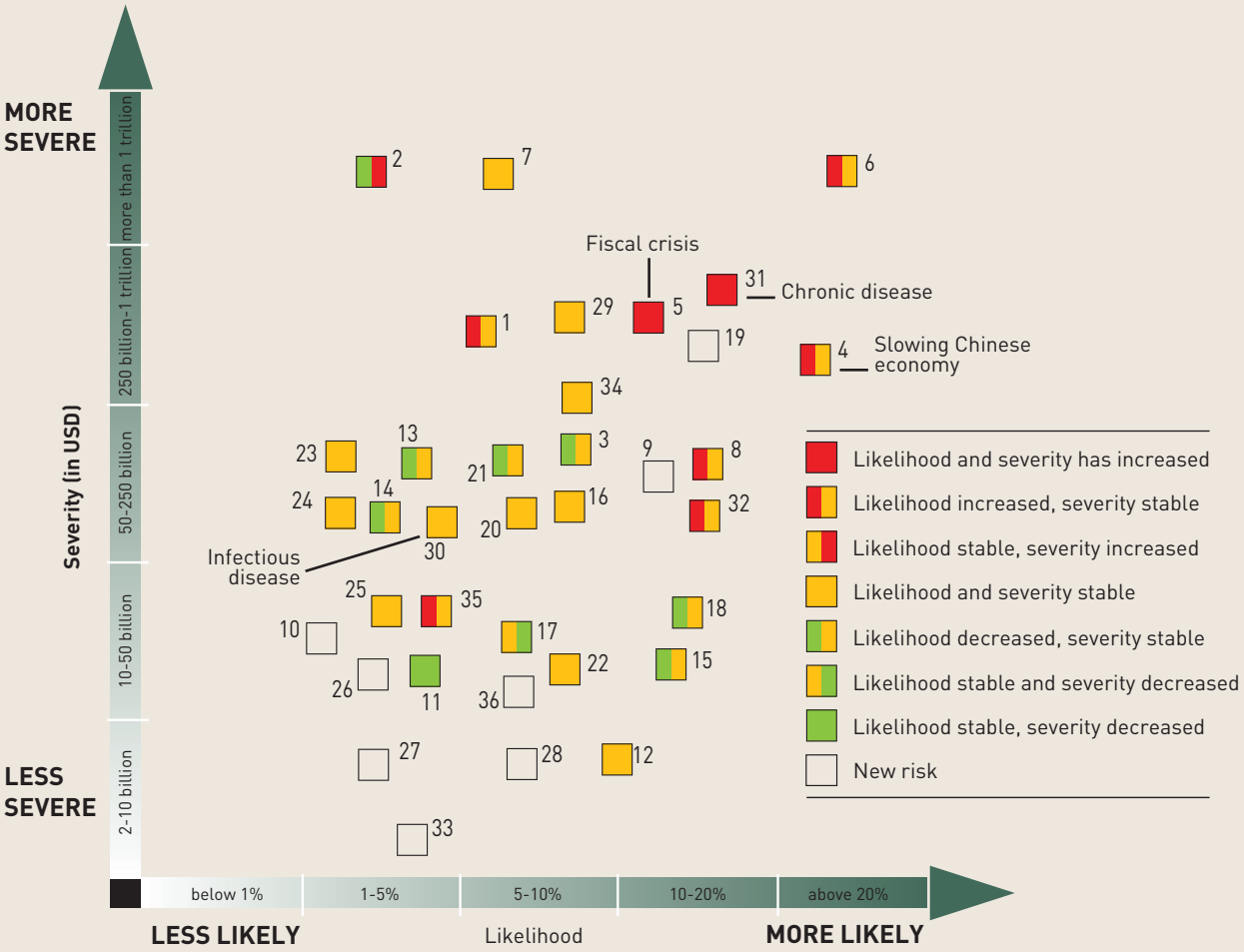
In May 2009, IDF, International Union Against Cancer (UICC) and World Heart Federation (WHF) rose to the challenge and issued a joint statement timed to coincide with the meeting of the World Health Assembly in Geneva. The organizations highlighted their support for the WHO Action Plan and called for the international community to:

1. Ensure the availability of essential medicines for people living with NCDs in low- and middle-income countries
2. Immediately and substantially increase financing for NCDs
3. Integrate NCD prevention into national health systems and the global development agenda
4. Create a Special Envoy of the UN Secretary-General for NCDs
5. Support a UN General Assembly Special Session on NCDs

Simple, cost-effective solutions exist to take on the burgeoning epidemic of NCDs. With 10-12 essential NCD medicines — most of which are out-of-patent and cost pennies to produce — the world could save millions of lives in LMCs. Such action would bring the international community closer to achieving the UN Millennium Development Goals. Governments who invest in prevention now will be spared the overwhelming costs of chronic care later.

IDF is working to raise awareness of the growing diabetes burden and catalyse political action to reverse the epidemic. Statements from the high level UN Economic and Social Council (ECOSOC) and Caribbean Heads of Government meetings in July 2009 show clearly that political momentum is growing. 2009 may come to be seen as a landmark year in moving diabetes and the other NCDs higher up the global agenda.

FIGURE 6.1 Likelihood and severity of risks to global development



Source: World Economic Forum 2009[1]

ECONOMIC
1 Food price volatility
2 Oil and gas price spike
3 Major fall in USD
4 Slowing Chinese economy (6%)
5 Fiscal crises
6 Asset price collapse
7 Retrenchment from globalization (developed)
8 Retrenchment from globalization (emerging)
9 Regulation cost
10 Underinvestment in infrastructure

GEOPOLITICAL
11 International terrorism
12 Collapse of NPT
13 US/Iran conflict
14 US/DPRK conflict
15 Afghanistan instability
16 Transnational crime and corruption
17 Israel-Palestine conflict
18 Violence in Iraq
19 Global governance gaps

ENVIRONMENTAL
20 Extreme climate change related weather
21 Droughts and desertification
22 Loss of freshwater
23 NatCat: Cyclone
24 NatCat: Earthquake
25 NatCat: Inland flooding
26 NatCat: Coastal flooding
27 Air pollution
28 Biodiversity loss

SOCIETAL
29 Pandemic
30 Infectious disease
31 Chronic disease: heart disease, stroke, cancer, chronic respiratory disease and diabetes
32 Liability regimes
33 Migration

TECHNOLOGICAL
34 CII breakdown
35 Emergence of nanotechnology risks
36 Data fraud/loss

6.2 WINNING THE BATTLE AGAINST DIABETES

The prevalence data in this edition of the *IDF Diabetes Atlas* demonstrate that we are losing the battle to contain diabetes. Diabetes is a disease that all countries have in common. The difference, however, is that people in low- and middle-income countries and disadvantaged communities all over the world often have no access to the essential diabetes medicines and care that their health depends on.

Unlike some other diseases, treatment exists for diabetes, and if managed correctly, is very effective in reducing complications such as heart attacks, amputations, blindness and kidney failure. Many of the essential medicines for diabetes and the other non-communicable diseases cost just pennies to produce. Despite this, essential NCD medicines are often not available to people living with diabetes in LMCs.

CALL TO FUND ESSENTIAL MEDICINES AND TECHNOLOGY

The current global economic crisis only exacerbates these problems. On a national level, the immediate impact of the economic downturn has been felt in reduced public health budgets and upon those individuals and families who struggle to fund their own care. The longer term impacts remains to be seen, but as many low-income countries depend on overseas development aid, a decrease in foreign aid will adversely affect healthcare budgets. Resources must be made available to healthcare systems in these countries to enable them to tackle chronic diseases, such as diabetes, HIV/AIDS and tuberculosis, the magnitude of which is hindering economic progress.

The International Diabetes Federation is thus calling on the international community to fund essential diabetes medicines and technology and respond to the requests from LMCs for support to strengthen their healthcare systems, in keeping with the goals of UN Resolution 61/225 on diabetes. The recent year has seen growing recognition at global level of the urgent need to take action on diabetes and the other non-communicable diseases. We have moved closer to the tipping point when financial and technical assistance will become available to low-income countries to address NCDs. IDF's national member associations are working together with governments and other partners to ensure that when such resources do come on stream, they are used effectively to benefit people with diabetes.

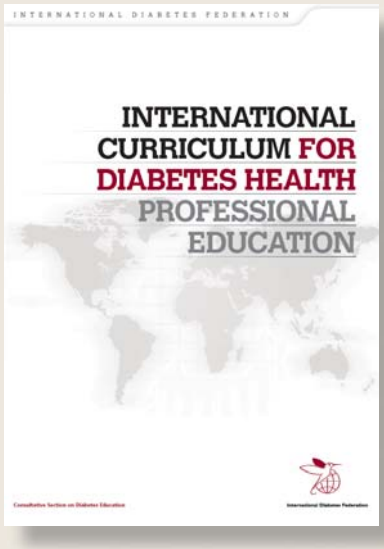
TOWARDS IMPLEMENTATION OF UN RESOLUTION ON DIABETES

Going forward into the next triennium IDF will work towards the full implementation of UN Resolution 61/225 by all governments. The Federation will continue to raise awareness and knowledge about diabetes through key activities such as the UN-recognized World Diabetes Day since ignorance and misconception remain widespread. IDF will strengthen its alliances with international organizations representing heart disease and cancer, forge new ones and lead the way in global advocacy. It will support the WHO Noncommunicable Diseases Action Plan, 2008—2013, which recognizes diabetes as a development issue (see Section 6.1).

In addition, the framework to strengthen diabetes education to ensure that the person with diabetes is an essential member of the management team will be further enhanced. IDF will continue to establish global guidelines for diabetes treatment, and develop and pilot effective models for the integrated management of diabetes and related NCDs. Work will continue to produce authoritative epidemiological and economic evidence, such as the *IDF Diabetes Atlas*, to underpin global and national policy making. IDF will persist in putting the case for resources for diabetes and for the development of affordable and appropriate diabetes technology.

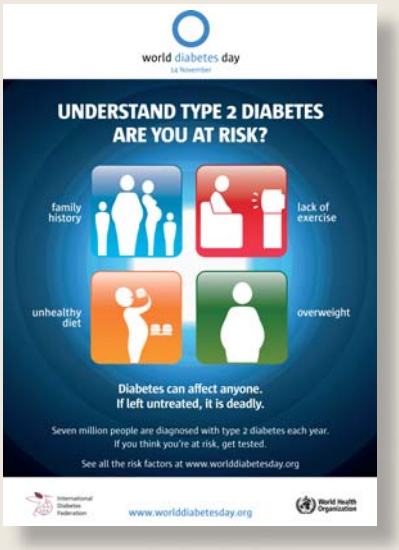
Above all IDF will work to strengthen its member associations since their work for people with diabetes connects the Federation's global advocacy to reality on the ground and enables it to speak as the global voice of the diabetes community. Once again IDF will express outrage that children and adults are dying for lack of a life-saving drug, insulin, that was discovered more than 88 years ago. Governments, civil society and people with diabetes have to work together to ensure that accidents of geography and history do not determine who should live or die because of inadequate access to optimal care and treatment, and essential medicines.

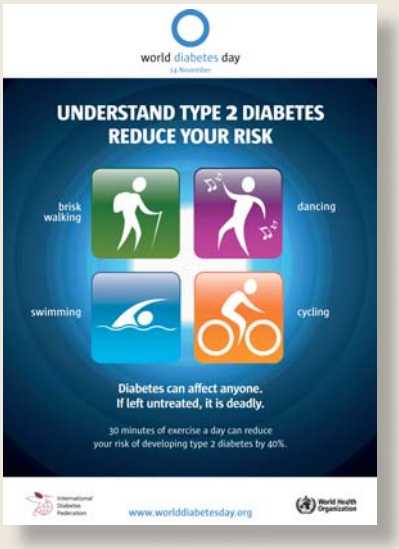
Jean Claude Mbanya
President-Elect
International Diabetes Federation
2006—2009

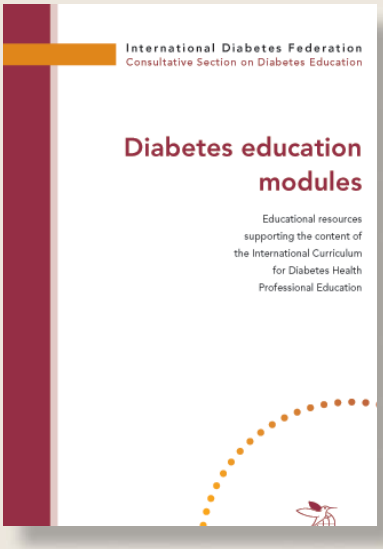


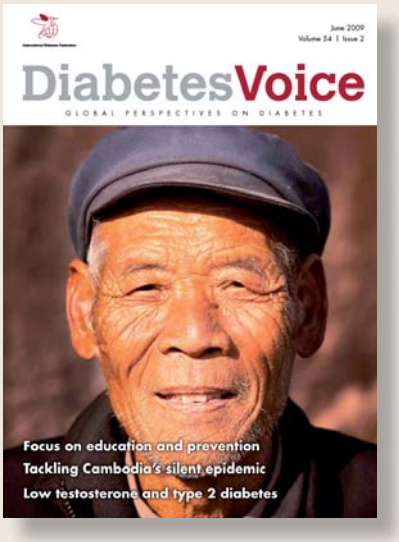
BRiDGES

Bringing Research in Diabetes to Global Environments and Systems









The International Diabetes Federation is engaged in action to tackle diabetes from the local to the global level – from programmes at community level to worldwide awareness and advocacy initiatives.

RESOURCES FOR ACTION

- The International Diabetes Federation
- The International Diabetes Federation Position Statements
- Useful Resources

7.1 THE INTERNATIONAL DIABETES FEDERATION

The International Diabetes Federation (IDF) is an umbrella organization of over 200 national diabetes associations in more than 160 countries. It represents the interests of the growing number of people with diabetes and those at risk. The Federation has been leading the global diabetes community since 1950. IDF's mission is to promote diabetes care, prevention and a cure worldwide. Led by the International Diabetes Federation, the Unite for Diabetes campaign secured a United Nations Resolution on diabetes in December 2006. The Federation continues to lead the global effort to implement Resolution 61/225 under the Unite for Diabetes banner.

The Federation is engaged in action to tackle diabetes from the local to the global level — from programmes at community level to worldwide awareness and advocacy initiatives. The Federation is divided into seven regions, with the aim of strengthening the work of national diabetes associations and enhancing the collaboration between them. The Federation's national diabetes associations are divided into the following seven regions: Africa (AFR), Europe (EUR), Middle East and North Africa (MENA), North America and Caribbean (NAC), South and Central America (SACA), South-East Asia (SEA) and Western Pacific (WP).

The Federation's activities aim to influence policy, increase public awareness and encourage health improvement, promote the exchange of high-quality information about diabetes, and provide education for people with diabetes and their healthcare providers. IDF 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).

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Europe
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Middle East and North Africa
www.idf.org/MENA

North America and Caribbean
www.idf.org/NAC

South and Central America
www.idf.org/SACA

South-East Asia
www.idf.org/SEA

Western Pacific
www.idf.org/WP

7.2 IDF POSITION STATEMENTS

Below is a list of position statements, and a brief description of the topic, issued by the International Diabetes Federation. The full texts of the position statements are available at the website addresses in the list.

Animal, Human and Analogue Insulins

Insulins are now available in different molecular forms, some because of species differences and some by design through molecular engineering. There is no overwhelming evidence to prefer one species of insulin over another and patients should not be changed from one species of insulin to another without reason.
www.idf.org/Position_statementsInsulins

Diabetes and Cardiovascular Disease (CVD)

People with diabetes are two to six times more likely to develop cardiovascular disease than people without diabetes. IDF recognizes the magnitude of this problem and strongly encourages all possible collaborative measures aimed at controlling the problem.
www.idf.org/Position_statementsdiabetes_cvd

Diabetes and Kidney Disease

Kidney disease caused by diabetes is the commonest cause worldwide of kidney failure requiring treatment by dialysis or kidney transplantation. Early kidney damage can be detected by simple urine testing. The risk of kidney failure, and the rate at which it develops, can be reduced by good blood glucose and blood pressure control.
www.idf.org/Position_statementsdiabetes_kidney

Diabetes and Obesity

Obesity and diabetes currently threaten the health, well-being and economic welfare of virtually every country in the world. IDF encourages those with responsibility for the provision of healthcare services to guarantee that all steps are taken to ensure that preventive measures are met.
www.idf.org/Position_statementsdiabetes_obesity

Diabetes and Smoking

Tobacco is harmful to health and is of particular danger to people with diabetes. Smoking cessation has immediate positive effects, however it is made difficult by tobacco dependence and by all forms of advertising and promotion used by the tobacco industry.
www.idf.org/Position_statementsdiabetes_smoking

Diabetes Education

Diabetes is a complex, chronic condition that affects all areas of a person's life and that requires high quality care. To this end, diabetes education is of critical importance and should be considered an integral part of diabetes prevention and care.
www.idf.org/Position_statementsdiabetes_education

Integrated Prevention of Non-Communicable Diseases

Statement made jointly by the International Obesity Task Force (IOTF) on behalf of the International Association for the Study of Obesity (IASO), the International Diabetes Federation (IDF), the World Heart Federation (WHF), the International Union of Nutritional Sciences (IUNS) and the International Pediatric Association (IPA).
www.idf.org/integrated-prevention-non-communicable-diseases

The Diabetic Foot: Amputations are Preventable

People with diabetes are at risk of nerve damage (neuropathy) and problems with the blood supply to their feet (ischaemia). Both neuropathy and ischaemia can lead to foot ulcers and slow-healing wounds which, if they get infected, may result in amputation. IDF recommends that every individual with diabetes receive the best possible foot care.
www.idf.org/Position_statementsdiabetic_foot

The Rights of the Child with Diabetes in the School

IDF is concerned about the situation of children with diabetes, especially in their school environment. IDF holds the position that children and adolescents must be able to manage their diabetes in the school setting without being excluded or discriminated.
www.idf.org/Position_statementsrights_of_children

The Role of Urine Glucose Monitoring in Diabetes

Diabetes is a complex disorder that requires vigilant monitoring on a long-term continuous basis by the person with diabetes and their family to achieve optimal control in an effort to avoid the serious complications of diabetes.
www.idf.org/Position_statementsurine_monitoring

Type 2 Diabetes in Young People

The prevalence of type 2 diabetes in children and adolescents is growing worldwide, and mirrors the increase of the condition in adults. IDF recommends that provisions be made to deliver the best possible care, prevent long-term complications, and promote further research in order to reach a better understanding of the condition.
www.idf.org/position-statement-type-2-diabetes-young-people

7.3 USEFUL RESOURCES

IDF Guidelines

- *Clinical Practice Guidelines*
  www.idf.org/idf-task-force-clinical-practice-guidelines
- *Diabetes Education*
  www.idf.org/Diabetes_Education
- *IDF Consensus on Type 2 Diabetes Prevention*
  www.idf.org/idf-consensus-type-2-diabetes-prevention
- *IDF Worldwide Definition of the Metabolic Syndrome*
  www.idf.org/metabolic_syndrome
- *National Diabetes Policy and Action*
  www.idf.org/national-diabetes-policy-and-action

Advocacy and IDF Programmes

- *BRIDGES*
  www.idfbridges.org
- *Diabetes Voice*
  www.diabetesvoice.org
- *IDF Europe Policy Puzzle*
  www.idf.org/EU-diabetes-policy-audit
- *Insulin, Test Strips and Other Diabetes Supplies*
  www.idf.org/insulin
- *Life for a Child*
  www.lifeforachild.org
- *Towards Improvement in Diabetes in Emergency Settings (TIDES)*
  www.idf.org/TIDES
- *World Diabetes Day*
  www.worlddiabetesday.org

World Health Organization

- *Diabetes Action Online*
  www.who.int/diabetesactiononline
- *Diet and Physical Activity: a Public Health Priority*
  www.who.int/dietphysicalactivity
- *Noncommunicable Diseases and Mental Health*
  www.who.int/nmh/en/
- *WHO NCD Action Plan*
  www.who.int/entity/nmh/publications/ncd_action_plan_en.pdf
- *WHO Diabetes Programme*
  www.who.int/diabetes/en
- *WHO Report of the Global Survey on the Progress in National Chronic Diseases Prevention and Control*
  www.who.int/chp/about/integrated_cd/en/index6.html
  www.who.int/entity/chp/about/Report-Global-Survey-09.pdf

Prevention costs governments far less than treating diabetes and its complications.

APPENDIX

APPENDIX 1 COUNTRY SUMMARY TABLE: ESTIMATES FOR 2010

		DIABETES MELLITUS (20-79 YEARS)			DIABETES MELLITUS TYPE 1 (0-14 YEARS)
COUNTRY/ TERRITORY	POPULATION (20-79 YEARS) (000'S)	PREVALENCE* (%)		TOTAL NUMBERS (000'S)	INCIDENCE RATE (PER 100,000 PER YEAR)
		NATIONAL	COMPARATIVE		
Afghanistan	12,911.1	6.6	8.6	856.5	1.2
Albania	2,121.4	4.8	4.5	102.8	3.9
Algeria	22,061.3	7.4	8.5	1,632.1	8.6
Andorra	51.7	8.8	6.6	4.6	13.0
Angola	7,941.8	2.8	3.5	223.7	N/A
Anguilla	9.1	5.9	5.9	0.5	3.5
Antigua and Barbuda	43.6	7.1	7.1	3.1	3.5
Argentina	26,026.6	6.0	5.7	1,557.9	6.8
Armenia	2,107.6	8.7	7.8	183.9	8.1
Aruba	72.9	12.8	10.2	9.3	0.1
Australia	15,127.7	7.2	5.7	1,085.8	22.4
Austria	6,301.6	11.2	8.9	708.4	13.3
Azerbaijan	5,826.5	7.1	7.5	412.3	1.2
Bahamas	221.9	10.2	10.4	22.5	10.1
Bahrain	534.6	14.4	15.4	76.9	2.5
Bangladesh	93,862.1	6.1	6.6	5,681.1	4.2
Barbados	218.7	9.2	8.0	20.1	2.0
Belarus	7,251.3	9.1	7.6	661.1	5.6
Belgium	7,643.9	8.0	5.3	610.0	15.4
Belize	163.7	7.9	9.8	12.9	1.5
Benin	4,527.0	3.9	4.6	174.5	N/A
Bermuda	41.5	10.2	10.2	4.2	2.3
Bhutan	413.0	2.9	3.6	11.9	0.6
Bolivia	5,293.4	5.2	6.0	274.1	0.5
Bosnia and Herzegovina	2,990.4	9.1	7.1	271.1	3.5
Botswana	1,073.3	4.1	5.4	44.0	N/A
Brazil	126,326.0	6.0	6.4	7,632.5	7.7
British Virgin Islands	15.4	10.2	10.2	1.6	3.5
Brunei Darussalam	262.3	10.7	12.6	28.2	0.3
Bulgaria	5,790.2	9.0	6.5	519.5	9.4
Burkina Faso	6,923.3	3.0	3.8	209.3	N/A

* The national prevalence indicates the percentage of each country's population that has diabetes, and is used for assessing the burden of diabetes for each country; comparative prevalence is adjusted to the age profile of the world population and is used for comparisons between countries.

IMPAIRED GLUCOSE TOLERANCE (20-79 YEARS)			NUMBER OF DEATHS ATTRIBUTABLE TO DIABETES (20-79 YEARS)			MEAN HEALTH EXPENDITURE	
PREVALENCE* (%)		TOTAL NUMBERS (000'S)	MALES	FEMALES	NATIONAL DIABETES PROGRAMME+	PER PERSON WITH DIABETES IN 2010, R=2 (USD)	COUNTRY/ TERRITORY
NATIONAL	COMPARATIVE						
7.2	8.7	931.0	8,337	10,694	YES	33	**Afghanistan**
2.6	2.4	54.6	489	869	N/A	261	**Albania**
5.8	6.5	1,289.5	5,309	8,768	N/A	162	**Algeria**
7.5	6.6	3.9	16	15	N/A	2,970	**Andorra**
7.4	8.6	584.9	1,937	2,854	N/A	66	**Angola**
11.5	11.5	1.1	N/A	N/A	N/A	N/A	**Anguilla**
11.5	11.5	5.0	17	28	NO	769	**Antigua and Barbuda**
9.9	9.7	2,581.0	8,278	7,243	YES	671	**Argentina**
7.3	6.7	154.9	1,095	1,861	N/A	117	**Armenia**
13.3	11.5	9.7	N/A	N/A	N/A	N/A	**Aruba**
9.8	8.3	1,481.0	3,296	3,284	YES	3,781	**Australia**
6.0	4.1	377.8	2,300	2,225	YES	4,007	**Austria**
6.0	6.1	349.0	2,013	4,576	N/A	89	**Azerbaijan**
11.5	11.5	25.6	118	121	N/A	1,743	**Bahamas**
17.0	18.8	91.0	177	215	YES	950	**Bahrain**
7.1	8.9	6,704.0	37,600	66,164	N/A	21	**Bangladesh**
12.5	11.5	27.4	104	124	N/A	908	**Barbados**
16.8	15.3	1,219.1	4,923	5,799	YES	238	**Belarus**
6.5	4.8	494.5	2,697	2,869	NO	3,763	**Belgium**
10.0	11.5	16.3	85	75	N/A	320	**Belize**
6.7	7.6	302.8	1,206	1,921	N/A	50	**Benin**
11.5	11.5	4.8	N/A	N/A	NO	N/A	**Bermuda**
2.9	3.3	12.2	34	44	N/A	97	**Bhutan**
7.3	8.0	384.6	1,819	2,235	NO	120	**Bolivia**
5.8	5.8	205.5	1,082	1,748	N/A	307	**Bosnia and Herzegovina**
6.9	8.7	73.7	411	1,269	N/A	735	**Botswana**
7.1	7.3	9,000.1	40,781	42,328	YES	563	**Brazil**
11.5	11.5	1.8	N/A	N/A	N/A	N/A	**British Virgin Islands**
19.8	17.9	51.9	134	92	N/A	730	**Brunei Darussalam**
6.0	5.0	344.7	3,999	4,125	N/A	301	**Bulgaria**
6.5	7.6	449.5	2,058	3,716	N/A	49	**Burkina Faso**

N/A Not available

+ Based on a survey of IDF member associations.

COUNTRY/ TERRITORY	POPULATION (20-79 YEARS) (000'S)	DIABETES MELLITUS (20-79 YEARS) PREVALENCE* (%) NATIONAL	DIABETES MELLITUS (20-79 YEARS) PREVALENCE* (%) COMPARATIVE	DIABETES MELLITUS (20-79 YEARS) TOTAL NUMBERS (000'S)	DIABETES MELLITUS TYPE 1 (0-14 YEARS) INCIDENCE RATE (PER 100,000 PER YEAR)
Burundi	4,262.8	1.4	1.8	60.1	N/A
Cambodia	8,194.7	4.3	5.2	354.0	0.3
Cameroon	9,493.1	4.4	3.9	415.3	N/A
Canada	24,735.7	11.6	9.2	2,866.1	21.7
Cape Verde	289.1	4.3	5.3	12.4	N/A
Cayman Islands	31.0	10.2	10.2	3.2	2.3
Central African Republic	2,145.7	3.8	4.5	82.2	N/A
Chad	5,043.1	2.8	3.7	139.3	N/A
Channel Islands	112.9	4.1	3.0	4.6	24.5
Chile	11,473.2	6.1	5.7	698.8	5.9
China	964,301.6	4.5	4.2	43,157.2	0.6
China, Hong Kong	5,732.5	10.2	8.5	586.6	2.0
China, Macau	382.9	9.2	8.5	35.2	2.0
Colombia	29,547.8	4.8	5.2	1,427.3	1.3
Comoros	437.8	2.8	3.4	12.3	N/A
Congo, Democratic Republic of	28,699.0	2.6	3.2	743.4	N/A
Congo, Republic of	1,901.7	4.3	5.1	82.6	N/A
Cook Islands	13.5	5.7	5.7	0.8	0.1
Costa Rica	2,963.0	8.8	9.3	261.7	1.3
Côte d'Ivoire	9,856.8	4.0	4.7	393.9	N/A
Croatia	3,437.5	9.2	6.9	315.9	8.9
Cuba	8,244.7	11.0	9.5	903.3	2.3
Cyprus	634.1	10.4	9.1	65.9	14.9
Czech Republic	7,824.3	8.7	6.4	677.3	17.2
Denmark	3,907.0	7.7	5.6	301.5	22.2
Djibouti	462.3	4.1	5.3	18.9	N/A
Dominica	45.0	11.5	11.5	5.2	5.7
Dominican Republic	5,818.3	10.4	11.2	605.7	0.5
Ecuador	8,017.7	5.5	5.9	443.4	1.3
Egypt	45,935.1	10.4	11.4	4,787.1	8.0
El Salvador	4,067.4	7.8	9.0	317.9	1.5
Equatorial Guinea	256.4	4.3	4.8	11.1	N/A

* The national prevalence indicates the percentage of each country's population that has diabetes, and is used for assessing the burden of diabetes for each country; comparative prevalence is adjusted to the age profile of the world population and is used for comparisons between countries.

IMPAIRED GLUCOSE TOLERANCE (20-79 YEARS)			NUMBER OF DEATHS ATTRIBUTABLE TO DIABETES (20-79 YEARS)			MEAN HEALTH EXPENDITURE	
PREVALENCE* (%)		TOTAL NUMBERS (000'S)	MALES	FEMALES	NATIONAL DIABETES PROGRAMME+	PER PERSON WITH DIABETES IN 2010, R=2 (USD)	COUNTRY/ TERRITORY
NATIONAL	COMPARATIVE						
7.3	8.6	311.3	658	1,116	NO	6	**Burundi**
9.4	10.6	770.8	4,090	3,835	N/A	53	**Cambodia**
0.9	1.1	87.8	4,291	7,561	N/A	83	**Cameroon**
12.9	11.2	3,188.6	5,715	9,483	YES	3,914	**Canada**
6.7	7.6	19.4	59	75	N/A	182	**Cape Verde**
11.5	11.5	3.6	N/A	N/A	N/A	N/A	**Cayman Islands**
6.9	7.6	147.1	907	1,750	N/A	22	**Central African Republic**
2.6	2.9	131.6	1,232	3,375	N/A	40	**Chad**
5.2	4.7	5.8	N/A	N/A		N/A	**Channel Islands**
10.2	9.7	1,169.2	2,509	2,175	YES	571	**Chile**
6.9	6.8	66,977.9	325,268	249,307	YES	115	**China**
12.7	10.8	728.9	N/A	N/A	N/A	N/A	**China, Hong Kong**
11.9	10.8	45.7	N/A	N/A	N/A	N/A	**China, Macau**
4.3	4.5	1,279.4	5,571	5,829	N/A	326	**Colombia**
7.4	8.6	32.5	68	83	N/A	25	**Comoros**
7.4	8.6	2,124.4	6,963	9,979	YES	59	**Congo, Democratic Republic of**
6.7	7.6	128.1	724	1,193	YES	54	**Congo, Republic of**
10.2	10.2	1.4	2	2	N/A	678	**Cook Islands**
7.0	7.3	206.6	703	526	N/A	482	**Costa Rica**
6.7	7.6	664.9	4,036	5,400	YES	9	**Côte d'Ivoire**
7.2	5.9	247.1	1,879	1,804	N/A	736	**Croatia**
12.9	11.5	1,061.7	2,327	4,068	YES	376	**Cuba**
6.7	5.9	42.8	218	171	YES	1,547	**Cyprus**
17.4	15.3	1,360.9	3,414	4,129	NO	979	**Czech Republic**
15.2	12.4	594.4	1,226	1,518	YES	4,930	**Denmark**
2.6	2.9	12.2	125	288	N/A	106	**Djibouti**
11.5	11.5	5.2	21	20	N/A	384	**Dominica**
11.0	11.5	639.7	2,414	3,850	N/A	295	**Dominican Republic**
7.7	8.0	619.5	2,168	2,254	N/A	232	**Ecuador**
4.8	5.1	2,196.5	18,800	39,317	NO	116	**Egypt**
6.8	7.3	278.0	1,666	1,650	NO	273	**El Salvador**
7.0	7.6	18.0	105	165	N/A	356	**Equatorial Guinea**

N/A Not available

+ Based on a survey of IDF member associations.

COUNTRY/ TERRITORY	POPULATION (20-79 YEARS) (000'S)	DIABETES MELLITUS (20-79 YEARS) PREVALENCE* (%) NATIONAL	DIABETES MELLITUS (20-79 YEARS) PREVALENCE* (%) COMPARATIVE	DIABETES MELLITUS (20-79 YEARS) TOTAL NUMBERS (000'S)	DIABETES MELLITUS TYPE 1 (0-14 YEARS) INCIDENCE RATE (PER 100,000 PER YEAR)
Eritrea	2,467.7	1.8	2.5	45.4	N/A
Estonia	994.0	9.9	7.6	97.9	15.3
Ethiopia	40,895.0	2.0	2.5	826.0	N/A
Fiji	499.3	9.1	9.4	45.2	0.1
Finland	3,863.4	8.3	5.7	319.8	57.4
France	44,091.3	9.4	6.7	4,164.2	12.2
French Guiana	123.0	11.8	12.0	14.5	0.1
French Polynesia	176.7	13.5	13.8	23.9	0.1
Gabon	761.0	4.4	5.0	33.8	N/A
Gambia	906.1	3.8	4.3	34.7	N/A
Georgia	3,123.0	9.2	7.5	287.1	4.6
Germany	62,654.4	12.0	8.9	7,494.3	18.0
Ghana	12,870.0	3.6	4.3	458.3	N/A
Greece	8,560.7	8.8	6.0	754.0	9.9
Grenada	59.7	8.5	9.5	5.1	2.0
Guadeloupe	304.4	10.7	8.9	32.5	5.7
Guam	112.5	7.1	6.7	8.0	0.1
Guatemala	6,695.4	6.9	8.6	464.9	1.5
Guinea	4,656.1	3.7	4.3	172.5	N/A
Guinea-Bissau	763.1	3.3	3.9	25.4	N/A
Guyana	438.8	10.2	9.5	44.6	0.1
Haiti	5,303.1	5.9	7.2	313.0	0.5
Honduras	3,816.6	7.1	9.1	272.7	1.5
Hungary	7,514.8	8.8	6.4	658.9	11.3
Iceland	210.5	2.1	1.6	4.4	14.7
India	713,498.4	7.1	7.8	50,768.3	4.2
Indonesia	152,827.7	4.6	4.8	6,963.5	0.3
Iran, Islamic Republic of	46,959.7	6.1	8.0	2,871.5	3.7
Iraq	14,995.4	7.8	10.2	1,175.9	3.7
Ireland	3,171.2	5.7	5.2	180.3	16.3
Israel	4,495.9	7.1	6.5	318.8	10.4
Italy	44,509.9	8.8	5.9	3,926.2	8.4
Jamaica	1,600.6	10.2	10.6	163.6	2.3
Japan	96,665.9	7.3	5.0	7,089.2	2.4

* The national prevalence indicates the percentage of each country's population that has diabetes, and is used for assessing the burden of diabetes for each country; comparative prevalence is adjusted to the age profile of the world population and is used for comparisons between countries.

IMPAIRED GLUCOSE TOLERANCE (20-79 YEARS)			NUMBER OF DEATHS ATTRIBUTABLE TO DIABETES (20-79 YEARS)			MEAN HEALTH EXPENDITURE	
PREVALENCE* (%)		TOTAL NUMBERS (000'S)	MALES	FEMALES	NATIONAL DIABETES PROGRAMME+	PER PERSON WITH DIABETES IN 2010, R=2 (USD)	COUNTRY/ TERRITORY
NATIONAL	COMPARATIVE						
7.1	8.6	176.1	276	434	YES	14	**Eritrea**
17.4	15.3	173.2	645	685	N/A	584	**Estonia**
7.5	8.6	3,084.8	7,061	9,851	NO	11	**Ethiopia**
10.4	10.8	52.1	467	368	N/A	227	**Fiji**
8.8	5.9	339.2	1,469	1,139	YES	3,157	**Finland**
7.6	6.6	3,339.6	18,443	11,984	YES	4,141	**France**
7.6	7.6	9.3	N/A	N/A	N/A	N/A	**French Guiana**
13.0	13.1	23.0	N/A	N/A	N/A	N/A	**French Polynesia**
7.0	7.6	52.9	286	398	N/A	432	**Gabon**
7.0	7.6	63.6	268	354	NO	25	**Gambia**
7.2	6.2	224.9	1,377	2,169	N/A	147	**Georgia**
6.6	4.1	4,132.6	27,585	26,994	NO	3,751	**Germany**
12.7	14.1	1,638.2	3,956	5,362	N/A	50	**Ghana**
7.4	5.9	634.5	2,957	3,585	YES	2,742	**Greece**
10.7	11.5	6.4	26	65	N/A	592	**Grenada**
13.0	11.5	39.7	N/A	N/A	N/A	N/A	**Guadeloupe**
17.9	17.3	20.1	N/A	N/A	N/A	N/A	**Guam**
6.6	7.3	439.2	3,112	2,753	N/A	227	**Guatemala**
6.8	7.6	318.2	1,301	1,960	N/A	37	**Guinea**
6.7	7.6	51.5	270	384	N/A	17	**Guinea-Bissau**
12.0	11.5	52.8	677	454	N/A	88	**Guyana**
6.7	7.5	356.4	2,666	4,660	NO	48	**Haiti**
6.4	7.3	243.7	1,401	1,319	N/A	156	**Honduras**
17.5	15.3	1,315.3	4,279	5,545	NO	973	**Hungary**
7.3	5.9	15.5	15	19	NO	7,001	**Iceland**
5.5	5.7	39,471.8	425,906	581,736	N/A	55	**India**
10.7	11.0	16,327.3	65,630	81,760	N/A	41	**Indonesia**
9.7	11.4	4,540.5	10,924	17,529	N/A	365	**Iran, Islamic Republic of**
7.3	8.7	1,098.6	8,073	8,334	N/A	96	**Iraq**
1.9	1.7	61.3	608	589	NO	5,035	**Ireland**
5.5	5.1	248.2	1,029	918	N/A	2,035	**Israel**
6.0	4.7	2,654.7	13,427	13,966	YES	2,807	**Italy**
11.4	11.5	181.8	588	696	YES	238	**Jamaica**
13.4	11.0	12,979.4	37,739	21,690	YES	3,125	**Japan**

N/A Not available

+ Based on a survey of IDF member associations.

		DIABETES MELLITUS (20-79 YEARS)			DIABETES MELLITUS TYPE 1 (0-14 YEARS)
COUNTRY/ TERRITORY	POPULATION (20-79 YEARS) (000'S)	PREVALENCE* (%)		TOTAL NUMBERS (000'S)	INCIDENCE RATE (PER 100,000 PER YEAR)
		NATIONAL	COMPARATIVE		
Jordan	3,566.0	7.5	10.1	268.6	3.2
Kazakhstan	10,436.3	5.6	5.8	584.2	1.2
Kenya	18,795.5	2.8	3.5	519.1	N/A
Kiribati	71.2	6.6	6.6	4.7	0.1
Korea, Democratic People's Republic of	16,581.1	5.7	5.3	942.9	1.1
Korea, Republic of	36,602.9	9.0	7.9	3,292.4	1.1
Kuwait	2,129.8	10.8	14.6	230.4	22.3
Kyrgyzstan	3,294.2	4.3	5.2	140.8	1.2
Lao People's Democratic Republic	3,174.6	4.5	5.6	143.3	0.3
Latvia	1,719.4	9.9	7.6	169.7	7.5
Lebanon	2,670.4	7.7	7.8	204.4	3.2
Lesotho	978.8	3.8	3.9	37.4	N/A
Liberia	1,802.5	3.8	4.7	68.8	N/A
Libyan Arab Jamahiriya	3,979.3	7.5	9.0	297.6	9.0
Liechtenstein	24.6	11.0	8.9	2.7	9.2
Lithuania	2,484.3	9.7	7.6	239.8	7.8
Luxembourg	348.9	7.0	5.3	24.3	15.5
Macedonia, the Former Yugoslav Republic of	1,490.3	8.0	6.9	119.3	3.9
Madagascar	9,881.3	2.7	3.2	269.7	N/A
Malawi	6,307.0	1.8	2.3	115.3	N/A
Malaysia	16,919.9	10.9	11.6	1,846.0	0.3
Maldives	186.0	6.5	7.4	12.0	4.2
Mali	5,496.3	3.3	4.2	184.0	N/A
Malta	306.8	9.8	6.8	29.9	15.6
Marshall Islands	40.7	9.1	9.1	3.7	0.1
Martinique	278.4	11.0	8.8	30.5	2.0
Mauritania	1,685.0	3.7	4.8	61.8	N/A
Mauritius	876.7	17.0	16.2	148.8	1.4
Mexico	67,317.0	10.1	10.8	6,826.8	1.5
Micronesia, Federated States of	57.1	5.3	6.2	3.0	0.1

* The national prevalence indicates the percentage of each country's population that has diabetes, and is used for assessing the burden of diabetes for each country; comparative prevalence is adjusted to the age profile of the world population and is used for comparisons between countries.

IMPAIRED GLUCOSE TOLERANCE (20-79 YEARS)			NUMBER OF DEATHS ATTRIBUTABLE TO DIABETES (20-79 YEARS)			MEAN HEALTH EXPENDITURE	
PREVALENCE* (%)		TOTAL NUMBERS (000'S)	MALES	FEMALES	NATIONAL DIABETES PROGRAMME+	PER PERSON WITH DIABETES IN 2010, R=2 (USD)	COUNTRY/ TERRITORY
NATIONAL	COMPARATIVE						
7.3	8.7	259.0	1,078	1,301	N/A	407	**Jordan**
7.0	7.1	729.1	5,645	5,538	N/A	213	**Kazakhstan**
7.2	8.6	1,361.1	4,926	8,545	N/A	43	**Kenya**
17.3	17.3	12.4	45	30	N/A	204	**Kiribati**
8.9	8.3	1,482.2	12,646	11,024	N/A	1	**Korea, Democratic People's Republic of**
9.4	8.3	3,438.4	18,422	10,386	NO	1,255	**Korea, Republic of**
15.9	18.8	338.6	409	389	YES	1,010	**Kuwait**
6.3	7.1	208.8	1,195	1,180	NO	44	**Kyrgyzstan**
7.6	8.8	241.3	1,846	1,843	N/A	31	**Lao People's Democratic Republic**
17.4	15.3	299.7	1,028	988	NO	493	**Latvia**
4.0	4.1	107.3	1,391	1,831	YES	692	**Lebanon**
7.2	8.7	70.5	678	1,575	N/A	67	**Lesotho**
6.5	7.6	117.4	566	829	N/A	17	**Liberia**
5.7	6.5	228.4	1,034	1,532	YES	362	**Libyan Arab Jamahiriya**
5.8	4.0	1.4	7	8	N/A	N/A	**Liechtenstein**
17.3	15.3	428.9	1,759	1,784	N/A	521	**Lithuania**
5.9	4.8	20.4	104	107	NO	7,268	**Luxembourg**
6.5	5.9	97.1	705	775	N/A	287	**Macedonia, the Former Yugoslav Republic of**
7.6	8.6	753.0	1,921	2,491	N/A	16	**Madagascar**
7.5	8.6	471.7	1,652	2,811	N/A	35	**Malawi**
4.4	4.4	745.1	14,330	9,502	YES	325	**Malaysia**
12.3	12.7	22.9	33	49	N/A	554	**Maldives**
6.6	7.6	362.9	1,480	2,804	YES	49	**Mali**
7.7	6.1	23.8	93	141	N/A	1,437	**Malta**
17.3	17.3	7.1	60	65	N/A	516	**Marshall Islands**
13.5	11.5	37.5	N/A	N/A	N/A	N/A	**Martinique**
2.7	2.9	44.7	336	825	N/A	30	**Mauritania**
13.8	13.5	120.9	814	776	N/A	254	**Mauritius**
7.7	8.0	5,206.6	24,994	29,898	YES	708	**Mexico**
15.8	17.3	9.0	26	24	N/A	506	**Micronesia, Federated States of**

N/A Not available

+ Based on a survey of IDF member associations.

COUNTRY/ TERRITORY	POPULATION (20-79 YEARS) (000'S)	DIABETES MELLITUS (20-79 YEARS) PREVALENCE* (%) NATIONAL	DIABETES MELLITUS (20-79 YEARS) PREVALENCE* (%) COMPARATIVE	DIABETES MELLITUS (20-79 YEARS) TOTAL NUMBERS (000'S)	DIABETES MELLITUS TYPE 1 (0-14 YEARS) INCIDENCE RATE (PER 100,000 PER YEAR)
Moldova	2,669.6	8.7	7.6	233.5	5.4
Monaco	23.2	9.1	6.7	2.1	12.2
Mongolia	1,723.3	1.3	1.6	22.9	0.6
Montenegro	424.4	8.4	6.9	35.7	13.5
Morocco	19,869.5	7.6	8.3	1,512.8	8.6
Mozambique	10,044.1	3.3	4.0	329.0	N/A
Myanmar	32,484.2	2.8	3.2	921.8	0.3
Namibia	1,109.9	3.9	4.4	43.1	N/A
Nauru	8.8	30.9	30.9	2.7	0.1
Nepal	15,556.5	3.3	3.9	510.7	0.6
Netherlands	11,943.4	7.7	5.3	922.4	18.8
Netherlands Antilles	142.3	14.0	11.5	19.9	0.1
New Caledonia	164.3	5.5	7.2	9.1	0.1
New Zealand	2,952.4	6.5	5.2	191.9	18.0
Nicaragua	3,093.6	8.0	10.0	248.1	1.5
Niger	6,525.1	3.4	3.9	224.0	N/A
Nigeria	72,059.5	3.9	4.7	2,819.1	N/A
Niue	0.9	4.6	4.6	0.0	0.1
Norway	3,356.7	4.7	3.6	159.3	27.9
Oman	1,623.1	11.1	13.4	180.2	2.5
Pakistan	93,644.1	7.6	9.1	7,146.4	0.5
Palau	13.3	9.1	9.1	1.2	0.1
Palestinian Territory, Occupied	1,952.3	6.4	8.6	125.6	3.2
Panama	2,137.8	9.2	9.6	196.9	1.3
Papua New Guinea	3,377.4	2.1	3.0	71.5	0.1
Paraguay	3,551.7	4.2	4.9	150.1	0.9
Peru	17,258.0	5.6	6.2	962.4	0.5
Philippines	50,999.8	6.7	7.7	3,398.2	3.8
Poland	28,618.0	9.3	7.6	2,674.6	12.9
Portugal	8,033.8	9.9	7.7	795.4	13.2
Puerto Rico	2,788.4	12.4	10.6	345.4	16.8
Qatar	640.1	13.3	15.4	85.0	11.4

* The national prevalence indicates the percentage of each country's population that has diabetes, and is used for assessing the burden of diabetes for each country; comparative prevalence is adjusted to the age profile of the world population and is used for comparisons between countries.

IMPAIRED GLUCOSE TOLERANCE (20-79 YEARS)			NUMBER OF DEATHS ATTRIBUTABLE TO DIABETES (20-79 YEARS)			MEAN HEALTH EXPENDITURE	
PREVALENCE* (%)		TOTAL NUMBERS (000'S)	MALES	FEMALES	NATIONAL DIABETES PROGRAMME+	PER PERSON WITH DIABETES IN 2010, R=2 (USD)	COUNTRY/ TERRITORY
NATIONAL	COMPARATIVE						
16.3	15.3	435.8	1,634	2,605	N/A	76	**Moldova**
7.4	6.6	1.7	9	6	N/A	5,866	**Monaco**
9.2	10.3	158.3	410	278	YES	61	**Mongolia**
6.8	5.9	28.7	234	265	N/A	14	**Montenegro**
6.2	6.5	1,224.6	4,558	5,366	YES	137	**Morocco**
7.6	8.6	767.4	4,062	7,457	N/A	25	**Mozambique**
6.5	6.9	2,103.9	17,114	16,961	N/A	7	**Myanmar**
7.0	8.7	77.3	290	753	N/A	284	**Namibia**
20.4	20.4	1.8	22	14	N/A	752	**Nauru**
3.8	4.1	591.3	3,822	6,848	NO	30	**Nepal**
6.3	4.8	748.0	3,675	4,108	YES	4,113	**Netherlands**
8.7	7.6	12.4	N/A	N/A	N/A	N/A	**Netherlands Antilles**
5.0	4.8	8.3	N/A	N/A	N/A	N/A	**New Caledonia**
6.7	5.9	196.9	597	804	YES	2,965	**New Zealand**
6.4	7.3	198.2	1,284	1,179	NO	125	**Nicaragua**
6.9	7.6	448.7	2,829	2,883	N/A	17	**Niger**
6.7	7.6	4,830.5	30,319	49,081	N/A	47	**Nigeria**
6.9	6.9	0.1	0	0	N/A	1,594	**Niue**
8.6	7.3	287.1	595	567	YES	6,933	**Norway**
9.3	10.9	150.2	594	472	YES	507	**Oman**
7.6	8.7	7,159.5	35,617	52,397	YES	24	**Pakistan**
17.3	17.3	2.3	11	6	N/A	983	**Palau**
7.2	8.7	140.3	N/A	N/A	N/A	N/A	**Palestinian Territory, Occupied**
7.1	7.3	151.7	660	623	N/A	504	**Panama**
8.0	9.4	269.7	950	1,225	NO	67	**Papua New Guinea**
8.7	9.7	308.6	626	861	YES	165	**Paraguay**
7.5	8.0	1,294.6	3,136	4,081	NO	194	**Peru**
9.6	10.9	4,890.8	22,873	27,924	NO	61	**Philippines**
16.9	15.3	4,843.3	14,150	15,126	NO	594	**Poland**
13.3	4.7	1,071.6	2,825	3,136	YES	1,957	**Portugal**
8.3	7.3	231.7	N/A	N/A	YES	N/A	**Puerto Rico**
15.5	18.8	99.3	133	101	NO	2,960	**Qatar**

N/A Not available

+ Based on a survey of IDF member associations.

COUNTRY/ TERRITORY	POPULATION (20-79 YEARS) (000'S)	DIABETES MELLITUS (20-79 YEARS) PREVALENCE* (%) NATIONAL	DIABETES MELLITUS (20-79 YEARS) PREVALENCE* (%) COMPARATIVE	DIABETES MELLITUS (20-79 YEARS) TOTAL NUMBERS (000'S)	DIABETES MELLITUS TYPE 1 (0-14 YEARS) INCIDENCE RATE (PER 100,000 PER YEAR)
Réunion	542.7	16.1	15.3	87.2	N/A
Romania	16,129.0	8.4	6.9	1,351.4	5.4
Russian Federation	107,183.9	9.0	7.6	9,624.9	12.1
Rwanda	4,836.1	1.1	1.6	54.4	N/A
Samoa	95.2	6.7	7.7	6.4	0.1
San Marino	21.6	8.0	5.9	1.7	8.4
Sao Tome and Principe	78.9	3.9	4.7	3.0	N/A
Saudi Arabia	15,186.8	13.6	16.8	2,065.3	12.8
Senegal	6,323.7	4.0	4.7	255.6	N/A
Serbia	7,166.4	8.6	6.9	613.4	12.9
Seychelles	51.2	14.4	14.4	7.4	N/A
Sierra Leone	2,880.8	3.9	4.4	111.4	N/A
Singapore	3,433.2	12.7	10.2	436.6	2.5
Slovakia	4,074.6	7.7	6.4	314.0	13.6
Slovenia	1,546.2	9.9	7.7	152.9	11.1
Solomon Islands	267.6	2.3	3.3	6.1	0.1
Somalia	4,333.2	2.5	3.0	108.9	N/A
South Africa	28,549.6	4.5	4.5	1,283.4	N/A
Spain	33,943.8	8.7	6.6	2,939.3	13.0
Sri Lanka	13,339.0	11.5	10.9	1,529.1	4.2
St Kitts and Nevis	24.8	9.0	9.0	2.2	2.0
St Lucia	107.3	8.6	9.3	9.3	2.0
St Vincent and the Grenadines	75.7	7.3	8.4	5.5	2.0
Sudan	20,602.6	3.3	4.2	675.3	10.1
Suriname	289.3	10.3	10.5	29.7	0.1
Swaziland	568.7	3.7	4.2	20.8	N/A
Sweden	6,618.6	7.3	5.2	484.4	41.0
Switzerland	5,569.1	11.3	8.9	629.9	9.0
Syrian Arab Republic	11,743.9	8.3	10.8	973.6	3.2
Taiwan	14,221.6	5.7	7.5	815.9	3.8
Tajikistan	3,617.5	3.6	5.0	130.1	1.2
Tanzania, United Republic of	19,591.5	2.6	3.2	504.2	0.9

* The national prevalence indicates the percentage of each country's population that has diabetes, and is used for assessing the burden of diabetes for each country; comparative prevalence is adjusted to the age profile of the world population and is used for comparisons between countries.

IMPAIRED GLUCOSE TOLERANCE (20-79 YEARS)			NUMBER OF DEATHS ATTRIBUTABLE TO DIABETES (20-79 YEARS)			MEAN HEALTH EXPENDITURE	
PREVALENCE* (%)		TOTAL NUMBERS (000'S)	MALES	FEMALES	NATIONAL DIABETES PROGRAMME+	PER PERSON WITH DIABETES IN 2010, R=2 (USD)	COUNTRY/ TERRITORY
NATIONAL	COMPARATIVE						
14.7	13.7	79.9	N/A	N/A	N/A	N/A	**Réunion**
17.0	15.3	2,743.4	8,985	9,083	YES	295	**Romania**
16.7	15.3	17,896.8	81,615	100,488	YES	325	**Russian Federation**
7.1	8.6	344.0	511	919	NO	35	**Rwanda**
6.0	6.5	5.7	73	73	N/A	195	**Samoa**
5.6	4.7	1.2	5	7	N/A	3,797	**San Marino**
6.8	7.6	5.4	18	28	N/A	86	**Sao Tome and Principe**
11.8	12.5	1,794.9	7,798	6,307	N/A	682	**Saudi Arabia**
6.9	7.6	433.8	2,274	2,659	N/A	66	**Senegal**
6.8	5.9	487.1	4,126	4,494	N/A	240	**Serbia**
13.3	13.7	6.8	36	45	NO	690	**Seychelles**
6.9	7.6	199.4	1,466	2,153	N/A	14	**Sierra Leone**
17.5	18.8	599.5	2,333	1,499	N/A	1,129	**Singapore**
16.6	15.3	676.2	1,822	2,256	N/A	779	**Slovakia**
17.5	15.3	271.2	618	427	NO	1,626	**Slovenia**
8.0	9.5	21.3	59	72	N/A	58	**Solomon Islands**
7.5	8.6	325.5	1,172	1,339	N/A	11	**Somalia**
7.6	8.7	2,163.8	12,953	33,004	NO	674	**South Africa**
7.5	6.6	2,533.8	10,969	9,581	YES	2,277	**Spain**
12.3	12.4	1,639.0	8,694	10,394	YES	70	**Sri Lanka**
11.5	11.5	2.9	11	20	N/A	659	**St Kitts and Nevis**
11.0	11.5	11.8	33	47	N/A	488	**St Lucia**
10.6	11.5	8.0	39	39	N/A	322	**St Vincent and the Grenadines**
2.3	2.8	478.0	4,071	10,180	N/A	52	**Sudan**
7.6	7.6	21.9	170	193	N/A	303	**Suriname**
6.8	8.7	38.4	304	842	N/A	248	**Swaziland**
9.0	7.3	597.7	1,406	2,231	YES	4,101	**Sweden**
6.1	4.1	339.2	1,640	1,710	NO	5,995	**Switzerland**
9.3	13.0	1,089.7	3,928	5,150	N/A	103	**Syrian Arab Republic**
3.9	4.6	551.6	N/A	N/A	YES	N/A	**Taiwan**
5.8	7.1	210.8	737	1,067	N/A	31	**Tajikistan**
7.5	8.6	1,464.5	5,688	9,720	NO	31	**Tanzania, United Republic of**

N/A Not available

+ Based on a survey of IDF member associations.

COUNTRY/ TERRITORY	POPULATION (20-79 YEARS) (000'S)	DIABETES MELLITUS (20-79 YEARS) PREVALENCE* (%) NATIONAL	DIABETES MELLITUS (20-79 YEARS) PREVALENCE* (%) COMPARATIVE	DIABETES MELLITUS (20-79 YEARS) TOTAL NUMBERS (000'S)	DIABETES MELLITUS TYPE 1 (0-14 YEARS) INCIDENCE RATE (PER 100,000 PER YEAR)
Thailand	45,924.4	7.7	7.1	3,538.0	0.3
Timor-Leste	564.4	2.9	3.5	16.3	0.3
Togo	3,338.6	3.6	4.3	120.0	N/A
Tokelau	0.9	8.6	8.6	0.1	0.1
Tonga	52.1	11.6	13.4	6.1	0.1
Trinidad and Tobago	942.8	11.4	11.7	107.7	2.0
Tunisia	7,079.5	8.5	9.3	601.8	7.3
Turkey	49,745.9	7.4	8.0	3,679.0	3.2
Turkmenistan	3,101.4	4.1	5.3	128.1	1.2
Tuvalu	7.8	13.9	13.9	1.1	0.1
Uganda	13,486.0	1.7	2.2	224.1	N/A
Ukraine	34,686.2	9.6	7.6	3,328.4	8.1
United Arab Emirates	3,492.7	12.2	18.7	425.0	2.5
United Kingdom	44,056.1	4.9	3.6	2,139.6	24.5
United States of America	217,335.3	12.3	10.3	26,813.6	20.8
Uruguay	2,222.1	6.6	5.7	146.6	8.3
US Virgin Islands	74.9	12.7	9.9	9.5	12.8
Uzbekistan	16,650.5	4.0	5.2	673.8	1.2
Vanuatu	124.1	2.4	3.2	3.0	0.1
Venezuela	17,457.2	5.9	6.5	1,033.7	0.1
Viet Nam	56,661.9	2.9	3.5	1,646.6	0.3
Western Sahara	329.7	4.1	5.7	13.5	N/A
Yemen	10,784.6	2.5	3.0	270.0	2.5
Zambia	5,447.4	3.1	4.0	169.0	N/A
Zimbabwe	6,874.6	3.4	4.1	235.3	N/A
World	4,344,755.3	6.6	6.4	284,611.4	

IMPAIRED GLUCOSE TOLERANCE (20-79 YEARS)			NUMBER OF DEATHS ATTRIBUTABLE TO DIABETES (20-79 YEARS)			MEAN HEALTH EXPENDITURE	
PREVALENCE* (%)		TOTAL NUMBERS (000'S)	MALES	FEMALES	NATIONAL DIABETES PROGRAMME+	PER PERSON WITH DIABETES IN 2010, R=2 (USD)	COUNTRY/ TERRITORY
NATIONAL	COMPARATIVE						
4.5	4.2	2,044.1	41,130	30,239	NO	144	**Thailand**
10.0	11.0	56.2	169	204	N/A	86	**Timor-Leste**
6.7	7.6	224.7	979	1,443	YES	30	**Togo**
13.1	13.1	0.1	N/A	N/A	N/A	N/A	**Tokelau**
11.4	13.1	5.9	32	68	N/A	164	**Tonga**
11.2	11.5	105.5	503	493	N/A	668	**Trinidad and Tobago**
3.2	3.4	228.0	1,706	2,772	N/A	230	**Tunisia**
6.3	6.6	3,137.7	13,001	20,830	YES	572	**Turkey**
6.1	7.1	188.9	1,151	1,238	N/A	265	**Turkmenistan**
13.1	13.1	1.0	11	13	N/A	294	**Tuvalu**
7.2	8.6	972.8	3,563	4,572	N/A	42	**Uganda**
17.2	15.3	5,976.0	27,751	35,047	YES	145	**Ukraine**
14.3	18.8	501.1	672	408	N/A	1,067	**United Arab Emirates**
5.1	4.7	2,250.5	9,481	9,226	YES[a]	3,574	**United Kingdom**
12.6	11.2	27,279.4	105,241	125,785	YES	7,383	**United States of America**
10.5	9.7	234.4	586	477	NO	517	**Uruguay**
14.1	11.5	10.5	N/A	N/A	N/A	N/A	**US Virgin Islands**
6.1	7.1	1,009.1	4,551	4,995	YES	43	**Uzbekistan**
8.2	9.5	10.1	31	36	NO	132	**Vanuatu**
4.8	5.0	842.2	4,451	4,360	YES	399	**Venezuela**
6.3	6.9	3,566.7	18,447	14,058	N/A	62	**Viet Nam**
2.5	2.9	8.3	N/A	N/A	N/A	N/A	**Western Sahara**
2.8	4.0	302.8	1,339	2,071	N/A	74	**Yemen**
7.3	8.6	398.3	2,362	4,167	N/A	66	**Zambia**
6.7	8.7	460.6	3,590	9,978	N/A	38	**Zimbabwe**
7.9	7.8	343,540.2	1,826,485	2,136,571		703	**World**

N/A Not available

+ Based on a survey of IDF member associations.

[a] YES for England, Scotland and Wales; NO for Northern Ireland

ABBREVIATIONS AND ACRONYMS

AFR	Africa
CHF	congestive heart failure
CI	confidence interval
CVD	cardiovascular disease
DEHKO	Development Programme for the Prevention and Care of Diabetes in Finland
DiabCare	Diabetes Care study
DM	diabetes mellitus
DPP-4	dipeptidyl peptidase-4
DSME	diabetes self-management education
ECOSOC	Economic and Social Council
EUBIROD	European Best Information through Regional Outcomes in Diabetes
EUCID	European Core Indicators in Diabetes
EUR	Europe
EURODIAB	Europe and Diabetes study
GDM	gestational diabetes mellitus
GDP	gross domestic product
GLP-1	glucagon-like peptide-1
HbA1c	Glycosylated haemoglobin A1c
HCQI	Health Care Quality Indicators
HIV	human immunodeficiency virus
IASO	International Association for the Study of Obesity
ICCCF	Innovative Care for Chronic Conditions Framework
ID	International Dollar
IDF	International Diabetes Federation
IFG	impaired fasting glucose
IGT	impaired glucose tolerance
IIF	International Insulin Foundation
IOTF	International Obesity Task Force
IPA	International Pediatric Association
IUNS	International Union of Nutritional Sciences
LDL	low-density lipoprotein
LMCs	low- and middle-income countries
MDGs	Millennium Development Goals
MENA	Middle East and North Africa
N/A	not available
NAC	North America and Caribbean
NCD	Non-communicable disease
NDP	national diabetes programme
ODA	Overseas Development Assistance
OECD	Organisation for Economic Co-operation and Development
QUALIDIAB	Quality of Diabetes Care network
RAPIA	Rapid Assessment Protocol for Insulin Access
SACA	South and Central America
SEA	South-East Asia
UICC	International Union Against Cancer
UN	United Nations
USA	United States of America
USD	United States Dollar
VAT	value added tax
WHF	World Heart Federation
WHO	World Health Organization
WP	Western Pacific

GLOSSARY

beta cells
Beta cells are found in the islets of Langerhans in the pancreas. They produce and release insulin.

diabetes mellitus (DM)
Diabetes mellitus is a chronic condition that arises when the pancreas does not produce enough insulin or when the body cannot effectively use the insulin produced. There are two basic forms of diabetes: type 1 and type 2. People with type 1 diabetes do not produce enough insulin. People with type 2 diabetes produce insulin but cannot use it effectively.

diabetes complications
Diabetes complications are acute and chronic adverse consequences for health caused by diabetes. Chronic complications include retinopathy (eye disease), nephropathy (kidney disease), neuropathy (nerve disease), cardiovascular disease (disease of the circulatory system), foot ulceration and amputation.

diabetic ketoacidosis (DKA)
Also called diabetic coma. It indicates a very high blood glucose level which requires emergency treatment. Ketoacidocis occurs because of lack of insulin.

epidemiology
The study of the occurrence and distribution of health-related states or events in specified populations, including the study of the determinants influencing such states, and the application of this knowledge to the control of health problems.

glucose
Also called dextrose. The main sugar the body produces 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.

hyperglycaemia
A raised level of glucose in the blood; a sign that diabetes is out of control. 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 are great thirst, dry mouth and need to urinate often.

hypoglycaemia
Too low a 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.

impaired fasting glucose (IFG)
IFG is a category of higher than normal blood glucose, but below the diagnostic threshold for diabetes, after fasting (typically after an overnight fast). For a full definition see the WHO diagnostic criteria (www.who.int/diabetes). People with IFG are at increased risk of developing diabetes.

impaired glucose tolerance (IGT)
IGT is a category of higher than normal blood glucose, but below the diagnostic threshold for diabetes, after ingesting a standard amount of glucose in an oral glucose tolerance test. For a full definition see the WHO diagnostic criteria (www.who.int/diabetes). People with IGT are at increased risk of developing diabetes.

incidence
It indicates how often a disease occurs. More precisely, it corresponds to the number of new cases of a disease among a certain group of people for a certain period of time.

insulin
A hormone whose main action is to enable body cells to absorb glucose from the blood and use it for energy. Insulin is produced by the beta cells of the islets of Langerhans in the pancreas.

insulin analogue
Insulins chemically very similar to human insulin, works in the same places in the body and thus have the same effects on the metabolism of glucose, fats and proteins. Rapid-acting analogues (insulins aspart, glulisine and lispro) are absorbed faster into the blood than human insulin after injection, and therefore act earlier and for a shorter time period. Long-acting analogues (insulins detemir and glargine) are absorbed more slowly into the blood, and therefore act over longer periods of time than conventional extended-acting insulins.

International Dollar
It is 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 (PPP), which are taken from studies of prices for the same basket of goods and services in different countries.

islets of Langerhans

Named after Paul Langerhans, the German scientist who discovered them in 1869, these clusters of cells are located in the pancreas. They produce and secrete hormones that help the body break down and use food. There are five types of cells in an islet including beta cells, which produce insulin.

pancreas
The pancreas is an organ situated behind the lower part of the stomach which produces insulin.

prevalence
The proportion of individuals in a population who at a particular time (be it a point in time or time period) have a disease or condition. Prevalence is a proportion not a rate.

> ***comparative prevalence***
> The comparative prevalence in this publication has been calculated by assuming that every country and region has the same age profile (the age profile of the world population has been used). This reduces the effect of the differences of age between countries and regions, and makes this figure appropriate for making comparisons. The comparative prevalence rate should not be used for assessing the proportion of people within a country or region who have diabetes
>
> ***national or regional prevalence***
> The national or regional prevalence indicates the percentage of each country's or region's population that has diabetes. It is appropriate for assessing the burden of diabetes for each country or region.

R
R is the Diabetes Cost Ratio, which is the ratio of all medical care costs for persons with diabetes to all medical care costs 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. As R varies from country to country and over time, the IDF estimates show results for likely lower and upper bounds of R, R=2 and R=3.

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