



**Access
to Medicines
and Supplies for
People with
Diabetes**

A GLOBAL SURVEY ON
PATIENTS' AND HEALTH
PROFESSIONALS'
PERSPECTIVE

Copyright

All rights reserved. No part of this publication may be reproduced or transmitted in any form or by any means without the written prior permission of the IDF. Requests to reproduce or translate IDF publications should be addressed to communication@idf.org

Publisher

Published by the International Diabetes Federation



ISBN: 978-2-930229-83-6

Cite this report as:

International Diabetes Federation. Access to Medicines and Supplies for People with Diabetes. Brussels, Belgium: International Diabetes Federation, 2016. www.idf.org/accesstomedicine

Correspondence

International Diabetes Federation,
166 Chaussée de La Hulpe
B-1170, Brussels
Belgium
info@idf.org

Design

Designed by Karakas

Support

The preparation of this document was made possible through grants provided by AstraZeneca and Novo Nordisk.



The supporters had no influence on the scope or the content of this publication.

Main Authors

David Cavan
Joao Diogo da Rocha Fernandes
Yadi Huang
Lydia Makaroff

IDF Task Force on Insulin, Test Strips and Other Diabetes Supplies

Larry Deeb, USA (Chair). **Neil Donelan**, Australia. **Graham Ogle**, Australia. **Alicia Jenkins**, Australia. **Edwin Jiménez**, Costa Rica. **Fadlo Fraige**, Brazil. **Viswanathan Mohan**, India. **Seyda Ozcan**, Turkey. **Ammar Ibrahim**, Dominican Republic. **Kaushik Ramaiya**, Tanzania. **Massimo Massi-Benedetti**, Italy. **Antoinette Moran**, USA.

Acknowledgments

Research and advice provided by Christy Braham, Sabine Dupont, Beatriz Yáñez Jiménez, Ute Linnenkamp, Belma Malanda, Lorenzo Piemonte, Dominique Robert and Romina Savuleac.

Contributions from IDF Members

IDF thanks its members who have invested their time in collecting the data, and without whom this report would not be possible (see in annex all participating IDF members).

List of Acronyms

ACE inhibitors	Angiotensin-converting-enzyme inhibitors	LDL	Low-density lipoprotein
CVD	Cardio-vascular disease	LIC	Low-income country
DI	Disposable income	MIC	Middle-income country
DPP-4	Dipeptidyl Peptidase 4	Mmol/L	Millimoles per Litre
FOC	Free of cost	NGO	Non-Governmental Organisation
GLP-1	Glucagon-like peptide-1	NPH insulin	Isophane insulin
HIC	High-income country	SGLT2	Sodium-glucose Cotransporter-2 inhibitors
IDF	International Diabetes Federation	WHO	World Health Organization

Table of contents

Foreword	4
Executive summary	5
What is diabetes?	8
Type 1 diabetes	8
Type 2 diabetes	9
Gestational diabetes	9
Medication for diabetes	10
Essential diabetes medicines for diabetes	10
Other diabetes medicines	11
Diabetes supplies	12
Essential cardiovascular disease medicines	12
Methods	13
Responses	13
Response rate	13
Access survey	14
Access snapshot	14
Key findings	15
Insulin	16
Ancillary supplies for insulin-treated patients	19
Metformin	21
Gliclazide and other sulfonylurea	22
Other diabetes drugs	23
Essential CVD medications	24
Summary	26
Insulin and supplies	26
Metformin and sulfonylurea	27
Glucagon	27
Other medications for type 2 diabetes	27
Cardiovascular medicines	27
Recommendations	28
Recommended strategies to improve access	29
Best practices	30
Limitations of the study	30
Annex	31
Contributions from IDF Members	31
References	33

List of figures

Figure 1 Medication for type 2 diabetes	12
Figure 2 Countries' response rate of access survey by IDF region and income group	15
Figure 3 Countries' response rate of access snapshot by IDF region and income group	16
Figure 4 Full provision of insulin to children in access survey by income group	16
Figure 5 Full provision of insulin to adults in access survey by income group	17
Figure 6 Availability of insulin in access survey by income group	17
Figure 7 Snapshot results: Countries in which each insulin was available, where available free of charge and the cost range as % disposable income by country income group	18
Figure 8 Share of countries with access to refrigerator by income group	18
Figure 9 Possible causes of lack of insulin	18
Figure 10 Full provision of government supplies to children, in access survey by countries' income group	19
Figure 11 Full provision of government supplies to adults, in access survey by countries' income group	19
Figure 12 Availability of supplies, in access survey by countries' income group	20
Figure 13 Number of countries reporting use of insulin pens, by income group	20
Figure 14 Snapshot results: Countries in which each item was available, where available free of charge and cost range as % disposable income by country income group	21
Figure 15 Countries with full provision of metformin, and sulfonylurea, access survey by income group	22
Figure 16 Countries with availability of metformin, and sulfonylurea, access survey by income group	22
Figure 17 Snapshot results: Countries in which each medicine was available, where available free of charge and cost range as % disposable income by country income group	22
Figure 18 Number of countries with full provision of non-essential diabetes drugs, in access survey by countries' income group	23
Figure 19 Number of countries with availability of non-essential diabetes drugs, in access survey by countries' income country	23
Figure 20 Number of countries with full provision of CVD medications, in access survey by countries' income group	24
Figure 21 Number of countries with availability of CVD medications, in access survey by countries' income group	24
Figure 22 Snapshot results: Countries in which each medicine was available, where available free of charge and cost range as % disposable income by country income group	25

Foreword



The International Diabetes Federation estimates that approximately 5 million people die each year as a consequence of diabetes. Many of these deaths could be prevented with proper access to medicines and supplies. Often, the total supply of medicine is less than required, there are transportation problems, or medicine is not available in regional areas. Solutions to improving access include increased education of health professionals, reducing taxes and duties, promoting competition and high-quality generic medicines, differential pricing, good procurement practices, and open access to pricing information.

This *Access to Medicine and Supplies for People with Diabetes* report introduces diabetes and related medicines, and provides the perception of people with diabetes, and health professionals on the availability, access and prices of medicines and supplies from around the world, and outlines public health policy solutions.

This new report provides evidence on the daily challenges faced on the ground and encourages intersectoral collaboration to strengthen health systems and improve access to medicines and supplies.

We produced this report so that policy makers, policy implementers and diabetes advocates have an accessible summary of the current data on availability, access to and prices of medicines and supplies from the view point of people with diabetes. We have also included evidence on actionable solutions.

The International Diabetes Federation is very grateful to our members and to the IDF Task Force on Insulin, Test Strips and other Diabetes Supplies in helping to bring it to fruition.

Dr Shaukat Sadikot
President, International Diabetes Federation

Executive summary



People with diabetes require medicines to control their blood glucose levels, blood pressure and blood lipids, equipment to monitor their blood glucose levels, and a healthcare system that can provide integrated and comprehensive care to all parts of the country.

Unfortunately, the quality of care for people with diabetes varies widely around the world. In many high-income countries, people with diabetes have access to all components of care. In some other countries, quality care is inaccessible or unaffordable. Continuous accessibility to medicines is still a major problem in many less-resourced areas, especially in low- and middle-income countries. In the case of insulin, the lack of a reliable and continuous supply can lead to severe illness and death.

Essential medicines for diabetes

Essential medicines are defined by the World Health Organization as those that satisfy the priority health care needs of the population. They are selected with due regard to public health relevance, evidence on efficacy and safety, and comparative cost-effectiveness. Essential medicines are intended to be available within the context of functioning health systems at all times in adequate amounts, in the appropriate dosage forms, with assured quality and adequate information about their usage, and at a price that the individual and the community can afford. The World Health Organization lists five diabetes-related medicines on its *Model List of Essential Medicines*. These medicines are short-acting insulin, intermediate-acting insulin, gliclazide, glucagon, and metformin¹.

Insulin is a hormone that is produced in the pancreas, and that allows glucose to enter the body's cells, where it is used for energy. People with type 1 diabetes need insulin to survive, and it is also used by approximately 27% of people with type 2 diabetes², and approximately 2-18% of women with gestational diabetes³⁻⁵.

Nearly 100 years after its discovery by Frederick Banting and Charles H. Best, insulin is still not available on an uninterrupted basis in many parts of the world. This is an issue in low- and middle-income countries, as well as low-income groups in some high-income countries.

Aim of the report

This report is the result of a global survey of people with diabetes on their ability to access medicines and supplies. It provides evidence-based policy recommendations, enables policy makers in low- and high-resource settings to make informed decisions, and supports IDF members in advocating for increased access to medicines. The primary target audience includes IDF members, healthcare decision makers and policy makers.

Methods

Data was sourced from IDF Young Leaders⁶, IDF Members and their members⁷, and thus was non-random. The study comprised two distinct components:

1. Access survey on government provision and availability
2. Access snapshot on prices

IDF Young Leaders in Diabetes (YLD)

This IDF programme identifies and supports the development of Young Leaders within the international diabetes community. It aims to empower and educate them to support the mission of the YLD and IDF through strengthening our relationship with IDF Members. Currently there are 184 YLD members throughout the world.

IDF Members

The International Diabetes Federation is an umbrella organisation of over 230 national diabetes associations in 170 countries and territories. The main objectives of IDF members are to represent the interest of people with diabetes, those at risk, and of health professionals working the field of diabetes.

Access survey on provision and availability

The 2016 survey asked IDF Members and IDF Young Leaders about access to human and analogue insulins and necessary supplies (syringes and needles or injection pens, blood glucose meters and test strips). It also enquired about other classes of diabetes medications, including those on the WHO list of essential medicines (metformin, gliclazide (or alternative sulfonylurea) and glucagon) as well as other classes of diabetes medications (glucagon like peptide-1 (GLP1) analogues, dipeptidyl peptidase 4 (DPP4) inhibitors, sodium glucose co-transporter 2 (SGLT2) inhibitors, meglitinides and alpha-glucosidase inhibitors). The survey was available online and as a printable document, and in English, French and Spanish.

Access Snapshot

The access snapshot was designed to assess the 'real life' availability of medicines across the globe. The researchers requested assistance from IDF Young Leaders and individuals from IDF Members in these locations, who carried out the snapshot. A training pack was sent to each individual, containing a letter to the manager of the medicine supply point, background information as well as the precise questions to be asked at the supply point. The materials were available in English, French and Spanish.

Results

Responses to the access survey were received from 82 countries, while from the access snapshot, responses were received from 34 countries. The largest share of responses to the survey came from Europe (n=23), followed by the South America and Caribbean Region (n=13), and the Western Pacific Region (n=12). The same pattern was observed in the access snapshot with Europe, South America and Caribbean, and Western Pacific regions having the highest number of responses.



Insulin

Essential insulin is defined as short-acting and intermediate-acting human insulin, which are both on the World Health Organization's *Model List of Essential Medicines*. Like

human insulin, analogue insulin is created in a laboratory using *Escherichia coli* (E. coli) bacteria. However, analogue insulin is genetically altered from the human form found in short- and intermediate-acting insulin to create either a more rapid-acting or more uniformly long-acting form of insulin.



In 75% of the high-income countries, essential insulin was provided by the government to children, while in middle-income countries the rate was 50%. In the case of low-income countries there was no country reporting full government provision of essential insulin. When considering provision from both government and non-government sources, there were slightly more high- and middle-income countries reporting full provision of both essential and analogue insulins. Slightly fewer countries reported full provision of insulin to adults compared to children.

According to the responses to the access survey, short- and intermediate-acting insulins were always available at the service delivery point in 81% and 84% respectively of high-income countries surveyed, while in middle-income countries it was always available in 46% and 44% respectively of countries surveyed. In the case of low-income countries, none had 100% availability of short-acting insulin, although one country reported 100% availability of a rapid-acting insulin analogue.

On the other hand, when revising the analysis to include availability at least 75% of the time, many more middle- and low-income countries reported availability of insulin. However, this still left only 40% of low-income countries where availability of essential insulin was reported at least 75% of the time, very similar to the 38% of countries that reported similar availability of analogue insulin.



Diabetes supplies

The survey of IDF Members found that 66% of high-income countries had full government provision of syringes and needles, and that in 63% of high-income countries surveyed there was full government provision of blood glucose meters and test strips. In middle-income countries, there was full government provision of syringes and needles in 40% of countries surveyed, and of blood glucose meters and test strips in 19% of countries surveyed. No low-income country reported full government provision of any of the diabetes supplies in the survey. However, full provision of both syringes and needles, and blood glucose meters and test strips by non-government sources were reported in 30% of low-income countries.

Based on the responses from IDF members, syringes, needles and insulin pens were always available to purchase in 81% of high-income countries surveyed, and blood glucose meters and strips were always available to purchase in 78% of high-income countries surveyed. Syringes and needles were always available to purchase in 50% of middle-income countries surveyed, insulin pens in 36% of countries, and meters and strips in 44% of countries. Syringes and needles were always available in 20% of low-income countries surveyed, insulin pens in 13% of countries, and meters and strips in 10% of countries. When extending the analysis from 100% to 75% of the time, many more middle- and low-income countries reported its availability. Half of all low-income countries surveyed reported at least 75% availability of syringes, needles, meters and strips at the supply point.

The usage of insulin pens was much more common in high-income countries, in which 72% reported that the majority of people used insulin pens, compared with 18% of middle-income and 10% of low-income countries.



Metformin

Metformin is an oral medicine that is used for type 2 diabetes treatment. According to the survey responses there was full government provision of metformin for adults in only 79% of high-income, 65% of middle-income and in only 20% of low-income countries surveyed. It was available at least three-quarters of the time in most high- and middle-income countries, but in only half of low-income countries surveyed.



Other medications for type 2 diabetes

There was full provision of most newer agents in at least 60% of high-income countries, but in very few middle-income and no low-income countries. There was, however, availability at least 75% of the time of some of these agents in over 60% of middle-income countries and in 50% of low-income countries; the latter being similar to the availability of metformin and sulfonylureas. It is worth noting that amongst the small number of low-income countries that responded, more countries reported 75% availability of GLP1 analogues – which like insulin are injectable medicines that require cold storage – than of essential insulins.



Cardiovascular medicines

There were few middle-income countries and no low-income countries that reported full provision of essential cardiovascular medicines. Availability was generally better than for many of the diabetes medications, although availability of ACE inhibitors for purchase at least 75% of the time was reported in only 67% of low-income countries; availability of statins for purchase at least 75% of the time was reported in only 56% low-income countries, despite these being seen as important in the secondary prevention in the micro and macrovascular complications of diabetes.

What is diabetes?

Diabetes is a chronic condition that occurs when the body cannot produce enough insulin (a hormone produced in the pancreas) or cannot use this hormone effectively, and is diagnosed by observing raised levels of glucose in the blood.

Over time, the resulting high levels of glucose in the blood (known as hyperglycaemia) cause damage to many tissues in the body, leading to the development of disabling and life-threatening health complications including loss of vision, kidney failure, heart attacks, strokes, leg amputations and heart failure¹.

There are three main types of diabetes:

- Type 1 diabetes
- Type 2 diabetes
- Gestational diabetes

Type 1 diabetes

Type 1 diabetes is caused by an autoimmune reaction, in which the body's defence system inappropriately attacks the insulin-producing beta cells in the pancreas. As a result, the body can no longer produce the insulin it needs. Why this occurs is not fully understood, but is likely to result from an abnormal immune response to an environmental factor, such as a virus, in genetically predisposed individuals. The disease can affect people of any age, but onset usually occurs in children or young adults.

In type 1 diabetes the body can no longer produce the insulin it needs. People with this form of diabetes need to inject insulin every day in order to control the levels of glucose in their blood. Without insulin, a person with type 1 diabetes will die.

Type 1 diabetes is diagnosed by an elevated blood glucose level along with the presence of symptoms such as excessive thirst, frequent urination, blurred vision, lethargy and weight loss. Onset is often rapid. In some parts of the world, where type 1 diabetes is less common, the symptoms may be mistaken for other illnesses such as malaria or tuberculosis, and it is therefore essential that the blood glucose is measured when excessive thirst and frequent urination are present. With daily insulin treatment, regular blood glucose monitoring and maintenance of a healthy diet and lifestyle, people with type 1 diabetes can live a normal, healthy life.

**Without insulin,
a person with type 1
diabetes will die**

Type 2 diabetes

Type 2 diabetes is the most common type of diabetes. It usually occurs in adults, but is increasingly seen in children and adolescents. In type 2 diabetes, there is a combination of inadequate production of insulin, and an inability of the body to respond fully to insulin (insulin resistance).

The symptoms of type 2 diabetes may be similar to those of type 1 diabetes but are often less severe, and may develop more slowly. Symptoms may include frequent urination, excessive thirst and blurred vision. In some cases, type 2 diabetes may not be associated with any overt symptoms, and as a result, many people with type 2 diabetes remain unaware of their condition for a long time. However, during this time the body is already being damaged by excess blood glucose. As a result, many people already have evidence of complications such as eye disease when they are diagnosed with type 2 diabetes.

Symptoms may include frequent urination, excessive thirst and blurred vision

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

In contrast to people with type 1 diabetes, most people with type 2 diabetes do not require daily insulin treatment to survive. The cornerstone of treatment of type 2 diabetes is the adoption of a healthy diet and increased physical activity. Type 2 diabetes progresses such that after several years of good glucose control with lifestyle changes, the blood glucose levels can rise, so additional medications are needed to maintain good glucose control. A number of oral medications are available, and if blood glucose levels continue to rise, people with type 2 diabetes may be prescribed insulin or other injectable drugs that lower blood glucose levels.

Gestational diabetes

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

- Gestational diabetes mellitus, or
- Diabetes mellitus in pregnancy

Pregnant women with slightly elevated blood glucose levels are classified as having gestational diabetes, whilst women with substantially elevated blood glucose levels are classified as having diabetes mellitus in pregnancy. Gestational diabetes should be diagnosed at any time in pregnancy if two-hour plasma glucose is between 8.5 and 11.0 mmol/L following a 75g oral glucose load, while diabetes in pregnancy should be diagnosed if two-hour glucose is higher or more than 11.1 mmol/L following a 75g oral glucose load⁸.

Overt symptoms of hyperglycaemia during pregnancy are rare and difficult to distinguish from normal pregnancy symptoms, but may include increased thirst and frequent urination. Women with hyperglycaemia detected during pregnancy are at greater risk of adverse pregnancy outcomes. These include very high blood pressure, pre-eclampsia (a syndrome of high blood pressure, fluid retention and urinary protein loss) and foetal macrosomia (a significantly larger than average baby), which can make a vaginal birth difficult and risky. Good control of blood glucose during pregnancy can reduce these risks.

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

Women with hyperglycaemia detected during pregnancy are at greater risk of adverse pregnancy outcomes

Medication for diabetes



People with diabetes require medicines to control their blood glucose levels, blood pressure and blood lipids, equipment to monitor their blood glucose levels, and a health care system that is able to provide integrated and comprehensive care to all parts of the country. For proper delivery of diabetes care, medicines, blood-glucose meters and test strips, and insulin syringes and needles should be available, accessible and at an affordable cost to all people with diabetes who require them. For type 1 diabetes care, blood or urine ketone test strips are desirable, as are glucagon injections for the treatment of severe hypoglycaemia in people with type 1 diabetes.

Unfortunately, the quality of care for people with diabetes varies widely around the world. In many high-income countries people with diabetes have complete access to all components of care. In some other countries, quality care is inaccessible or unaffordable. Continuous access to medicines is still a major problem in many low- and middle-income countries. In the case of insulin, lack of a reliable and continuous supply can lead to severe illness and death. In addition to the lack of access to insulin in some low-income countries, the low prevalence of type 1 diabetes means there are often few health professionals with the necessary skills to diagnose and treat diabetes, often leading to misdiagnosis. Thus the prognosis for people with type 1 diabetes in the poorest countries of the world is likely to be very poor. Currently, the life expectancy for a child with type 1 diabetes in rural Mozambique in the 21st century has been estimated as less than that of a child in the USA before the discovery of insulin⁹. In some countries, expert care is available but resources are limited and early complications arise frequently and lead to premature mortality in young adulthood.

Essential medicines for diabetes

Essential medicines are defined by the World Health Organization as those that satisfy the priority health care needs of the population. They are selected with due regard to public health relevance, evidence on efficacy and safety, and comparative cost-effectiveness. Essential medicines are intended to be available within the context of functioning health systems at all times in adequate amounts, in the appropriate dosage forms, with assured quality and adequate information about their usage, and at a price that the individual and the community can afford. The World Health Organization lists five diabetes-related medicines on its Model List of Essential Medicines. These medicines are short-acting insulin, intermediate-acting insulin, gliclazide, glucagon, and metformin¹.

The World Health Organization lists five diabetes-related medicines on its Model List of Essential Medicines. These medicines are **short-acting insulin, intermediate-acting insulin, gliclazide, glucagon, and metformin**

Insulin is a hormone that is produced in the pancreas, which allows glucose to enter the body's cells, where it is used for energy. People with type 1 diabetes need insulin to survive, and it is also used by approximately 27% of people with type 2 diabetes², and up to 18% of women with gestational diabetes³⁻⁵.

Nearly 100 years after its discovery, insulin is still not available on an uninterrupted basis in many parts of the world. This is an issue in low-and middle-income countries, as well as low-income groups in some high-income countries.



Insulin has to be given by injection, or in affluent regions by an insulin pump delivering insulin subcutaneously continuously and with user-initiated meal boluses. Most insulin available on the market since the 1980s is so-called 'human insulin' that is produced in a laboratory using *E. coli* bacteria. Short-acting (regular or soluble) insulin is taken up to about 30 minutes before a meal. Intermediate-acting insulin is held in a suspension (e.g. NPH insulin) in order to prolong its action. It is usually injected once or twice a day, in the morning and/or in the evening, and helps to keep blood glucose levels more stable overnight and between meals.



Metformin belongs to another class of oral medicine, biguanide, used for type 2 diabetes treatment. It works by reducing insulin resistance and enabling the body use its own insulin more effectively. It is regarded as the first-line treatment for type 2 diabetes in most guidelines around the world.



Glucagon is another hormone produced by the pancreas and increases blood glucose levels by breaking down stores of glycogen in the liver and muscles. It is also available as a manufactured injectable medicine in the form of a powder that must be reconstituted just prior to injection under the skin or into muscle. It has the opposite effect of insulin, increasing blood glucose levels, and is used to treat severe episodes of low blood glucose (hypoglycaemia).



Sulfonylureas are a class of oral medicines used for the treatment of type 2 diabetes that work by stimulating the pancreas to increase insulin production. Sulfonylureas include gliclazide, glipizide, glimepiride, tolbutamide and glibenclamide, although the latter is not recommended because of its long half-life and increased risk of hypoglycaemia.

Other diabetes medicines

Several new insulins, as well as other drugs for the treatment of type 2 diabetes, have been introduced in the past ten years. Some of these have come off patent and others will do so in the next few years, which generally increases the number of 'brands' available and reduces the drug costs to the health care systems and consumers.

Like human insulin, analogue insulin is also created in a laboratory using *E. coli* bacteria. However, analogue insulin is genetically altered from the human form found in short- and intermediate-acting insulin to create either a more rapid-acting or more uniformly long-acting form of insulin. Rapid-acting analogue insulins (such as insulin lispro, aspart or glulisine) are generally injected just before eating a meal. Long-acting analogue insulins (such as insulin glargine, degludec or detemir) are injected once or twice a day, and help to keep blood glucose levels more stable overnight and between meals. There is evidence that use of analogues reduces the likelihood of hypoglycaemia in people with type 1 diabetes¹⁰. There is little evidence of benefit in type 2 diabetes¹¹.

Other medications for type 2 diabetes are summarised in the table on page 12.

GLP1 analogues are injectable medicines that stimulate the release of insulin. DPP4 inhibitors are oral medicines that block glucagon release to help reduce blood glucose, and stimulate the secretion of postprandial insulin. SGLT2 inhibitors are oral medicines that lower blood glucose by increasing its excretion via the kidneys. Meglitinides are oral medicines that stimulate increase insulin production. Alpha-glucosidase inhibitors are oral medicines that prevent the digestion of carbohydrates.

Figure 1 Medication for type 2 diabetes

MEDICATION	MODE OF ACTION
Biguanides	Reduces hepatic glucose output and increases uptake of glucose by the periphery tissues <i>Metformin*</i>
Sulfonylureas	Stimulates insulin secretion <i>Glyburide /Glibenclamide, Glipizide, Gliclazide*, Glimpiride</i>
Meglitinides	Stimulates insulin secretion <i>Repaglinide, Nateglinide</i>
α-glucosidase inhibitors	Slows intestinal carbohydrate digestion/absorption <i>Acarbose, Miglitol</i>
DPP-4 inhibitor	Increases insulin secretion and reduces glucagon secretion <i>Sitagliptin, Vildagliptin, Saxagliptin, Linagliptin, Alogliptin</i>
Thiazolidinediones (TZDs)	Increases insulin sensitivity <i>Pioglitazone, Rosiglitazone (withdrawn in many countries)</i>
GLP-1 receptor analogues	Increases insulin secretion, reduces glucagon secretion, slows gastric emptying and increases satiety <i>Exenatide, Liraglutide, Albiglutide, Lixisenatide, Dulaglutide</i>
SGLT-2 inhibitors	Blocks reabsorption of glucose in the kidneys, which increases glucose excretion and lowers blood glucose levels <i>Canagliflozin, Dapagliflozin, Empagliflozin</i>

* On the WHO Model List of Essential Medicines

Diabetes supplies

For people who require insulin, access to insulin itself is not sufficient. They also need to have access to syringes and needles, a blood glucose meter to determine insulin dosage and test strips to measure glucose levels. Access to these essential tools is often problematic and adds to the challenges faced by people in many countries.



Essential cardiovascular disease medicines

People with diabetes are at increased risk of cardiovascular disease, and many may benefit from the use of medications to reduce high blood pressure or cholesterol levels. Suitable medications listed on the World Health Organization *Model List of Essential Medicines* include examples of calcium channel blockers, beta blockers, ACE inhibitors, thiazide diuretics, and statins.

Calcium channel blockers are oral medicines that are used to treat angina and to lower blood pressure. Beta blockers are oral medicines that are used to manage irregular heartbeat, lower blood pressure, and reduce the risk of heart attacks. ACE inhibitors are oral medicines used to treat high blood pressure and heart failure. They are also used to protect kidney function in people with diabetes. Thiazide diuretics are oral medicines used to treat high blood pressure.

HMG CoA reductase inhibitors ('statins') are oral medicines used to reduce LDL-cholesterol levels.

Methods

This report is the result of a global survey of people with diabetes on their ability to access medicines and supplies. It provides evidence-based policy recommendations, enables policy makers in low- and high-resource settings to make informed decisions, and supports IDF members in advocating for increased access to medicines. The primary target audience includes IDF members, healthcare decision makers and policy makers.

Responses

Data was sourced from IDF Young Leaders⁶ and IDF Members⁷, and thus was non-random. The study comprised two distinct components:

1. Access survey on government provision and availability
2. Access snapshot on local availability and prices

IDF Young Leaders in Diabetes (YLD)

This IDF programme identifies and supports the development of Young Leaders within the international diabetes community. It aims to empower and educate them to support the mission of the YLD and IDF through strengthening our relationship with IDF Members. Currently there are 184 YLD members throughout the world.

IDF Members

The International Diabetes Federation is an umbrella organisation of over 230 national diabetes associations in 170 countries and territories. The main objectives of IDF members are to represent the interest of people with diabetes, those at risk, and of health professionals working the field of diabetes.

Response rate

Strategies used to increase response rate:

- Sending a notification one week before the start of the survey period
- Keeping survey duration under 10 minutes (20 questions)
- Using just one link in an e-mail
- Informing participants:
 - The purpose of the research and how their responses would be used
 - The benefit to the member association
 - How long the survey will take to complete
 - If they wish, the logo of their member association will be included in the report
 - Privacy statement
- Sending frequent reminders after the survey has been sent

Access survey

The survey was based on the 1994 questionnaire developed by IDF for the study on *Insulin Availability Among International Diabetes Federation Member Associations*, the 2003 IDF *Global Access to Insulin and Diabetes Supplies Survey*, the 2013 questionnaire developed by IDF Europe for their study on *Access To Quality Medicines And Medical Devices For Diabetes Care In Europe*¹², and the 2013 IDF *Life for a Child Survey Of Diabetes Care For Children And Youth*¹³.

The survey was distributed to all 160 countries in which IDF has at least one member association. Answers from 82 countries were received, and in half of these, more than one association answered the questionnaire. In cases where different IDF Member Associations from the same country gave disparate responses, the member associations were contacted and responses discussed in order to resolve the differences.

The 2016 survey asked IDF members about their assessment of access to human and analogue insulins and necessary supplies (syringes and needles (or injection pens), blood glucose meters and test strips). It also enquired about other diabetes medications on the WHO list of essential medicines (metformin, gliclazide (or alternative sulfonylurea) and glucagon) as well as other classes of diabetes medications (glucagon like peptide-1 (GLP1) analogues, dipeptidyl peptidase 4 (DPP4) inhibitors, sodium glucose co-transporter 2 (SGLT2) inhibitors, meglitinides and alpha-glucoside inhibitors. Thiazolidinediones were not included as their availability is restricted by licencing authorities in a number of countries because of safety concerns. The full questionnaire can be found at www.idf.org/accesstomedicine.

The survey also asked IDF members about access to drugs from the classes of medication on the WHO list of essential medicines for cardiovascular disease (calcium channel antagonists, beta receptor antagonists, angiotensin converting enzyme inhibitors, thiazide diuretics and statins).

The survey asked specifically about provision from government or non-government sources, defined as a medication or supply that is provided at no or low cost to users as a matter of government policy or by a non-government agency. Available responses were: full government provision, limited government provision, no government provision, full provision by either government or non-government sources. It also asked about the typical availability of each medicine or supply at pharmacies. Available responses for each item included: available 100% of the time, 75-99% (at least three quarters) of the time, 25-74%, and less than 25% of the time. For insulin and related consumable supplies, especially for people with type 1 diabetes, 100% availability is essential. For other agents, 100% availability is required, although availability to purchase at least three-quarters of the time is probably acceptable, especially in areas of low access. Thus results are presented as showing 100% and >75% availability for each item.

The survey asked about possible reasons for lack of access to insulin and about population access to a refrigerator and usage of insulin pens (100%, 75-99%, 25-74%, and less than 25%).

Access snapshot

The Access snapshot was designed to assess the 'real-life' availability of medicines across the globe.

The researchers requested assistance from IDF Young Leaders and individuals from IDF Member Associations in their respective locations, who carried out the snapshot. A training pack was sent, which contained background information as well as the precise questions to be asked at the supply point. The access snapshot questions can be found in the [IDF website](#).

The snapshot focused on medicines on the WHO Model List of Essential Medicines for diabetes and cardiovascular disease as well as on analogue insulins and insulin injection and blood glucose monitoring supplies. The IDF Young Leaders and individuals from IDF Member Associations were asked to visit their nearest supply point (public or private hospital or pharmacy) and to ask the pharmacist for details about the preparations available that day, the total cost for each one and the cost to the patient.

Public sector

The public sector includes the main public hospital and public sector medicine outlets. For hospitals, medicine price/availability data are collected for the outpatient/primary healthcare service.

Private sector

The private sector includes licensed retail pharmacies and licensed drug stores only. The private sector does not include unlicensed drug stores, drug sellers in the informal sector, pharmacies in private clinics and hospitals or health facilities operated by private companies, such as mining companies.

The access survey was available for completion online (SurveyMonkey) or as a Word document; the snapshot was sent as a Word document for completion locally.

Once the content of the access survey and access snapshot were finalised, an assessment was first carried out in five countries as a pilot study to assess feasibility. They were then made available to all members and Young Leaders for completion over a six-month period. The responses came from a diverse range of supply points, which include public pharmacies, private pharmacies, and hospitals, from both rural and urban areas.

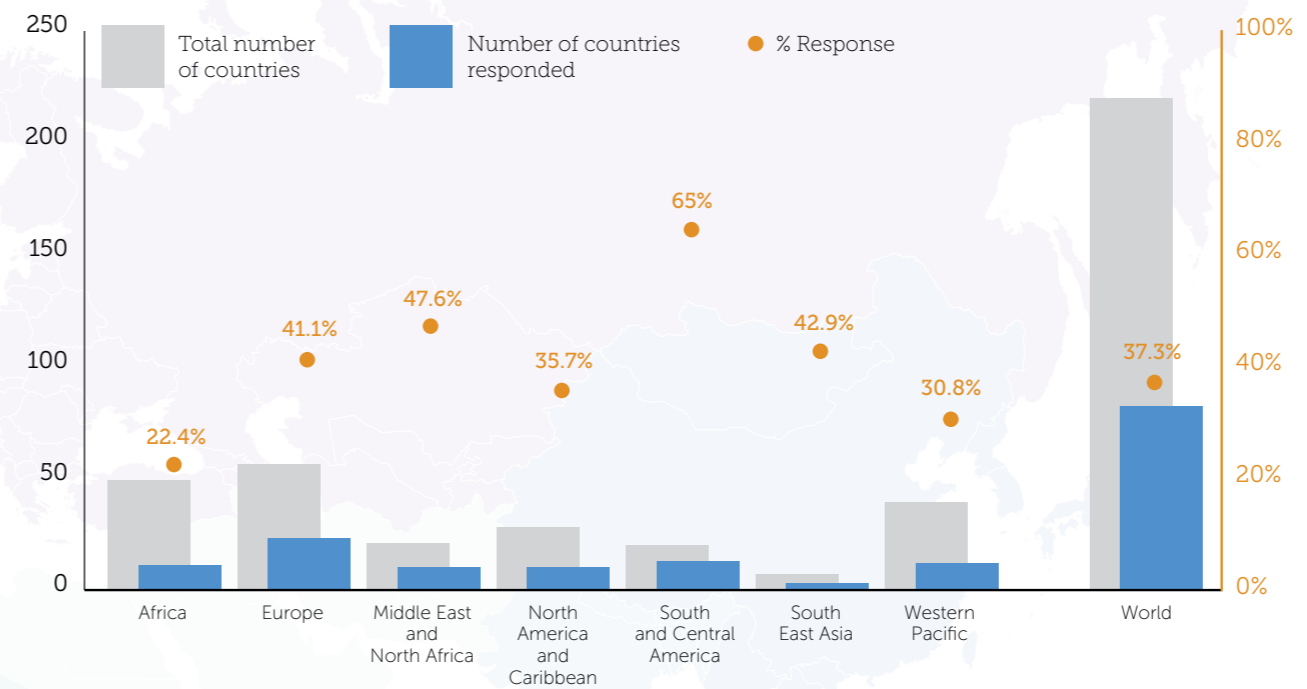
Data from the survey was analysed by country and presented in country income groups, based on the World Bank Income Classification¹⁴. Cost data from the snapshot was converted from local currency to international dollars (ID), as per purchasing power parity rates published by the World Bank¹⁵, and expressed as the cost for one month's supply of each item, based on requiring 1000 units of insulin (eg one 10ml vial of U100 strength insulin) each month and 30 tablets of a typical dose of the other medications. The cost of each item was then calculated as a percentage of the disposable income for each country¹⁶.

Key findings



Responses to the access survey were received from IDF members in 82 countries. Where responses were received from more than one source in a country, a single response was generated in consultation with the respondents from that country. Responses were received from all seven IDF regions and from all country income groups (See figure 2).

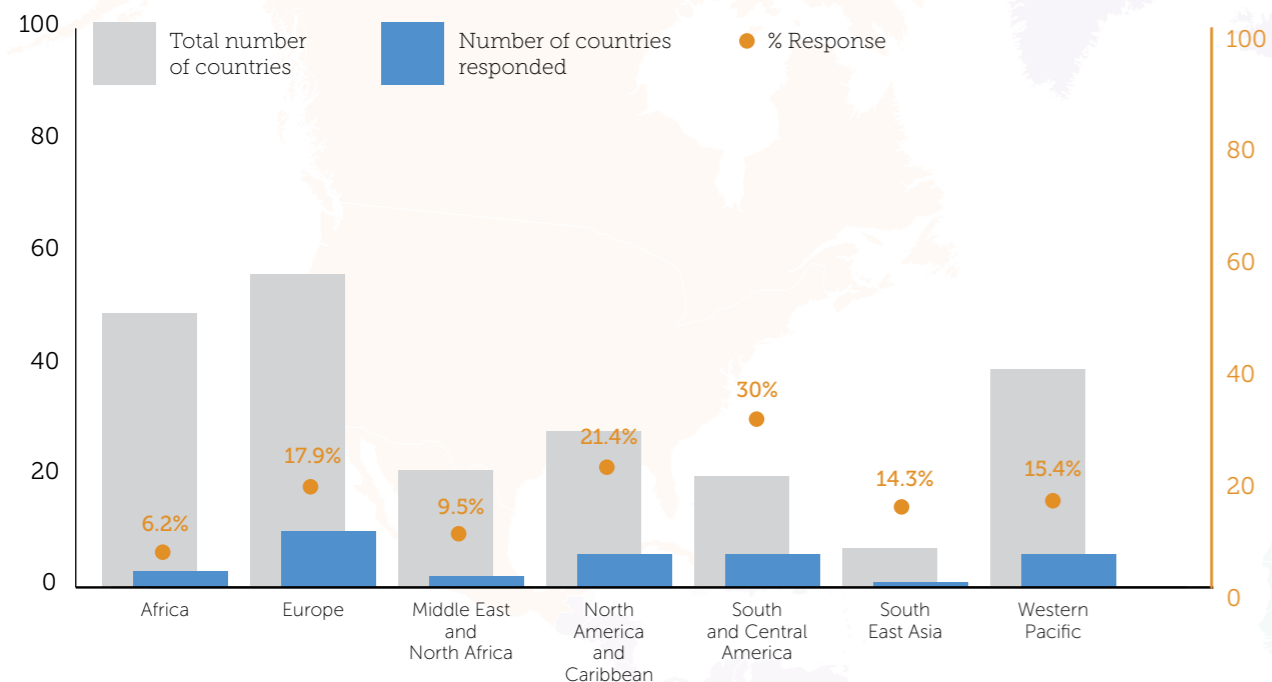
Figure 2 Countries' response rate on access survey by IDF region and income group



World Bank income group	Total number of countries	Number of countries responded	% Response
Low income	32	10	31.3%
Middle income	110	41	37.3%
High income	78	31	39.7%

There were fewer responses to the access snapshot, with a total of 34 countries responding. As with the access survey there were cases where information was received from more than one source; in these cases, a single response was generated in consultation with the respondents (See figure 3).

Figure 3 Countries' response rate to access snapshot by IDF region and income group



World Bank income group	Total number of countries	Number of countries responded	% Response
Low income	32	4	12.5%
Lower-middle income	53	7	13.2%
Upper-middle income	57	7	12.3%
High income	78	16	20.5%

Not all respondents answered every question, and so in the tables that follow, the denominator is adjusted to take into account those who responded to each question, excluding those that either did not answer, or responded with 'don't know'.

Insulin

Survey respondents were asked about access to four types of insulin in their country: short-acting (regular) and intermediate-acting (NPH or isophane) human insulin, both on the WHO list of essential medicines, and rapid- and long-acting analogues.

The survey found that 75% of high-income countries had full government provision of essential insulins for children, with 69%-72% providing analogue insulins. Fifty percent of middle-income countries had full government provision of essential insulins for children and 28-30% provided analogue insulins (See figure 4). Based on the responses received, no low-income country guaranteed full provision for any insulin to children. Taking into account provision from non-government sources, there were slightly more high- and middle-income countries reporting full provision of both essential and analogue insulins. Non-government sources ensured full provision of short- (regular) and intermediate-acting insulin in two (20%) and three (30%) low-income countries respectively, and of analogue insulins to children in one country. Slightly fewer countries reported full provision for insulin in adults compared to children (See figure 5).

Figure 4 Full provision of insulin to children in access survey by income group

No (%) countries reporting full provision for children	Full provision by government			Full provision by government or non-government sources		
	High-income countries	Middle-income countries	Low-income countries	High-income countries	Middle-income countries	Low-income countries
Short-acting/regular insulin	24/32 75%	19/38 50%	0/10 0%	25/32 78%	21/39 54%	2/10 20%
Intermediate-acting insulin	24/32 75%	20/39 51%	0/10 0%	25/32 78%	22/39 57%	3/10 30%
Rapid-acting insulin analogue	22/32 69%	11/37 30%	0/7 0%	23/32 72%	13/37 35%	1/7 14%
Long-acting insulin analogue	23/32 72%	11/39 28%	0/7 0%	24/32 75%	15/39 39%	1/7 14%

Figure 5 Full provision of insulin to adults in access survey by income group

No (%) countries reporting full provision for adults	Full provision by government			Full provision by government or non-government sources		
	High-income countries	Middle-income countries	Low-income countries	High-income countries	Middle-income countries	Low-income countries
Short-acting/regular insulin	22/30 73%	17/32 53%	0/10 0%	23/30 77%	17/32 53%	2/10 20%
Intermediate-acting insulin	21/30 70%	17/30 57%	0/10 0%	22/30 73%	18/30 60%	1/10 10%
Rapid-acting insulin analogue	21/30 70%	9/31 29%	0/7 0%	22/30 73%	9/31 29%	1/7 14%
Long-acting insulin analogue	22/30 73%	10/31 32%	0/7 0%	22/30 73%	14/39 36%	1/7 14%

According to the responses of IDF members, short- and intermediate-acting insulins were always available at the service delivery point in 81% and 84% of high-income countries respectively, with similar availability for analogue insulins. In middle-income countries, short- and intermediate-acting insulins were always available in 46% and 44% of countries respectively, with rapid- and long-acting analogues always available in 29% and 35% of countries. In low-income countries, intermediate-acting insulin was always available in one country. No low-income country had 100% availability of short-acting insulin (See figure 6).

Many more middle- and low-income countries reported availability of insulins to purchase at least three-quarters of the time, although there were still only 40% of low-income countries where essential insulins were available to purchase at least three-quarters of the time, very similar to the 38% of countries that reported that analogue insulins were available for purchase at least three-quarters of the time.

No low-income country had 100% availability of short acting insulin

Figure 6 Availability of insulin in access survey by income group

No (%) countries reporting 100% or >75% availability	100% availability			>75% availability		
	High-income countries	Middle-income countries	Low-income countries	High-income countries	Middle-income countries	Low-income countries
Short-acting insulin	26/32 81%	17/37 46%	0/10 0%	31/32 97%	33/37 89%	4/10 40%
Intermediate-acting insulin	27/32 84%	16/36 44%	1/10 10%	31/32 97%	34/36 94%	4/10 40%
Rapid-acting insulin	27/32 84%	11/38 29%	1/8 13%	30/32 94%	26/38 68%	3/8 38%
Long-acting insulin	26/32 81%	13/37 35%	0/8 0%	29/32 91%	24/37 65%	3/8 38%

According to the snapshot survey of medicine supply points, short-acting insulin was available at the service point surveyed in 88%, and intermediate-acting insulin in 91%, of the countries (See figure 7). The countries with the highest out-of-pocket cost of insulin, as a proportion of average disposable income, were the Democratic Republic of the Congo, the Philippines, Egypt, and Kyrgyzstan. In Egypt, the cost of purchasing essential insulin for people with type 1 diabetes was estimated as consuming up to 57% of the average monthly disposable income. The countries with the lowest out-of-pocket cost of insulin, as a proportion of average disposable income, were the United Kingdom, Sweden, and Portugal.

The access to rapid-acting analogue insulin was the lowest of the four types of insulin analysed, with respondents from 58% of countries confirming its availability. Analogue insulin was more available in high-income countries (86%) than in low- (0%) and middle-income (56%) countries.

Insulin was reported as being provided free of charge to patients in 69 to 73% of the high-income countries (depending on the type of insulin) from which responses from IDF members were received. On the other hand, no type of insulin was available free of charge in the low-income countries analysed, the same being observed for analogue insulin in middle-income countries.

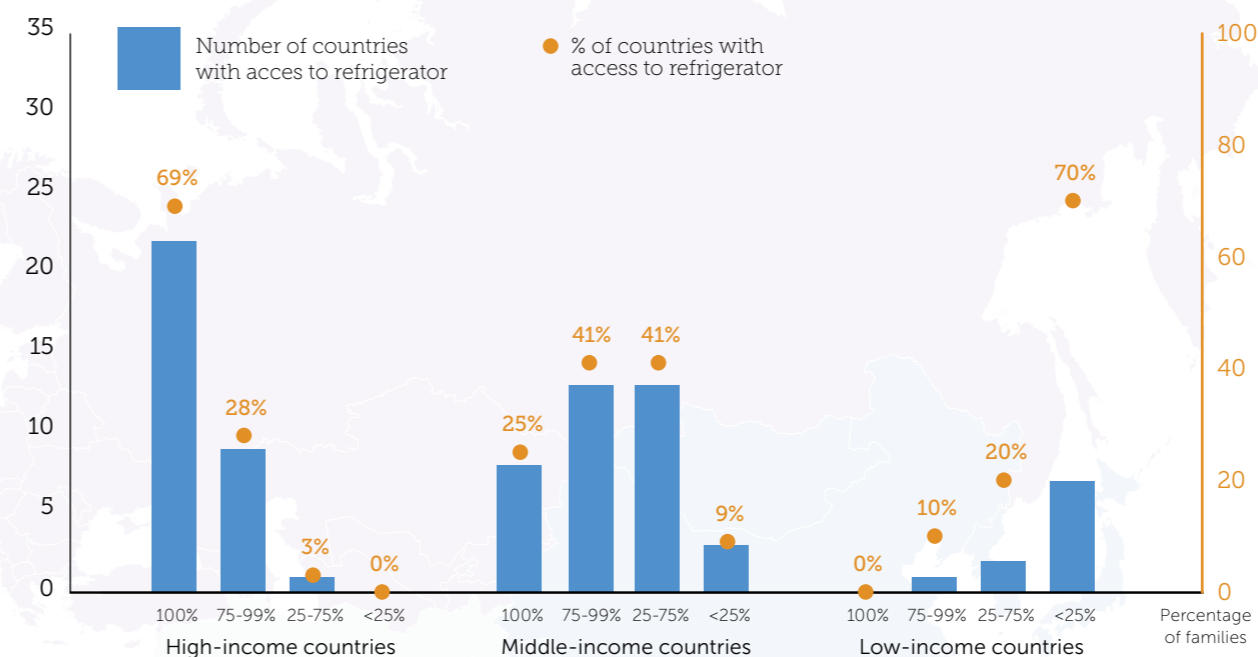
In countries where insulin was not provided free of charge, respondents reported out-of-pocket payments for a month's supply to be from 0.1% to 7.6% of the monthly disposable income in high-income countries, and 0.4% to 66.1% of disposable income in middle-income countries. Due to the low number of responses from low-income countries, no conclusions were obtained (See figure 7).

Figure 7 Snapshot results: Countries in which each insulin was available, where available free of charge and the cost range as % disposable income by country income group

		High-income countries	Middle-income countries	Low-income countries
Short-acting insulin	No (%) countries available	16/16 100%	10/14 71%	4/4 100%
	No (%) FOC	9/13 69%	2/7 29%	0/3 0%
	Cost as %DI (range)	0.1-2.2%	0.4-23.8%	N/A
Intermediate-acting insulin	No (%) countries available	13/15 87%	12/14 86%	4/4 100%
	No (%) FOC	8/11 (73%)	2/12 (17%)	0/3 (0%)
	Cost as %DI (range)	0.2-2.2%	0.4-21.7%	N/A
Rapid-acting insulin	No (%) countries available	12/14 86%	7/13 54%	0/4 0%
	No (%) FOC	9/13 69%	0/7 0%	0/1 0%
	Cost as %DI (range)	0.1-7.6%	0.9-58.1%	N/A
Long-acting insulin	No (%) countries available	15/16 94%	9/13 69%	0/4 0%
	No (%) FOC	10/14 71%	0/7 0%	0/1 0%
	Cost as %DI (range)	0.2-3.7%	0.4-66.1%	N/A

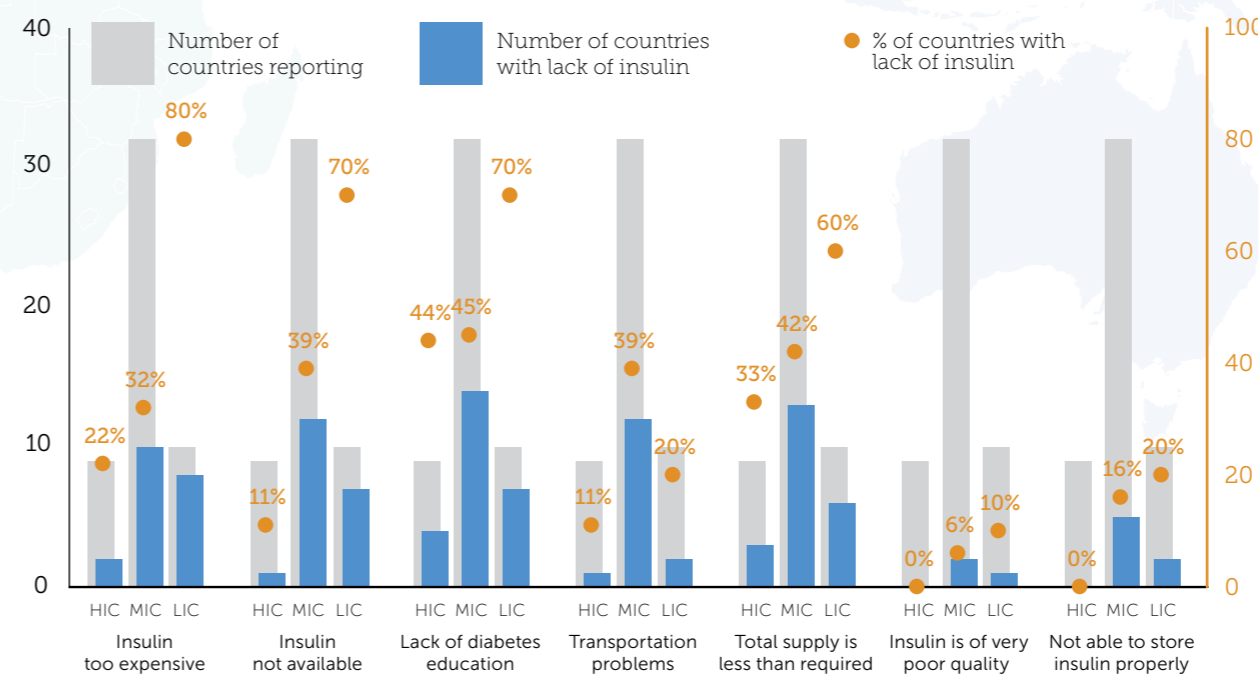
Current guidance states that insulin must be kept cool in order to maintain its action, typically in a refrigerator, with temperature between 2 and 8 degrees Celsius. The survey therefore enquired about access to a refrigerator. Ninety-seven percent of respondents from high-income countries reported that over 75% of families had access to a refrigerator; this compares with 66% of middle-income and 10% of low-income countries (See figure 8). Due to this low access to a refrigerator, families often find alternative methods to store insulin in order to ensure the survival of those with diabetes¹⁷.

Figure 8 Share of countries with access to refrigerator by income group



The survey also asked IDF members and Young Leaders to identify possible causes of lack of access of insulin, by choosing from a number of options (See figure 9). It can be seen that cost, lack of supply and availability were the most frequently cited problems, and that these problems were most frequently raised by respondents from low-income countries. On the other hand, in high-income countries, lack of information was considered the biggest obstacle to access of insulin.

Figure 9 Possible causes of lack of insulin based on responses from IDF members and Young Leaders



Ancillary supplies for insulin-treated patients

The survey of IDF members enquired about provision of essential supplies, including injection equipment, blood glucose testing equipment and glucagon. It reported that 66% of high-income countries had full government provision of syringes and needles, 68% had full government provision of insulin pens and 63% had full government provision of glucose meters and strips for children. In middle-income countries, there was full government provision of these items in 40%, 29% and 19% of countries respectively. No respondents from any low-income countries reported full government provision of any of these supplies. Taking provision by non-government sources into account, there was a slight increase in the number of high- and middle-income countries with full provision and a significant increase in the number of low-income countries reporting full provision (of syringes and needles in 30%, insulin pens in 25% and glucose meters and strips in 30% of countries).

There were slightly fewer high- and middle-income countries that reported full government provision of supplies to adults than to children. There was full non-government provision to adults of syringes and needles in 30%, of insulin pens in 25% and of blood glucose meters and strips in 30% of low-income countries. Thus in the majority of low-income countries, both adults and children with diabetes are responsible for purchasing their own insulin supplies themselves, without government or non-government assistance, based on the answers received.

Glucagon is a treatment for hypoglycaemia, and is classed as an essential medicine. However, in many countries, it is prescribed mainly to those with type 1 diabetes that experience or are at risk of severe hypoglycaemia, which is defined as requiring assistance from another person for recovery. It is for occasional rather than daily use and so guaranteed availability is not as critical as with insulin. As per the knowledge of IDF members, there was full government provision of glucagon for children in 72% of high-income countries and in 28% of middle-income countries surveyed. No low-income country had full government provision for glucagon. When provision by government and non-government sources was examined, there was full provision in 79% of high-income countries, 41% of middle-income countries and 17% of low-income countries (See figure 10).

According to the data collected, there was full government provision of glucagon for adults in three-quarters of high-income countries and in 32% of middle-income countries surveyed. No low-income country had full government provision for glucagon for adults. When provision by government and non-government sources was examined, there was full provision in 79% of high-income countries, 40% of middle-income countries and 17% of low-income countries (See figure 11).

Figure 10 Full provision of government supplies to children, in access survey by countries' income group

No (%) countries reporting full provision for children	Full provision by government			Full provision by government or non-government sources		
	High-income countries	Middle-income countries	Low-income countries	High-income countries	Middle-income countries	Low-income countries
Syringes and needles	21/32 66%	15/38 40%	0/10 0%	23/32 72%	17/38 45%	3/10 30%
Insulin pens	21/31 68%	10/35 29%	0/8 0%	22/31 71%	13/35 37%	2/8 25%
Blood glucose meters and test strips	20/32 63%	7/37 19%	0/10 0%	22/32 69%	14/37 38%	3/10 30%
Glucagon	21/29 72%	8/29 28%	0/6 0%	23/29 79%	12/29 41%	1/6 17%

Figure 11 Full provision of government supplies to adults, in access survey by countries' income group

No (%) countries reporting full provision for adults	Full provision by government			Full provision by government or non-government sources		
	High-income countries	Middle-income countries	Low-income countries	High-income countries	Middle-income countries	Low-income countries
Syringes and needles	19/30 63%	12/31 39%	0/10 0%	21/30 70%	14/31 45%	1/10 10%
Insulin pens	20/30 67%	6/26 23%	0/8 0%	21/30 70%	8/26 31%	1/8 13%
Blood glucose meters and test strips	17/30 57%	7/30 23%	0/10 0%	20/30 67%	10/30 33%	1/10 10%
Glucagon	21/28 75%	9/28 32%	0/6 0%	22/28 79%	11/28 40%	1/6 17%

Key findings

Syringes, needles and insulin pens were available all of the time in 81%, and blood glucose meters and strips in 78% of high-income countries. Syringes and needles were always available in 50%, insulin pens in 36% and meters and strips in 44% of middle-income countries, and in 20%, 13% and 10% of low-income countries respectively. Many more middle- and low-income countries reported at supplies were available to purchase at least three-quarters of the time, with 50% of low-income countries reporting that syringes, needles, meters and strips were available to purchase at least three-quarters of the time (See figure 12).

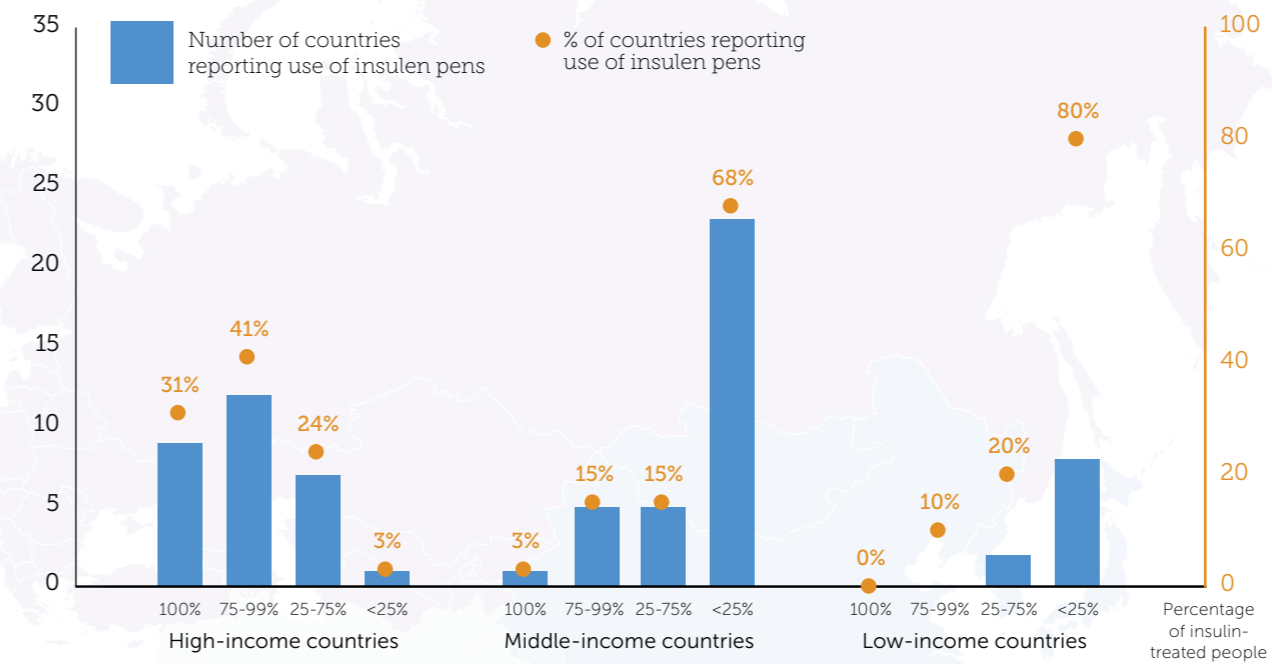
According to the survey of IDF members, there was 100% availability of glucagon in 71% of high-income countries, 38% of middle-income countries and 14% of low-income countries. Many more high- (87%) and middle-income countries (67%) reported that glucagon was available to purchase at least three-quarters of the time (See figure 12).

Figure 12 Availability of supplies, in access survey by countries' income group

No (%) countries reporting 100% or >75% availability	100% availability			>75% availability		
	High-income countries	Middle-income countries	Low-income countries	High-income countries	Middle-income countries	Low-income countries
Syringes and needles	26/32 81%	18/36 50%	2/10 20%	20/21 94%	30/36 83%	5/10 50%
Insulin pens	26/32 81%	12/33 36%	1/8 13%	30/32 94%	22/33 67%	2/8 25%
Blood glucose meters and test strips	25/32 78%	16/36 44%	1/10 10%	29/32 91%	22/28 79%	5/10 50%
Glucagon	22/31 71%	9/24 38%	1/7 14%	27/31 87%	16/24 67%	1/7 14%

The survey specifically enquired about the proportion of insulin-treated people with diabetes that use insulin pens, as opposed to syringes and needles. The usage of insulin pens was much more common in high-income countries, in which 72% reported that over 75% of people used insulin pens, compared with 18% of middle-income and 10% of low-income countries (See figure 13).

Figure 13 Number of countries reporting use of insulin pens, by income group



According to the snapshot assessment of medicine supply points, glucagon was the item that was least physically present (in 10 out of 34 countries) compared to all other drugs and supplies surveyed. It was available at no cost to the patient in six high-income countries only.

From the diabetes supplies analysed, glucose test strips were responsible for the highest out-of-pocket expenditure. In high-income countries test strips accounted for 0.1-24% of the average monthly disposable income, 0.3-55% in middle-income countries, and 5-38% in low-income countries (See figure 14).

Figure 14 Snapshot results: Countries in which each item was available, where available free of charge and cost range as % disposable income by country income group

		High-income countries	Middle-income countries	Low-income countries
Syringes	No (%) countries available	16/16 100%	11/14 79%	3/4 75%
	No (%) FOC	7/14 50%	2/9 22%	0/3 0%
	Cost of 1 syringe as %DI (range)	0.4-1.1%	0.1-7.3%	3.8%
Needles	No (%) countries available	15/16 94%	7/14 50%	1/4 25%
	No (%) FOC	7/12 58%	0/6 0%	0/2 0%
	Cost of 1 needle as %DI (range)	0.2-2.1%	0.1-7.6%	3.6%
Blood glucose meters	No (%) countries available	13/16 81%	7/14 50%	4/4 100%
	No (%) FOC	6/12 50%	2/8 25%	0/2 0%
	Cost of 1 meter as % yearly income (range)	0.4-2.4%	2.5-25.7%	N/A
Test strips	No (%) countries available	15/16 94%	7/14 50%	3/4 75%
	No (%) FOC	8/14 57%	2/9 22%	0/3 0%
	Cost of 4 strips as %DI (range)	0.1-24.3%	0.3-54.5%	5.0-38.4%
Glucagon	No (%) countries available	8/16 50%	2/14 14%	0/4 0%
	No (%) FOC	6/10 60%	0/2 0%	N/A
	Cost of 1 kit as % monthly income (range)	0.4-2.4%	2.5-25.7%	N/A

Metformin

Metformin is an essential medicine used for the treatment of type 2 diabetes. Increasingly, it is required for the treatment of type 2 diabetes in children, and so the survey recorded separately the provision for children and adults.

For adults, full government provision of metformin was reported in 72% of high-income countries, 58% of middle-income countries, and 10% of low-income countries. When both government and non-government provision was assessed, full provision was available in 79% of high-income countries, 65% of middle-income countries and 20% of low-income countries. Similar levels of provision were reported for children as shown in the figure 15.

According to the survey of IDF members, metformin was available all the time in 88% of high-income countries, 64% of middle-income countries, and 20% of low-income countries. There was availability to purchase at least three-quarters of the time in 97%, 89% and 50% countries respectively. According to the snapshot assessment of medicine supply points, it was the item that was most physically present compared to all other drugs and supplies surveyed. It was available at every supply point assessed. The monthly out-of-pocket cost of metformin for people with type 2 diabetes was estimated to range from 0-6% of the average monthly disposable income based on two tablets per day prescription. It was available at no cost to the patient in eight countries out of 23 from which a response was received.

Metformin was available free of cost in **8 of 23** responding countries



Gliclazide and other sulfonylurea

According to the survey of IDF members, 70% of high-income countries had full government provision of gliclazide (or an alternative sulfonylurea), compared to 39% of middle-income countries and no low-income countries. Taking into account NGO provision, 73% of high-income countries reported full provision, as did 46% of middle-income countries and 10% of low-income countries (See figure 15).

A sulfonylurea was available all the time in 84% of high-income countries, 53% of middle-income countries, and in one low-income country (11%). Sulfonylurea were available to purchase at least three-quarters of the time in 97% of high-income, 77% of middle-income and 44% of low-income countries surveyed (See figure 16).

According to the snapshot assessment of medicine supply points, a sulfonylurea was physically present in supply points in 31 out of 34 countries. In 18 countries, glibenclamide was the agent available, even though it is no longer routinely recommended because of the risks of hypoglycaemia associated with its use, particularly in older people. The monthly out-of-pocket costs of a sulfonylurea were estimated to range from 0-5% of the average monthly disposable income. However, in one middle-income country, the price quoted was 14% of the average monthly disposable income. It was available at no cost to the patient in nine countries out of 23 from which a response was received (See figure 17).

Figure 15 Countries with full provision of metformin and sulfonylurea, access survey by income group

No (%) countries reporting full provision	Full provision by government			Full provision by government or non-government sources		
	High-income countries	Middle-income countries	Low-income countries	High-income countries	Middle-income countries	Low-income countries
Metformin-children	24/30 80%	17/38 45%	1/8 13%	25/30 83%	19/38 50%	2/8 25%
Metformin-adults	21/29 72%	18/31 58%	1/10 10%	23/29 79%	20/31 65%	2/10 20%
Sulfonylurea-adults	21/30 70%	11/28 39%	0/10 0%	22/30 73%	13/28 46%	1/10 10%

Figure 16 Countries with availability of metformin and sulfonylurea, access survey by income group

No (%) countries reporting 100% or >75% availability	Always available to purchase			Available to purchase at least three-quarters of the time		
	High-income countries	Middle-income countries	Low-income countries	High-income countries	Middle-income countries	Low-income countries
Metformin	28/32 88%	23/36 64%	2/10 20%	31/32 97%	32/36 89%	5/10 50%
Sulfonylurea	27/32 84%	16/30 53%	1/9 11%	31/32 97%	23/30 77%	4/9 44%

Figure 17 Snapshot results: Countries in which each medicine was available, where available free of charge and cost range as % disposable income by country income group

	High-income countries	Middle-income countries	Low-income countries
Metformin			
No (%) countries available	15/16 94%	13/14 93%	4/4 100%
No (%) FOC	7/14 50%	1/9 11%	0/3 0%
Cost as %DI (range)	0.2-0.6%	0.2-6.1%	0.8-3.8%
Sulfonylurea			
No (%) countries available	15/16 94%	11/14 79%	3/4 75%
No (%) FOC	8/14 57%	1/9 11%	0/3 0%
Cost as %DI (range)	0.4-1.1%	0.1-13.5%	0.5%

Other diabetes drugs

The non-essential diabetes drugs include DPP4 inhibitors, GLP1 analogues, SGLT2 inhibitors, meglitinides, and alpha glucosidase inhibitors. As per the knowledge of the IDF members, there was full government provision of these agents in 47-59% of high-income countries and in 7-20% of middle-income countries, depending on the agent, as shown in the table. No low-income country reported full provision of any of these agents. Provision from non-government sources increased the number of high- and middle-income countries reporting full provision to 61-69% and 11-23% respectively (See figure 18).

Figure 18 Number of countries with full provision of other diabetes drugs, in access survey by countries' income group

No (%) countries reporting full provision for adults	Full provision by government			Full provision by government or non-government sources		
	High-income countries	Middle-income countries	Low-income countries	High-income countries	Middle-income countries	Low-income countries
DPP4 inhibitor	16/31 52%	4/31 13%	0/9 0%	19/31 61%	5/31 16%	0/9 0%
GLP1 analogue	14/30 47%	2/28 7%	0/9 0%	19/30 63%	3/28 11%	0/9 0%
SGLT2 inhibitor	14/28 50%	3/26 12%	0/9 0%	19/28 68%	4/26 15%	0/9 0%
Meglitinide	15/28 54%	4/29 14%	0/8 0%	19/28 68%	5/29 17%	0/8 0%
Alpha glucosidase inhibitor	17/29 59%	6/30 20%	0/7 0%	20/29 69%	7/30 23%	0/7 0%

According to the survey of IDF members, these treatments were available all the time in 77-86% of high-income countries, 16-27% of middle-income countries, and 14-33% of low-income countries. They were available at least three-quarters of the time in 88-93% of high-income countries, 47-70% of middle-income countries, and 29-50% of low-income countries. In middle-income countries, the availability of non-essential oral diabetes drugs was generally less than the availability of metformin. It is interesting to note that GLP1, an injectable treatment that requires refrigeration, was available at least three-quarters of the time in 50% of low-income countries, a level of availability that was higher than that of insulin. In low-income countries, the availability of non-essential diabetes drugs was approximately equivalent to the availability of metformin.

Figure 19 Number of countries with availability of other diabetes drugs, in access survey by countries' income country

No (%) countries reporting 100% or >75% availability	Always available to purchase			Available to purchase at least three-quarters of the time		
	High-income countries	Middle-income countries	Low-income countries	High-income countries	Middle-income countries	Low-income countries
DPP4 inhibitor	24/28 86%	7/26 27%	2/8 25%	26/28 93%	16/26 62%	4/8 50%
GLP1 analogue	20/26 77%	4/23 17%	2/6 33%	23/26 88%	11/23 48%	3/6 50%
SGLT2 inhibitor	19/23 83%	3/19 16%	1/5 20%	21/23 91%	9/19 47%	2/5 40%
Meglitinide	21/24 88%	5/23 22%	1/6 17%	22/24 92%	13/23 57%	2/6 33%
Alpha glucosidase inhibitor	22/26 85%	4/20 20%	1/7 14%	24/26 92%	14/20 70%	2/7 29%

Essential CVD medications

Essential CVD medications include calcium blockers, beta blockers, ACE inhibitors, thiazides and statins.

In this study, full government provision was reported in 61-70% of high-income countries and 31-38% of middle-income countries, depending on the agent. Only one low-income country reported full government provision of thiazide diuretics; no low-income country reported full provision of any other essential CVD medications. Non-government sources slightly increased the number of high- and middle-income countries with full provision, but not of low-income countries (See figure 20).

Figure 20 Number of countries with full provision of CVD medications, in access survey by countries' income group

No (%) countries reporting full provision for adults	Full provision by government			Full provision by government or non-government sources		
	High-income countries	Middle-income countries	Low-income countries	High-income countries	Middle-income countries	Low-income countries
Calcium channel blockers	19/31 61%	11/35 31%	0/9 0%	22/31 71%	11/35 31%	0/9 0%
Beta blockers	20/31 65%	11/34 32%	0/9 0%	23/31 75%	11/34 32%	0/9 0%
ACE inhibitors	21/31 68%	13/34 38%	0/9 0%	24/31 77%	14/34 41%	0/9 0%
Thiazide diuretics	21/30 70%	13/35 37%	1/9 11%	24/30 80%	14/35 40%	1/9 11%
Statins	20/31 65%	13/35 37%	0/9 0%	23/31 74%	13/35 37%	0/9 0%

The availability of these agents was quite similar. They were available all of the time in 80-83% of high-income countries, 44-52% of middle-income countries, and 22-33% of low-income countries. They were available at least three-quarters of the time in 90-97% of high-income countries, 84-91% of middle-income countries, and 56-67% of low-income countries. Despite the fact that these medications can be stored at room temperature, are listed as essential medicines, and can be purchased at low cost, less than half of all low- and middle-income countries had them always available (See figure 21).

Figure 21 Number of countries with availability of CVD medications, in access survey by countries' income group

No (%) countries reporting 100% or >75% availability	Always available to purchase			Available to purchase at least three-quarters of the time		
	High-income countries	Middle-income countries	Low-income countries	High-income countries	Middle-income countries	Low-income countries
Calcium channel blockers	24/30 80%	16/32 50%	3/9 33%	28/30 93%	29/32 91%	6/9 67%
Beta blockers	25/31 81%	14/32 44%	3/9 33%	29/31 94%	27/32 84%	5/9 56%
ACE inhibitors	25/31 81%	16/32 50%	3/9 33%	29/31 94%	29/32 91%	6/9 67%
Thiazide diuretics	25/31 81%	15/33 45%	3/9 33%	28/31 90%	29/33 91%	6/9 67%
Statins	25/30 83%	17/33 52%	2/9 22%	29/30 97%	28/33 85%	5/9 56%

The snapshot results showed higher availability of medicines for cardiovascular disease than for diabetes. Calcium channel blockers, beta blockers, ACE inhibitors, thiazide diuretics, and statins were available in at least 88% of high-income countries, 79% of middle-income countries, and 75% of low-income countries (See figure 22)

There were only five countries where CVD medicines were available free of charge: one middle-income country, and four high-income countries. Out-of-pocket payments were the highest for statins, which accounted for up to 5% of disposable income in high-income countries, 12% in middle-income countries, and 5% in low-income countries (See figure 22).

Figure 22 Snapshot results: Countries in which each medicine was available, where available free of charge and cost range as % disposable income by country income group

		High-income countries	Middle-income countries	Low-income countries
Calcium channel blockers	No (%) countries available	15/16 94%	11/14 79%	3/4 75%
	No (%) FOC	4/13 31%	1/7 14%	0/3 0%
	Cost as %DI (range)	0.1-0.6%	0.1-8.4%	1.0-6.7%
Beta blockers	No (%) countries available	15/16 94%	11/14 79%	3/4 75%
	No (%) FOC	4/13 31%	1/8 13%	0/1 0%
	Cost as %DI (range)	0.1-2.1%	0.3-11.8%	1.7-1.9%
ACE inhibitors	No (%) countries available	14/16 88%	12/14 86%	3/4 75%
	No (%) FOC	4/12 33%	1/8 13%	0/3 0%
	Cost as %DI (range)	0.1-1.2%	0.4-11.8%	1.2-2.8%
Thiazide diuretics	No (%) countries available	15/16 94%	11/14 79%	3/4 75%
	No (%) FOC	4/14 29%	1/8 13%	0/2 0%
	Cost as %DI (range)	0.2-5.5%	0.1-11.8%	0.5-2.0%
Statins	No (%) countries available	15/16 94%	11/14 79%	3/4 75%
	No (%) FOC	4/13 31%	1/9 11%	0/3 0%
	Cost as %DI (range)	0.1-4.6%	0.1-11.8%	1.1-5.4%

20%
availability of metformin in low-income countries



Summary



This survey is the first conducted by IDF since 2006. This time, and for the first time, IDF asked its members about access to medications for type 2 diabetes and for cardiovascular disease. With the inexorable increase in cases of type 2 diabetes worldwide, and the high morbidity and mortality associated with cardiovascular disease in people with diabetes, it is important to ensure that there is access at least to the essential medicines for these conditions. The survey also enquired about access to other diabetes medications, including insulin analogues and the newer agents for type 2 diabetes, including GLP1 analogues, DPP4 inhibitors and SGLT2 inhibitors. Also, unlike the 2006 IDF survey, this was a global survey of all IDF members, the aim of which was to glean some top-level information about access to medicines that will help inform IDF's advocacy work. This survey is therefore designed to complement other work in the area of access to insulin, which is looking specifically at some of the barriers to better access, or at specific countries. The global response from 82 countries makes this the largest such study, with good representation across all global regions and amongst countries of all income groups.

Insulin and supplies

Nearly 100 years after the first use of insulin, it is a sad fact that in so many parts of the world, people struggle to access it reliably in many middle-income as well as low-income countries. As per the responses obtained, no low-income country had full government provision (at no or low cost) of essential insulins to children or adults. Non-government sources ensured full provision in a small number of low-income countries. Even for those who have to pay for their insulin, less than half of middle-income countries and only one low-income country reported that insulin was always available. Whereas essential insulins were reported to be available at least three-quarters of the time in around 90% of middle-income countries, this was only the case in 40% of low-income countries, according to IDF members. In the cases of low- and middle-income countries where insulin was available, it was associated with significant out-of-pocket payments that consume up to two-thirds of disposable income. Effective insulin treatment requires access to injection and monitoring equipment as well as the insulin itself. However, full provision and availability of these supplies is even lower than it is for insulin itself, especially for adults with diabetes. As has been reported before, the cost of blood glucose supplies often exceeds the cost of insulin, especially in some of the poorest countries, where test strips can consume half of the average disposable income¹⁹.

Metformin and sulfonylurea

Metformin is universally recommended as first-line treatment for type 2 diabetes. It is therefore of concern that full provision of metformin for adults was reported in only 79% of high-income, 65% of middle-income and in only 20% low-income countries. It was available at least three-quarters of the time in most high- and middle-income countries, but in only half of low-income countries. Where it was available, the cost was generally reasonable, varying from 1-6% of average disposable income. Provision and availability of sulfonylureas was slightly lower than for metformin and generally at low cost. However, in more than half of pharmacies visited for the snapshot, the sulfonylurea offered was glibenclamide, which is no longer routinely recommended in most guidelines.

Glucagon

Glucagon is a treatment for hypoglycaemia, and is classified by WHO as an essential medicine for diabetes. However, in many countries, it is prescribed mainly to those with type 1 diabetes that experience or are at risk of severe hypoglycaemia. It is for occasional rather than daily use, and so guaranteed availability is not as crucial as it is for insulin. Nearly 80% of high-income countries reported full provision of glucagon, while less than a half (41%) of middle-income, and only 17% of low-income countries reported the provision of this essential medication by either government or non-government sources.

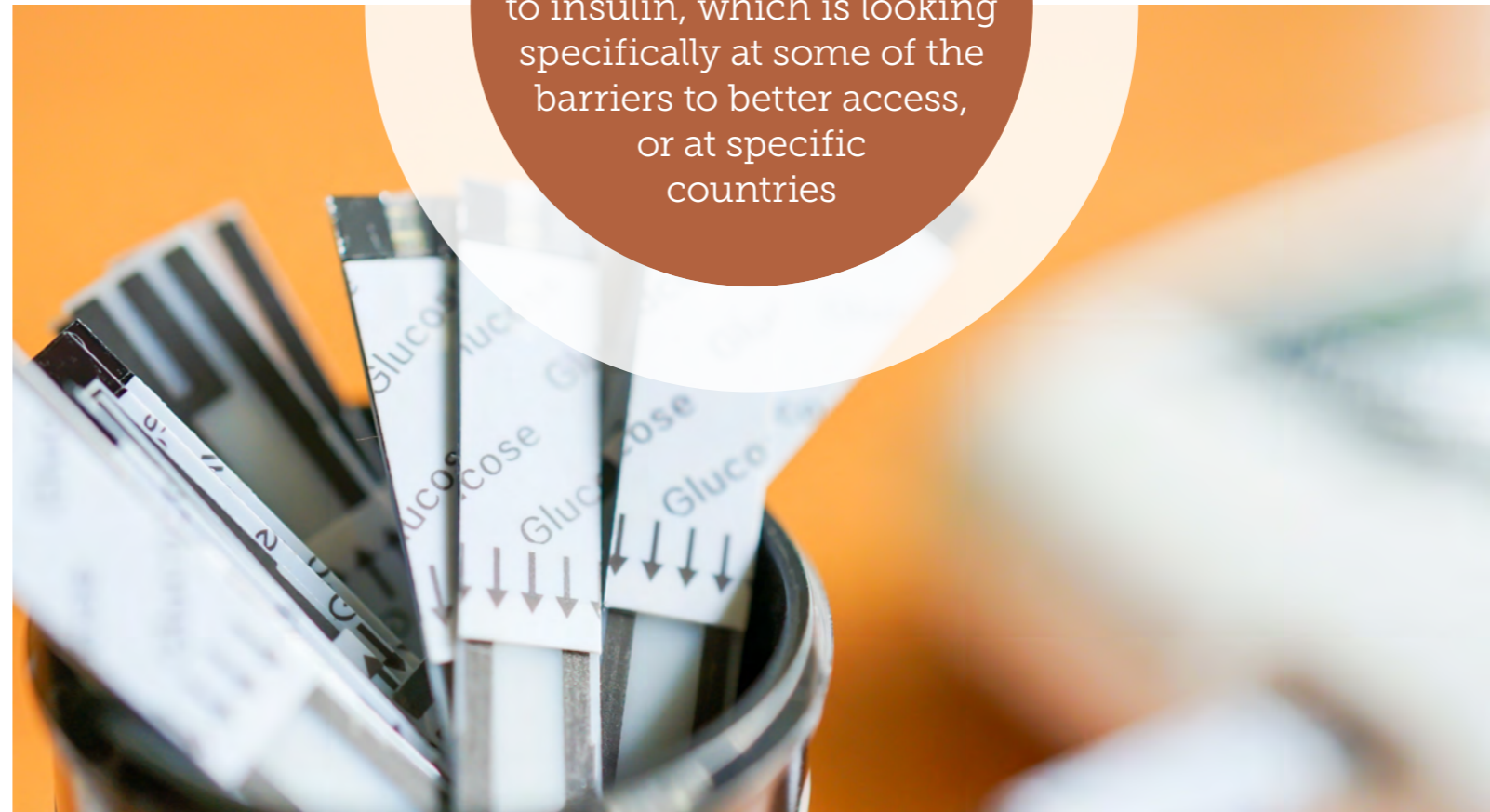
Other medications for type 2 diabetes

There was full provision of most newer agents (DPP4 inhibitor, GLP1 analogue, SGLT2 inhibitor, meglitinide, alpha glucosidase inhibitor) in at least 60% of high-income countries, but in very few middle-income and no low-income countries. There was however 75% availability of some of these agents in at over 60% of middle-income and in half of low-income countries; the latter similar to the availability of metformin and sulfonylureas. It is worth noting that in low-income countries, more countries reported 75% availability of GLP1 analogues – which like insulin are injectable medicines that require cold storage – than of essential insulins.

Cardiovascular medicines

There were few middle-income countries and no low-income countries that reported full provision of essential cardiovascular medicines. Availability was generally better than for many of the diabetes medications, although at least 75% availability of ACE inhibitors was reported in only two-thirds of low-income countries; 75% availability of statins was reported in about half of low-income countries, despite these being seen as important in the secondary prevention in the micro and macrovascular complications of diabetes. The cost associated to these five CVD medications analysed was relatively low compared to that of insulin and its supplies, being responsible for up to 12% of the average disposable income.

This survey is designed to complement other work in the area of access to insulin, which is looking specifically at some of the barriers to better access, or at specific countries



Recommendations



This report demonstrates that many people with diabetes do not have access to the medicines that they need for managing their diabetes. While some countries are addressing this issue, many countries need to implement high-impact, affordable interventions to improve access to medicines. The IDF is committed to advocating for improved access for all people living with diabetes.

The IDF Diabetes Atlas estimates that approximately three-quarters of the global population with diabetes live in low- and middle-income countries²⁰. The *IDF Diabetes and Cardiovascular Disease Report* highlighted how CVD mortality is

increased in these countries, especially where high blood pressure is more prevalent²¹. Protecting the future health of people with diabetes means that it is essential that well-established, inexpensive and safe medications such as insulin, metformin, ACE inhibitors and statins are universally available in these countries and at affordable prices. Continued unavailability of these essential medicines will lead to even greater rates of morbidity and mortality, disproportionately affecting people of working age. It is therefore in the interests of national governments to adopt policies that will facilitate increased access to these medicines.

The findings presented here suggest that medicines and supplies for diabetes are not reaching the populations in need. The responsibility lies with a number of stakeholders, and therefore IDF calls for all parties in the public and private sector to come together

The findings presented here suggest that medicines and supplies for diabetes are not reaching the populations in need

and develop sustainable strategies to improve the lives of those with diabetes, and at the same time promote growth and development.

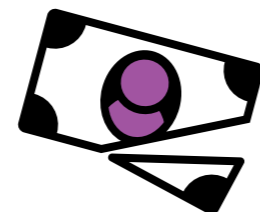
The IDF Diabetes Atlas estimates that approximately 75% of the global population with diabetes live in low and middle-income countries

Recommended strategies to improve access

There are two main components to improving access to medicines and supplies. The cost to patients must be affordable, and the items must also be physically available. Strategies to increase affordability of medicines include reducing price, improving education, improving evidence, improving availability, and investment in health systems.

Reducing price

The cost of medicines and supplies is one barrier for people with diabetes. The focus of many initiatives has been on insulin access and price. However, syringes and needles and glucose testing equipment also need to be made more affordable and available for everyone with diabetes.

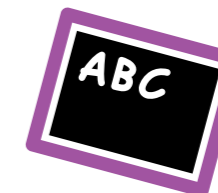


Costs can be reduced by:

- Improving supply chain distribution, and decreasing mark-ups at each point in the chain as suggested by the WHO. There is often a dramatic difference between the manufacturers' price, the distributors' price, and the price at the pharmacy²².
- Promoting competition for multi-source products. Good quality, safe and inexpensive generic medicines and biosimilars should be encouraged where available. Any promotion of competition should use safeguards compatible with the agreement on Trade-Related Aspects of Intellectual Property Rights (TRIPS), such as parallel importation and compulsory licensing.
- Good procurement practices following standards set by the WHO, such as local manufacturing, bulk purchasing and/or efficient distribution, will streamline the medication supply. Low-income countries should not be forced to pay more for their drugs due to their lower purchasing power²³.
- Equity pricing. Equity pricing policies ensure that, from the point of view of the community and the individual, the price of a drug is fair, equitable, and affordable. Low-income countries should pay less for essential medicines than high-income countries. Differential pricing (sometimes also called tiered pricing) is the sale of the same good to different buyers at different prices, with the aim of improving the affordability of drugs while generating revenue for the pharmaceutical industry. Differential pricing has reduced the cost of many anti-retroviral HIV/AIDS therapies by up to 90% in low-income countries, although they continue to be sold at market price in developed countries. However, there are concerns that differential pricing will result in product diversion, with cheaper drugs leaking back into wealthy countries. One example of differential pricing in the field of diabetes is that practiced by Novo Nordisk in the least developed countries in the world²⁴.

Improving education

In order to ensure that limited resources are allocated appropriately and out-of-pocket payments are minimised, better education is needed for policy makers, procurers, health professionals, and people with diabetes. Policy makers need information on the cost-effectiveness of all medications in order to identify the best value for money; procurers need training on procurement practices; health professionals need unbiased education about the relative effectiveness of medicines and the cost-effectiveness of generic essential medicines; and people with diabetes need assistance with self-management of their condition.



In low-resource countries, decision makers should be informed that in order to maximise benefits, the focus should be first on ensuring that all people with diabetes have access to essential medicines, including human insulin, syringes, and test strips where required, before supporting the provision of more expensive and newer medications and technologies.

Improving evidence

Better evidence will strengthen advocacy efforts. Once there is good data on the costs of medications and supplies, the regions that lack government provision, and the areas where there is limited availability, then better strategies can be developed. Good national and international policies for addressing access to medicines and supplies require evidence and information to ensure that the strategies are targeted and effective.



Improving availability

Essential medicines should be available at the community level, including pharmacies and other medicine supply points. Not only should governments be providing essential medicines to people who need them, these medicines should also be physically available. Essential medicines should be available in regional areas as well as in the city centres. For drugs such as insulin, where a cold chain distribution is required, local sources of refrigeration should be identified to ensure that essential medicines are always available if needed.



Investment in health systems

Greater investment in health systems is critical for improving the health of people with diabetes. Improving public health services is an investment in the long-term health and well-being of the population, which is both of intrinsic value as well as a major component of economic productivity. Inequalities in the fundamental elements of the health system, particularly



at the primary care level, present hurdles to the delivery of healthcare for people living with and diabetes. Health-system strengthening should be a major focus in the prevention and management of non-communicable diseases. The global efforts concerning universal health coverage present an opportunity to prioritise access to diabetes medicines.

Health insurance schemes

As this survey has demonstrated, diabetes can place a high economic burden on those with diabetes and their families. In order to minimise its impact, it is important to create safety-net mechanisms that ensure access to diabetes medicines and supplies regardless of one's social conditions. One of the possibilities to achieve this is through public health insurance schemes, which collectively negotiate with health providers, creating a risk pooling system, and at the same time guarantee the availability of health services free of costs, or based on low co-payments.



Strategies to increase affordability of medicines include reducing price, improving education, evidence, availability, and investment in health systems, and public health insurance schemes

Best practices

Country-level initiatives

Some countries have implemented interesting initiatives that might serve as examples to other countries. Through a government initiative, the Barbados Drug Service, human insulin (regular, NPH, Lente, 70/30), syringes and needles, and testing strips are available free of cost to Barbadian nationals i.e. those with valid national registration numbers. In Senegal the government provides a subsidy for insulin, with the aim of offering free insulin, but for this advocacy is needed.

International initiatives

Various international initiatives such as the Insulin for Life and IDF Life for a Child²⁵ programmes deal with poor access or unavailability by providing insulin and supplies. These activities should complement and not replace the role of government agencies in doing so. The work of the International Insulin Foundation and its Rapid Assessment Protocol for Insulin Access look at ways of improving the overall system in order to improve the health system as a whole and deal with the chronic shortages and structural problems with regards to access to insulin and other materials necessary for diabetes. All these initiatives should be promoted in order to address both types of needs.

Limitations of the study

This study relied on IDF member associations completing the survey to the best of their knowledge within their own country. It was not possible to verify all responses and it is possible that some inaccuracies were reported. Although the survey had responses from more countries than previous such surveys, it is important to be aware that a response rate of 38% is not necessarily representative of the global picture.

The snapshot was intended to provide some real-life evidence of the availability and cost of medications. No inference can be made about the availability or cost of any item in a whole country on the basis of a visit to one or two pharmacies, except where national policies dictate availability and cost of medicines.

The survey asked IDF members about 'full government provision' of medications and supplies. This term may be interpreted differently in different countries, especially in areas where a co-payment is required, or reimbursement is obtained only after payment. Furthermore, the distinctions between government and non-government provision may have been unclear in some countries, for example in regions where there is a government-mandated and subsidised usage of non-government health insurance schemes.

Annex



Contributions from IDF Members

Afghanistan Diabetes Association	Afghanistan
Antigua and Barbuda Diabetes Association	Antigua & Barbuda
Liga Argentina de Protección al Diabético	Argentina
Sociedad Argentina de Diabetes	Argentina
Österreichische Diabetes Gesellschaft	Austria
Faridpur Diabetic Association	Bangladesh
Diabetes Association of Barbados	Barbados
Diabetes Liga	Belgium
Belize Diabetes Association	Belize
Bermuda Diabetes Association	Bermuda
Diabetes Association of Botswana	Botswana
Associação de Diabetes Juvenil	Brazil
Federação Nacional de Associações e Entidades de Diabetes	Brazil
Sociedade Brasileira de Diabetes	Brazil
Bulgarian Diabetes Association	Bulgaria
Burundian Diabetes Association	Burundi
Cambodian Diabetes Association	Cambodia
Canadian Diabetes Association	Canada
Cayman Islands Diabetes Association	Cayman Islands
Sociedad Chilena de Endocrinología y Diabetes	Chile
Chinese Diabetes Society	China
Chinese Taipei Diabetes Association	Chinese Taipei
Asociación Colombiana de Diabetes	Colombia
Asociación Día Vida Pro Diabéticos	Costa Rica
Croatian Association for Diabetes and Metabolic Disorders	Croatia
Croatian Medical Association	Croatia
Cyprus Diabetic Association	Cyprus
Ceska Diabetologicka Spolecnost	Czech Republic
SVAZ Diabetiků České Republiky	Czech Republic
Association Vaincre le Diabète au Congo	Democratic Republic of Congo

Association des Diabétiques du Congo	Democratic Republic of Congo
Instituto Nacional de Diabetes, Endocrinología y Nutrición	Dominican Republic
Fundación Los Fresnos Casa de la Diabetes	Ecuador
Arabic Association for the Study of Diabetes and Metabolism	Egypt
Asociación Salvadoreña de Diabetes	El Salvador
Ethiopian Diabetes Association	Ethiopia
Finnish Diabetes Association	Finland
Diabetic Children's Protection Association	Georgia
Georgian Union of Diabetes and Endocrine Associations	Georgia
diabetesDE	Germany
National Diabetes Association Ghana	Ghana
Guyana Diabetic Association	Guyana
Iranian Diabetes Society	Iran
Diabetes Ireland	Ireland
Latvian Diabetes Association	Latvia
Chronic Care Center	Lebanon
Libyan Diabetic Association	Libya
Lithuanian Diabetes Association	Lithuania
Macedonian Diabetes Association	Macedonia, TFYR
Diabetes Society of Maldives	Maldives
Association Malienne de lutte contre le Diabète	Mali
Ligue Marocaine de Lutte contre le Diabète	Morocco
Sociedad Mexicana de Nutrición y Endocrinología	Mexico
Prodiab	Moldova
Diabetes New Zealand	New Zealand
Asociacion de Padres de Niños y Jovenes Diabeticos	Nicaragua
Fundación Nicaraguense para la Diabetes	Nicaragua
Diabetes Committee of Hospitals Association of Korea	North Korea

Diabetic Association of Pakistan	Pakistan
Diabetes Palestine	Palestine, State of
Asociación Panameña de Diabeticos	Panama
Diabetes Philippines	Philippines
Polskie Stowarzyszenie Diabetyków	Poland
Associação Protectora dos Diabéticos de Portugal	Portugal
Associação Diabéticos do Minho	Portugal
Associação de Jovens Diabéticos de Portugal	Portugal
Korean Diabetes Association	Republic of Korea
Prodiab	Republic of Moldova
St Lucia Diabetic and Hypertension Association	Saint Lucia
Saudi Diabetes and Endocrine Association	Saudi Arabia
Association of Diabetes Educators	Singapore
Zveza Drustev Diabetikov Slovenije	Slovenia
St Lucia Diabetes & Hypertension Association	St Lucia
Diabetes Vereniging Suriname	Suriname
Diabetes Swaziland	Swaziland
Swedish Society for Diabetology	Sweden
Gambia Diabetes Association	The Gambia
Association Togolaise du Diabete	Togo
Tonga Diabetes Association	Tonga
Association Tunisienne des Diabétiques	Tunisia
Diabetes UK	United Kingdom
Sociedad de Diabetología y Nutrición del Uruguay	Uruguay
Federación Nacional de Asociaciones y Unidades de Diabetes	Venezuela (República Bolivariana de)
Sociedad Venezolana de Endocrinología y Metabolismo	Venezuela (República Bolivariana de)
Zimbabwe Diabetic Association	Zimbabwe

References



1. World Health Organization. WHO Essential Medicines and Health Products Annual Report 2015 [Internet]. Geneva, Switzerland; 2016. Available from: http://www.who.int/medicines/publications/AR2015_links_bookmarks.pdf?ua=1
2. Koro CE, Bowlin SJ, Bourgeois N, Fedder DO. Glycemic control from 1988 to 2000 among U.S. adults diagnosed with type 2 diabetes: a preliminary report. *Diabetes Care*. 2004 Jan;27(1):17–20.
3. Crowther CA, Hillier JE, Moss JR, McPhee AJ, Jeffries WS, Robinson JS. Effect of Treatment of Gestational Diabetes Mellitus on Pregnancy Outcomes. *N Engl J Med*. 2005 Jun 16;352(24):2477–77. 16
4. Hillier TA, Ogasawara KK, Pedula KL, Vesco KK. Markedly different rates of incident insulin treatment based on universal gestational diabetes mellitus screening in a diverse HMO population. *Am J Obstet Gynecol*. 2013 Nov;209(5):440.e1–440.e9.
5. Ouzounian JG, Rosenheck R, Lee RH, Yedigiarova L, Walden CL, Korst LM. One-hour post-glucose results and pre-pregnancy body mass index are associated with the need for insulin therapy in women with gestational diabetes. *J Matern Fetal Neonatal Med*. 2011 May;24(5):718–22.
6. International Diabetes Federation. ABOUT THE IDF YOUNG LEADERS IN DIABETES [Internet]. Brussels, Belgium; 2016. Available from: <http://www.idf.org/youngleaders/about>
7. International Diabetes Federation. Meet our Members [Internet]. Brussels, Belgium; 2016. Available from: <http://www.idf.org/membership/meet-our-members>
8. World Health Organization. Diagnostic Criteria and Classification of Hyperglycaemia First Detected in Pregnancy [Internet]. Geneva, Switzerland; 2013. Available from: http://apps.who.int/iris/bitstream/10665/85975/1/WHO_NMH_MND_13.2_eng.pdf?ua=1%2520%2520
9. Beran D, Silva Matos C. REPORT ON THE RAPID ASSESSMENT PROTOCOL FOR INSULIN ACCESS IN MOZAMBIQUE 2009 [Internet]. London; 2004. Available from: <http://apps.who.int/medicinedocs/documents/s16734e/s16734e.pdf>
10. Kristensen PL, Tarnow L, Bay C, Nørgaard K, Jensen T, Parving H-H, et al. Comparing effects of insulin analogues and human insulin on nocturnal glycaemia in hypoglycaemia-prone people with Type 1 diabetes. *Diabet Med* [Internet]. 2017 Feb [cited 2017 Feb 21]; Available from: <http://doi.wiley.com/10.1111/dme.13317>
11. Horvath K, Jeitler K, Berghold A, Ebrahim SH, Gratzner TW, Plank J, et al. Long-acting insulin analogues versus NPH insulin (human isophane insulin) for type 2 diabetes mellitus. In: *Cochrane Database of Systematic Reviews* [Internet]. John Wiley & Sons, Ltd; 2007 [cited 2015 Jun 15]. Available from: <http://onlinelibrary.wiley.com/doi/10.1002/14651858.CD005613.pub3/abstract>
12. International Diabetes Federation Europe. ACCESS TO QUALITY MEDICINES AND MEDICAL DEVICES FOR DIABETES CARE IN EUROPE [Internet]. Brussels, Belgium; 2014. Available from: https://www.idf.org/sites/default/files/FULL-STUDY_0.pdf
13. Ogle GD, Middlehurst AC, Silink M. The IDF Life for a Child Program Index of diabetes care for children and youth: Life for a Child Index of diabetes care. *Pediatr Diabetes*. 2016 Aug;17(5):374–84.
14. The World Bank. Country and Lending Groups [Internet]. 2015 [cited 2015 Aug 1]. Available from: <http://data.worldbank.org/about/country-and-lending-groups>
15. World Bank. World Development Indicators. Price level ratio of PPP conversion factor (GDP) to market exchange rate [Internet]. Washington D.C., USA; 2016. Available from: <http://data.worldbank.org/indicator/PA.NUS.PPPC.RF>
16. Numbeo. Prices by Country of Average Monthly Disposable Salary (Net After Tax) (Salaries And Financing) [Internet]. 2017. Available from: https://www.numbeo.com/cost-of-living/prices_by_country.jsp?displayCurrency=USD&itemId=105
17. Ogle GD, Abdullah M, Mason D, Januszewski AS, Besanlanle Salary (Net After Tax) in hot climates without refrigeration: temperature reduction efficacy of clay pots and other techniques. *Diabet Med*. 2016 Nov;33(11):1544–53.
18. Ogle G, Beran D, Raab R, Deeb L. Global access to and availability of insulin. *Diabetes Voice* [Internet]. 2006;51. Available from: https://www.idf.org/sites/default/files/attachments/article_464_en.pdf
19. Ogle GD, Kim H, Middlehurst AC, Silink M, Jenkins AJ. Financial costs for families of children with Type 1 diabetes in lower-income countries. *Diabet Med*. 2016 Jun;33(6):820–6.
20. International Diabetes Federation. IDF Diabetes Atlas seventh edition [Internet]. Seventh edition. Brussels, Belgium; 2015 [cited 2016 Jan 5]. Available from: <http://diabetesatlas.org/component/attachments/?task=download&id=116>
21. International Diabetes Federation Europe. Diabetes and cardiovascular disease [Internet]. Brussels, Belgium; 2016. Available from: http://www.idf.org/sites/default/files/CVD_in_diabetes_report.pdf
22. Wenhui M, Wen C, World Health Organization. Improving Health System Efficiency - The Zero Mark-up Policy for essential medicines at primary level facilities [Internet]. China; 2015. Available from: http://apps.who.int/iris/bitstream/10665/188623/1/WHO_HIS_HGF_CaseStudy_15.2_eng.pdf?ua=1
23. Pan American Health Organisation. Pan American Network for Drug Regulatory Harmonization [Internet]. Washington D.C., USA; 2016. Available from: [http://www.paho.org/hai/index.php?option=com_content&view=article&id=7006%3Apromess-programme-medicaments-essentiels&catid=689%3AAHAI+PROMESS+\(Content\)&Itemid=230&lang=en](http://www.paho.org/hai/index.php?option=com_content&view=article&id=7006%3Apromess-programme-medicaments-essentiels&catid=689%3AAHAI+PROMESS+(Content)&Itemid=230&lang=en)
24. Novo Nordisk. Our Access to Insulin Commitment [Internet]. Denmark; 2017. Available from: <http://www.novonordisk.com/sustainability/actions/Access-to-care/Differential-pricing-policy.html>
25. International Diabetes Federation. No child should die of diabetes - Life for Child an International Diabetes Federation programme [Internet]. 2015 [cited 2016 Jan 25]. Available from: <http://www.idf.org/sites/default/files/attachments/LFAC-flyer-2015.pdf>