Make a difference in diabetes awareness

Innovative diagnostic testing and diabetes management

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SIEMENS Healthineers

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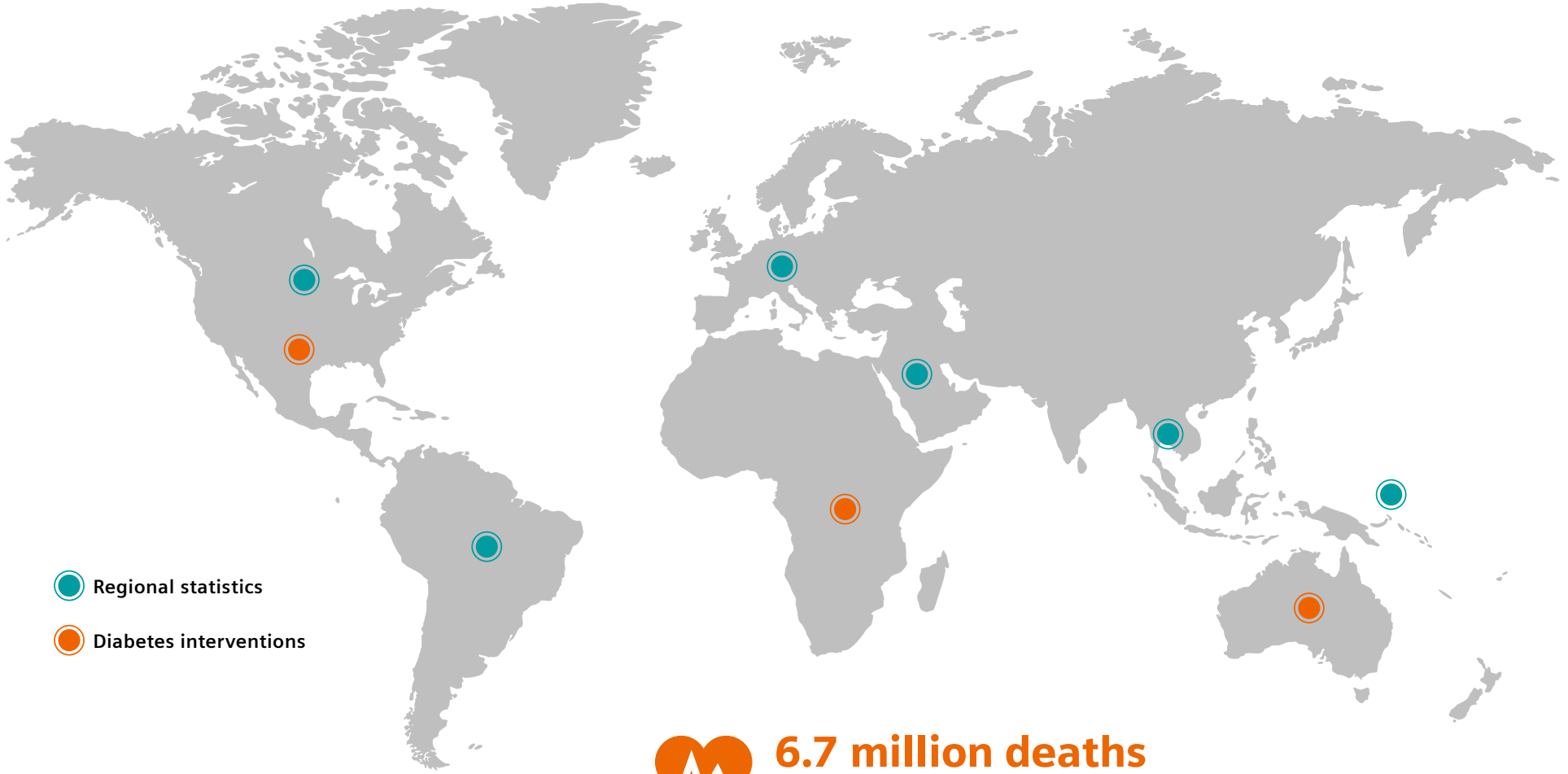
More than 537 million people around the world have diabetes—45% don't know it



6.7 million deaths

In 2021, IDF estimates show that 6.7 million deaths were attributed to diabetes.

Source: IDF Diabetes Atlas. 10th ed. 2021.
Available from: https://diabetesatlas.org/atlas-presentation/

Preventing diabetes in Australia's Aboriginal communities

Garry Barker

When Professor Mark Shephard, director of the Flinders University International Centre for Point-of-Care Testing, launched the Quality Assurance for Aboriginal and Torres Strait Islander Medical Services (QAAMS) program, the battle against Aboriginal diabetes took a new turn.

Before the European arrival, Aboriginal people lived on a hunter-gatherer lifestyle. Few Aboriginal people, even those in communities hundreds of kilometers from the smallest town, now live this way. Today, most Indigenous people in rural and remote areas shop at small stores stocking frozen or canned Western-style foods, including highly sugared bottled drinks.

Professor Mark Shephard of Flinders University Adelaide took an interest in Aboriginal culture and met many people proud of their traditional lands. "But I saw incredible poverty and ill health, and I had wondered if we could use point-of-care testing (POCT) to deal with chronic diseases in those communities." Shephard told a government official of his ideas, and a program called Quality Assurance for Aboriginal and Torres Strait Islander Medical Services (QAAMS) was launched. QAAMS has made regular, laboratory-standard POCT available to Indigenous people across Australia, and its methods are being used in other countries.

Local Aboriginal health workers were trained by Shephard's center to conduct POCT for HbA1c and empowered with direct control in patient care. But most important was that patients got results quickly. "Prior to POCT, it took on average 24 days to get patients back for their consultations in some remote communities," Shephard said. "With POCT, they have the result in 6 minutes with just a finger-prick of blood needed for the test. Follow-up is in another 15 minutes. With laboratory testing, mean turnaround time was 42 hours in remote communities. Patients often did not return. Convenience and accessibility are key."

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Preventing diabetes in Australia's Aboriginal communities

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The health center staff provides encouragement and education to patients about how to combat diabetes and the diseases it can cause during the 6-minute waiting time for the test result. It is a vital task, but very complex and difficult, exacerbated by the remoteness of many Outback clinics.

Education of patients and treatment in many communities have brought improvements in glycemic control, meaning these patients are at lower risk of complications from disabling or life-threatening diseases. "Reducing or avoiding these problems is what diabetes management is all about."

Access to suitable food in remote Aboriginal communities has also improved, Shephard said, "but it's dependent on the store managers in those places. There is a strong knowledge base now and a push by the communities for better and fresher foods. Even a 1% reduction in hemoglobin A1c can significantly reduce the risk of complications."

Read Complete Article

"Prior to POCT, it took on average 24 days to get patients back for their consultations in some remote communities."

Professor Mark Shephard
Director, Flinders University International Centre for Point-of-Care Testing

Prevalence of diabetes in Australia

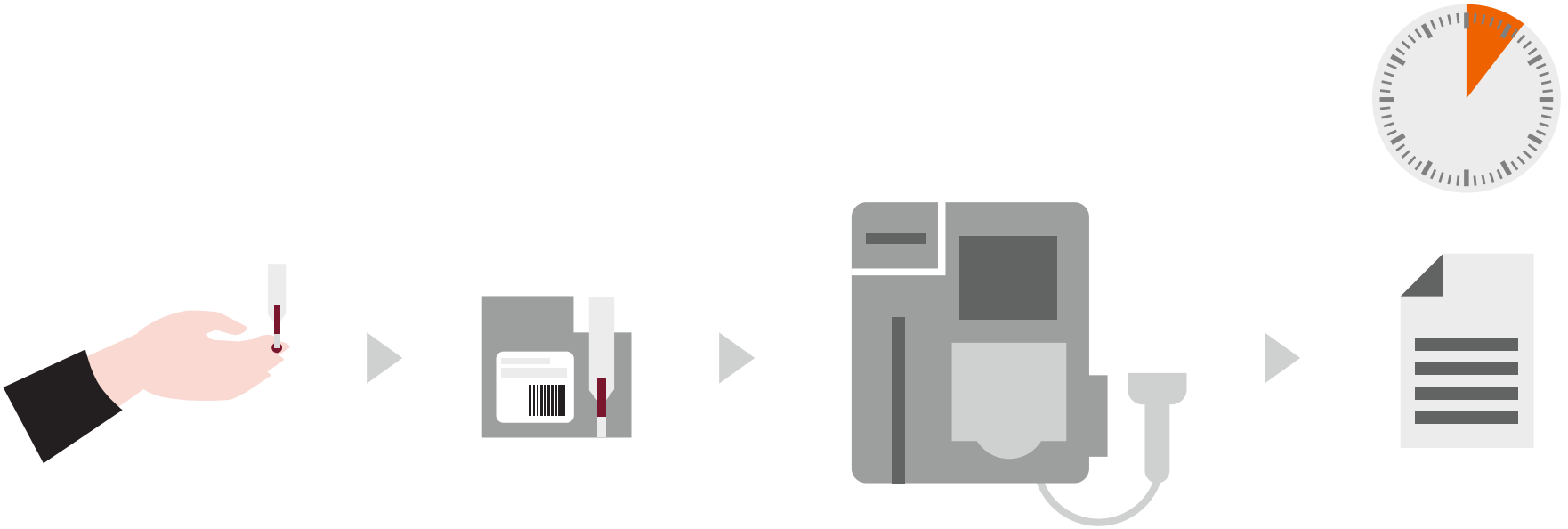
1 in 16
adults have diabetes

"The prevalence of diabetes (among Aboriginals) is four times higher than in non-Aboriginal people and exacerbated in some cases by a combination of obesity, access to poor diet, alcohol, lifestyle factors, poor and overcrowded housing, poor hygiene, and poor water quality. The gap in life expectancy has improved a bit, but it is still wide compared with other groups such as New Zealand's Maoris or Canada's Indigenous people."

Professor Mark Shephard
Director of the Flinders University International Centre for Point-of-Care Testing

Reduction in time to result from 24 days to 6 minutes

Point-of-care testing simplifies diabetes testing, particularly in remote and medically underserved areas, by delivering fast test results in 6 minutes.



Sample
Add sample to sampling device and wipe capillary.

Add
Insert sampling device into cartridge.

Scan and load
Slide cartridge through bar-code scanner and insert cartridge into analyzer.

Results in 6 minutes
Analyzer prints or transmits results.

Strengthening diabetes treatment for children in Africa

Janine Stephen

Imagine an ill child in an underresourced African country. The youngster has lost weight, resumed bed-wetting, always seems to be hungry and thirsty, and is suddenly woozy and fatigued. Scarce family funds are used to transport the child to the nearest hospital, 4 hours away. Yet even here, the signs of diabetes may be missed. Lack of knowledge about type 1 diabetes is not only a norm for new patients, but for some health workers too.

Life for a Child's mission is to change this. LFAC works and helps over 10,000 children in 19 African countries to make sure young people with diabetes access the medication they need. Graham Ogle, MD, the organization's general manager, is a pediatric endocrinologist. "We work with existing local diabetes centers to provide supplies such as insulin, syringes, and blood glucose monitoring equipment."

But literacy and numeracy levels can be low—important when training people to inject insulin and monitor blood glucose levels. In such contexts, point-of-care (POC) testing is invaluable. Once diagnosis and acute symptoms are dealt with, long-term care kicks in: checking compliance, monitoring average blood glucose levels, and adjusting treatment.

"The HbA1c test is vital. With POC testing, the result is available in 6 minutes. You can have a discussion on the spot," Ogle says. "You can educate the patient about how they're doing compared to the last time they visited. It's a feedback loop for health professionals and patients."

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Strengthening diabetes treatment for children in Africa

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A clinic's mean HbA1c value for its type 1 patients is also a valuable marker of the level of care it offers and can measure improvements. "Doctors and nurses who have not seen type 1 before basically need a recipe book—a practical, step-by-step guide tailored to the resources at their disposal," says Ogle. At a 2018 event held in Ethiopia, over 50 doctors and nurses discussed issues such as access to care and complicated cases, while families gave the patients' perspective.

A study in Rwanda proved that education, with systematic care and regular HbA1c testing, can dramatically improve mean HbA1c levels. Patients learn to take control. "We've even heard of children teaching nurses how to give injections," says Ogle. Thanks to testing and increased knowledge, type 1 diabetes need no longer be a death sentence.

Read Complete Article

"With POC testing, the result is available in 6 minutes. You can have a discussion on the spot and educate the family."

Graham Ogle, MD
International Diabetes Federation
Life for a Child (LFAC) program

Prevalence of diabetes in sub-Saharan Africa

The International Diabetes Federation (IDF) estimates that in sub-Saharan Africa, almost **7 in 10** diabetes cases go undiagnosed

"The presenting features of type 1 diabetes can look like pneumonia or gastroenteritis or typhoid, and children are often misdiagnosed."

Graham Ogle, MD
International Diabetes Federation
Life for a Child (LFAC) program

Fighting diabetes on the Texas-Mexico border

Diana Smith

In San Juan, Texas, 20 miles from the border of Mexico, diabetes is a serious health problem: one in three people have the disease. With real-time information from modern point-of-care analyzing systems, a team of dedicated professionals led by Brian Wickwire, MD, is doing its best to minimize diabetes' devastating effects in a seemingly unlikely spot—the local flea market.

"In our clinical practice, on the Texas-Mexico border, the prevalence of diabetes in the adult population is approximately 30%," says Wickwire. "You've got almost one out of three adults who have diabetes. Not only that, but the population has a genetic predisposition to progress in renal failure and develops renal disease faster than other populations."

A Cultural Shift

To achieve change, Wickwire recognized information, education, and support had to be more readily accessible to the people in the area. Many do not seek medical care because they lack transportation and/or insurance. With a start-up grant from Methodist Healthcare Ministries, Wickwire and a team from the clinics and the Texas A&M Public Health Science Center launched an innovative community-based project, the Pulga Program, which includes speedy point-of-care testing and health education on diabetes, emphasizing nutrition and physical activity. The Pulga Program team set up shop at a huge Mexican-style market where local residents regularly come to socialize and shop, perusing rows of fresh, colorful produce, household items, and special treats like Mexican candy. Now, in the same place, families and individuals can get tested for early kidney disease (the most common complication of diabetes), with results available in minutes. "The ability to go out into a community and provide point-of-care testing is an enormous tool to find people not seeking medical care," explains Wickwire. "With that information in real time, within 20 minutes, you try and help them find a medical home where they can receive definitive treatment and prevent the complications of diabetes, such as blindness and kidney failure, among others."

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Fighting diabetes on the Texas-Mexico border

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Speed and Accuracy

At the market, health professionals use Siemens Healthineers DCA Vantage® Analyzer to perform glycosylated hemoglobin (HbA1c) and microalbumin tests (albumin-to-creatinine ratio, or ACR). "It is extremely important and critical to have a way to check for early kidney disease and encourage people to seek treatment," emphasizes Wickwire. "Every 3 to 6 months, they should have their A1c tested if they have diabetes, and also their urine tested once a year for early kidney disease."

Wickwire prefers the HbA1c testing to a simple glucose test. "Random finger-stick glucose tests only tell you the sugar at the moment," he explains. A1c is unique in its ability to test people at any time of day or night, regardless of whether or not they have eaten recently. He adds, "Point-of-care A1c testing and testing for early kidney disease using the albumin-to-creatinine ratio in the urine allows you to detect early cases of diabetes, which can be controlled very easily and inexpensively with oral medications."

Read Complete Article

"Point-of-care A1c testing and testing for early kidney disease using the albumin-to-creatinine ratio in the urine allows you to detect early cases of diabetes, which can be controlled very easily and inexpensively with oral medications."

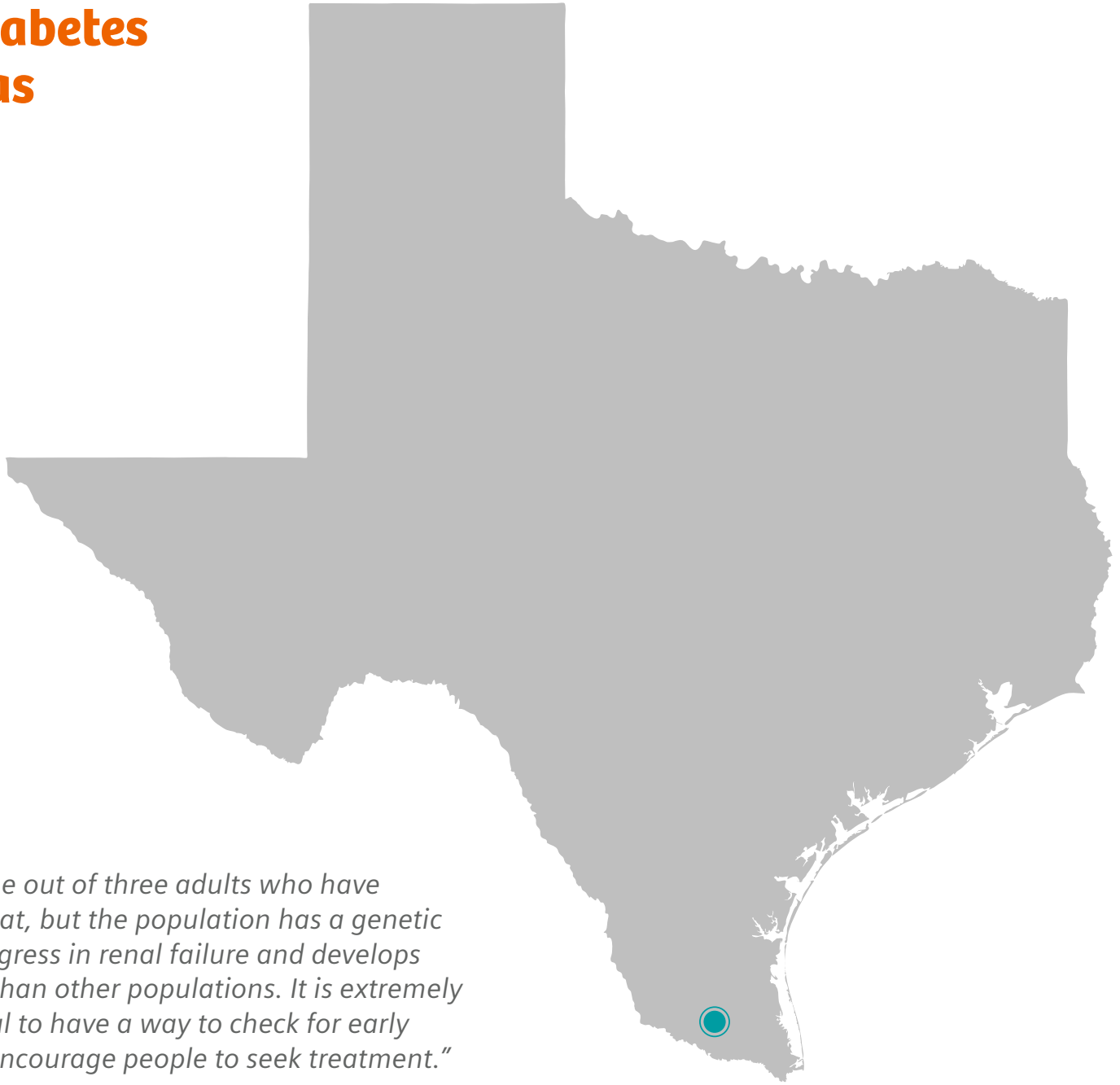
Dr. Brian Wickwire
PhD Biochemistry
Nuestra Clinica del Valle, San Juan, Texas

Prevalence of diabetes in Southern Texas

The prevalence of diabetes in the adult population is approximately

30%

in Hidalgo County, South Texas



"You've got almost one out of three adults who have diabetes. Not only that, but the population has a genetic predisposition to progress in renal failure and develops renal disease faster than other populations. It is extremely important and critical to have a way to check for early kidney disease and encourage people to seek treatment."

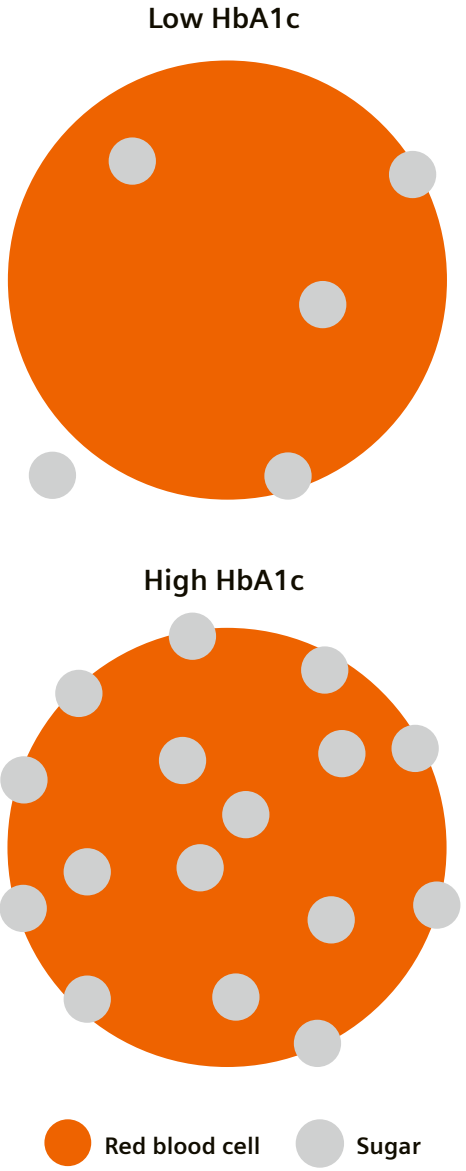
Dr. Brian Wickwire
PhD Biochemistry
Nuestra Clinica del Valle, San Juan, Texas

Know your A1c

What is HbA1c (A1c)?
Hemoglobin (Hb) is a protein found inside red blood cells that carries oxygen from the lungs to the rest of the body. Glucose in the blood can bond with hemoglobin to form glycated hemoglobin, or HbA1c. If there is excess glucose in the blood, the level of HbA1c will be higher.

By measuring HbA1c, doctors can gauge your average blood sugar levels from the last 2–3 months and thereby provide a more tailored treatment plan. HbA1c measurement can also show whether treatment plans and lifestyle choices have been effective.

Where can I get tested?
Ask your doctor about getting an HbA1c test done in the office during your next visit.



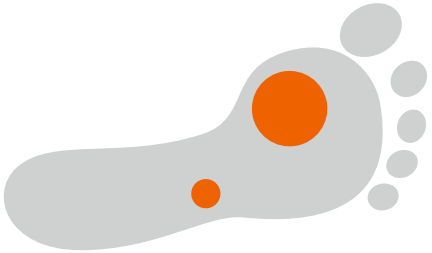
Go to Full Video

Source: https://diabetes.org/about-diabetes/a1c

Long-term risks of diabetes

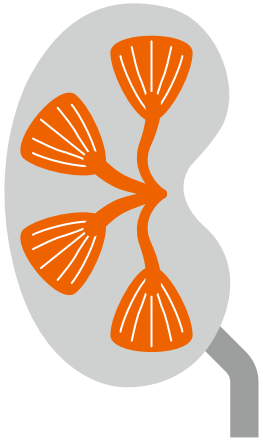
Increased blood pressure

Could lead to heart attack or stroke.



Sores and infections on feet and skin

Left untreated, could lead to amputation.



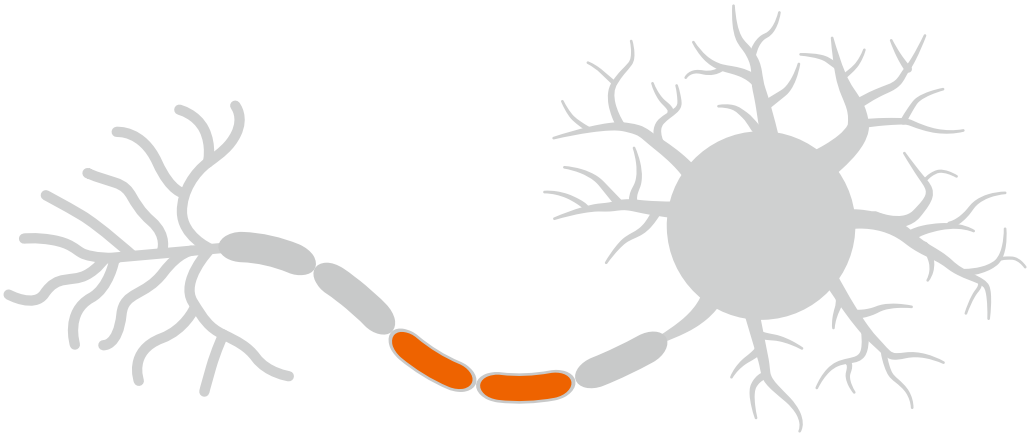
Kidney Disease

Diabetes is a leading cause of kidney disease.

About 1 out of 4 adults with diabetes have kidney disease.

Eye problems

Could lead to blindness.



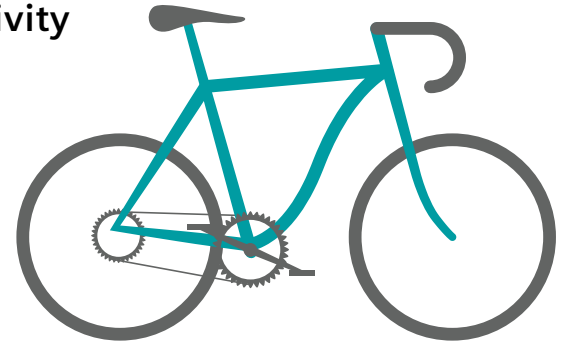
Nerve damage

Nerve problems can develop at any time, but risk rises with age and longer duration of diabetes.

Source: Afkarian M, Zelnick LR, Hall YN, et al. Clinical manifestations of kidney disease among U.S. adults with diabetes. Journal of the American Medical Association. 2016;316(6):602-10.

How to have a healthier lifestyle with diabetes

- Exercise and engage in physical activity
- Maintain a healthy diet
- Eat more fruits and vegetables
- Consume less sugar
- Take medications as prescribed
- Check blood sugar regularly
- Visit your doctor regularly and consult them with questions



HbA1c testing solutions

Atellica CH Enzymatic Hemoglobin A1c Assay

The Enzymatic Hemoglobin A1c Assay for the Atellica® CH Analyzer is now available to meet the increasing demand for HbA1c testing. It aids in the diagnosis and monitoring of long-term blood glucose control in patients with diabetes mellitus and identification of those at risk for developing diabetes mellitus.

The Siemens Healthineers Atellica CH Enzymatic Hemoglobin A1c Assay is an NGSP-certified assay traceable to the IFCC reference calibrators. It provides the precision and accuracy needed to meet new industry standards and the automation to improve throughput compared to traditional HPLC assays.

Learn More

DCA Vantage Analyzer

The DCA Vantage® Analyzer is a clinically proven point-of-care diabetes system that delivers hemoglobin A1c (HbA1c) and albumin testing results, including A:C ratio, to improve patient outcomes. The system is simple enough to use in your office lab, yet powerful enough to deliver lab-quality results.

- Provides HbA1c and A:C ratio testing results in minutes
- Improves patient experience by requiring a smaller whole-blood sample (1 µL)
- Eliminates transcription errors and saves time with onboard printed results

Learn More

Using Hemoglobin A1c testing for diabetes diagnosis and management

H. Roma Levy, MS

Insulin and cellular uptake of glucose by the insulin receptor

Cells require glucose for energy; however, glucose cannot diffuse through most cell membranes. Cellular glucose uptake is regulated by the interaction of the pancreatic hormone insulin with cellular insulin receptors.[1] Insulin is released from pancreatic beta cells in response to a carbohydrate-rich meal.[2] Upon binding to the insulin receptor, a long-signal cascade assembles transmembrane glucose channels to admit glucose.[1] Insulin levels decrease as glucose is sequestered. This feedback loop, along with glucose storage by the liver in the form of glycogen, helps to maintain blood glucose within a fairly narrow range.[2] Diabetes occurs when either insulin production or receptor function become impaired.

Pathophysiology of diabetes

There are three primary types of diabetes. Type 1 diabetes (T1D) is a chronic and incurable autoimmune disease that usually occurs in childhood or adolescence but can develop later due to injury or other pancreatic disease. In T1D, T cells gradually destroy insulin-producing beta cells, creating insulin deficiency. Insulin production eventually becomes so deficient that it cannot support appropriate glucose regulation necessary for normal cell functionality.[3,4,5]

Table 1. Countries with the highest levels of undiagnosed diabetes (ages 20–79 years) in 2017. These countries also carry the highest burden of diagnosed diabetes (adapted from IDF Diabetes Atlas, 8th edition, 2017[3]).

Rank	Country	Estimated Undiagnosed Individuals	Estimated Diagnosed Individuals	Proportion Undiagnosed
1	China	61.3 million	114.4 million	53.6%
2	India	42.2 million	72.9 million	57.9%
3	United States	11.5 million	30.2 million	38.2%
4	Indonesia	7.6 million	10.3 million	73.7%
5	Brazil	5.7 million	12.5 million	46.0%
6	Pakistan	4.6 million	7.5 million	61.5%
7	Russian Federation	4.5 million	8.5 million	53.7%
8	Mexico	4.5 million	12.0 million	37.4%

Type 2 diabetes (T2D) accounts for up to 95% of all cases in developed countries.[3,4] T2D is primarily a disease of poor diet and weight management and can develop at any age.[3] While it too is a chronic disease, a recent large-scale study demonstrated that remission can be achieved through significant calorie restriction and behavior modification.[6] In T2D, cells become insensitive (resistant) to insulin due to insulin receptor or long-signal cascade component malfunction. Reduced glucose uptake results in hyperglycemia.[2]

Inflammatory cytokines released from excess lipocytes also impair the action of insulin on insulin receptors.[7] As T2D progresses, increased insulin production in response to hyperglycemia triggers beta cells to release chemokines that result in their self-destruction by signaling IL-1β release by infiltrating macrophages.[8]

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Comparison of Hemoglobin Variants across Siemens Healthineers HbA1c Assays

The most common variants worldwide (in order of approximate prevalence) are HbS, HbE, HbC, and HbD. However, exact prevalence varies widely from country to country, and even within different geographic areas within a country or region.

Variant Study

A hemoglobin variant study was performed on the following Siemens Healthineers assays: Atellica® CH A1c_E, ADVIA® Chemistry A1c_E, Dimension® A1C, and Dimension Vista® A1C assays. A minimum of 20 samples for each of the following variants were tested according to CLSI protocol EP07-A2: HbA2, HbC, HbD, HbE, and HbS.

Samples were obtained from the National Glycohemoglobin Standardization Program (NGSP) and the International Federation of Clinical Chemistry and Laboratory Medicine (IFCC). Note that not all of the same samples were run on each platform.

Conclusion

Siemens Healthineers offers several hemoglobin A1c assays that demonstrated little to no significant interference across all systems and variants tested. The overall mean bias was <5% across all systems and variant types.

Table 1. Overall mean % biases of each test method and the comparison method (NGSP reference method) for each variant type.

	ADVIA Chemistry A1c_E					Atellica CH A1c_E					Dimension A1C					Dimension Vista A1C				
Hb Variant	A2	C	D	E	S	A2	C	D	E	S	A2	C	D	E	S	A2	C	D	E	S
n	20	45	24	20	25	20	37	27	21	20	23	20	20	20	22	25	53	31	29	29
Overall Mean %Bias	-1.05	1.02	0.18	2.70	2.88	-2.40	-4.61	-2.71	-0.14	-1.99	-0.17	-2.60	-2.09	-2.27	-0.94	0.63	-1.08	0.07	0.79	-0.31

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Test your knowledge

Globally, what is the estimated percentage of undiagnosed diabetics?

A) 16%

B) 32%

C) 50%

With POCT solutions, remote clinics in the Australian Outback have reduced time to result from?

A) 24 days to 6 days

B) 24 days to 6 minutes

C) 24 hours to 6 minutes

In addition to frequent HbA1c tests, Dr. Wickwire recommends annual _____ testing to check for signs of kidney disease?

A) ACR

B) Troponin I

C) Electrolyte

At Siemens Healthineers, we pioneer breakthroughs in healthcare. For everyone. Everywhere. By constantly bringing breakthrough innovations to market, we enable healthcare professionals to deliver high-quality care, leading to the best possible outcome for patients.

Our portfolio, spanning from in-vitro and in-vivo diagnostics to image-guided therapy and innovative cancer care, is crucial for clinical decision-making and treatment pathways. With our strengths in patient twinning, precision therapy, as well as digital, data, and artificial intelligence (AI), we are well positioned to take on the biggest challenges in healthcare. We will continue to build on these strengths to help fight the world's most threatening diseases, improving the quality of outcomes, and enabling access to care.

We are a team of 66,000 highly dedicated employees across more than 70 countries passionately pushing the boundaries of what's possible in healthcare to help improve people's lives around the world.

Product availability may vary from country to country and is subject to varying regulatory requirements. Please contact your local representative for availability.

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