

Chapter 1

The Origins and Dangers of Prediabetes

In This Chapter

- ▶ Crossing the line from health to prediabetes to diabetes
 - ▶ Noting the recent origin of prediabetes
 - ▶ Figuring out who is affected
 - ▶ Calculating the costs
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About 60 million people in the United States have prediabetes. That means if you are in a room with three other adult U.S. citizens, one of you will probably have prediabetes, and chances are that person won't know it. The purpose of this book is to radically change that situation. Anyone who reads this book will know whether he or she has prediabetes. Anyone who follows the recommendations in this book will *not* proceed to diabetes and will probably return to normal health.



This book will not make you younger, but it will help you continue to get older.

Diagnosing prediabetes is crucial because prediabetes is the critical step before developing diabetes. As you find out in this book, diabetes is associated with complications that may cause considerable physical and mental discomfort at best and be life-threatening at worst. So you don't want to go there.

Even if you go on to develop diabetes, all is not lost. You can use the suggestions found here to avoid further complications. You can't get rid of the diagnosis, but you can get rid of the problems.

In this chapter, you discover how to differentiate among three physical states: normal health, prediabetes, and diabetes. I explain that prediabetes is a recent phenomenon, which parallels the epidemic of obesity and lack of exercise in the United States and around the world.

Next, you discover who is affected by prediabetes and which groups of people are at the highest risk. I also touch on special considerations for children and the elderly at risk for prediabetes.

Finally, I focus on the costs of prediabetes, which are not only monetary. I explain that even though prediabetes is often considered a benign condition and not a disease, changes occur in the body of a person with prediabetes that may not be benign after all.

Distinguishing Prediabetes from Diabetes



Jane Johnson is a 48-year-old woman. She is postmenopausal and has gained about 15 pounds since her twenties, when her weight was normal. She complains of some fatigue. She goes to Dr. Sugarfeld, who discovers that Jane has family members with diabetes. Jane mentions that she used to be physically active but doesn't have the time to do much exercise these days. A physical examination reveals only that Jane is overweight and has mild high blood pressure, so Dr. Sugarfeld sends her for blood tests. One of the blood tests the doctor orders is called a *fasting blood glucose*, and it discovers the level of sugar in someone's blood in the morning after that person has fasted through the night.

When Jane returns a week later, Dr. Sugarfeld informs her that her fasting blood glucose was 114 mg/dl (6.3 mmol/L). (In the Introduction to this book, I explain what *mg/dl* and *mmol/L* stand for, in case you're interested.) The doctor asks Jane to have one more fasting blood glucose test. This value is 108 mg/dl (6 mmol/L). Dr. Sugarfeld informs Jane that she has prediabetes.

Going from normal to prediabetes

This anecdote describes one of the most common ways that prediabetes is discovered. Another common occurrence is simply the discovery that the *blood glucose* — the amount of sugar in the blood — is higher than it should be in a routine blood test.

The diagnosis of prediabetes is made the same way that a diagnosis of diabetes is made: by doing a blood glucose test in the laboratory. The critical *values* (numbers) in the test results are as follows:

- ✓ A normal fasting blood glucose result is less than 100 mg/dl (5.6 mmol/L).
- ✓ Prediabetes is diagnosed when the fasting blood glucose is between 100 and 125 mg/dl (5.6–6.9 mmol/L) on more than one occasion.

- ✓ Diabetes is diagnosed when the fasting blood glucose is 126 mg/dl (7 mmol/L) or greater on more than one occasion.
- ✓ A normal blood glucose level two hours after eating 75 grams of glucose is less than 140 mg/dl (7.8 mmol/L).
- ✓ Prediabetes is diagnosed when the glucose two hours after eating 75 grams of glucose is between 140 and 199 mg/dl (7.8–11.1 mmol/L) on more than one occasion.
- ✓ Diabetes is diagnosed when the glucose two hours after eating 75 grams of glucose is 200 mg/dl (11.1 mmol/L) or greater on more than one occasion.

Table 1-1 is a summary of these values.

<i>Type of Test</i>	<i>Normal</i>	<i>Prediabetes</i>	<i>Diabetes</i>
Fasting blood glucose	Less than 100 mg/dl	100–125 mg/dl	126 mg/dl or greater
Blood glucose two hours after eating 75 grams of glucose	Less than 140 mg/dl	140–199 mg/dl	200 mg/dl or greater

Here's what I can hear you saying: "You mean if my blood glucose is 99 mg/dl after fasting I don't have prediabetes, but if my blood glucose is 100 mg/dl — one measly milligram of glucose more — I do?" I'm afraid so.



These definitions are arbitrary. They have changed in the past, and they may do so again depending on scientific studies. For example, a fasting glucose result of greater than 140 mg/dl (7.8 mmol/L) used to be the cutoff point for a diagnosis of diabetes. Then doctors discovered that people who had fasting glucose levels below 140 mg/dl suffered from the complications of diabetes without having a diagnosis of diabetes. So they lowered the level for the diagnosis to 126 mg/dl (7 mmol/L). Unfortunately, even some people with fasting blood glucose levels below 126 have shown up with complications of diabetes.

You should be familiar with some other terms for these levels of blood glucose, because you will likely read or hear about them:

- ✓ *Impaired fasting glucose* (IFG) is another name for the condition where the fasting blood glucose is between 100 and 125 mg/dl (5.6–6.9 mmol/L) after an overnight fast.
- ✓ *Impaired glucose tolerance* (IGT) is another name for the condition where the blood glucose is between 140 and 199 mg/dl (7.8–11.1 mmol/L) two hours after eating 75 grams of glucose.



Some people have impaired fasting glucose, while others have impaired glucose tolerance. Still others have both conditions combined, so the total number of people with prediabetes is *not* the sum of the people with IFG plus the people with IGT.

Other terms that you may hear should be disregarded because they have no clear meaning and are no longer used scientifically. These include:

- ✓ Borderline diabetes
- ✓ Touch of sugar

(It's important to get your terms straight. Otherwise, you may create confusion similar to what happened when a famous pianist told his audience that he was going to play a piece by a Danish composer named Mozart: Hans Christian Mozart.)

Someday it may be possible to make a diagnosis of prediabetes and diabetes without obtaining a blood sample by way of a needle stuck into a vein. A study by Melinda Sheffield-Moore, PhD, and others published in the March 2009 issue of *Diabetes Care* described a novel method to accomplish a diagnosis. People were given glucose to drink in which the carbon atoms were replaced by a harmless *radioisotope* (a form of the carbon that is made radioactive). The researchers found that the amount of radioactivity in the breath of people with prediabetes or diabetes was significantly lower than that in the breath of people with normal glucose tolerance. This result is expected because glucose is broken down for energy fairly quickly in healthy people, more slowly in people with prediabetes, and even more slowly in diabetics.

Focusing on type 2 prediabetes

There are two major types of diabetes called *type 1 diabetes mellitus* (T1DM) and *type 2 diabetes mellitus* (T2DM). (If you want to find out exactly what distinguishes them, pick up my book *Diabetes For Dummies*, which is also published by Wiley.) Here's a grossly oversimplified overview:

- ✓ Type 1 is an autoimmune disease that usually occurs in children.
- ✓ Type 2 may occur in either children or adults and is often associated with risk factors such as being overweight, having high blood pressure, and leading a sedentary lifestyle.

Prediabetes that can lead to type 1 diabetes is pretty similar to prediabetes that can lead to type 2 diabetes. However, in this book I focus on the prediabetes associated with type 2. When diabetes develops in type 1, it's because of a lack of the key hormone that controls blood glucose: *insulin* (see Chapter 2).

When diabetes develops in type 2, the body still has plenty of insulin but not enough to keep the blood glucose in the normal range because the body resists the action of insulin.



The word *prediabetes* in this book refers to the period between normal blood glucose control and type 2 diabetes.

Knowing the Recent History of Prediabetes

In this section, I discuss the reason for the development of the term *prediabetes*, as well as the fact that prediabetes is not an entirely benign condition.

Needing new language

The term *prediabetes* hasn't been around long. In fact, it was first used in 2002. It was introduced by the American Diabetes Association (ADA) and by then–Health and Human Services Secretary Tommy G. Thompson.

There were a number of reasons for the introduction of this term:

- ✓ The terms *impaired fasting glucose* and *impaired glucose tolerance* were meaningless to patients and required a lot of explaining.
- ✓ Other terms, like *touch of sugar* and *borderline diabetes*, were generally meaningless.
- ✓ Studies such as the Diabetes Prevention Program showed that diet and exercise resulting in a weight loss as little as 5 to 7 percent of someone's initial weight would lower the incidence of type 2 diabetes by up to 58 percent.
- ✓ A broadly understandable term was needed so that patients could know where they were and where they had to go with respect to diabetes. These people stood to benefit from lifestyle modification and other treatments.

Studies at the time showed that most people with prediabetes would go on to develop diabetes within ten years unless they made relatively modest changes in diet and exercise. Therefore, the ADA and Secretary Thompson put together an expert panel of doctors and other diabetes experts. The panel report stated that intervention in prediabetes is critical for three reasons:

- ✔ Just having glucose levels in the prediabetic range puts a person at a 50 percent greater risk of a heart attack or stroke.
- ✔ The development of type 2 diabetes can be delayed or prevented by modest lifestyle change.
- ✔ For many people, modest changes in lifestyle can turn back the clock and return elevated blood glucose levels to normal.

Along with the new term, the ADA recommended that physicians begin to screen their patients for prediabetes at age 45. Screening was especially important for people who answered yes to these questions:

- ✔ Do you have a relative with type 2 diabetes or heart disease?
- ✔ Are you overweight or obese?
- ✔ Do you have high blood pressure?
- ✔ Do you have a sedentary lifestyle?
- ✔ Do you have high levels of triglycerides and/or low levels of HDL cholesterol (both being types of fats measured in a blood test)?
- ✔ Do you belong to a higher-risk ethnic group, such as African American, Latino, or Asian American/Pacific Islander?
- ✔ Do you have apple-shaped rather than pear-shaped weight distribution? This means your excess weight is around your stomach rather than your hips.
- ✔ For women who have had children, did you develop diabetes during the pregnancy or have a baby who weighed more than 9 pounds at birth?
- ✔ For women, is there a history of *polycystic ovarian syndrome*, a condition that may include lack of periods, infertility, and increased hair on the body?

These days, if you can answer no to all these questions, you may be from outer space. So most doctors just screen all people over age 45.



Maria Sanchez was a 48-year-old woman whose mother had type 2 diabetes. Maria had a body mass index (BMI) of 31, which put her in the category of obese. (As I explain in Chapter 2, BMI shows how your weight relates to your height.) Her blood pressure was high at 150/94. She was from Nicaragua. Her body shape had the appearance of an apple, not a pear. She had had a baby who was 9 pounds, 4 ounces at birth. When she was tested for prediabetes, guess what? She didn't have it. Fooled you! But seriously, you can't make assumptions. That's why we have to test.

Understanding the risks

Prediabetes may not be associated with most of the problems of diabetes (which I discuss in Part IV), but your body is developing some reversible damage if you have this condition. I discuss the most important issues here.

Heart attacks and strokes

Numerous studies, including one in the journal *Circulation* in July 2007 and another in the *American Heart Journal* in August 2003, have shown that increased risks of heart disease and stroke exist even when blood glucose levels are significantly below the current glucose levels necessary for a diagnosis of diabetes. These risks even extend into the levels considered normal (less than 100 mg/dl of glucose). The risk has been found to be as much as doubled for people with prediabetes compared to people in the normal range for glucose. When prediabetes becomes diabetes, the risk doubles again.

When prediabetes is reversed and you get back to normal glucose levels, your risk of heart disease and stroke is significantly reduced. So you should make every effort to achieve normal blood glucose levels.

Retinopathy

Retinopathy is an abnormality within the eyeball that is specifically associated with diabetes; I describe it fully in Chapter 13. A study in the journal *Lancet* in March 2008 showed that retinopathy occurs even in the prediabetic state. As glucose levels increase, the prevalence of retinopathy increases dramatically. Although there is no definite threshold below which you don't have to worry about retinopathy, the more normal the blood glucose, the lower the risk for this complication.

Alzheimer's disease

Strong evidence exists that links diabetes to Alzheimer's disease. In fact, being diabetic *doubles* the odds of developing Alzheimer's disease. And even people with prediabetes show evidence of memory loss and *dementia* (loss of intellectual capacity).

A study in *Neurology* in August 2004 found that women with the highest levels of glucose (in the diabetes range) did worst on tests of mental capacity. Women in the prediabetic range did better, while women in the normal range did best.

I'm reminded of the story of the musician who told his wife at the airport that he wished he had brought his piano. "Why would you bring your piano to the airport?" inquired his wife. "Because I left the airline tickets on the piano," he replied.

Quality of life

At a conference in Uruguay in 2008, Consumer Health Sciences, an international provider of consumer information, presented data concerning the quality of life for the person with prediabetes. The data showed that a prediabetic's health-related quality of life is significantly lower than that of a healthy person. For example, someone with prediabetes loses an average of 5.6 weeks of work productivity per year compared to a healthy person.



Even though prediabetes is not as serious as diabetes, it does involve medical deterioration. The longer you allow yourself to have prediabetes, the greater the damage. Start to reverse it now!

Realizing Who Is Affected

Some groups of people are affected by prediabetes more than others, and they may even be affected when their blood glucose levels are lower than the levels that currently define prediabetes. (In the earlier section "Going from normal to prediabetes," I spell out those levels.)

As I write these words, studies are taking place to try to understand who may need to worry about prediabetes more than others. In addition, unfortunately, type 2 diabetes has begun to be found in children to a much greater extent than ever before, so many children are obviously going through a stage of prediabetes. And the largest group with prediabetes is the elderly. These age groups have special considerations that I introduce here and address in much more detail in Chapter 11.

Comparing ethnic groups

The prevalence of diabetes and prediabetes in non-Hispanic whites, non-Hispanic blacks, and Mexican Americans was last compared in 2005–2006 and published in *Diabetes Care* in February 2009. The study showed the expected increase in prediabetes with aging. While only 16 percent of people age 12 to 19 had prediabetes, 48 percent of people older than 75 had prediabetes. Table 1-2 shows the prevalence of prediabetes in the various ethnic groups over the age of 20.

Table 1-2 Prediabetes and Diabetes in Different Ethnic Groups

<i>Group</i>	<i>Prediabetes</i>	<i>Diabetes</i>
Non-Hispanic white	29%	12%
Non-Hispanic black	25%	17%
Mexican Americans	32%	14%

Although the percent of Mexican Americans appears larger than the other groups with prediabetes, the authors of the study state that there is no significant difference among the groups. But when it comes to moving on to diabetes, minorities have significantly higher rates than whites.

Overall, the study showed that in 2005–2006, 13 percent of the adult U.S. population 20 years of age or older had diabetes (7.7 percent diagnosed and 5.3 percent undiagnosed), and another 29 percent had prediabetes. This means that more than 40 percent of the U.S. population has a condition of high blood glucose.

The study compared glucose levels in the various populations in the years 1988–1994 with the 2005–2006 results. Surprisingly, the prevalence of prediabetes didn't change between the two time periods. However, the prevalence of diabetes was much higher in the later study. In 1988–1994, 9.3 percent of the U.S. population had diabetes (5.1 percent diagnosed and 4.2 percent undiagnosed). The group that showed the largest increase in diabetes between the two periods was non-Hispanic blacks.

Another ethnic group that shows a high rate of diabetes is Asian Americans. The prevalence of diagnosed diabetes in this group is 7.5 percent. The prevalence of prediabetes in Asian Americans is not known.

The enormous increase in cases of high glucose has resulted in a correspondingly huge increase in the cost of care, which I discuss in the last part of this chapter.

Considering children and adolescents

By the end of 2007, the Centers for Disease Control and the National Institutes of Health were reporting that 2 million U.S. children and adolescents had prediabetes. The numbers have increased since then. The reason for all this prediabetes in children is the growing epidemic of obesity in children.



The prevalence of obesity among children ages 6 to 11 more than doubled in the past two decades, going from 6.5 percent in 1980 to 17 percent in 2006. Among adolescents ages 12 to 19, obesity has tripled in that time frame, going from 5 percent to 17.6 percent.

Not only are children with obesity at greater risk for prediabetes and diabetes, but they may suffer bone and joint problems, *sleep apnea* (periods of stopping breathing during sleep that lead to extreme fatigue during the day), and social and psychological problems. In Chapter 11, I offer specific advice about prediabetes and obesity in children and adolescents.

Finding rampant prediabetes in the elderly

The elderly (which means people who are older than me) are at the greatest risk of developing prediabetes and diabetes. About one-third of people age 65 and older have diabetes, and another 30 percent have prediabetes. Only one-third of elderly people have neither condition. When these conditions are combined with the other ills common to the elderly, such as heart disease, reduced kidney function, and mental deterioration, the results are significant sickness, the need for many types of medications, and complications that require a lot of medical care.

In the elderly, using just the fasting blood glucose test to diagnose prediabetes misses most of the cases. To really determine the prevalence of prediabetes in this group, taking a glucose reading two hours after drinking 75 grams of glucose is necessary.

Because it's such a complicated problem, prediabetes in the elderly deserves its own large section in Chapter 11.



Prediabetes in the elderly is reversible just as it is in children, adolescents, and adults. Reversing the condition may be more difficult because of the reduced ability to exercise and the tendency to eat a less healthful diet, but it's never too late to prevent and reverse prediabetes.

Considering the Costs

All this potential sickness and real sickness comes with very large costs. In 2008, the cost for diabetes and prediabetes in the United States was determined to be \$218 billion. One of every ten dollars spent for health care was spent for these conditions. That number was up from \$173 billion in 2007, and it's not likely to go down anytime soon. In this section, I discuss both the dollar costs and the other costs of prediabetes.

Actual health costs

Most of the costs of diabetes and prediabetes are for treating the complications that I discuss in Part IV. These complications include

- ✓ Eye disease possibly leading to blindness
- ✓ Kidney disease possibly leading to kidney failure
- ✓ Nerve disease possibly leading to severe pain or amputation
- ✓ Heart disease and arterial disease possibly leading to heart attacks, strokes, or severe leg pain



The fact is that the top three complications will *never occur* if prediabetes is reversed or never allowed to occur in the first place. Stopping prediabetes in its tracks is preventive medicine. Unfortunately, health insurance companies are willing to spend the thousands needed for treating the end results of disease but won't spend the much smaller sums needed to prevent the complications in the first place.

The Diabetes Prevention Program showed that preventive methods like diet and exercise delay the development of type 2 diabetes by an average of 11 years and reduce the number of new cases of diabetes by 20 percent. The costs for time with doctors and medications could be reduced by \$1,100 per year per person.

Other economic costs

As I write these words in mid-2009, with the economy of the United States and the rest of the world in a very precarious position, the huge costs of medical care are a major drain on our society. The automobile industry is the best-known example of an industry that has been hugely affected by health-care costs for its workers, much of those costs generated by diabetes and prediabetes.

The Diabetes Prevention Program showed that prevention of diabetes would save \$8,800 of societal costs per person. *Societal costs* are the indirect costs like lost productivity, taxes paid for health care and disability, and other non-medical costs.

Social costs

People who suffer blindness or kidney failure can't work at the level of people without these conditions, so much of their productivity is lost. Sometimes these complications — and the heart disease that is so much worse with diabetes — lead to an early death, so the losses from diabetes also affect entire families.

Because prediabetes and type 2 diabetes are now being seen so often in children and adolescents, we can expect that people will develop complications at much younger ages. People who should be in the prime of their lives will instead be suffering illness and premature death.

The goal of this book is to show you that such a path isn't inevitable and that these costs can be avoided. Turn the page to begin finding out how to walk the road back to health.