



Am I at Risk for Type 2 Diabetes?

Taking Steps to Lower Your Risk of Getting Diabetes



U.S. Department of Health and Human Services

NATIONAL INSTITUTES OF HEALTH

NIDDK NATIONAL INSTITUTE OF DIABETES AND DIGESTIVE AND KIDNEY DISEASES

National Diabetes Information Clearinghouse

Am I at Risk for Type 2 Diabetes?

Taking Steps to Lower Your Risk
of Getting Diabetes



U.S. Department
of Health and
Human Services

NATIONAL INSTITUTES OF HEALTH

NIDDK | NATIONAL INSTITUTE OF
DIABETES AND DIGESTIVE
AND KIDNEY DISEASES

National Diabetes Information Clearinghouse

Table of Contents

What is type 2 diabetes?.....	1
Can type 2 diabetes be prevented?.....	1
What are the signs and symptoms of type 2 diabetes?.....	4
Should I be tested for diabetes?.....	4
What does having pre-diabetes mean?.....	5
Besides being older and overweight, what other factors increase my risk for type 2 diabetes?.....	5
How can I reduce my risk?.....	6
Making Changes to Lower My Risk.....	7
Hope through Research.....	13

What is type 2 diabetes?

Diabetes is a disease in which blood glucose levels are above normal. People with diabetes have problems converting food to energy. After a meal, food is broken down into a sugar called glucose, which is carried by the blood to cells throughout the body. Cells use the hormone insulin, made in the pancreas, to help them process blood glucose into energy.

People develop type 2 diabetes because the cells in the muscles, liver, and fat do not use insulin properly. Eventually, the pancreas cannot make enough insulin for the body's needs. As a result, the amount of glucose in the blood increases while the cells are starved of energy. Over the years, high blood glucose damages nerves and blood vessels, leading to complications such as heart disease, stroke, blindness, kidney disease, nerve problems, gum infections, and amputation.

Can type 2 diabetes be prevented?

Research has demonstrated that people at risk for type 2 diabetes can prevent or delay developing type 2 diabetes by losing a little weight. The results of the Diabetes Prevention Program (DPP) showed that weight loss through moderate diet changes and physical activity can delay and prevent type 2 diabetes. Participants in this federally funded study of 3,234 people at high risk for diabetes experienced a 5- to 7-percent weight loss. For example, a 5- to 7-percent weight loss for a 200-pound person would be 10 to 14 pounds.



Am I at Risk for Type 2 Diabetes?

Family history and overweight are strong risk factors for type 2 diabetes. DPP study participants were overweight and had higher than normal levels of blood glucose, a condition called pre-diabetes, also called impaired glucose tolerance. Both pre-diabetes and obesity are strong risk factors for type 2 diabetes. Because of the high risk for diabetes among some minority groups, about half of the DPP participants were African American, Alaska Native, American Indian, Asian American, Pacific Islander, or Hispanic/Latino.

DPP participants also included others at high risk for developing type 2 diabetes, such as women with a history of gestational diabetes and individuals aged 60 and older.

The DPP tested two approaches to preventing diabetes: lifestyle change—a program of healthy eating and physical activity—and the diabetes drug metformin. People in the lifestyle change group exercised about 30 minutes a day 5 days a week, usually by walking, and lowered their intake of fat and calories. Those who took the diabetes drug metformin received information on physical activity and diet. A third group only received information on physical activity and diet.

The results showed that people in the lifestyle change group reduced their risk of getting type 2 diabetes by 58 percent. In the first year of the study, people lost an average of 15 pounds. Lifestyle change was even more effective in those aged 60 and older. They reduced their risk by 71 percent. People receiving metformin reduced their risk by 31 percent.



Types of Diabetes

The three main kinds of diabetes are type 1, type 2, and gestational diabetes.



Type 1 Diabetes

Type 1 diabetes, formerly called juvenile diabetes or insulin-dependent diabetes, is usually first diagnosed in children, teenagers, or young adults. In this form of diabetes, the beta cells of the pancreas no longer make insulin because the body's immune system has attacked and destroyed them. Treatment for type 1 diabetes includes taking insulin shots or using an insulin pump, making wise food choices, exercising regularly, controlling blood pressure and cholesterol, and taking aspirin daily—for some.



Type 2 Diabetes

Type 2 diabetes, formerly called adult-onset or noninsulin-dependent diabetes, is the most common form of diabetes. People can develop type 2 diabetes at any age, even during childhood. This form of diabetes usually begins with insulin resistance, a condition in which fat, muscle, and liver cells do not use insulin properly. At first, the pancreas keeps up with the added demand by producing more insulin. In time, however, it loses the ability to secrete enough insulin in response to meals. People who are overweight and inactive are more likely to develop type 2 diabetes. Treatment includes taking diabetes medicines, making wise food choices, exercising regularly, controlling blood pressure and cholesterol, and taking aspirin daily—for some.



Gestational Diabetes

Some women develop gestational diabetes late in pregnancy. Although this form of diabetes usually goes away after the baby is born, a woman who has had gestational diabetes is more likely to develop type 2 diabetes later in life. Gestational diabetes is caused by the hormones of pregnancy or a shortage of insulin.

What are the signs and symptoms of type 2 diabetes?

Nearly 6 million people in the United States have type 2 diabetes and do not know it. Many have no signs or symptoms. Symptoms can also be so mild that you might not even notice them. Some people have symptoms but do not suspect diabetes.

Symptoms include

- increased thirst
- increased hunger
- fatigue
- increased urination, especially at night
- weight loss
- blurred vision
- sores that do not heal

Many people do not find out they have the disease until they have diabetes complications, such as blurry vision or heart trouble. If you find out early that you have diabetes, then you can get treatment to prevent damage to your body.

Should I be tested for diabetes?

Anyone 45 years old or older should consider getting tested for diabetes. If you are 45 or older and overweight—see the BMI chart on pages 10 and 11—getting tested is strongly recommended. If you are younger than 45, overweight, and have one or more of the risk factors on page 5, you should consider getting tested. Ask your doctor for a fasting blood glucose test or an oral glucose tolerance test. Your doctor will tell you if you have normal blood glucose, pre-diabetes, or diabetes.

What does having pre-diabetes mean?

Pre-diabetes means your blood glucose is higher than normal but lower than the diabetes range. In 2007, at least 57 million American adults had pre-diabetes. Having pre-diabetes also means you are at risk for getting type 2 diabetes and heart disease. However, you can reduce the risk of getting diabetes and even return to normal blood glucose levels with modest weight loss through healthy eating and moderate physical activity. If you are told you have pre-diabetes, have your blood glucose checked again in 1 to 2 years.

Besides being older and overweight, what other factors increase my risk for type 2 diabetes?

To find out your risk for type 2 diabetes, check each item that applies to you.

- I have a parent, brother, or sister with diabetes.
- My family background is Alaska Native, American Indian, African American, Hispanic/Latino, Asian American, or Pacific Islander.
- I have had gestational diabetes, or I gave birth to at least one baby weighing more than 9 pounds.
- My blood pressure is 140/90 mm Hg or above, or I have been told that I have high blood pressure.
- My cholesterol levels are not normal. My HDL cholesterol—"good" cholesterol—is below 35 mg/dL, or my triglyceride level is above 250 mg/dL.
- I am fairly inactive. I exercise fewer than three times a week.

Am I at Risk for Type 2 Diabetes?

- I have polycystic ovary syndrome, also called PCOS—women only.
- On previous testing, I had impaired fasting glucose (IFG) or impaired glucose tolerance (IGT).
- I have other clinical conditions associated with insulin resistance, such as a condition called acanthosis nigricans, characterized by a dark, velvety rash around my neck or armpits.
- I have a history of cardiovascular disease.

The more items you checked, the higher your risk.

How can I reduce my risk?

You can do a lot to lower your chances of getting diabetes. Exercising regularly, reducing fat and calorie intake, and losing a little weight can help you reduce your risk of developing type 2 diabetes. Lowering blood pressure and cholesterol levels also helps you stay healthy.

If you are overweight

Then take these steps:

- Reach and maintain a reasonable body weight (see page 8).
- Make wise food choices most of the time (see page 9).
- Be physically active every day (see page 12).

If you are fairly inactive

Then take this step:

- Be physically active every day (see page 12).

If your blood pressure is too high

Then take these steps:

- Reach and maintain a reasonable body weight (see page 8).
- Make wise food choices most of the time (see page 9).
- Reduce your intake of sodium and alcohol (see page 9).
- Be physically active every day (see page 12).
- Talk with your doctor about whether you need medicine to control your blood pressure (see page 12).

If your cholesterol or triglyceride levels are too high

Then take these steps:

- Make wise food choices most of the time (see page 9).
- Be physically active every day (see page 12).
- Talk with your doctor about whether you need medicine to control your cholesterol levels (see page 12).

Making Changes to Lower My Risk

Making big changes in your life is hard, especially if you are faced with more than one change. You can make it easier by taking these steps:

- Make a plan to change behavior.
- Decide exactly what you will do and when you will do it.
- Plan what you need to get ready.
- Think about what might prevent you from reaching your goals.
- Find family and friends who will support and encourage you.
- Decide how you will reward yourself when you do what you have planned.

Your doctor, a dietitian, or a counselor can help you make a plan. Consider making changes to lower your risk of diabetes.

Am I at Risk for Type 2 Diabetes?

Reach and Maintain a Reasonable Body Weight

Your weight affects your health in many ways. Being overweight can keep your body from making and using insulin properly. Excess body weight can also cause high blood pressure.

Body mass index (BMI) is a measure of body weight relative to height. You can use BMI to see whether you are underweight, normal weight, overweight, or obese. Use the table on pages 10 and 11 to find your BMI.

- Find your height in the left-hand column.
- Move across in the same row to the number closest to your weight.
- The number at the top of that column is your BMI. Check the word above your BMI to see whether you are normal weight, overweight, or obese.

If you are overweight or obese, choose sensible ways to get in shape.

- Avoid crash diets. Instead, eat less of the foods you usually have. Limit the amount of fat you eat.
- Increase your physical activity. Aim for at least 30 minutes of exercise most days of the week. (See page 12 for suggestions.)
- Set a reasonable weight-loss goal, such as losing 1 pound a week. Aim for a long-term goal of losing 5 to 7 percent of your total body weight.

Make Wise Food Choices Most of the Time

What you eat has a big impact on your health. By making wise food choices, you can help control your body weight, blood pressure, and cholesterol.

- Take a look at the serving sizes of the foods you eat. Reduce serving sizes of main courses such as meat, desserts, and foods high in fat. Increase the amount of fruits and vegetables.
- Limit your fat intake to about 25 percent of your total calories. For example, if your food choices add up to about 2,000 calories a day, try to eat no more than 56 grams of fat. Your doctor or a dietitian can help you figure out how much fat to have. You can also check food labels for fat content.
- Limit your sodium intake to less than 2,300 mg—about 1 teaspoon of salt—each day.
- Talk with your doctor about whether you may drink alcoholic beverages. If you choose to drink alcoholic beverages, limit your intake to one drink—for women—or two drinks—for men—per day.
- You may also wish to reduce the number of calories you have each day. People in the DPP lifestyle change group lowered their daily calorie total by an average of about 450 calories. Your doctor or dietitian can help you with a meal plan that emphasizes weight loss.
- Keep a food and exercise log. Write down what you eat, how much you exercise—anything that helps keep you on track.
- When you meet your goal, reward yourself with a nonfood item or activity, like watching a movie.

Continued on Page 12

Body Mass Index Table

	Normal						Overweight					Obese									Extreme Obesity															
BMI	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40	41	42	43	44	45	46	47	48	49	50	51	52	53	54
Height (inches)												Body Weight (pounds)																								
58	91	96	100	105	110	115	119	124	129	134	138	143	148	153	158	162	167	172	177	181	186	191	196	201	205	210	215	220	224	229	234	239	244	248	253	258
59	94	99	104	109	114	119	124	128	133	138	143	148	153	158	163	168	173	178	183	188	193	198	203	208	212	217	222	227	232	237	242	247	252	257	262	267
60	97	102	107	112	118	123	128	133	138	143	148	153	158	163	168	174	179	184	189	194	199	204	209	215	220	225	230	235	240	245	250	255	261	266	271	276
61	100	106	111	116	122	127	132	137	143	148	153	158	164	169	174	180	185	190	195	201	206	211	217	222	227	232	238	243	248	254	259	264	269	275	280	285
62	104	109	115	120	126	131	136	142	147	153	158	164	169	175	180	186	191	196	202	207	213	218	224	229	235	240	246	251	256	262	267	273	278	284	289	295
63	107	113	118	124	130	135	141	146	152	158	163	169	175	180	186	191	197	203	208	214	220	225	231	237	242	248	254	259	265	270	278	282	287	293	299	304
64	110	116	122	128	134	140	145	151	157	163	169	174	180	186	192	197	204	209	215	221	227	232	238	244	250	256	262	267	273	279	285	291	296	302	308	314
65	114	120	126	132	138	144	150	156	162	168	174	180	186	192	198	204	210	216	222	228	234	240	246	252	258	264	270	276	282	288	294	300	306	312	318	324
66	118	124	130	136	142	148	155	161	167	173	179	186	192	198	204	210	216	223	229	235	241	247	253	260	266	272	278	284	291	297	303	309	315	322	328	334
67	121	127	134	140	146	153	159	166	172	178	185	191	198	204	211	217	223	230	236	242	249	255	261	268	274	280	287	293	299	306	312	319	325	331	338	344
68	125	131	138	144	151	158	164	171	177	184	190	197	203	210	216	223	230	236	243	249	256	262	269	276	282	289	295	302	308	315	322	328	335	341	348	354
69	128	135	142	149	155	162	169	176	182	189	196	203	209	216	223	230	236	243	250	257	263	270	277	284	291	297	304	311	318	324	331	338	345	351	358	365
70	132	139	146	153	160	167	174	181	188	195	202	209	216	222	229	236	243	250	257	264	271	278	285	292	299	306	313	320	327	334	341	348	355	362	369	376
71	136	143	150	157	165	172	179	186	193	200	208	215	222	229	236	243	250	257	265	272	279	286	293	301	308	315	322	329	338	343	351	358	365	372	379	386
72	140	147	154	162	169	177	184	191	199	206	213	221	228	235	242	250	258	265	272	279	287	294	302	309	316	324	331	338	346	353	361	368	375	383	390	397
73	144	151	159	166	174	182	189	197	204	212	219	227	235	242	250	257	265	272	280	288	295	302	310	318	325	333	340	348	355	363	371	378	386	393	401	408
74	148	155	163	171	179	186	194	202	210	218	225	233	241	249	256	264	272	280	287	295	303	311	319	326	334	342	350	358	365	373	381	389	396	404	412	420
75	152	160	168	176	184	192	200	208	216	224	232	240	248	256	264	272	279	287	295	303	311	319	327	335	343	351	359	367	375	383	391	399	407	415	423	431
76	156	164	172	180	189	197	205	213	221	230	238	246	254	263	271	279	287	295	304	312	320	328	336	344	353	361	369	377	385	394	402	410	418	426	435	443

Source: Adapted from *Clinical Guidelines on the Identification, Evaluation, and Treatment of Overweight and Obesity in Adults: The Evidence Report.*

Am I at Risk for Type 2 Diabetes?

Be Physically Active Every Day

Regular exercise tackles several risk factors at once. It helps you lose weight, keeps your cholesterol and blood pressure under control, and helps your body use insulin. People in the DPP who were physically active for 30 minutes a day, 5 days a week, reduced their risk of type 2 diabetes. Many chose brisk walking for exercise.

If you are not very active, you should start slowly. Talk with your doctor first about what kinds of exercise would be safe for you. Make a plan to increase your activity level toward the goal of being active at least 30 minutes a day most days of the week.

Choose activities you enjoy. Some ways to work extra activity into your daily routine include the following:

- Take the stairs rather than an elevator or escalator.
- Park at the far end of the parking lot and walk.
- Get off the bus a few stops early and walk the rest of the way.
- Walk or bicycle whenever you can.

Take Your Prescribed Medications

Some people need medication to help control their blood pressure or cholesterol levels. If you do, take your medicines as directed. Ask your doctor about medicines to prevent type 2 diabetes.

Hope through Research

We now know that many people can prevent type 2 diabetes through weight loss, regular exercise, and lowering their intake of fat and calories. Researchers are intensively studying the genetic and environmental factors that underlie the susceptibility to obesity, pre-diabetes, and diabetes. As they learn more about the molecular events that lead to diabetes, they will develop ways to prevent and cure the different stages of this disease. DPP researchers continue to monitor DPP participants to learn more about the study's long-term effects through the Diabetes Prevention Program Outcomes Study.

People with diabetes and those at risk for it now have easier access to clinical trials that test promising new approaches to treatment and prevention. Participants in clinical trials can play a more active role in their own health care, gain access to new research treatments before they are widely available, and help others by contributing to medical research. For information about current studies, visit www.ClinicalTrials.gov.

For More Information

National Diabetes Education Program

1 Diabetes Way

Bethesda, MD 20814-9692

Phone: 1-888-693-NDEP (6337)

TTY: 1-866-569-1162

Fax: 703-738-4929

Email: ndep@mail.nih.gov

Internet: www.ndep.nih.gov

American Diabetes Association

1701 North Beauregard Street

Alexandria, VA 22311

Phone: 1-800-DIABETES (342-2383)

Fax: 703-549-6995

Email: AskADA@diabetes.org

Internet: www.diabetes.org

National Diabetes Information Clearinghouse

1 Information Way
Bethesda, MD 20892-3560
Phone: 1-800-860-8747
TTY: 1-866-569-1162
Fax: 703-738-4929
Email: ndic@info.niddk.nih.gov
Internet: www.diabetes.niddk.nih.gov

The National Diabetes Information Clearinghouse (NDIC) is a service of the National Institute of Diabetes and Digestive and Kidney Diseases (NIDDK). The NIDDK is part of the National Institutes of Health of the U.S. Department of Health and Human Services. Established in 1978, the Clearinghouse provides information about diabetes to people with diabetes and to their families, health care professionals, and the public. The NDIC answers inquiries, develops and distributes publications, and works closely with professional and patient organizations and Government agencies to coordinate resources about diabetes.

Publications produced by the Clearinghouse are carefully reviewed by both NIDDK scientists and outside experts. This booklet was originally reviewed by David G. Marrero, Ph.D., Indiana University School of Medicine, Diabetes Research and Training Center, and Michael L. Parchman, M.D., M.P.H., Associate Professor, Department of Family and Community Medicine, University of Texas Health Science Center.

This publication is not copyrighted. The Clearinghouse encourages users of this booklet to duplicate and distribute as many copies as desired.

This booklet is also available at www.diabetes.niddk.nih.gov.

This publication may contain information about medications. When prepared, this publication included the most current information available. For updates or for questions about any medications, contact the U.S. Food and Drug Administration toll-free at 1-888-INFO-FDA (463-6332) or visit www.fda.gov. Consult your doctor for more information.



U.S. DEPARTMENT OF HEALTH
AND HUMAN SERVICES
National Institutes of Health

NIDDK | NATIONAL INSTITUTE OF
DIABETES AND DIGESTIVE
AND KIDNEY DISEASES

NIH Publication No. 09 4805
November 2008