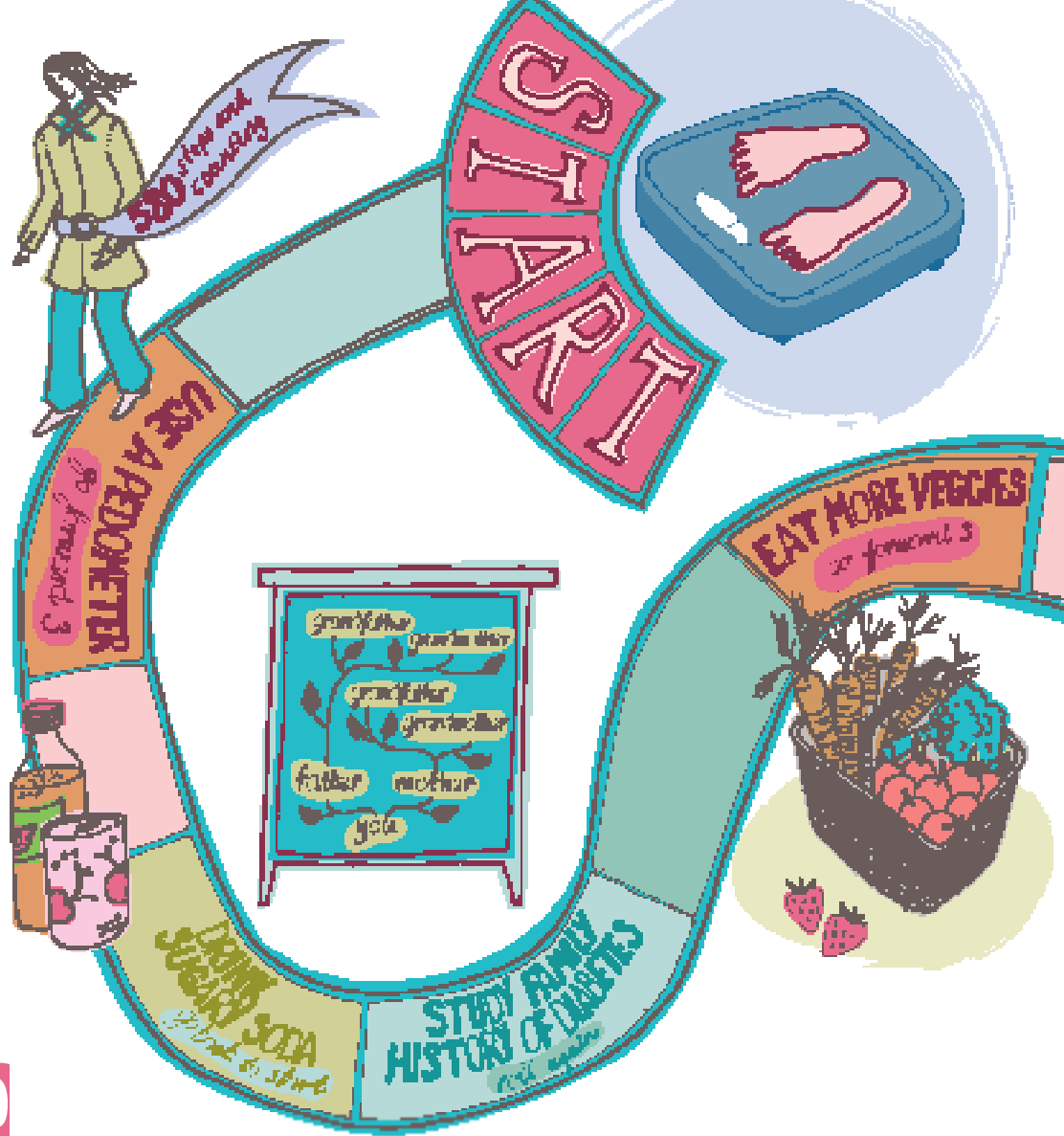


(to your **HEALTH**

Overweight, but not diagnosed with diabetes yet? Extra weight, inflammation, and insulin resistance put a person on the path to type 2. Here's how those at risk can prevent a diagnosis.

by HOPE S. WARSHAW,
M.S., R.D., CDE, BC-ADM

Stop type 2 in its tracks



Packing on pounds is a health gamble—especially because those extra pounds can lead to a diagnosis of pre-diabetes and eventually type 2 diabetes. “As more Americans gain weight, they risk triggering a cascade of events involving insulin resistance and inflammation that rolls the dice in favor of type 2 diabetes,” says Peter Sheehan, M.D., of Mount Sinai School of Medicine in New York City and chair of the Cardiometabolic Risk

Subcommittee for the American Diabetes Association (ADA).

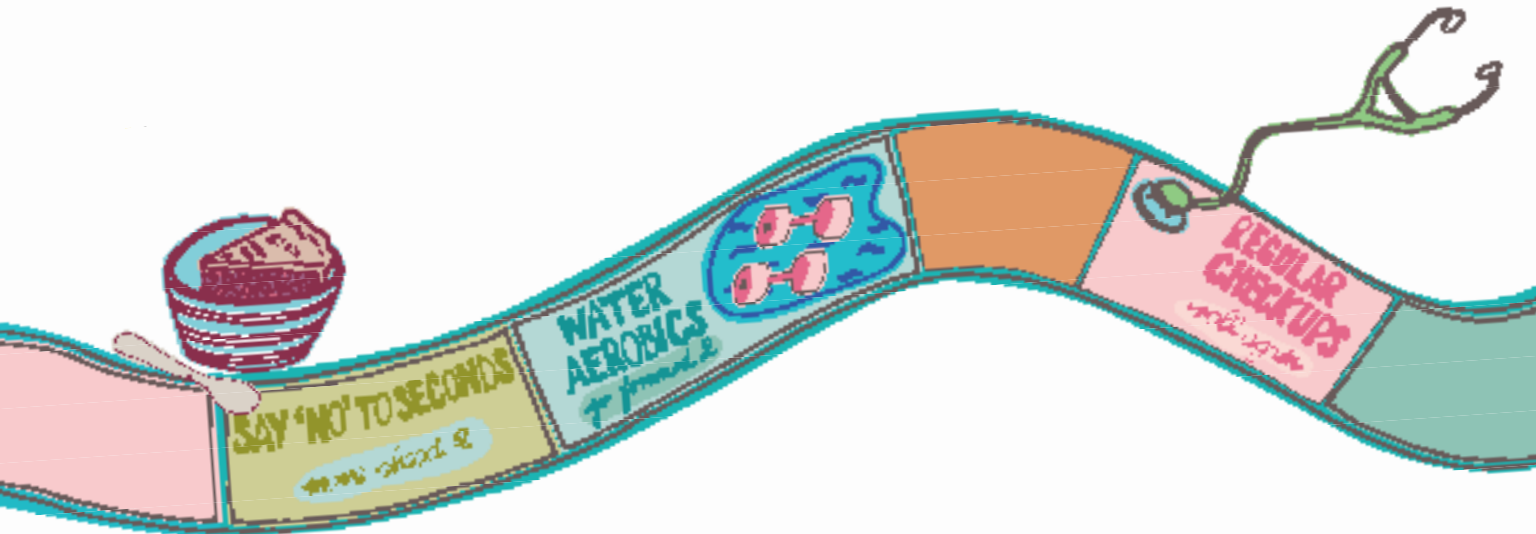
Excess weight causes insulin resistance and inflammation—and this can eventually lead to type 2 diabetes. The good news? Your at-risk family members may be able to head off the disease through weight loss, healthful eating, and physical activity.

Who Is at Risk

In the United States, 66 percent of adults (133 million) are obese

or overweight, according to the National Institutes of Health (NIH). Adults aren't the only ones with weight issues: Children and adolescents are increasingly overweight and obese, which puts them at risk for type 2 diabetes—a disease seldom diagnosed in children 30 years ago. The ADA estimates that 70 million Americans have insulin resistance and 54 million have pre-diabetes. “There's overlap

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in these numbers,” Sheehan says. “However, all are at cardiometabolic risk,” susceptible to type 2 diabetes and heart disease.

The Route to Type 2

Scientists have connected the dots from excess weight, inflammation, and insulin resistance to type 2 diabetes. “Excess weight begets inflammation, which begets insulin resistance,” Sheehan says. “This isn’t the short-lived inflammatory process the body calls into action for repairing tissue. It’s chronic inflammation triggered by being overweight.”

Many experts use the term “metabolic syndrome” to describe the condition. The effects are serious, according to Sheehan. “What matters most is that insulin resistance and inflammation can lead to type 2 diabetes and heart disease if a person doesn’t take action.”

A key to knowing whether you are susceptible to insulin resistance is your family’s health profile. If your parents or siblings have type 2 diabetes, that’s a significant risk factor. “Add family history to excess weight and inactivity and you’ve stirred up the recipe to start down the type

2 diabetes road,” says Joanne Gallivan, M.S., R.D., director of the NIH’s National Diabetes Education Program (NDEP) and a member of *Diabetic Living* magazine’s advisory board. See the “Healthful Targets” chart, *page 24*, to understand how to reduce your personal risk factors.

The Path to Type 2 Diabetes

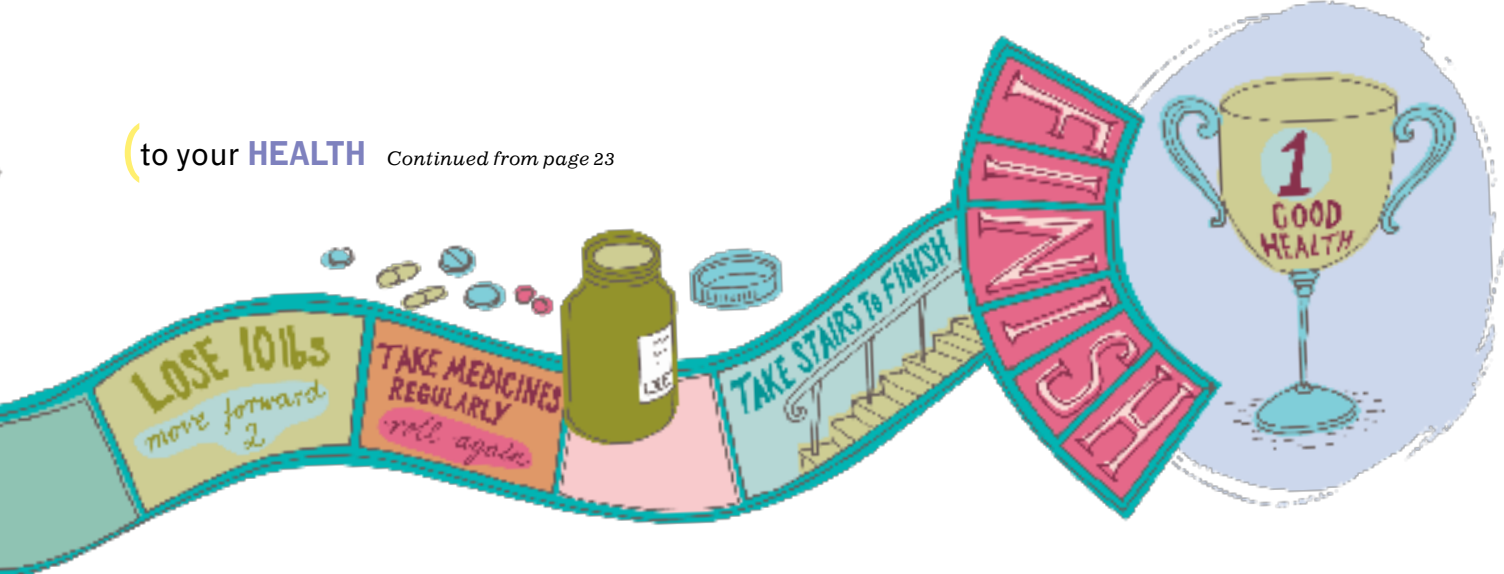
Here’s how people head toward being diagnosed with diabetes. ** Excess weight and inactivity stoke the flame.* Extra fatty tissue releases cytokines (inflammatory markers) into the bloodstream,

Continued on page 24

(diagnosing diabetes)

According to the American Diabetes Association’s Standards of Medical Care, these numbers should be used to diagnose pre-diabetes or diabetes. The ADA suggests everyone over age 45 be checked every three years—especially if your body mass index (BMI) is over 25 (see “Determining Your BMI,” *page 25*). People with a family history of diabetes should be tested at a younger age and more frequently.

TIME OF TEST	NORMAL PLASMA GLUCOSE LEVELS	PRE-DIABETES GLUCOSE LEVELS	TYPE 2 DIABETES GLUCOSE LEVELS
Fasting	Less than 100 mg/dl	Equal to or greater than 100 and less than 126 mg/dl	Equal to or greater than 126 mg/dl. A second test is required for confirmation.
Two hours after eating	Less than 140 mg/dl	Equal to or greater than 140 and less than 200 mg/dl	Equal to or greater than 200 mg/dl. A second test is required for confirmation.



causing inflammation.

* *Inflammation causes insulin resistance to escalate.*

Inflammation inhibits the action of insulin made in the pancreas, leading your body to ineffectively

use insulin and increase its demand for it. This damages your body's tissues yet goes unnoticed.

* *With ongoing inflammation and insulin resistance, your body powers up the beta cells in your*

pancreas to crank out more insulin. Larger amounts of insulin are delivered to the bloodstream to keep blood glucose normal. However, lipid levels begin to become abnormal. Triglycerides rise and HDL (good) cholesterol decreases. Blood pressure often rises, too.

* *First-phase insulin production dwindles.* Blood glucose levels rise after meals, but fasting and before-meal blood glucose numbers remain normal. Insulin secreted by the pancreas is released in two phases to control the rise of blood glucose after eating. In the first phase, insulin is released in a quick burst to control the rise of blood glucose from the first bites of food. In the second phase, insulin is released more slowly for about 90 minutes during and after eating.

* *Blood glucose climbs gradually.* The pancreatic beta cells become exhausted and can't make enough insulin to keep blood glucose at normal levels. Blood glucose rises to pre-diabetes levels (see "Diagnosing Diabetes," page 23). This subtle process can take 5–10 years for adults. Research shows it may happen more quickly for children.

* *When your pancreas is no longer able to keep up with the demand for insulin, your blood glucose rises to levels that warrant the diagnosis of diabetes.*

healthful targets

Maintaining recommended targets for the following risk factors may help you avoid heart disease and type 2 diabetes. Aim for the targets below, as recommended by the American Diabetes Association in its Check Up America program at checkupamerica.org.

RISK FACTOR	HEALTHY TARGET OR RANGE
Weight	Body mass index between 19 and 25
Waist circumference	Less than 35 inches for women and 40 inches for men
LDL (bad) cholesterol	Less than 100 mg/dl
HDL (good) cholesterol	Greater than 60 mg/dl
Total cholesterol	Less than 200 mg/dl
Triglycerides	Less than 150 mg/dl
Blood pressure	Less than 120/80 mmHg
Blood glucose	Less than 100 mg/dl
Smoking cigarettes	No safe level
Physical activity	At least 30 minutes of moderate activity most days

60%

The percentage of people with pre-diabetes who lost just 5 to 7 percent of their body weight, were active, and prevented or delayed type 2 diabetes for at least 3 years.

—Diabetes Prevention Program study

By the time most people are diagnosed with diabetes, they have lost about 50 percent of their insulin-making capacity.

* *Your ability to make insulin continues to dwindle*, causing you to need blood-glucose-lowering pills, such as metformin and/or glitazones. These help your body release more insulin and decrease insulin resistance.

* *Over time, insulin production decreases further*, so many people who have type 2 diabetes eventually need to inject insulin to control their blood glucose. As insulin resistance continues over time, it may be necessary to continue to take blood-glucose-lowering meds in addition to insulin injections.

Stopping the Progression

“Results from the Diabetes Prevention Program (DPP) study verify that people can disrupt this path to type 2 diabetes by implementing lifestyle changes,” says Gallivan.

“The DPP showed that if people with pre-diabetes lost 5 to 7 percent from their starting body weight, and if they were active about 30 minutes five times a week, nearly 60 percent of study participants were able to prevent or delay the progression from pre-diabetes to type 2 for the 3 years of the study,” Gallivan says. If you weigh 200 pounds, losing just 10 to 15 pounds can have big health benefits. In addition to lower blood glucose levels, people in the study

experienced a host of other health benefits: lower blood pressure, improved blood lipids, and a reduction in prescription medicines to control these conditions. People in the DPP study are participating in a longer study to see if weight maintenance and physical activity can help continue to prevent type 2 diabetes. To gauge whether your weight is in the desired range or whether your scale is pointing to the overweight or obese categories, see “Determining Your BMI, left.

Irish Stovall, of Washington, D.C., was 66 when she entered the DPP study nine years ago with pre-diabetes. She weighed 230 pounds and was an admitted couch potato. Today, Irish is 40 pounds thinner and just blew out 75 birthday candles. “I still don’t have type 2 diabetes because I walk five miles a day, eat fruits and vegetables, and prepare my foods with nearly no fat,” she says.

Irish walks the talk of the DPP. “It’s a mind thing and darn hard work,” she says. Her cut-to-the-chase advice: “Decide that your health is more important than eating unhealthful foods and not moving much.” 🍌

Hope S. Warsaw is a certified diabetes educator and dietitian, author of Diabetes Meal Planning Made Easy (ADA), and a member of this magazine's editorial

(determining your BMI)

Body mass index (BMI) is a ratio of weight to height that’s used as a measure of body fat. Use this formula to calculate your BMI or go to nhlbisupport.com/bmi/bmicalc.htm for a quick calculation. Then check your BMI category below.

FORMULA:

$$\text{BMI} = [(\text{weight in pounds} \div \text{height in inches}) \div \text{height in inches}] \times 703$$

BMI CATEGORIES:

- * Underweight <18.5
- * Normal weight..... 18.5–24.9
- * Overweight 25–29.9
- * Obese >30