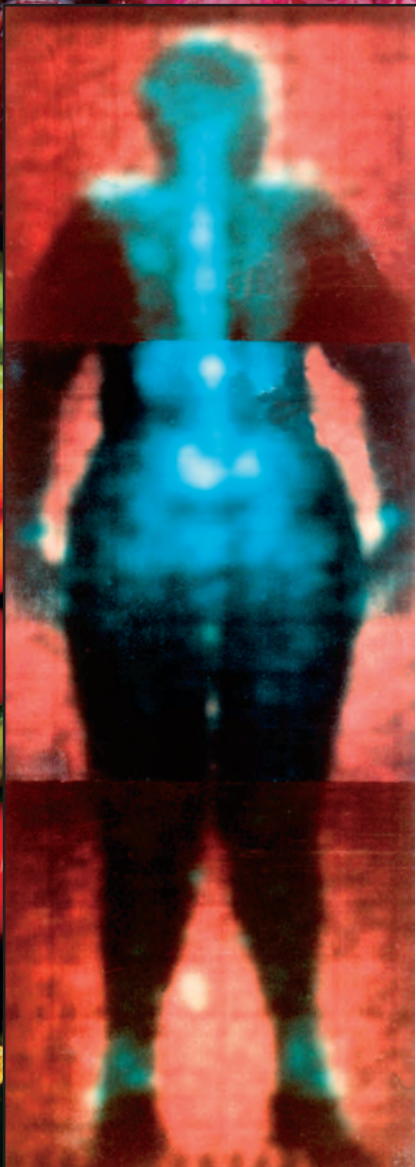


HEALTHY PEOPLE LIBRARY PROJECT

American Association for the Advancement of Science

# Obesity

*The Science Inside*



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# *Obesity: The Science Inside*

HEALTHY PEOPLE LIBRARY PROJECT

American Association for the Advancement of Science

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# INTRODUCTION

**W**ho wants to read anything else about how fat we are? It seems like you can't turn on the TV without someone on the news talking about how much we weigh, how much we ought to weigh, and how weighing too much is bad, bad, bad. It's almost enough to make you dig into that half gallon of ice cream you have in the freezer.

It's true that many of us do weigh more than we ought to and that weighing too much is related to certain health risks. That's just a fact of life, related to science. Our bodies need a certain amount of food to stay alive and work properly, and extra food can make us gain weight.

**Obesity**, or being too heavy for your height, is a serious subject. It's one of the worst **chronic** illnesses we now face. Today only one third of Americans weigh a healthy amount. Two thirds of Americans are **overweight**, meaning they weigh more than they should and are at risk for health problems, including obesity. Half of all overweight people—and a third of all Americans—suffer from obesity,



which can lead to serious health problems.

It doesn't have to be that way, though.

We can learn why our bodies act the way they do—what they need to work and what they do with extra food we eat. We can find out how to keep from gaining too much weight in the first place. We can learn how to change what we eat and how much we exercise in order to lose weight. We can find out what health conditions we're at risk for and be tested for them. We can become healthier, no matter what we weigh.

*Jennifer Portnick, a 240-pound, 5-foot-8 San Francisco aerobics instructor, believes healthy people come in all shapes and sizes. Exercising will help us live healthier lives, regardless of our weight.*



## Obesity: The Science Inside

This book will give you information about some of these things so you can help shape your body and your future. It will also provide resources for where you can go for more information. Write down questions you have as you go along. Your local librarian can help you look for some of the answers and point you to local resources. Your health care provider can help answer other questions you might have about your personal weight and health.

It's good to keep in mind that obesity is a medical problem. Just as people shouldn't be judged if they have high blood pressure or are

blind, they also shouldn't be judged because they suffer from obesity. Chronic health problems can be controlled. If you work to control your weight, the effects on your health—both in the short term and over time—will be positive. Losing even a little weight if you are obese can have a big impact on your health. It is possible to be healthier at any weight.

Obesity isn't a fun thing to think about. But the good news is that obesity is treatable and that, if you suffer from it, over time you can get down to a healthy weight. You are in control of living a healthy life and of becoming and being the healthiest person you can be.



# Part 1: What Is Obesity?

**O**besity is one of those words that you hear used on the news all the time. You have a general idea of what it means. But are you right?

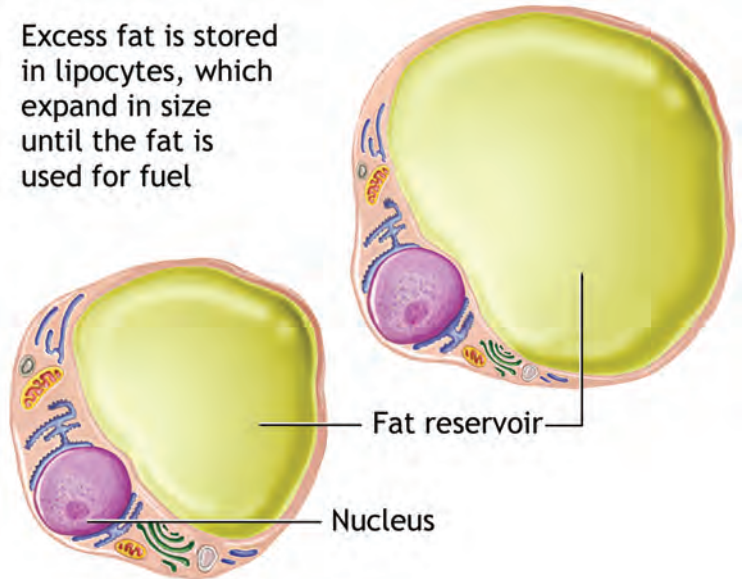
Medically, someone who is **obese** has more fat on his or her body than is considered a healthy average for his or her height and bone structure.

## What about fat?

In order to understand obesity, you have to understand fat. But fat is another term that can be confusing because there are two different kinds: **dietary fat** and **body fat**.

Dietary fat is a part of food. You want to have a little bit of fat in your diet because it serves as a major source of energy for your body. It is used to make cell membranes and compounds in your body that control blood pressure, heart rate, blood clotting, and other body functions. It carries certain vitamins from your food throughout your body. Fat gives you healthy hair, skin,

Excess fat is stored in lipocytes, which expand in size until the fat is used for fuel



and nails. In infants and toddlers, it helps the brain develop. Fat also helps you to feel full and tells your brain that it is time to stop eating. We will talk more about dietary fats in Part 4 on page 33.

Body fat is a part of the human body and what scientists mean when they refer to a person's weight or body composition. Your body needs to have a certain amount of body fat. It acts like a blanket to keep you warm. It

*When energy input is equal to energy output, fat cells (lipocytes) don't have to expand to accommodate excess energy. It is only when more calories are taken in than used that the extra fat is stored in the lipocytes and the person begins to accumulate fat.*



## Obesity: The Science Inside



*Healthcare providers may use devices called calipers to estimate body fat percentages.*

helps to cushion you against injury. In certain extreme cases, stored body fat is needed as the main source of energy to keep the body running.

But while your body does need a little bit of fat in it, it really isn't good to gain too much weight.

### Healthy weight

The key to overcoming obesity is understanding what weight is healthy for you. But how do you find out?

The most common way to determine a healthy weight for a person is by using a tool called the **body mass index (BMI)**. The BMI compares your weight to your height to figure out whether you are too heavy for your height.

The BMI does not measure how much of your weight comes from your muscles compared to how much comes from fat, though. If, for instance, you are an athlete taking part in a sport every day for several hours, the body mass index cannot tell that much of your extra weight is in your muscles. For that reason, some people prefer to use other tools to measure body fat.

Some doctors use **body fat percentages** to measure body fat. This method uses measurements of weight, height, and the amount of fat on different body parts to estimate body fat percentages.

Men and women need different amounts of fat in their body. Women's muscles do not have the same mass as men's, so their body fat percentage is higher.

### *Calculate your body mass index*

BMI is a math problem. It is figured out by dividing your weight in kilograms by your height in meters (squared).

If you don't know your height and weight in meters or kilograms, you can use the formula below to find your BMI:

Take your height in inches. \_\_\_\_\_

Multiply that number by itself to find your height in inches squared. \_\_\_\_\_

Take your weight in pounds. \_\_\_\_\_

Divide that number by your height in inches squared. \_\_\_\_\_

Multiply that number by 703 to get your BMI. \_\_\_\_\_

Let's say you are 5'4" tall and weigh 125 pounds.

If you are 5'4", you are 64 inches tall.

$64 \times 64 = 4,096$  inches squared.

$125 / 4,096 = 0.031$

$0.031 \times 703 = 21.793$

If the number is below 25, you are at a healthy weight.

If the number is at least 25 but below 30, you are overweight.

If the number is 30 or higher, you are obese.

Free BMI calculators are available on the Internet that will do the math for you.

In order for the body to work properly, men's body fat should not drop below 2% of their body composition. Women's should not be less than 10%. If a person's body fat percentage falls below those numbers, the body will not work right and the person may have health problems, such as heart disease and infertility.

Ideally, people who exercise regularly and eat a balanced diet will have a body fat percentage that is neither too low

nor too high. For women, body fat should not be more than 25% of their total body. For men, it shouldn't be more than 17%.

An obese person has a high amount of body fat. Women with more than 32% body fat are considered obese, as are men with more than 25%.

Figuring out your body fat percentage uses a complicated math formula. Health care providers can give you an

## Obesity: The Science Inside

### Body fat distribution

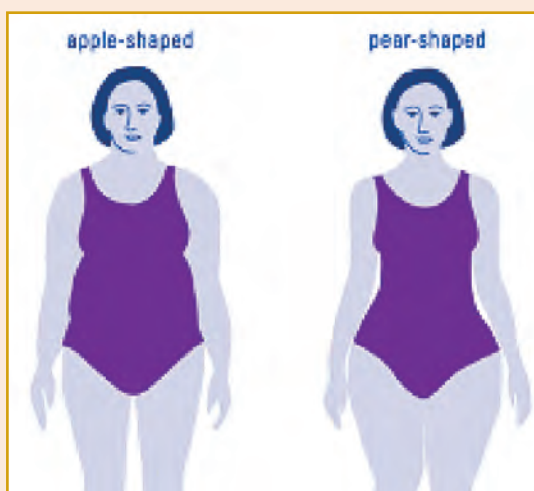
Doctors feel that it is important to know where your fat is located on your body. This can tell you whether you are at a higher risk of certain health problems.

#### WAIST CIRCUMFERENCE

Place a tape measure around the narrowest part of your waist (probably an inch or two above your belly button). The tape measure should be flat against your body. You are more at risk of having health problems if your waist measurement is more than 35 inches if you are a woman and more than 40 inches if you are a man.

#### BODY SHAPE

Doctors feel that it is important to look at not only how much body fat you have, but also where your body fat is found. If you are apple-shaped, storing extra weight around and above your waist, you may be more at risk for obesity-related health problems than those who are pear-shaped, storing their extra weight around their hips and thighs.



#### WAIST-HIP RATIO

The waist-hip ratio is a mathematical way to look at body shape. Measure around your waist (at its narrowest point) and then around your hips (at their widest point). Divide your waist number by your hips number to get your waist-hip ratio. For men, a ratio of .90 or less is considered healthy; women should aim for a ratio of .80 or less. If the ratio is 1.0 or more, you are considered to be at risk for health problems.

estimate using **calipers**, or tools that measure body fat in an area. You also can find calculators on the Internet. Use a calculator that asks for at least three measurements to get the most accurate number. You may need to know your height, your weight, and the measurement in inches around the widest part of your forearm (the arm between the wrist and elbow), your waist, and your hips. If you are using a computer in a public place to find out your body fat percentage, you may want to take these measurements at home or in a private place like a restroom.

### Overweight

Being overweight is the middle step between healthy weight and obesity. You are overweight if your weight is above what is thought of as healthy for your height. On the body mass index, most adults are overweight if their body mass index is between 25 and 29.9.

Being overweight is a problem in the United States. A third of all adult Americans are overweight. Seventeen percent of teenagers are overweight. Even children are affected—19% of all children between the ages of six and 11 are overweight.

## Part 1: What Is Obesity?

If you are overweight, you are at high risk for obesity. And even if you don't become obese, you are at a higher risk than a person with a healthy weight of having certain serious health problems, particularly diabetes, high blood pressure, high cholesterol, and heart disease. You are also more at risk for less serious health problems, such as bone and joint problems or pain, shortness of breath or asthma, and sleep disorders.

### Childhood obesity

Obesity is not just a problem for adults. Teenagers, adolescents, and even pre-schoolers are beginning to show signs of obesity in greater and greater numbers. Fifteen percent of children and 16% of teens were obese in the year 2000. These numbers are almost four times what they were in the early 1970s. An additional 15% of children and teens are at risk for becoming overweight.

Childhood obesity has real-time effects in everyday life. Children need exercise and healthy foods in order to grow and learn.

Kids who go without healthy, balanced meals during their growing years are likely to suffer a number of problems, including

fatigue (keeping them from concentrating and learning) and poor cognitive development (affecting their performance in school). Children need a proper diet of nutritious food to stimulate growth and to give them energy. Breakfast is particularly important to sustain a child's ability to concentrate at school.



*Fifteen percent of children are overweight. Between 26 and 41% of them will still be overweight as adults.*



## Obesity: The Science Inside

Unfortunately, children today get much less exercise than in previous generations. While your mother may have walked to school every day, your children now ride the bus or in a car. Your father played stickball or tag after school; now kids play video games or are on the computer or watch TV.

Many schools have tried to avoid cutting lesson time by cutting gym classes or recess instead. Without proper time for exercise, children can become overweight. It can also lead to problems focusing in class,

with some kids acting tired and others being hyperactive.

In addition to problems with concentration, childhood obesity can lead to the early onset of **puberty**, the period of sexual maturation where children's bodies become capable of sexual reproduction.

Childhood obesity is also linked to what used to be thought of as adult diseases, like type 2 diabetes and high blood pressure. The number of children with type 2 dia-

*A resident of public housing in the South Side of Chicago, IL, weeds the community vegetable garden as part of a USDA urban revitalization program.*





betes quadrupled in the mid-1990s. Obese children are nine times more likely than children with healthy weights to suffer from high blood pressure.

Your school nurse or **pediatrician** can help you find out if your child is overweight or obese. Your health care provider may use pediatric BMI charts (which are slightly different than adult BMI numbers) to figure out if your child is at a healthy weight. Other doctors still use **height-weight growth charts**, particularly with young, growing children, to determine whether your child is at a healthy weight. Doctors can use these charts to compare your child's height and weight to other children of the same age and gender to make sure your child is growing and gaining weight properly.

It's important to help obese children lose weight sooner rather than later. Approximately one third of overweight preschoolers will grow up to be overweight adults. But by the time those children become teens, their risk of remaining overweight as adults has risen to 50%.

### The uneven impact of obesity

Obesity does not affect all people or groups alike. Accord-

ing to the Centers for Disease Control and Prevention, African American women, white men, and the poor are very likely to suffer from being overweight or obese.

The CDC also reported in a 2005 survey that 33% of African Americans, 28% of Native Americans, and 26% of Latinos say they are obese compared to 21% of Caucasians and only 6% of Asian Americans. If the category is broadened to include overweight as well as obesity, the numbers go up significantly—to 78% of African American women, 70% of white men, and 65% of poor people.

Among children, the trends remain true, too. African American girls are almost twice as likely as white girls to be overweight. Mexican American children's obesity rates are more than double those of white children. Thirty-eight percent of Native American children are overweight.

While Asian Americans have traditionally not suffered much from overweight or obesity, their children are beginning to catch up to other children in terms of weight problems. The percentage of overweight Asian American children in California, the state with the most Asian Americans

## Obesity: The Science Inside

in the United States, more than doubled to 15% between 1994 and 2003.

The problem has continued to grow worse over the last 15 years. The rate of obesity among African Americans and Mexican Americans rose by 120% as compared to 50% among whites.

Economics is another reason for the uneven impact. Millions of Americans cannot afford health insurance or expensive treatments. Health insurance pays for things like medicine and doctor visits. People whose jobs don't offer them health insurance, or who can't afford it on their own, often aren't able to afford to go to the doctor regularly. Without a doctor's care, it can be harder to find out what

you weigh, find a healthy diet plan, and be screened for health conditions that can arise from being obese, such as diabetes or high blood pressure. People without health insurance also often receive worse care than those who can afford to pick their doctors. People from lower socioeconomic groups also tend to have less nutritious diets and to be less physically active. Healthier foods are often more expensive than unhealthy foods. Often poorer families live in areas without easy access to a grocery store and have to rely on stores with fewer options for their shopping. In addition, people living in poor areas have fewer opportunities to live active lifestyles due to safety concerns and fewer parks or low-cost gyms.

### *Childhood Obesity— A Growing Problem*

Growing up as an overweight kid in Mexico City, Mexico, Norell Rosado was the picture of health—at least in his mother's eyes.

Now, as a pediatrician who works with overweight children and their parents, Rosado knows his mother isn't alone in her desire to raise robust kids. "There's this perception, especially in the Latino community, that being plump means a child is healthy. The problem is that if a child is overweight when they are 18–24 months, chances are they will be obese as an adult."

Rosado is a classic case in point. He entered life as a heavy baby and the pattern continued throughout childhood. It's easy to understand why: growing up, he had to look no further than his family's pantry for high-calorie sweets and snacks. Mealtimes meant big portions of foods high in fat and carbohydrates, and desserts were a daily part of his diet, as was a nighttime snack of sweet bread.

As a college student and as a medical resident, Rosado continued making unwise food choices—a practice that would result in his weight ballooning to more than 200 pounds, about 20% more than the ideal weight for his 5'9" frame.

After residency, Rosado began working at the Pediatric Obesity Clinic at Mount Sinai Hospital in Chicago, Illinois, where he counseled families about the dangers of obesity. It was a subject that hit too close to home. So several years ago, at age 30, he decided he had had enough. "Here I was counseling parents about the dangers of being overweight, and I was heavy myself," Rosado admits. Rosado dropped 45 pounds, but not everyone was pleased. "My mother continues to call me asking if I'm still skinny,"

Rosado says with a chuckle. "She worries that I don't eat enough."

Of course, it's the extra pounds, especially in children, that should cause alarm.

Coinciding with the rise in childhood obesity has been a frightening increase in type 2 diabetes in children. Obesity can also lead to heart disease, liver disease, high blood pressure, and joint problems. Not incidentally, obesity in children can also affect their self-esteem.

Because of the dangers associated with childhood obesity, early intervention and family support is critical, says Rosado, who works predominantly with the Latino community. He begins educating parents about proper nutrition when their baby is about nine months—the age when table food is typically introduced. If the wrong foods are at the dinner table, the child is in trouble.

The problem is that parents often believe long-standing nutritional myths, including that fruit juice and sports drinks, which often contain lots of sugar, are nutritious, and that a child can never consume too much milk. These beliefs and others like them have contributed to childhood obesity in the United States doubling over the last 10 years, with one child in nine being considered far beyond the healthy range.

By working together on food selection, portion control, and exercise, Rosado believes families can achieve their weight loss goals and help ensure a healthier future.

"Children cannot lose weight on their own. They need a parent who can help them make smart food choices and who will encourage them to exercise."

And for overweight kids who feel that a healthy weight is a struggle that can't be won, Rosado is living proof to his patients that it can.



## Part 2: What Causes Obesity?

**N**ow that we know what obesity is, we can ask what causes it? If being overweight is such a bad thing, why are so many Americans so heavy?

A long time ago, when food was hard to find, people had to work hard to eat. Some people were hunter-gatherers, and they had to chase animals around to catch them for food. Other people had to move from place to place as they gathered up all the resources in each spot or as the animals they were hunting moved on. Other people were farmers and they had to work hard in the fields to make things grow. Either way, people used up a lot of energy to bring food to the table. Food was used as a fuel (the way you put gas in a car to make it go). Any food that wasn't burned up right away in your daily activities was stored by your body for times when it would be harder to find food, like winter or times of drought.

Over time, though, the way we get food has gotten easier. Most of us don't need to hunt wild animals or gather berries in the woods for our dinner. And very few of us live on farms where we have to take care of our animals or work in the fields.

Today most of us hunt for food in the grocery store and gather it off the shelves. We live in places

*When people had to farm to get food to eat, they used up as much energy to bring food to the table as they got from eating that food.*





## Obesity: The Science Inside

### *Why do our bodies store energy?*

Back when humans were hunter-gatherers (which seems long ago, but was for most of the time that human beings have existed), their very time on earth demanded they be active in order to follow their prey or to gather fresh fruit, grains, and vegetables. Because these people were always traveling, they could only hunt or gather what they could carry with them. There was no point in taking more than they could use, because it required too much work to take with them.

To survive long winters, the human body evolved. It stored any excess energy in fat cells so it could draw on that resource when new energy sources were hard to come by (like a savings account or a rainy day fund). So if there wasn't any food to eat one day, the body could use up spare energy it had stored in the fat cells. Eventually, the body would either find new energy, or it would use up the energy the body had stored and would die.

Later (about 10-12,000 years ago), people began to farm. This also required a lot of energy, so people were still very active. However, they had stopped traveling so much, so they were able to save extra food for when times were hard. They didn't have to rely as much on their own personal ability to save extra calories for later. Because they were still using up lots of energy just to exist, though, obesity was still rare.

Nowadays, food is readily available almost everywhere in the developed world. We tend to stay put much more, and time- and energy-saving machines have made it so that even if we work a job that requires a lot of physical activity, we don't use up as much energy as our ancestors did. Society has evolved to make life easier, but our bodies still believe we should be hunter-gatherers and are outdated in terms of the need to store spare energy.

where we drive or take public transportation to the grocery stores. We buy food that someone else has made. Often times, we just have to pop it into the microwave, and we don't even have to work in the kitchen to have a meal.

While this is really good for letting us do other things we'd



## Part 2: What Causes Obesity?

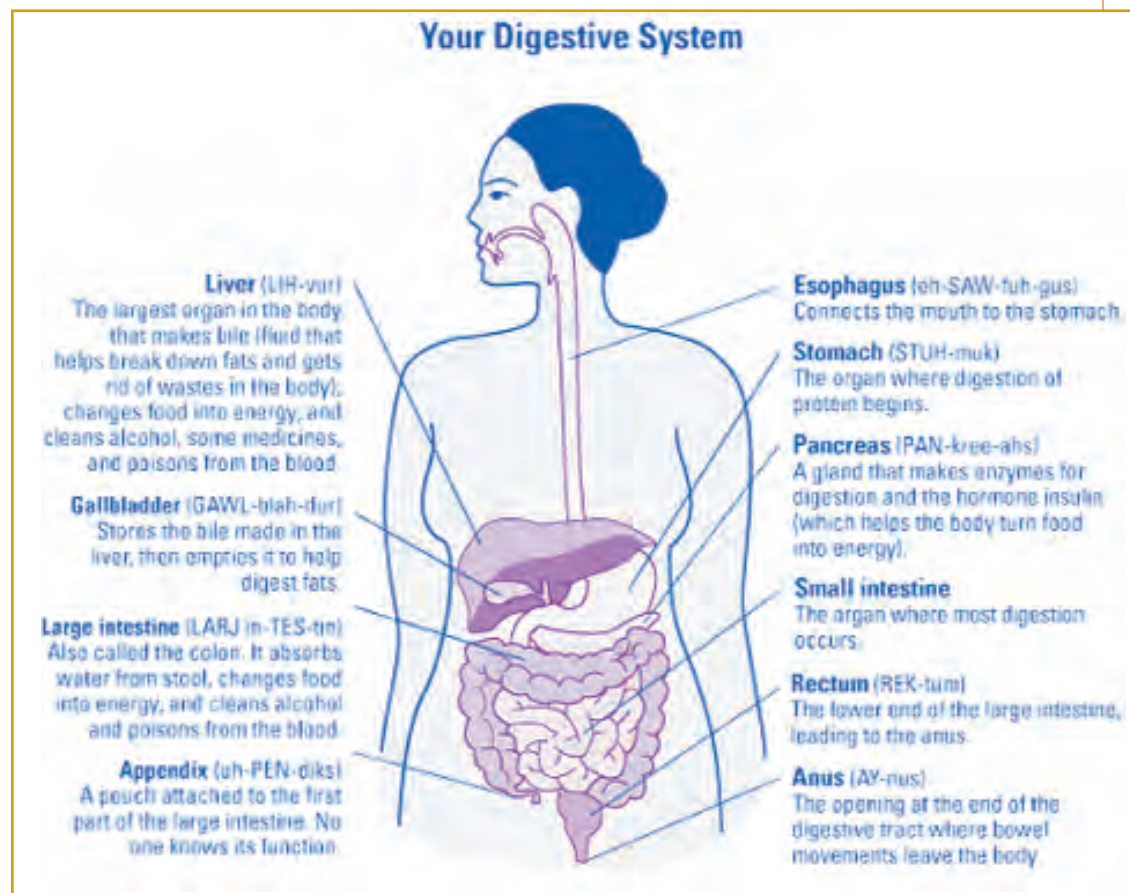
rather spend time on, it's not how our bodies are meant to work.

### Bad eating habits

Natural and healthy foods are best for the human body. But let's face it; few of us actually eat only foods you can find in nature. These days, it's actually hard work to find, prepare, and eat only those foods. It's much easier (and cheaper!) to find a candy bar or a soda at the local corner market than it is to buy an apple or a cup of yogurt.

For most of us, eating unhealthy things every once in a while won't hurt us. What will hurt us is when we eat them regularly.

The main link between our eating habits and obesity is how much food we eat. Back when people were farmers or hunter-gatherers, they didn't have easy access to food and so people ate small portions and few meals a day. As it became easier to get food, people began eating more meals and bigger portions.



### HIDDEN SUGARS

*Sugars are often hidden in the labels of foods. While you may see sugar listed in the ingredients, you should also look for these “hidden sugars”:*

Corn syrup  
High-fructose corn syrup  
Fruit juice concentrate  
Honey  
Molasses  
Brown sugar  
Dextrose  
Fructose (sugar found in fruit and fruit products)  
Glucose  
Invert sugar  
Lactose (sugar found in milk products)  
Maltose  
Malt syrup  
Maple syrup  
Raw sugar  
Sucrose  
Syrup

In fact, even over the last 30 years, portions have gotten bigger. Twenty years ago a bagel was three inches in diameter and contained 140 calories. Today’s bagel is twice that size and contains 2<sup>1</sup>/<sub>2</sub> times the calories. And at fast food restaurants and movie theaters today the small-sized soda is the same size as our parents’ large size.

But just because times (and portion sizes) have changed doesn’t mean the body’s way of reacting to food has.

The basic unit of energy in food is called a **calorie**. All the foods you eat have different amounts of calories. But one calorie in one food is equal to one calorie in another food. And a calorie of protein is the same as a calorie of fat. In other words, a chocolate cake calorie is the same as a collard green calorie. (Chocolate cake has a lot more calories than collard greens, though!)

After you eat food, it moves to the stomach to be digested.

All the activities you take part in use up different amounts of calories or energy. Even the things your body does that you don’t have to think about—growth, thought, movement, breathing—use up

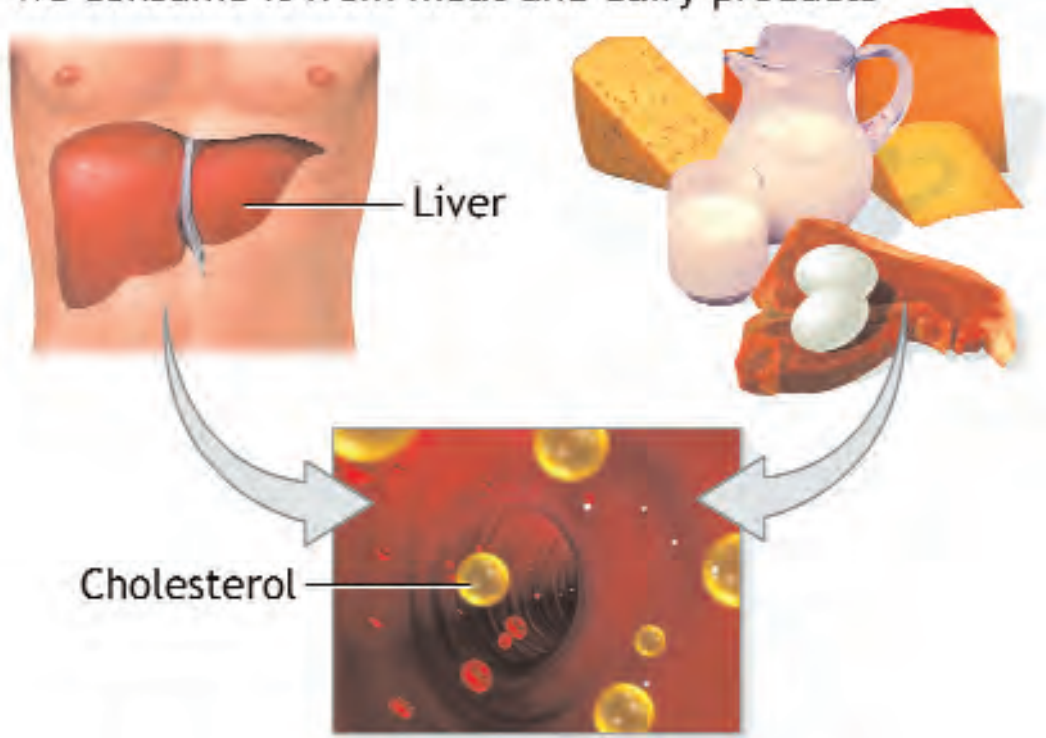
energy.

The body works best when it has a balance between what goes into the body and what the body puts out. In other words, you should try to eat about the same number of calories your body will use up. How many calories we use depends on three things:

1. ***How much muscle we have.*** Our muscles use energy all the time, and they use up the majority of the calories we should put into our body.
2. ***How much we weigh.*** It takes energy to move each pound from place to place.
3. ***How far we go.*** Moving our bodies takes energy. Walking requires more energy than standing still because we move our bodies over a distance. Running for 10 minutes uses more energy than walking 10 minutes. But running two miles and walking two miles use up almost the same amount of energy because you have traveled the same distance.

Most of us, though, tend to put in more calories than we use up. We eat big portions, or we snack on foods that are high in calories, or we eat all the time. In fact, Americans tend to eat 3,800 calories a day—nearly twice the average amount we should.

Cholesterol is produced by the liver and we consume it from meat and dairy products



When we consume more calories than our body can use up, the body thinks we are trying to store those calories for later and converts them into fat cells. One pound of fat is only 3,500 excess calories. (You have to use up an additional 500 calories above what you consumed every day of the week just to lose one pound!) Store too many extra calories and have too much fat, and you're at risk of becoming overweight or obese.

Our bodies need certain kinds of nutrients in our food because they provide important things to keep us healthy. We need proteins (made up of amino acids) to grow, build and keep up the body's organs, tissues, and muscles, and to help with digestion. We need carbohydrates, which provide energy. We need certain types of dietary fat to grow and develop as babies, to insulate the body, to create some hor-



### Cholesterol

Cholesterol is a soft, waxy substance found in all areas of the body, including the heart, liver, intestines, muscle, skin, and nervous system. It is produced by the liver and derived from animal-based foods (like meat, eggs, and butter) in the diet. Its job is to help form cell membranes, some hormones, and vitamin D.

There are two types of cholesterol: “good” and “bad.” “Bad” cholesterol (LDL) flows from the liver to the rest of the body. When there is too much LDL cholesterol in the bloodstream, some of it can stick to the inside of the arteries, causing a buildup of plaque and hampering the flow of blood. This can lead to stroke or heart attacks. It is recommended that people maintain blood levels that are low in “bad” cholesterol and relatively high in “good” cholesterol. “Good” cholesterol (HDL) flows back in the blood from the rest of the body to the liver. It helps blood vessels and the liver to clean up and eliminate excess cholesterol.

The healthiest levels of cholesterol are:

**Total cholesterol:** Less than 200

**LDL:** Less than 100

**HDL:** Greater than 40

Your health care provider can tell you your cholesterol levels after drawing some of your blood and testing it.

mones, to absorb some vitamins, and to have healthy hair, skin, and hearts.

In addition to just plain eating too much, we also eat too much of the wrong things, in particular sugar and fats. Americans have a sweet tooth. We start the day with sugary cereals. We like desserts. We eat lots of sweet snacks.

Sugar is a **carbohydrate**, as are starches and fiber. (The word “carbohydrate” is sometimes shortened to “carb.”) Carbohydrates provide energy for the body, especially the brain and the nervous system. The liver breaks down all carbohydrates into **glucose** (blood sugar), which the body uses for energy. There are two types of carbs: simple and complex. The body processes simple carbs quickly. Those found in nature, such as fruits and fruit juices, milk products, and some vegetables, can be a quick source of healthy energy for your body. Refined sugars, such as table sugar, candy bars, and soda, are not healthy. They are also simple carbs, but while they provide calories, they don’t add anything else your body needs, like vitamins, minerals, or fiber.

Complex carbohydrates, found in foods like beans, whole grain bread and cereal, and starchy vegetables give your body not only calories but also vitamins, minerals, and



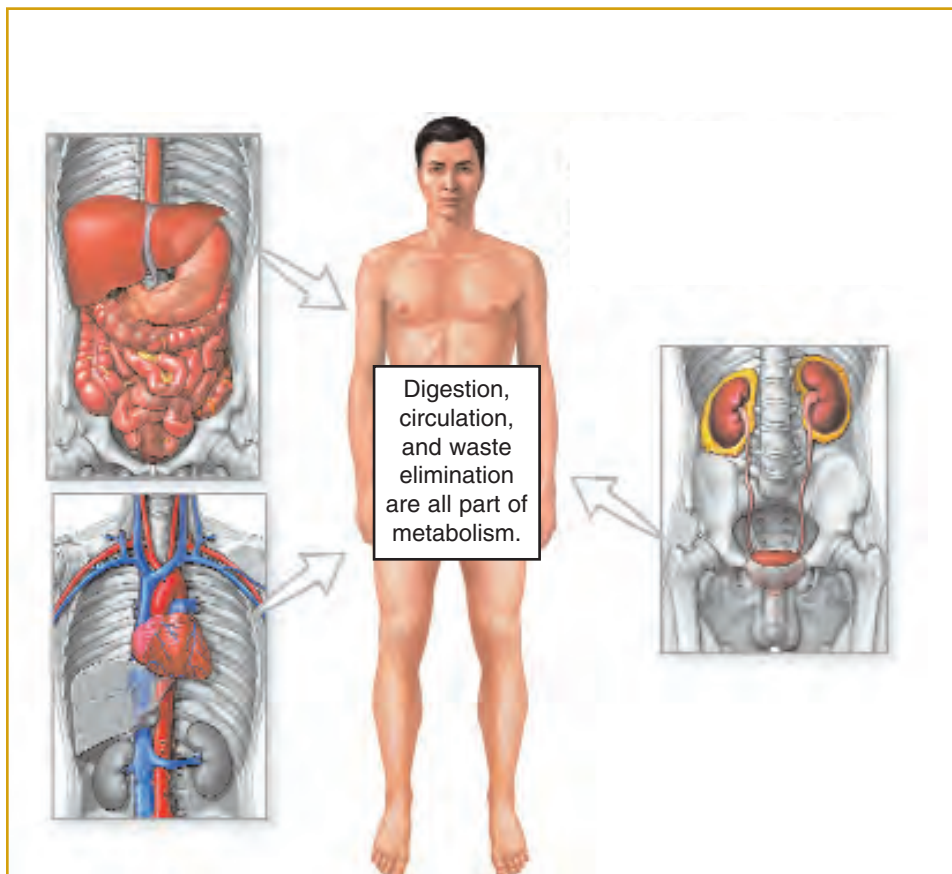
## Part 2: What Causes Obesity?

fiber. They take longer for the liver to break down and leave you feeling full longer. (Foods like white bread and white rice have been processed, contain less fiber and more simple sugars, and will not keep you feeling full for as long.)

The other things we tend to have too much of in our diets are the bad kinds of fat. We eat foods that are cooked in animal-based fats (butter or lard). We eat fatty cuts of meat. We eat ice cream and put half-and-half in our coffee.

There are four different types of fats in our diet. The first two are **unsaturated fats** (monounsaturated fats and polyunsaturated fats) and are found in olives and olive oil, most nuts, avocados, fish, and most liquid cooking oils, such as corn and soybean. These types of fats give us a good balance of **cholesterol** in our bloodstream.

The fats that increase our bad cholesterol levels are **saturated fats** and **trans fatty acids**. Saturated fats are found in whole milk and other dairy products,



## Obesity: The Science Inside

red meat, chocolate, and coconuts. Trans fatty acids are the fats that were invented in order to eat less saturated fat and to give foods a longer shelf life. They are the worst type of fat you can eat, and you should try not to include them in your diet. Trans fats include partially hydrogenated vegetable oil, vegetable shortening, and most margarines. They're found in anything deep-fried, like french fries, and many other fast foods, as well as most baked goods you buy at the store (and at many bakeries).

### Metabolism

The chemical processes of maintaining and sustaining your body are called your **metabolism**. Metabolism includes digestion, waste elimination, breathing, circulation, and temperature

regulation. By the time adults enter their 30s, their metabolism naturally begins to slow and the body becomes less efficient at processing calories. This slowdown can be reduced, however, by increasing muscle building exercise and physical activity.

### A lack of exercise

As we've already talked about, your body works best when it is using up the same number of calories you're putting into it. Those farmers and hunter-gatherers used up a lot of energy getting their food and preparing it. Today, we live a very **sedentary** lifestyle. In other words, we don't get up and move enough.

Technology and modern life have made things very easy for us. We have remote controls for our TVs



### How to exercise off your food

This much food	Contains this many calories	That you will have to do this much exercise to use up*
1/2 cup carrots	25 calories	5 minutes of grocery shopping
4 oz. unsweetened juice	60 calories	15-minute stroll
1 medium egg	75 calories	15 minutes of playing Frisbee
1/2 English muffin	80 calories	11 minutes of gardening
1 cup fat-free milk	90 calories	27 minutes of ironing
1 ounce cheddar cheese	115 calories	12 minutes of housecleaning
1 12-ounce can of cola	160 calories	35 minutes of weight-lifting
1 croissant	235 calories	37 minutes of swimming
1 hamburger	245 calories	30 minutes of working out at the gym
1 pan-fried pork chop	335 calories	38 minutes of half-court basketball
1 cup chili con carne with beans	340 calories	45 minutes of raking leaves
1 cup potato salad made with mayonnaise	360 calories	30 minutes of touch football
1 cup moist bread stuffing	420 calories	31 minutes of stair climbing
1 slice pecan pie	520 calories	58 minutes of shoveling snow
1 cup oil-roasted peanuts	840 calories	81 minutes of soccer
*These figures are approximate and are based on a 200 pound person exercising at a moderate level. Someone who weighs less will use up fewer calories during the same time period.		

and our stereos so we don't have to get up to change the channel. We can pop food into the microwave and go watch TV while dinner cooks instead of standing in the kitchen for hours. We can drive or ride public transportation instead of walking to work, school,

or the shopping center. We sit in front of computers, TVs, or video games all day. We ride elevators to get to our apartments or offices instead of taking the stairs. The statistics are stunning. Nearly 38% of all Americans get no exercise at all. Nearly 55% of Native

## Obesity: The Science Inside

### OBESITY AS A SYMPTOM

*Mild or even moderate obesity can also be a symptom of certain health conditions. If you know you have one of these health conditions (or if you suddenly gain weight for no obvious reason), you should talk to your doctor:*

- *Thyroid disorders*
- *Cushing's syndrome*
- *Hormonal imbalances, such as polycystic ovary syndrome*

Americans, 52% of Latinos, and 50% of African Americans report that they are inactive. People who haven't graduated from high school and who lack a GED are even worse off—61% of them get no exercise—as well as 55% of poor people. People who live in the city get more exercise than people outside a city area. Geographically, Southerners are 8% less active than people in the rest of the country. The good news among the numbers? Without exception, people are slowly becoming more active.

Sometimes we don't get enough exercise by choice. We choose to take the elevator instead of the stairs. We prefer watching TV to going outside to the park. Other times, things that are out of our control make getting exercise harder. We live in a town where there are no sidewalks. Our neighborhood is dangerous and kids shouldn't play outside. We have a health condition that makes it hard to exercise. We can't find the time to exercise between working two jobs. (Some low-cost ways to fit in exercise can be found in Part 4 on page 36.)

### Genetics

Health research has shown that **genetics** is linked to obesity and the health conditions it can cause.

Genetics is the field of science that looks at how **genes** are passed down from one generation to another to influence traits.

Some people have a **genetic predisposition** to a certain disease if there is a history of the disease developing in members of their family or in people from their same ethnic background.

Obesity seems to run in families. Some of that can be attributed to similar lifestyles and eating habits. But not all of it. For instance, while having two obese parents makes a child six times more likely to become obese himself, having only one obese parent still makes a child twice as likely as children of non-obese parents to be obese.

Genetics works in other ways, too. Fat cells produce an appetite-controlling hormone, leptin, which is supposed to tell the brain that the body is full. When you have fewer fat cells, less leptin is produced and the brain believes it needs to eat. Most obese people have higher leptin levels than average, which should mean that their bodies don't want to eat. But somewhere in their bodies, the message from the leptins gets lost. Scientists think that a person's genes could cause this malfunction.





*Obesity can run in families. If you have overweight relatives, you might be at risk, too.*

## Obesity: The Science Inside

### *A Losing Proposition for Life*



Something strange happened when Adona Leonard turned 25 years old. Her waistband began to pinch. A roll of flesh appeared that wasn't there a year earlier. Her face became

fuller, as did her arms, legs, and hips.

Her body—always lean in spite of being raised on southern cooking—was suddenly storing fat in ways it never had before. Seemingly overnight, Leonard packed on 30 extra pounds.

"I tried dieting, and I lost a few pounds, but I wasn't really committed to losing weight until my mother died when she was only 59 years old," explains Leonard, a stylish woman with a bright, vibrant smile. "That's when it clicked: I had to be healthy or I would follow in the footsteps of my mom and the other women in my family." The women in her family, Leonard says, tend to be overweight and suffer from a host of serious health conditions, including diabetes and high blood pressure—life-threatening conditions that often come with being overweight.

With a steely resolve that came with knowing that she wanted to live a long and full life, Leonard joined a national weight loss program that focuses on eating nutritious foods, exercise, behavior modification, and emotional support. It wasn't her first time joining the program, though for her, the third time really was the charm.

"I wasn't so concerned about the numbers on the scale. In fact, it took me a year to lose all the weight that I wanted," Leonard says. "Losing weight slowly didn't bother me because I knew that I wanted to make long-term changes that would result in my being healthier."

For instance, Leonard used to think a plate of collard greens and other vegetables drenched in butter and flavored with ham hocks was an example of healthful eating. "After all they're vegetables, right? A lot of people are like that. They think they are eating well, but they don't know what they are really putting into their bodies," says Leonard.

After a year of faithfully attending weight-loss meetings, walking on a treadmill at home, and breaking a lifetime's worth of bad eating habits, Leonard's waistband stopped pinching: She'd lost 28 pounds.

Still, three years after reaching and maintaining her goal, Leonard still attends several weight loss meetings a week and even totes a portable scale with her to many of the meetings. That's because instead of attending the weight loss meetings, she is leading them.

And she's doing it with more than a pinch or two of humor, an extra serving of enthusiasm, and a healthy portion of encouragement.

"Who's a 'big loser?'" she asks at the start of many of her meetings—held throughout Montgomery County, Maryland. To Leonard's sheer delight, a number of people proudly wave their hands.

If they continue their winning ways, Leonard—no doubt—will be seeing a lot less of them in the future. And that would keep a smile on her face.

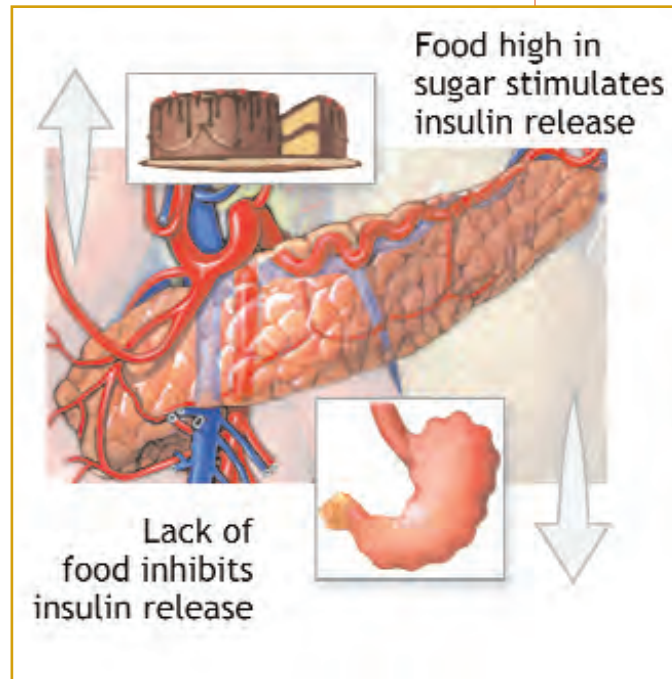


# Part 3: What Problems Can Obesity Cause?

**W**hy is obesity such a big deal, you might ask. Most of us, after all, carry around a little extra weight or would like to be a little thinner. What's it hurt if we gain a few pounds?

You might be surprised to know that it can hurt—a lot. Five out of the top ten chronic diseases are related directly to overweight and obesity. They can lead to some of the deadliest preventable health problems out there—diabetes, heart disease, high blood pressure, high cholesterol, stroke, and even cancer. In addition to those major health problems, diabetes has also been linked to a number of less severe but still chronic health conditions including arthritis. According to the leading British medical journal, obesity has even been linked to premature aging. Being obese can make your body think you're up to nine years older than you actually are!

In addition to the impact on our own health, obesity affects society and those around us in gener-



al through the higher cost of health care. Let's look at some of these problems in more depth.

## Diabetes

Overweight and obesity are key triggers for type 2 **diabetes**.

Glucose is a form of sugar found in food. When the body digests food, glucose moves into the bloodstream. In response the body is supposed to release a

*When the body's cells don't react right to insulin, it is a condition known as diabetes.*

## Obesity: The Science Inside

**hormone** called **insulin**. An organ called the **pancreas** releases insulin, and it triggers the opening of body cells so glucose can enter and be used for energy.

When the body's cells resist the action of insulin, this is known as **insulin resistance** and is the cause of type 2 diabetes. Diabetes is a chronic disease, so while it can be prevented and controlled, it cannot yet be cured.

If glucose doesn't move into the cells, too much stays in the blood. This makes a chemical imbalance in the body which increases the fats in the blood and which can damage the **blood vessels**, the pipelines through which blood travels to all parts of the body.

Diabetes is a serious condition alone, but it can also lead to other health problems if it isn't controlled, including blindness, heart disease, stroke, pregnancy complications, **kidney disease**, and circulation problems that can lead to amputations.

Carrying extra fat appears to trigger insulin resistance, though researchers do not yet understand why. What they do know is that more than three-fourths of all people with type 2 diabetes are overweight or obese.

Early findings from the Diabetes Prevention Program suggest that for those people who are at high risk for diabetes, there is some bright news on the horizon. With intensive lifestyle changes consisting of diet and exercise, overweight people who lost five percent of their body weight and who exercised moderately at least 30 minutes a day, reduced their risk of getting type 2 diabetes by 58 percent.

People who already suffer from diabetes can also improve their health by losing 10% of their body weight. By losing weight, you help control your blood sugar levels, which, in turn, can lower the amount of medicines you need to take.

### **High blood pressure**

Obesity is a key risk for **high blood pressure** (also called **hypertension**).

Every time your heart beats, it pumps blood through **arteries**, exerting pressure (or force) on the inside of your blood vessels. This is called **blood pressure**. Normal blood pressure is below 120/80. (The two numbers reflect the measurements of the pressure in the arteries when the heart is pumping and when it is resting.)



If the pressure caused by the blood on the arteries is too high, it is known as high blood pressure. If this condition isn't treated, it will cause damage to the arteries and put strain on the heart. This can lead to serious health problems, including heart disease, stroke, kidney failure, and blindness.

When a person gains weight, his or her blood levels also increase, causing the heart to pump more blood. The additional weight also can cause a person's blood pressure to rise because it can increase cholesterol levels, which may lead to a further straining and hardening of the blood vessels and heart.

Losing weight helps lower blood pressure. Losing just 10 pounds if you are overweight will help to lower your blood pressure several points. The more weight you lose, the lower your blood pressure will be. In addition to that, modest weight loss, with or without lowering the amount of sodium you consume, can lower your risk of developing high blood pressure by up to 20% if you are overweight and at high risk of developing the condition.

### Heart disease

Obesity and its complications are among the top risks for heart disease.

**Heart disease** is a term used to describe a variety of illnesses in

## Obesity: The Science Inside

which the heart doesn't work or pump right. It is caused by the narrowing of the arteries that feed the heart.

Heart disease causes about 40% of the deaths in the U.S. People who are obese or overweight are twice as likely to develop heart disease and are much more likely to die from it.

The risk of heart failure increases for each additional point of a person's BMI (4–8 pounds). For men, their risk increases by 5%; for

women by 7%. Similarly, losing just 10% of your body weight can reduce your risk of developing heart disease by improving how your heart works and lowering your blood pressure and cholesterol.

A diet high in saturated and trans fats has been shown to lead to heart disease.

Seventeen percent of the total cost of heart disease, \$8.8 billion, is related to overweight and obesity.

### *Reduce your sodium levels, too!*

In addition to the unhealthy ways we eat that contribute to obesity, we also have too much **sodium** into our diets. While this is not a direct cause of obesity, it does contribute to other health problems, like high blood pressure and heart disease.

You should not have more than 2,300 milligrams of sodium a day in your diet. This is about the amount of salt in a teaspoon. A better amount to aim for is 1,500 milligrams of sodium a day.

Most Americans eat two to four times that amount every day. Some of that sodium comes from salting our food when it's cooking or when it gets to the table.

Most of it, though, is hidden in the food before it gets to us. Processed foods (food that is mass-produced or that is changed before it gets to us) contain salt or salt products to give them more or a different flavor or to give them a long shelf life. That means that instead of the food spoiling quickly, the way it would in nature, it stays fresh on the shelves of your grocery store. Salt is also found in many flavorings.

Processed foods that are high in sodium include frozen dinners, canned foods, catsup, potato chips, and rice blends (as opposed to rice without flavorings added to it). Other foods that are high in sodium include cured meats, such as ham, and pickled foods, such as dill cucumber pickles.

Lower the amount of sodium you have in your diet by eating fresh foods. Frozen vegetables contain less sodium, but if you prefer canned vegetables, make sure you rinse them before you cook them. Use lemon, herbs, or spices to season your food instead of table salt.

A little bit of salt in our diets is okay. But when we only eat foods that come out of boxes or bags, we're getting more salt than our bodies can handle.

### High cholesterol

Because overweight and obese people often eat diets high in saturated and trans fats, they often have high cholesterol levels.

Roughly a quarter of those who are overweight or obese have high cholesterol.

High cholesterol is a risk factor for stroke and heart disease.

Eating less saturated fat, avoiding trans fat, and increasing the proportion of unsaturated fats and fiber in your diet can lower cholesterol levels.

### Stroke

Obesity is a risk factor for a **stroke** as well.

A stroke is what happens when an artery carrying oxygen to the brain bursts or becomes blocked by a blood clot or some other particle. The brain doesn't get enough oxygen and its nerve cells begin to die. The nerves in the brain control different parts and functions of the body and if the nerves die, then those parts or functions don't work right.

Obesity can cause the risk factors for stroke—high blood pressure, diabetes, high cholesterol levels, and heart disease—as well as being a risk factor itself. Stroke is the number three killer among all diseases.

As mentioned earlier, losing weight seems to have a direct impact on lowering blood pressure, which is a key risk factor for stroke.

### Sleep apnea

Obesity, particularly in the upper body, is the main risk factor for obstructive sleep apnea.

**Obstructive sleep apnea** is a condition in which a person regularly stops breathing while asleep because of an obstruction in the airway. It can lead to fatigue during the day and difficulty with logical thinking skills.

People who are more than 100 pounds overweight are 12–30 times more likely to have sleep apnea. About 7% of obese children suffer from sleep apnea. Two thirds of the people with obstructive sleep apnea are obese.

*A girl adjusts the straps on the mask she wears at night to treat her sleep apnea.*





## Obesity: The Science Inside

Obesity also contributes to other sleeping disorders, including day-time sleepiness.

Losing weight can help to improve the **symptoms** of this condition.

### **Arthritis**

Obesity has been linked to osteoarthritis and gout.

**Arthritis** is pain, swelling, and stiffness in the body's joints, which causes permanent damage to the joints. Osteoarthritis is the most common kind of arthritis and usually affects older people. Obesity can cause it to happen earlier. Obesity particularly affects osteoarthritis in the hands, hips, back, and knees. It is possible both to keep osteoarthritis in the knees from getting worse and to get rid of symptoms of the condition by losing weight.

**Gout** occurs when too much uric acid builds up in the body, leading to the development of needle-like crystals in the joints (particularly the big toe), uric acid under the skin, and kidney stones. Being overweight is linked to gout because there is more tissue in the body and more uric acid. An increase in uric acid also can be related to eating a diet heavy in certain foods, including alcohol or organ meats such as liver.

Weight loss can lower the stress on knees, hips, and back and can improve the symptoms related to gout and arthritis.

It should be noted that if you have suffered from gout before, you should talk to your doctor before beginning a diet. Some diets increase uric acid in the body for a period of time, and this can lead to a flare up of the condition.

### **Cancer**

Obesity is a risk factor for several types of cancer. They include post-menopausal breast cancer, kidney cancer, esophageal cancer, **colorectal cancer**, and endometrial cancer. Obesity and a lack of physical activity may account for 25–30% of these cancers. Some studies have reported links between obesity and cancers of the gallbladder, ovaries, and pancreas. Other cancers—including of the liver, stomach, **prostate**, and cervix—have a higher death rate for those with a higher BMI.

Women who gain nearly 45 pounds after age 18 are twice as likely to develop breast cancer. Almost half of post-menopausal women are obese.

Men who are morbidly obese have cancer death rates that are 52% higher than their non-obese peers; women's rates are 62% higher! It



*Obesity is a risk factor for many types of cancer. It also seems to lower the survival rate of some cancer patients.*

is estimated that obesity could be linked to as many as one fifth of all cancer deaths.

Information about how exercise impacts cancer rates is lacking, but recent studies suggest that getting regular moderate exercise can lower colon cancer risk.

Further studies are necessary to make a definite link, though.

### **Societal impact**

Obesity has a very real cost to society in terms of its direct health care costs: \$61 billion.

Among children and teens, annual hospital costs related to obesity have more than tripled over the last 20 years, now reaching \$127 million.

According to some estimates, by 2020, one fifth of all health care dollars spent on adults ages 50–69 will be on obesity-related medical problems, double what it was in 2000. The obesity-related disability rate of that group also will grow by about 20%.

In addition to health care costs, obesity leads to lost productivity. More than 39 million workdays are lost every year due to obesity.

The good news is that the same steps you take to lose weight (eating a healthier diet and exercising) also are steps to lowering your risk of many of these health problems. By changing your lifestyle, you are protecting yourself from some very serious conditions at the same time.

### *Thinking Beyond the Waistline*



To women who think that good health can be measured solely by the size of their waist or a number on a bathroom scale, Dr. D. Lee Alekel, an associate professor of nutrition at Iowa State University, cautions that weight is just part

of the equation to good health.

Her assertion is based on 20 years of scientific research showing a strong link between nutrition and physical activity and overall health in mid-life women. It is also a finding—like so much scientific inquiry conducted in labs across the country—that comes from her personal commitment, determination, and sacrifice.

"It's difficult to have balance in life," says Alekel. "As a researcher and a professor, it's not unusual to put in 15-hour days. I do it because I have always had a strong interest in science and nutrition, and I think it's important to help people lead healthier lives."

On the Iowa State University campus, she attempts to do that on a number of fronts: She instructs undergraduate students, teaches graduate courses, helps those working on their graduate degrees, serves on professional committees, gives talks in the community, and works with women who volunteer to take part in research. And if that were not enough, she writes proposals seeking grant money so that scientific research can continue.

"It's never-ending," Alekel says with a laugh. But, she adds in a matter-of-fact way, "That's how it is."

Alekel, who developed her love of biology in junior high school, does get satisfaction in knowing that women today are more health conscious than their mothers.

Specifically, Alekel believes that more women today, particularly those with children, are acknowledging and accepting that good health depends on making smart choices with both nutrition and exercise in mind. "Women are tending to think beyond their waistline. They understand that the choices they make today will affect their health and quality of life in their later years."

Unfortunately, too many women, particularly those who are younger, still make dietary and exercise choices based on a concern about outward appearance. To this, Alekel warns, "Sharply reducing fat intake and calories simply is not the answer. The concern should be about what is going on in the inside, not just how you look on the outside."

Fruits and vegetables, whole-grains, fiber, and other cancer-fighting **antioxidants** are among the categories of foods that Alekel recommends as part of a well-balanced diet. Good nutrition—combined with exercise—can make a profound impact on preventing breast cancer, **osteoporosis**, obesity, and other diseases and disorders that affect women at a disproportionately higher rate than they do men. Importantly, **cardiovascular disease**, a leading killer of both men and women, can also be prevented through nutrition and exercise.

Alekel's approach—a blend of moderate exercise and a balanced diet—is simple, yet tried and true.

But with the busy lives that most women lead, is it really possible to eat smart and exercise regularly? Alekel, who is also the proud mother of a 10-year-old boy, is proof the answer is yes. "I guess I'm lucky; I really like healthy foods. It is difficult to make time for exercise, but I do try to make time to bicycle and walk, particularly in nice weather."

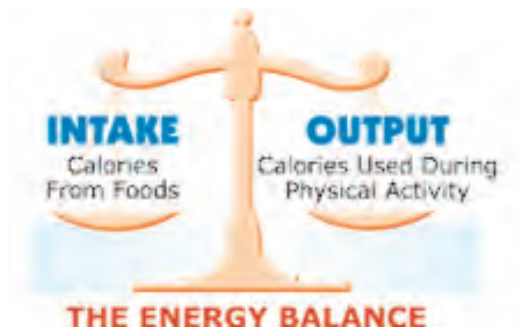
# Part 4: How Can Obesity Be Prevented and Treated?

**U**nderstanding what causes obesity is key to knowing how to prevent it in the first place. The good news is that obesity is both preventable and treatable. It is much easier, however, to prevent than it is to treat. If you aren't overweight or obese, now is the time to find out how to stay that way. If you are already overweight or obese and you want to make changes to your lifestyle, there is no miracle cure, no magic pill that will change your weight or body type. But making changes to your diet and exercise and eating habits will allow you to safely and gradually lose weight.

## Exercise

The first step to preventing obesity, or to losing weight, is exercise.

As we discussed in Part 2, your body works best when the number of calories you eat and the number of calories you use up are nearly the same. The best way to use up lots of calories all at once is to exercise.



Your body will just use up active calories in the first 20 minutes of working out. To use up stored fuel (or fat), you need to work out for more than 20 minutes. For this reason, it is better to exercise in larger chunks of time. If, however, you don't have large chunks of time available, exercising in ten-minute bursts is better than nothing at all.

In order to stay at your current weight, you should do at least 30 minutes of moderate-intensity physical activity, like swimming or brisk walking, every day. During moderate-intensity activities, you should be able to talk without a problem. This level of activity will use up the calories in a healthy diet.

*The calories you feed your body should not be more than the calories your body uses up during physical activity and with other bodily functions, like breathing.*



## Obesity: The Science Inside



*A man, who would manage to lose 100 pounds in the following year, participates in a weight control program for individuals with serious weight and health problems.*

If you want to prevent gradual weight gain or if you need to lose a little bit of weight, you should do an hour of moderate- to vigorous-intensity activity every day. This level of activity leaves you out of breath at the end.

If you want to lose weight, you should increase your physical activity to 90 minutes at a moderate-intensity level.

To be physically fit, you should include three types of physical activity in your workout:

- **Cardiovascular** conditioning (or aerobic exercise) is active and improves your heart health. It also burns the most calories. This category includes running, biking, and swimming.

- Stretching improves your body's flexibility. This includes tai chi and yoga.
- Resistance training improves muscle strength and endurance. This includes activities like weight lifting.

If you have not exercised in a long time, expect to be tired and sore at first. Within a week, your body will have adjusted. If you experience chest pains at all, stop immediately and call your doctor. And if you have a health condition, double-check with your doctor before you start or change your exercise program.

## Part 4: How Can Obesity Be Prevented and Treated?

### How Hard Should I Be Exercising?

To figure out your maximum heart rate, subtract your age in years from 220.	Let's say you're 30 years old. To find your maximum heart rate: $220 - 30 = 190$	My age is _____. My maximum heart rate (MHR) should be $220 - (\text{my age}) =$ _____
To find your target heart rate (60–85% of how hard your heart can beat), multiply that number by .6 (for 60%) or .85 (for 85%).	To find your target heart rate: $190 \times .6 = 114$ $190 \times .85 = 161.5$	My target heart rate would be: _____ (My MHR) $\times .6 =$ _____ _____ (My MHR) $\times .85 =$ _____
You want your heartbeats per minute to fall between those numbers.	Your heart should be beating between 114 and 162 beats per minute when you're exercising at your hardest.	When I'm exercising at my hardest, my heart should beat between _____ and _____ times per minute.
Check your <b>pulse</b> (heartbeats per minute) by putting two fingers on the side of your neck and counting the beats for 1 minute. Use a watch that keeps track of seconds to time yourself. (If you find it's hard to keep track of your heart rate for a whole minute, you can check it for 30 seconds and double that number.)		

### Good nutrition

The government has changed its recommendations about food over the years as we learn more about the science of nutrition.

An average diet should include 2,000 calories a day. Based on your weight, your weight goals, and your physical activity level, you may need fewer or more calories. Do not forget to include any drinks (other than water) that you have when you're figuring out your daily calories.

In fact, water is a good place to start when planning a healthy diet. While there is

no one number that fits every-one scientists suggest people aim for 48–64 ounces of water



## Obesity: The Science Inside

### *Low-cost exercise ideas*

- Use ordinary household goods instead of dumbbells for weight training. You can fill empty milk, water, or dishwashing-detergent bottles with water or sand and use duct tape to make sure the tops stay on. You can adjust how much is in the container to get different weights. Canned goods can be used as hand weights or a pair can be put into tube socks to use as ankle or wrist weights. Bags of cereal, potatoes, and frozen vegetables come in sizes up to 10 pounds.
- Walk more. Park further from the office or store if you drive. Get off the bus or the subway a stop earlier than usual if you take mass transportation. Take the stairs or walk up the escalator—a few extra times if you can. Many malls open early to let people walk laps in a safe, dry location.
- Use the library. Most libraries have free video sections that include workout tapes or DVDs.
- Take advantage of public facilities. Many cities have public parks, public pools, and park and recreation centers that people who live in town can use for free or very little money.
- Use your baby as a weight. Walking with your baby in a baby-backpack uses more calories than pushing him or her in a stroller.
- If you have children, ask your schools to have gym classes or recess every day or to form after-school exercise clubs. This can help prevent childhood obesity and lower your child's weight.
- Put on up-tempo music. You can dance to it in your apartment without anyone seeing you. Or you can do your housecleaning to it. You'll clean much faster—which is good for your body and gets your cleaning over with!
- Jog in place, jump rope, or do a combination of push-ups and sit-ups while you watch TV.
- See if anyone at your place of work or worship wants to start an exercise class or a walking club.
- If you have a video game system, some games encourage players to use their whole body while playing.
- Thrift stores may have used exercise equipment they're selling for a low cost.



a day. (Some scientists suggest that you can find the right amount by dividing your weight in pounds in half and drinking that many ounces.) You can consume water in other ways (some fruits and vegetables, fruit juice, coffee, soda, and milk are high in water content), but many of those other drinks are high in calories, caffeine, or sugar. In addition to cutting calories, by drinking more water you can help decrease your appetite. The body's signals that it is hungry or thirsty are very similar, and drinking a glass of water as a first response can be a good step toward limiting the amount of food you eat.

You should eat a wide variety of foods rich in vitamins, minerals, proteins, healthy unsaturated fats,

and fiber. These are contained in foods like vegetables, fruits, nuts, fish, beans, and whole grains.

Americans often don't eat enough fruits and vegetables. You should consume two cups of fruit and two and a half cups of vegetables a day. It is important to eat different kinds (green leafy, orange, legumes, starchy, and other vegetables) every day because different kinds contain different levels of vitamins.

Whole grains are another important part of a diet. Try replacing other carbohydrates with whole grain breads and pasta or wild rice.

Americans consume more than the recommended amounts of saturated and trans fats, cholesterol, sugar, and salt. You should limit foods in your diet that contain these items and replace them with unsaturated fats. Your total fat intake should be 20–35% of your total calories. Less than 10% of your daily calories should come from saturated fats. Dietary cholesterol should be limited to less than 300 mg/day.

In 2005, the Food and Drug Administration came out with a new food pyramid. What this new pyramid looks like depends on your age, gender, and physical activity.



**MyPyramid.gov**  
STEPS TO A HEALTHIER YOU

*(You can visit the MyPyramid.gov Web site to find out what your personal food pyramid should look like.)*

Each one will look slightly different, but they all resemble the food pyramid on this page.

It can be difficult to understand just from looking at the picture what everything means, but the colors stand for different types of food and their width stands for how much of your diet each one should be.

**ORANGE:** Grains. You should eat at least three ounces of whole grains a day.

**GREEN:** Vegetables. You should eat at least five servings of vegetables a day, totaling two and a half cups for an average adult. They should include dark green, starchy, orange, dry beans and peas, and other vegetables.

**RED:** Fruits. You should eat three servings, or two cups, of fruit a day.



## Obesity: The Science Inside



## Controlling portion sizes

So you know your BMI and how many servings you need of each food, but you don't want to weigh your food or carry a measuring cup around with you to find out the right amount. What's the answer?

ESTIMATE:

- One quarter of a cup (a serving of dried fruit) is the size of a golf ball.
- One half of a cup (a serving of vegetable juice) is the size of a standard yo-yo or an ice cream scoop.
- One cup (a serving of leafy green vegetables) is the size of a tennis ball or a baseball.
- One ounce (a serving of cheese or beans) is the size of two dice.
- Three ounces (three servings of cooked meat or fish) is the size of a deck of playing cards.
- Two tablespoons (a serving of salad dressing) is roughly half the size of the ladle.

As you can see, if you've been filling your plate with food, you've probably been eating way too much!

**YELLOW:** Oils. You should limit your oils to six teaspoons a day of unsaturated oils.

**BLUE:** Dairy products. You should consume no more than three cups of low-fat dairy products a day.

**PURPLE:** Low-fat Meats and Beans. You should eat five ounces a day.

The stairs on the side of the pyramid remind you to include physical activity every day in your plan to live a healthier life.

### Treatment methods

If you are already obese, eating healthier and exercising is a good way to start to lose some weight. If you have tried those methods before and haven't had much

### Healthy ethnic cuisine

When you start to think about changing your diet, you don't want to lose out on the foods of your childhood. Here are some healthier ethnic cuisine adaptations:

#### SOUL FOOD:

- Flavor collard greens and beans with smoked turkey instead of pork fat
- Season carrots with honey and cilantro instead of butter and salt
- Use frozen instead of canned collard, turnip, and mustard greens (all of which are excellent for you)
- Substitute spice seasonings for salt
- Substitute two egg whites for a whole egg in desserts
- Bake sweet potato chips instead of frying sweet potato fries
- Cook in olive oil instead of butter, lard, or bacon grease
- Choose skinless poultry (or remove the skin before eating) and lean cuts of meat (such as round, sirloin, and loin)
- Use low-fat or fat-free milk in macaroni and cheese

#### ASIAN FOOD:

- Steamed instead of fried rice
- Steamed, poached, roasted, boiled or barbecued meats instead of battered or fried
- Dishes without MSG

- Stir-fry with less oil
- Use more vegetables and less meat

#### LATINO FOOD:

- Rice and black beans
- Soft corn tortillas instead of fried corn tacos or flour tortillas
- Salsa or pico de gallo instead of cream sauce or sour cream
- Spicy chicken
- Baked, grilled, or pan-seared options
- Seafood or beans instead of meat
- Fajitas instead of quesadillas
- Use low-fat or fat-free cheese
- Grill plantains instead of frying them
- Drain the fat from meat before serving

#### NATIVE AMERICAN FOOD:

- Consume fewer drinks containing sugar or alcohol
- Have only one piece of fry bread at special occasions
- Substitute bannock (oven) bread for fry bread
- Eat more lean meats, such as buffalo

#### EUROPEAN FOOD:

- Red sauces instead of cream or butter sauces
- Piccata
- Primavera (non-cream sauces)
- Sautéed or grilled meats instead of fried
- Sun-dried or crushed tomatoes
- Minestrone soup

## Obesity: The Science Inside

### Don't starve yourself!

You might think that the fastest way to lose weight would be to stop eating. After all, if you keep up your normal level of activity and keep using the same amount of energy, then you should use up lots and lots of stored energy in fat cells, right?

Wrong! As we mentioned earlier, our bodies are outdated in how they process food. When new energy stops coming into the body, the body is programmed to think there's a problem and that there isn't enough food. It becomes more efficient and tries to use less energy for activities. It also looks for other places from where it can draw energy.

The body starts by using lean tissue and muscle to provide it with the calories it needs to keep working. This can lead to muscle loss. Since the amount of muscle determines how much energy our body needs, having less muscle means we use less energy. Our metabolism slows down—by up to 45% over time—when the body loses a lot of muscle while taking in too few calories.

If we were in an area suffering from a hard winter or were facing a famine, this would be a good strategy because it keeps us alive longer. But if we're trying to lose weight, it's a very bad idea. It's much more effective—and healthier—to use a different method of losing weight, such as eating healthier, exercising, or talking with a health care provider about diet drugs or weight-loss surgery.

luck, your doctor may talk to you about other ways to lose weight.

### Diets

Everyone knows someone who has tried one diet plan or another: The Subway sandwich diet. The cereal diet. The cabbage soup diet. Weight Watchers. Jenny Craig. Atkins. South Beach. There are nearly as many diet plans as there are people!

Usually a diet plan works at first. The person takes off some weight.

But then they come off the diet and the weight comes right back.

A successful diet combines several things:

1. *Eating fewer calories.* Some diets do this by replacing your normal food with their own, pre-measured food to make sure you pay attention to portion size. Others suggest ways you can substitute lower-calorie foods for your normal ones. Remember, if you take in too many calories—no matter how healthy their food source is—your body will convert the ones you don't use up into fat.
2. *Balanced meals.* Most healthy diets will have you eat less of the foods that Americans tend to overeat, such as trans and saturated fats and sugary carbohydrates. They also emphasize portion control, leading you to eat more of the healthy, low-calorie foods and less unhealthy, fattening foods.
3. *Long-term goals vs. short-term goals.* Almost every diet plan will help you to lose weight right at the beginning of it simply because you are changing what and how you eat. A good diet will give you tools for making these changes part of your lifestyle in order to keep the weight from coming back. Yo-yo

diets where you lose weight and gain weight quickly over a short period of time are unhealthy. It is much healthier to lose a half to two pounds a week over a longer period of time.

4. *Diets that specifically ban certain types of food* do not tend to be successful in the long run; you might be able to keep from eating something for a short period of time, but it's hard to never eat your favorite foods again.
5. *Focus and support.* It is easier to lose weight if you are paying attention to what, when, and why you are eating. Some people overeat without noticing. The act of focusing on your food can help to curb that tendency. Many successful diets also combine some form of professional counseling or group support. Knowing that you are not alone in wanting to lose weight and in slipping into unhealthy behaviors every once in a while can help you to reduce your stress levels and to make long-term changes to your lifestyle that will help you lose extra weight and to keep it off.
6. *Exercise.* All diets will tell you that it is necessary to exercise in order to burn stored fat.

### Diet drugs

You've seen the ads on TV and the Internet and in magazines. "Lose weight while you sleep!" and "Shed pounds without exercise!" sound very promising. It would be great if you could just take a pill and have your excess fat melt away without any extra work on your part—and people spend lots of money hoping these commercials and infomercials are giving them a miracle cure.

The truth is that there is no miracle cure. Drugs that you can buy over the counter or that you send away for on TV are not the answer. Dietary aids, **supplements**, and herbal medicines do not have to be tested by the federal government to make sure they are safe for you or that they do what they promise. Some scientists hope to find new information about herbs and dietary





## Obesity: The Science Inside

supplements. The National Center for Complementary and Alternative Medicine warns that no single supplement has been proven effective in large-scale studies. They do go on to say that there are some smaller studies of certain supplements that suggest that further testing is necessary.

For now, though, these drugs are ineffective; they don't do anything extra like they promise they will. Usually, they have very fine print that says you must stick to a low-calorie diet and exercise regularly in addition to taking their pill or powder to see any real weight loss—and you can lose weight by doing both those things and *not* taking their drugs!

Some “miracle drugs” are even worse and are actually dangerous to your health. Some are addictive. Others cause serious health problems. Ephedra, for instance, has been linked to seizures, **heart attacks**, heart beat irregularities, and high blood pressure. It is not legal to sell it in the U.S. as a pill, but it is still sold as an ingredient in some “health” teas, as well as over the Internet, where people can ship it from places where it can be sold legally.

Remember, the people who advertise diet drugs on TV and the Internet are in the business of

making money. If you are curious about any of the products you see or read about, talk to your health care provider. He or she can help you figure out if it's worthwhile for you to try. And the main thing to keep in mind is that if it sounds too good to be true, it almost always isn't going to help you.

However, if you are obese, you have obesity-related health problems, and traditional diets and lifestyle changes have not worked for you, there are some drugs that your health care provider can prescribe. Prescription diet drugs can, when taken properly, carefully, and under a doctor's supervision, help you begin to lose weight. These prescription drugs are very powerful, though, and you should seriously think about their side effects when making your decision:

**Sibutramine** (sold as Meridia) changes the way your brain works to make you feel fuller sooner. Its bad side effects include high blood pressure, constipation, and not being able to sleep. No one with high blood pressure or heart disease, or the risk of heart disease, should take it.

**Orlistat** (sold as Xenical) keeps your intestines from breaking down and absorbing fat. Because it also keeps your intestines from absorbing vitamins A, D, and E, you will also need to take a daily

supplement. Its side effects include frequent oily bowel movements, diarrhea, and pain in your midsection. There have been allegations that orlistat is linked to certain types of cancers.

**Phentermine** (sold as Adipex-P, Pro-Fast, and Ionamin) keeps you from feeling hungry. You should use it for less than three months only, and the weight you lose can come back after you stop taking it. Its side effects are nausea and dizziness.

Other short-term appetite-suppressants include **diethylpropion** and **phendimetrazine**.

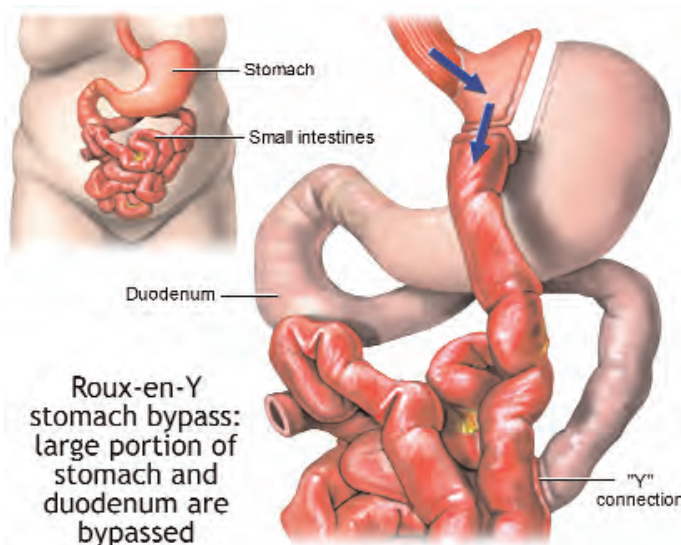
In 2002, less than 2.4% of those people who were medically eligible for diet drugs asked for them.

### Weight-loss surgery

Between 1998 and 2002, the number of people who had weight-loss surgery quadrupled.

There are several different types of weight-loss surgery:

- **Gastric bypass (Roux-en-Y gastric bypass) surgery** involves re-routing your stomach. A surgeon will staple closed a tiny pouch the size of an egg (which can hold an ounce or so of food) and attach the middle portion of the small intestine directly to it. This closes off most of the stomach, as well as the first section of the small intestine. The benefits of this surgery are that the part of the stomach that is no longer being used still secretes healthy digestive juices and



*The Roux-en-Y gastric bypass procedure involves creating a stomach pouch out of a small portion of the stomach and attaching it directly to the small intestine, bypassing a large part of the stomach and duodenum. Not only is the stomach pouch too small to hold large amounts of food, but by skipping the duodenum, fat absorption is substantially reduced.*

your small intestine doesn't absorb as many calories. Research indicates that patients can expect to lose between 48 and 74% of their excess body weight after the first year alone, followed by gradual and slower rates of weight loss until the person's body weight becomes balanced.

Gastric bypass, which is the most common weight-loss surgery, can be done as a **laparoscopic surgery**. That kind of operation uses a small instrument with a tiny camera attached to it that's inserted into your body through small cuts, instead of having to make large cuts, so a surgeon can fit his or her hands into your body. Laparoscopic surgery has a shorter healing and recovery time.

- **Adjustable gastric banding** uses a band made of hollow rubber to reduce the size of the opening to the stomach, helping you to feel full much sooner. The band can be tightened or loosened or removed altogether.
- **Vertical gastric banding** uses both a band and staples to reduce the size of the opening to the stomach. Once the most common weight-loss surgery, this is not used often anymore.

- **Biliopancreatic diversion** is a much more complicated surgery in which the doctor removes most of the stomach and bypasses both the first and the middle sections of the small intestine. This type of surgery can lead to nutritional deficiencies, so it is not performed as often as some of the others.

Weight-loss surgery has been shown to be very effective in helping severely obese people lose weight. It is important to keep in mind, though, that weight-loss surgeries are risky, as are all surgeries. Possible side effects include gallstones, dehydration, hernias, ulcers, and vitamin and mineral deficiencies as well as the threat of death, blood clots, pneumonia, and leaks at the points of surgery. And while weight-loss surgery is successful for many people in helping them to lose extra pounds, some people do regain the weight they lose after the surgery. It is important to talk with your doctor about your options and to seriously consider this decision.

## *A Walking Testament to the Power of Exercise*



“Shop ‘til you drop” is a battle cry for many mall patrons, but for Pat Langer and other dedicated mall walkers, the only thing dropping is pounds, inches, and a **sedentary** lifestyle.

More than a decade ago the famous Mall of America in Bloomington, Minnesota, opened its doors to customers and walkers alike. Langer was one of the original “Mall Stars,” as the walking participants are known. Over the past ten years—thanks in large part to a two-hour-, nine-mile-a-day, five-days-a-week walking regimen—she has lowered her cholesterol and shed more than 60 pounds while gaining flexibility.

“I began walking as part of exercise 15 years ago because of the onset of osteoarthritis,” says Langer, a Minnesotan native.

“I knew that I had to take exercise seriously, even though I thought I had always been pretty health conscious.”

Mall walking has enabled Langer to stick to her exercise regardless of snow accumulation or below-zero temperatures, the hallmarks of a true Minnesota winter. Aside from offering a pleasant temperature, the mall provides a smooth, controlled path, free of bumps, potholes, and rain puddles, not to mention speeding cars and chasing dogs.

The decision to walk come rain or shine has paid huge dividends for Langer, especially when she underwent knee replacement surgery. Just one week after her operation, she was on a stationary bike—a step in recovery that normally takes six weeks. Doctors attribute her remarkable recovery to a good range of motion and flexibility—the rewards of walking.

“I would recommend mall walking to anyone. There is such an enormous benefit to your health and well-being, and it’s a type of exercise that virtually anyone can do,” says Langer. “You can set your own pace. Many people walk with the help of a cane or a walker, while others are speed demons. Likewise, you can walk with a friend or walk by yourself—whatever you prefer.”

For her part, Langer, a piano teacher and mother of three grown children, enjoys walking early in the morning, but varies her routine depending on her work schedule. She just puts on her walking shoes and comfortable clothes, jumps in her car, and within seven minutes she’s able to start walking. She doesn’t worry about packing a headset because she “loves to hear the rhythm of life.”

More than 3,000 individuals participate in the walking program at the Mall of America, where a lap around one level of the mall equals just over a half-mile. Given the high level of participation, it isn’t unusual for Langer to recognize plenty of familiar faces. “I walk nine miles a day, so I tend to see a lot of fellow walkers,” she says.

So does Langer go to the mall to shop? As they say in Minnesota, “You betcha!” After all, she wears out about four pairs of walking shoes each year!





# Part 5: What Does Research Tell Us About Obesity?

## Current lines of research

As science, technology, and medicine have advanced over the centuries, so has humankind's understanding about the benefits of proper nutrition and fitness and the kinds of diseases and disabilities that come from obesity.

Over the years, many thousands of researchers in all fields of science have dedicated their lives to investigating and discovering exactly how obesity leads to or worsens serious diseases and conditions like diabetes, high blood pressure, and heart disease. They also are looking at the health benefits of good nutrition and fitness.

Today, many of these health discoveries are well publicized, as people read about them in newspapers or online or hear about them on the news. While much has been learned about the strong relationship between eating well, exercising, and good health, many questions remain unanswered. Ongoing and past **clinical trials** have helped



scientists learn about diseases—and have helped save the lives of many people through that knowledge. Past, present, and future findings in all areas of research will only improve Americans' chance of living long, healthy lives without chronic illnesses.

**Population studies.** Researchers can learn a lot about the positive and negative effects of good and bad nutrition and fitness by studying groups of people over a long period of time.

*Scientists are looking into all areas of nutrition, from what food is healthiest to how our genes affect our risk of obesity.*

## Obesity: The Science Inside



*The mouse at left is missing the gene thought to be involved with obesity and is thin. The mouse on the right had no gene removed and is obese. Scientists will use these mice to test obesity treatments and diabetes drugs.*

One very important study has involved studying the high rates of diabetes and obesity among the Pima Indians of Arizona. Among other things, this ongoing 30-year study has let researchers establish evidence that regular exercise and a healthy diet can delay the development of diabetes.

These findings, along with other studies, have helped the medical community conclude that being overweight or obese is a significant risk factor of diabetes.

The Pima Indian researchers have been able to further explore the relationship between nutrition, fitness, and diabetes by comparing their findings with another very similar tribe of Pimas in Mexico. Compared with the Arizona Pima tribe, the Mexican tribe has a healthier lifestyle that includes eating more nutritious foods and

living more active lives. The Pima tribe of Mexico has a much lower rate of diabetes than the Pima tribe of Arizona, which also supports their findings about the strong relationship between nutrition, fitness, and diabetes.

**Genetic research.** Genetic research plays a large part in what scientists and researchers are looking at in terms of obesity. Scientists recently found the first common gene that increases the risk for obesity. The gene, which seems to affect how the body stores and burns fat, appears to be present in 10% of the population and boosts the risk for obesity in this group by 30–50%. Scientists hope to identify the gene itself and to learn more about it to help them better understand obesity and how to treat it with drug therapy. Scientists have already identified other more rare genes that seem to affect obesity.

Obesity has been linked to many health conditions, and eating a healthy diet and exercising have been shown to play a major role in the fight against illness. We will know more and more about the roles of diet and exercise when medical science is able to identify which people are genetically predisposed to develop specific diseases.

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Currently, a good part of genetic research takes place in a laboratory, where researchers study genes using technologically advanced equipment to look at how the genes cause disease in the body (and ways to prevent it from happening). Genetic studies also take place among people, where researchers interview participants and their families to figure out which diseases or disorders were passed down, which members developed the condition, and how the illness ran its course.

Current studies on the effects of nutrition and exercise on inherited diseases will add to discoveries being made at the cellular level. Among the many fitness-based studies is one that found

that obese men who exercised every day for three weeks and ate a high-fiber, low-fat diet lowered their cholesterol and blood pressure levels and eased heart stress and other indicators of heart disease despite only losing a little bit of weight.

**Weight management.** Another important part of the medical research effort is to search for better, healthier, and more effective ways for people to lose weight and keep it off. In the various studies dealing with weight loss, there is added significance simply because of the importance obesity has with regard to so many other health problems.

One such study has taken place at the University of Pennsylv-



*Without volunteers of all ages, scientists would not be able to test new treatments and to come up with new ways to prevent weight gain or to lose weight.*



### *Obesity and Your Brain*

What role does the brain play in obesity? Is it just a matter of calories in must equal calories out? Or is there something more complicated at work?

Some scientists, who specialize in the way the brain works, are looking at a number of ways in which the brain may affect obesity. They believe the brain may play a key role both in who becomes overweight and how the body reacts to attempts at weight loss.

For instance, a number of scientists are looking at the way the brain responds to two chemicals in the body. One, leptin, is produced in fat tissue and sends messages to the brain about the amount of nutrition the body needs. When working properly, leptin levels increase or decrease at the same time body fat levels do and tell the brain whether it should be hungry or full. The brains of some obese people, however, do not seem to respond to leptin, meaning that their appetites don't shrink just because their bodies have enough fat. Those looking at the role leptin plays include NASA scientists, who have tested rats at different levels of gravity to find out how and why leptin works, why it sometimes doesn't work, and how the body's response to leptin could be fixed.

The other chemical, ghrelin, is found mostly in the stomach and helps to regulate the body's energy. Ghrelin slows metabolism and tells your brain when there is no food in the digestive system so that it should feel hungry. Scientists are looking into several aspects of ghrelin. One study suggests that ghrelin isn't as affected by fat as by protein or sugar calories, meaning that a high-fat diet doesn't actually lessen the signal to your brain that you're hungry. Others are looking at why ghrelin doesn't seem to work right in obese people. Yet others are testing a vaccine that prevents ghrelin from reaching the central nervous system and delivering its message to the brain.

vanian Medical Center's Weight and Eating Disorders Program. They received funding to develop better long-term ways to help obese men and women manage their weight. Another similar study is trying to

develop ways of helping young children who are obese and who are at risk for developing heart disease and diabetes.

Another major research effort from the last ten years seeking to help high blood pressure patients lose weight and lower their sodium intake is the Dietary Approaches to Stop Hypertension (DASH) study. Supported by the National Heart, Lung, and Blood Institute, the DASH diet is a healthy low-sodium, low-cholesterol eating plan that emphasizes eating lots of fruits and vegetables and consuming low-fat dairy products. Within weeks, it was shown to significantly lower blood pressure levels and weight of men and women of all ages, races, physical conditions, and medical backgrounds. Studies have shown since then that the DASH diet also lowers "bad" cholesterol (LDL-cholesterol) and **homocysteine** (an amino acid), which has been associated with a greater risk for heart disease.

Minority participants in the DASH study, particularly African Americans, benefited even more than white participants from the diet. In addition to sample menus and recipes, the DASH diet plan also provides a form to document eating habits before starting the diet and a chart that will help manage and guide a person's shopping and meal planning once a

person starts. By testing the DASH diet and other nutrition-based efforts, researchers work to find better ways for people with or at risk for hypertension to eat healthy and manage their eating habits more effectively.

Researchers also are looking more closely at other treatment plans. They are trying to find new drugs and improve older ones to take better advantage of what we have learned about obesity. They are trying to figure out if drugs that are now prescribed for non-weight-related reasons, such as diabetes or depression, have additional properties that make them good to use as diet drugs. Doctors may hear of some drugs that seem to help patients lose weight in addition to or instead of treating their initial health problem. Then, doctors want to find out if these drugs can help everyone or just some people.

Other studies look at the safety of diet drugs. The Sibutramine in Cardiovascular Outcomes Study is in the midst of looking at what role sibutramine plays with regard to cardiovascular disease. Some people are trying to figure out if it's still safe to prescribe. Others are looking at whether it just needs to be taken with other drugs to make it safer for those at risk for **cardiovascular**

**disease.** In the past, some drugs were discovered to create more problems than they solved. Fen Phen and Redux, for instance, were removed from the market when they were found to cause heart valve problems in some people.

Still other studies have found that just using diet drug therapy alone is not effective. Those who lost weight without changing their lifestyle regained the weight after they stopped using the drug.

Other scientists are focusing their research on weight-loss surgery. Some are looking at the role of pre-existing health conditions on the success of surgery. One study showed that if patients suffer from depression, they have a poorer health-related quality of life after their weight-loss surgery than those who do not suffer from depression. This can help doctors better screen patients before surgery and treat them after they've had the surgical procedure.

Many researchers have found evidence to support the effectiveness of weight-loss surgery. A number of studies show that weight-loss surgery is more effective than making lifestyle changes combined with drug therapy in reducing weight over the long run.

## Obesity: The Science Inside

Another, the Swedish Obese Subjects study, looked at the long-term weight loss of 500 patients. It found that those who had had weight-loss surgery kept off 16% of their body weight over the course of eight years. The Longitudinal Assessment of Bariatric Surgery is looking at the risks and benefits of different types of obesity surgery

and their impact, as well as helping to identify those who will benefit most from them.

### **The important role of volunteers**

Researchers and medical science in general would not be able to understand obesity—or make



inroads against the diseases it can lead to—without the help of thousands of volunteers in the last century alone. As participants in research studies, volunteers are willing to share their personal medical histories; participate in clinical studies, often for long

periods of time; and accept many other sacrifices in order to help humankind's ongoing effort to learn more about the health benefits of good nutrition and fitness. When conducting a study, it is critical for researchers to be able to access and study hundreds, if

### *Is a little baby fat dangerous?*

At one time, people generally believed that chubby cheeks and a little "baby fat" showed that infants were getting enough of the right nutrients. But with today's focus on when the obesity problem begins, scientists are starting to ask if the conventional wisdom is correct.

One doctor at Children's Hospital of Philadelphia believes that the problem of obesity starts as early as the first few months of life. He has been combing through records of thousands of babies born in the early 1960s and has found that the amount of weight that children gain in the first four months of life is linked to childhood obesity at age 7, regardless of birth weight or if they were overweight at a year old.

Among his other studies this same doctor has found that a large weight gain during the first week of life among babies being fed formula seems to tie in with being obese decades later. For every extra 3.5 ounces a baby gains in weight in its first eight days, his or her chances of being overweight as an adult also increase by 10%. These studies seem to show that early infancy is an important time period for the development of obesity and metabolism.

Other studies show similar results. One found that large babies and those who gained weight quickly over the first two years of life were nine times more likely to suffer from obesity later on. Another showed that low-birth-weight babies who gained the most weight during infancy and early childhood were most likely to suffer from high blood pressure as adults.

Yet more studies look at how and how much infants are fed. Infant rats that are regularly overfed have an increased level of a hormone known as leptin, which helps to regulate appetite. Breastfeeding is another area of scientific exploration. Scientists have found the longer an infant is fed only breast milk, the lower his or her risk of childhood obesity.

In short, scientists are still trying to find out when exactly obesity becomes a problem for growing children. While there is cause for concern if your baby gains weight quickly, scientists say not to overreact—particularly if your baby is breastfed only—and to talk to your baby's doctor if you think there could be a problem.



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not thousands, of people of all ages, races, and lifestyles in order to determine how certain diseases, activities, and foods affect different people. This enables them to gather more accurate race-, age-, or gender-specific information and possibly to uncover new insights or ways of treating special groups with specific conditions.

When different subgroups or communities participate in a research study, they are able to take advantage of the most current and perhaps most effective medical treatment for any given disease or condition. The quality of care volunteer patients receive during the course of a study is often very high and very beneficial. Volunteers also benefit from knowing that their participation may one day help others.

# Conclusion

**E**ating well and staying fit could save your life one day. Millions of Americans are going to face a variety of life-threatening diseases because they are overweight or obese. A good way to commit to healthier living is to stay informed about health improvements and to make them part of your life. Another way is to help others learn more about good health:

**Educate yourself.** Reading this book is a great start. It is important to continue to educate yourself about obesity, particularly as you get older and as new information and research from the medical community comes out. Good sources of information are the library and the Internet. Ask a librarian for help in your search, if necessary. Make sure to share the interesting things you've learned here and will learn in the future with your family, friends, and community.

**Eat healthy.** Think about your current diet. How does it compare with what you've learned about healthy foods? What are some of



the unhealthy foods you regularly eat that can be replaced by healthier ones? Keep thinking about your diet and make simple changes to make you healthier in the long run. Does obesity or an obesity-related condition run in your family? Use the library or one of the Web sites in the Resources section of this book (starting on page 61) to find out what kinds of foods, activities, or tests you can use to prevent obesity. Commit now to better eating, and think long term. Talk with your friends and family, too, about the serious benefits of eating better.

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**Stay fit.** How much do you exercise? What physical activities do you enjoy most? Do you spend at least an hour a day most days being active? If not, it is never too late to start—and the benefits are almost immediate! As with improving your diet, half the trick of becoming a person who works out regularly is the slow and gradual commitment you make to exercising as a way of life. Exercising can make you feel and function better both inside and out. Among other things, it also fights off disease and depression. Share the information you have learned about fitness with the people you know. Everyone likes to learn something that might be lifesaving.

**Monitor your health.** In addition to watching your diet and getting enough exercise, it is important to meet with your health care providers on a regular basis. Your health care providers can help you keep track of your BMI, test you for conditions for which you are at risk, and help you make goals for losing weight or improving your diet. Finding out if you have an obesity-related condition can be scary, but it is better to find out for sure. Then you can learn how to manage your symptoms and prevent your condition from getting worse.

**Get involved in your community, at schools, or in research trials.** Find out about the various obesity prevention and treatment programs that take place in your community and get involved in one you are interested in. Do the schools in your community serve healthy meals, and do they have gym class every day? Let the school system know how important this issue is to you. How are the fitness opportunities for both adults and children in your community? You can have fun and meet others by participating in these activities or by helping to expand them for the betterment of others. There may also be health research trials that are taking place near you. You can become a volunteer or help someone you know get involved or participate.

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# Appendix 1: Questions to Ask Your Doctor About Obesity

What is my body mass index?

Do I need to lose weight?

Am I at risk for any health conditions?

Should I be tested for any conditions?

Do I need to make changes in my lifestyle to prevent any illnesses?

What help is available for making those changes?

Can I take part in any exercise or sport I want to?

What is a healthy eating plan for me?

Should I look into weight-reduction surgery or weight-loss drugs?

What can be my short-term goals for control of my obesity?

What can be my long-term goals?

What is the treatment plan?

What lifestyle changes are required by this treatment plan?

Do I need to see any specialists?

What medications will help control the complications of obesity?

What is the schedule for check-ups?

Can you help me locate a clinical trial to join?

How can I help my child lose weight if he or she is obese?

How can I help my child maintain a healthy weight?



## Appendix 2: Taking Part in Research Studies—Questions to Ask

A research study is a way of finding answers to difficult scientific or health questions. Here are some important questions you should ask of anyone who wants you or members of your family or community to be part of a research study:

1. What is the study about?  
Why are you doing the study?  
Why do you want to study me or people like me? Who else is being studied?  
What do you want to get out of the study?  
What will you do with the results?  
Have you or others done this type of study ever before? Around here?  
What did you learn?
2. Who put the study together?  
Who is running or is in charge of the study?  
Whose idea was the study?  
How were people like me part of putting it together?  
Who are the researchers? Are they doctors or scientists? Who do they work for?  
Have they done studies like this before?  
Is the government part of the study? Who else is a part of the study?  
Who is paying for the study?  
Who will make money from the results of the study?

3. How can people like me share their ideas as you do the study?  
How will the study be explained in my community?  
Who among people like me will look at the study before it starts?  
Who among people like me are you talking to as you do the study?  
A Community Advisory Board?  
Who from the study can I go to with ideas, questions, or complaints?  
How will people like me find out about how the study is going?
4. Who is going to be in the study?  
What kinds of people are you looking for? Why?  
Are you trying to get minorities into the study?  
Are you including people younger than 18 years old?  
How are you finding people for the study?  
Is transportation or day care provided for people who take part in the study?  
Do I need to sign anything in order to participate?  
Will you answer all of my questions before I sign the consent form?  
Can I quit the study after signing the consent form? If I quit the study, will anything happen to me?
5. What will I get out of the study?  
What are the benefits?  
Is payment involved? How will I be paid?  
Will I get free health care or other services if I participate? For how long?  
Will I get general health care or psychological care if I participate? For how long?
6. How will I be protected from harm?  
Do I stand a chance of being harmed in the study? In the future?  
Does the study protect me from all types of harm attributable to it?  
If I get harmed, who will take care of me? Who is responsible?  
If I get harmed in any way, will I get all needed treatment? Who pays for treatment?

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7. How will my privacy be protected?  
Who is going to see the information I give?  
Will my name be used with the information?  
What happens to the information I gave if I quit the study?  
Is there a written guarantee of privacy?
8. What do I have to do in the study?  
When did you start the study? How long will it last?  
How much of the study have you already done?  
Have there been any problems so far?  
Will I get treated the same as everyone else?  
What kinds of different treatments are offered in the study? Are there both real and fake treatments?
9. What will be left behind after the study is over?  
What will happen to the information people give? How will it be kept?  
What are you going to do with the results of the study?  
How will the public learn about the results? Will results be in places where the public can see them?  
Are you going to send me a copy of the results? When?  
What other studies are you planning to do here?

*The questions above are from a pamphlet developed by Project LinCS (Linking Communities and Scientists), Community Advisory Board (Durham, N.C.), and Investigators (University of North Carolina Center for Health Promotion and Disease Prevention) in cooperation with the Centers for Disease Control and Prevention, Atlanta, Ga. For copies of this brochure, contact the CDC National Prevention Information Network at 1-800-458-5231.*

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# Resources

## **American Heart Association**

*The leading national organization devoted to heart health.*

7272 Greenville Avenue

Dallas, TX 75231

1-800-AHA-USA-1 (242-8721)

[www.heart.org](http://www.heart.org)

## **American Obesity Association**

*The national organization on obesity-related issues, from education to prevention to anti-discrimination work.*

1250 24th Street, NW

Suite 300

Washington, DC 20037

[www.obesity.org](http://www.obesity.org)

## **American Stroke Association**

*National organization dedicated to stroke prevention, research, and treatment.*

7272 Greenville Avenue

Dallas, TX 75231

1-800-4-STROKE (478-7653)

[www.strokeassociation.org](http://www.strokeassociation.org)

## **ClinicalTrials.gov**

*A web-based resource for finding clinical trials in need of volunteers.*

[www.clinicaltrials.gov](http://www.clinicaltrials.gov)

## **Combined Health Information Database**

*A web-based service that combines resources on health and disease topics from several federal agencies. A service of the National Institutes of Health.*

[chid.nih.gov/simple/simple.html](http://chid.nih.gov/simple/simple.html)

## **Healthy People 2010**

*A nationwide health promotion and disease prevention campaign sponsored by the Department of Health and Human Services.*

*One of the goals of the campaign is to reduce health disparities.*



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Office of Disease Prevention and Health Promotion  
200 Independence Avenue, SW, Room 738G  
Washington, DC 20201  
[www.healthypeople.gov](http://www.healthypeople.gov)

*For information on the “Healthy People 2010 Microgrant” program that finances community-based prevention activities: [www.healthypeople.gov/implementation/community/](http://www.healthypeople.gov/implementation/community/)*

### **MEDLINEplus**

*A comprehensive source of health information provided by the National Library of Medicine.*  
[www.nlm.nih.gov/medlineplus/](http://www.nlm.nih.gov/medlineplus/)

### **National Center for Chronic Disease Prevention and Health Promotion**

*Sponsored by the CDC, the center promotes the transfer of research knowledge into actual prevention and treatment strategies. Provides information to the general public.*

Centers for Disease Control and Prevention  
4770 Buford Highway, NE, Mailstop K13  
Atlanta, GA 30341-3724  
770-488-5080  
[www.cdc.gov/nccdphp/](http://www.cdc.gov/nccdphp/)

### **National Heart, Lung, and Blood Institute**

*Part of the National Institutes of Health dedicated to learning about cardiovascular issues and lung-related illnesses.*

P.O. Box 30105  
Bethesda, MD 20824-0105  
301-592-8573/TTY: 240-629-3255  
[www.nhlbi.nih.gov/](http://www.nhlbi.nih.gov/)

### **National Center on Minority Health and Health Disparities**

*Promotes the health of racial and ethnic populations through research and education and through support of minority involvement in research careers. Affiliated with the National Institutes of Health.*

6707 Democracy Blvd., Suite 800  
MSC 5465  
Bethesda, MD 20892-5465  
301-402-1366/TTY: 301-451-9532  
[ncmhd.nih.gov](http://ncmhd.nih.gov)

### **National Stroke Association**

*Group that offers information on stroke prevention and treatment and information on local resources.*

9707 E. Easter Lane  
Englewood, CO 80112  
1-800-STROKES (787-6537)  
[www.stroke.org](http://www.stroke.org)

### **Native American Research Centers for Health**

*Research centers that link the Native American community with health research and that work to increase the number of Native American scientists and health professionals.*

National Institute of General Medical Sciences  
National Institutes of Health  
45 Center Drive MSC 6200  
Bethesda, MD 20892-6200  
301-496-7301  
[www.nigms.nih.gov](http://www.nigms.nih.gov)

### **New York Online Access to Health**

*A searchable health information resource in English and Spanish.*  
[www.noah-health.org/index.html](http://www.noah-health.org/index.html)

### **Office for Human Research Protections**

*A source of information on the guidelines and ethics of research studies with humans.*

Department of Health and Human Services  
1101 Wootton Parkway, Suite 200  
Rockville, MD 20852  
866-447-4777/301-496-7005  
[www.hhs.gov/ohrp](http://www.hhs.gov/ohrp)

### **Office of Minority Health Resource Center**

*Serves as a national resource and referral service on minority health issues. Affiliated with the U.S. Department of Health and Human Services.*

P.O. Box 37337  
Washington, DC 20013-7337  
1-800-444-6472  
[www.omhrc.gov/omhrc/](http://www.omhrc.gov/omhrc/)

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### **Shape Up America!**

*Raises awareness of obesity as a health issue and provides evidence-based information and guidance on weight management.*

808 17th Street, NW

Suite 600

Washington, DC 20006

*[www.shapeup.org](http://www.shapeup.org)*

### **Weight-control Information Network**

*Provides science-based information on weight control, obesity, physical activity, and related nutritional issues.*

1 WIN Way

Bethesda, MD 20892–3665

1-877-946-4627

*[win.niddk.nih.gov](http://win.niddk.nih.gov)*

# Bibliography

- Agency for Healthcare Research and Quality. "AHRQ Study Finds Weight-loss Surgeries Quadrupled in Five Years." July 12, 2005.  
[www.ahrq.gov/news/press/pr2005/wtlosspr.htm](http://www.ahrq.gov/news/press/pr2005/wtlosspr.htm)
- American Heart Association. "Heart and Stroke Facts." 2003. [heart.org/downloadable/heart/1056719919740HSFacts2003text.pdf](http://heart.org/downloadable/heart/1056719919740HSFacts2003text.pdf)
- Appel, Lawrence J., MD, MPH; Michael W. Brands, PhD; Stephen R. Daniels, MD, PhD; Njeri Karanja, PhD; Patricia J. Elmer, PhD; Frank M. Sacks, MD. *Hypertension*. "Dietary Approaches to Prevent and Treat Hypertension." Feb. 2006;47:296-308.
- Calorie Control Council. "Lighten up and Get Moving." [www.caloriecontrol.org/exercalc.html](http://www.caloriecontrol.org/exercalc.html)
- CBS News. "Fat Babies Face Health Problems." Feb. 3, 2002. [www.cbsnews.com/stories/2002/02/04/health/main328189.shtml](http://www.cbsnews.com/stories/2002/02/04/health/main328189.shtml).
- CDC. "Preventing Obesity and Chronic Diseases Through Good Nutrition and Physical Activity." July 2005.  
[www.cdc.gov/nccdphp/publications/factsheets/Prevention/obesity.htm](http://www.cdc.gov/nccdphp/publications/factsheets/Prevention/obesity.htm)
- Chiang, Mona. *Science World*. "Obesity: Battling a National Health Epidemic." Feb. 7, 2005.
- The Children's Hospital of Philadelphia. "Newborn's First Week May Be Critical Period for Developing Obesity in Adulthood." April 18, 2005.  
[www.prnewswire.com/cgi-bin/micro\\_stories.pl?ACCT=159681&TICK=CHOP&STORY=/www/story/04-18-2005/0003432937&EDATE=Apr+18,+2005](http://www.prnewswire.com/cgi-bin/micro_stories.pl?ACCT=159681&TICK=CHOP&STORY=/www/story/04-18-2005/0003432937&EDATE=Apr+18,+2005).
- Harvard School of Public Health. "Fats & Cholesterol." 2006.  
[www.hsph.harvard.edu/nutritionsource/fats.html](http://www.hsph.harvard.edu/nutritionsource/fats.html)
- Kalb, Claudia and Anna Kuchment. *Newsweek*. "Saving Soul Food." Jan. 30, 2006.
- Kellow, Judith, RD. Weight Loss Resources. "Dining and Metabolism." [www.weight-lossresources.co.uk/calories/burning\\_calories/starvation.htm](http://www.weight-lossresources.co.uk/calories/burning_calories/starvation.htm)
- Lambert, Craig. *Harvard Magazine*. "The Way We Eat Now." May-June 2004.
- Mann, Denise. *WebMD*. "The Latin Diet." <http://aolsvc.health.webmd.aol.com/content/article/73/82025>
- Masters, Coco. "The Myth of Baby Fat." *Time*. May 5, 2006.  
[time.blogs.com/daily\\_rx/2006/05/\\_the\\_myth\\_of\\_ba.html](http://time.blogs.com/daily_rx/2006/05/_the_myth_of_ba.html).
- Mayo Clinic. "Fitness on a budget: Low-cost ideas for getting in shape." Aug. 19, 2004.  
[www.mayoclinic.com/health/fitness/HQ00694\\_D](http://www.mayoclinic.com/health/fitness/HQ00694_D)
- National Center for Health Statistics. "Health, United States, 2005 With Chartbook on Trends in the Health of Americans." Hyattsville, Maryland: 2005.
- National Heart, Lung, and Blood Institute. NIH. "Tip Sheet: Eating Healthy with Ethnic Food." [www.nhlbi.nih.gov/health/public/heart/obesity/lose\\_wt/eth\\_dine.htm](http://www.nhlbi.nih.gov/health/public/heart/obesity/lose_wt/eth_dine.htm)



## Obesity: The Science Inside

National Institute of Diabetes and Digestive and Kidney Diseases. "Diet and Exercise Dramatically Delay Type 2 Diabetes: Diabetes Medication Metformin Also Effective." [www.niddk.nih.gov/welcome/releases/8\\_8\\_01.htm](http://www.niddk.nih.gov/welcome/releases/8_8_01.htm)

—. "Your Digestive System and How It Works." [digestive.niddk.nih.gov/ddiseases/pubs/yrdd/](http://digestive.niddk.nih.gov/ddiseases/pubs/yrdd/)

—. "Longitudinal Assessment of Bariatric Surgery Fact Sheet." NIH Publication No. 04-5573. June 2005.

—. "Lower Your Risk, Improve Your Health." Jan. 1, 1990. [health.yahoo.com/topic/weightloss/overview/article/niddk/weight\\_loss\\_wlc\\_risks1](http://health.yahoo.com/topic/weightloss/overview/article/niddk/weight_loss_wlc_risks1)

—. "Understanding Adult Obesity." NIH Publication No. 01-3680: October 2001. Updated March 2006.

Popcorn Board. "Understanding Calories." [www.popcorn.org/nutrition/calories/pccal-fax.cfm](http://www.popcorn.org/nutrition/calories/pccal-fax.cfm)

Raloff, Janet. "Still Hungry? Fattening revelations-and new mysteries-about the hunger hormone." Science News Online. April 2, 2005. [www.sciencenews.org/articles/20050402/bob9.asp](http://www.sciencenews.org/articles/20050402/bob9.asp)

Rand Corporation. "Cost Of Treatment For Obesity-Related Medical Problems Growing Dramatically" March 9, 2004.

Reaney, Patricia. Reuters. "Obesity, smoking speed up ageing." June 14, 2005.

Stein, Rob. *Washington Post*. "Science Notebook: A Common Gene for Obesity." April 17, 2006. Page A06.

United States Department of Health and Human Services. "Key Recommendations for the General Population, Dietary Guidelines for Americans 2005." January 11, 2005. [www.health.gov/dietaryguidelines/dga2005/recommendations.htm](http://www.health.gov/dietaryguidelines/dga2005/recommendations.htm)

University of Alabama Health System. "Dear Doctor Column." (August 25, 2003). [www.health.uab.edu/show.asp?durki=61705](http://www.health.uab.edu/show.asp?durki=61705)

University of California Davis Health System. "Obesity increasing among Asian Americans." Oct. 23, 2004.

University of Utah University Health Care. "A Healthier U—Health Calculators." [uuhsc.utah.edu/uuhsc/healthierU/calculator/bodyFatCal.cfm](http://uuhsc.utah.edu/uuhsc/healthierU/calculator/bodyFatCal.cfm)

Vincitorio, Mike. "Mike's Calorie And Fat Gram Chart For 1000 Foods." [www.caloriecountercharts.com/index.html](http://www.caloriecountercharts.com/index.html)

Willett, Walter C., M.D. *Eat, Drink, and Be Healthy*. New York: Simon and Schuster, 2001.

# Glossary

**ad·just·a·ble gas·tric band·ing:** weight-loss surgery that reduces the stomach's opening.

**ar·ter·ies:** any of the muscular elastic tubes that form a branching system and that carry blood away from the heart to the cells, tissues, and organs of the body.

**an·ti·ox·i·dants:** a substance, such as vitamin E, vitamin C, or beta-carotene, thought to protect body cells from some kinds of damage.

**ar·thri·tis:** inflammation of a joint, usually accompanied by pain, swelling, and stiffness, and resulting from infection, trauma, degenerative changes, metabolic disturbances, or other causes.

**bil·i·o·pan·cre·at·ic di·ver·sion:** weight-loss surgery that removes most of the stomach.

**blood pres·sure:** pressure of blood against artery walls.

**blood ves·sels:** the pipelines through which blood travels to all parts of the body.

**bod·y fat:** extra calories stored for later use in the body.

**bod·y fat per·cent·age:** an estimate of how much of your body is made up of fat.

**bod·y mass in·dex (BMI):** a measure of fatness that is calculated using height and weight. An ideal body mass index is 19, 20, or 21. The formula for body mass index is: weight in pounds divided by height in inches, divided by height in inches again, times 703.

**cal·i·pers:** tools that measure body fat in an area of the body.

**cal·o·ries:** units of energy-producing potential equal to the amount of heat that is contained in food and released upon oxidation by the body.

**car·bo·hy·drates:** foods that contain sugars and starches.

**car·di·o·vas·cu·lar:** term that describes the heart and blood vessels.

**car·di·o·vas·cu·lar dis·ease:** the combination of disease of the blood vessels and disease of the heart.

**cho·les·ter·ol:** a waxy substance produced by the body and taken in with food. The body needs cholesterol for functions such as making hormones, but too much can clog arteries and cause health problems.

**chron·ic:** long lasting and on going.

**clin·i·cal tri·als:** research tests using people that are performed to evaluate the success of a medical treatment, medicine, or prevention

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strategy. A clinical trial usually is conducted only after the test has been successful in the laboratory and on animals.

**co·lo·rec·tal can·cer:** a malignancy that arises from the lining of either the colon or the rectum. Cancers of the large intestine are the second most common form of cancer found in males and females.

**di·a·be·tes:** a set of illnesses caused by improper amounts of glucose (a form of sugar found in the body) in the blood.

**di·ag·no·sis:** a professional medical opinion, based on an examination of the patient, about what is causing symptoms of illness.

**di·as·tol·ic:** minimum pressure that remains within the artery when the heart is at rest.

**di·e·tary fat:** fat found in food.

**di·eth·yl·pro·pi·on:** a short-term appetite suppressant.

**gas·tric by·pass:** weight-loss surgery that re-routes the stomach.

**genes:** units of hereditary information contained in each cell of the body.

**ge·net·ics:** the field of science that looks at how genes are passed down from one generation to another to influence traits.

**ge·net·ic pre·dis·po·si·tion:** the term for a person's increased likelihood of developing some trait or ill-

ness because he or she carries certain genes.

**glu·cose:** blood sugar.

**gout:** a painful buildup of uric acid in the body.

**health dis·par·i·ty:** the uneven impact of a health problem that may occur between groups of people.

**heart at·tack:** a failure of the heart to perform its job of pushing blood through the blood vessels.

**heart dis·ease:** disease of the heart, the organ that pumps blood through the body. It is one of the possible complications of high blood pressure.

**height-weight growth chart:** a measurement doctors use to see if a child weighs too much for his or her height.

**high blood pres·sure:** a condition in which blood is pushed through the body's blood vessels at greater force than normal. It can lead to tiredness, heart attack, stroke and other health problems. High blood pressure is also known as hypertension.

**hor·mone:** a protein produced by an organ of the body to trigger activity in other locations.

**hy·per·ten·sion:** the medical term for high blood pressure.

**im·mune sys·tem:** the coordinated responses of the body that serve to protect it against outside invaders such as viruses and bacteria.

## Glossary

**in·flam·ma·tion:** a localized protective reaction of tissue to irritation, injury, or infection, characterized by pain, redness, swelling, and sometimes loss of function.

**in·su·lin:** a hormone released by the pancreas that triggers the opening of body cells to receive glucose.

**in·su·lin re·sis·tance:** actions by the cells to oppose insulin, which seeks to open the cells so that glucose may enter.

**kid·ney dis·ease:** a disease of the kidneys, the pair of organs that filter the blood. The disease can lead to kidney failure. It is also called neuropathy. It is one of the possible complications from high blood pressure.

**kid·neys:** the pair of organs that have the job of filtering the blood.

**lap·a·ro·scop·ic:** a less invasive type of surgery that uses a fiberoptic instrument.

**mal·nu·tri·tion:** poor nutrition caused by an insufficient or poorly balanced diet or faulty digestion or utilization of foods.

**me·tab·o·lism:** the series of chemical changes that take place in an organism, by means of which food and other substances are changed into energy and waste materials are eliminated.

**mm Hg:** abbreviation for millimeters of mercury. It is used to express measures of blood pressure. It refers

to the height to which the pressure in your blood vessels would push a column of mercury.

**o·bese:** suffering from obesity.

**o·be·si·ty:** the condition of being too heavy for one's height.

**ob·struc·tive sleep ap·ne·a:** a condition where a person stops breathing while asleep because of an obstruction in the airway.

**or·li·stat:** a diet drug that prevents fat absorption

**os·te·o·po·ro·sis:** a disease in which the bones become extremely porous, are subject to fracture, and heal slowly, occurring especially in women following menopause and often leading to curvature of the spine from vertebral collapse.

**o·ver·weight:** the condition of weighing more than one should.

**pan·cre·as:** the organ of the body that produces insulin and other hormones.

**pe·di·a·tri·cian:** a specialist in the care of babies and young children.

**phen·di·met·ra·zine:** a short-term appetite suppressant

**phen·ter·mine:** a diet drug that keeps you from feeling hungry.

**po·tas·si·um:** a mineral in the body's cells necessary for maintaining fluid balance. Good sources of potassium are bananas and orange

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juice. “Salt substitutes” usually contain potassium.

**prostate cancer:** the second most common malignancy in men. Most commonly seen in older men, with the age of 73 being the average age at the time of diagnosis.

**protein:** one of the body’s main building blocks. Protein is made by the liver and comes from certain foods like fish and beans.

**puberty:** the stage of adolescence in which an individual becomes physiologically capable of sexual reproduction.

**pulse:** heartbeats per minute.

**salt:** common table salt or sodium chloride.

**saturated fatty acids:** a fatty acid whose carbon chain cannot carry any more hydrogen; found chiefly in animal fats.

**sedentary:** accustomed to sitting or to taking little exercise.

**sibutramine:** a diet drug that makes you feel full.

**sodium:** a mineral that can contribute to high blood pressure in some people. It is found in baking soda, some antacids, the food preservative MSG (monosodium glutamate), among other items.

**starches:** a naturally abundant nutrient carbohydrate found in the seeds, fruits, corn, potatoes, wheat, and rice.

**stroke:** damage to the blood vessels in the brain because of loss of blood flow, which can result in the inability to speak or move part of the body.

**supplements:** something added to complete a thing, make up for a deficiency, or extend or strengthen the whole, as in “dietary supplements.”

**symptom:** a sign of a problem, such as a disease.

**systolic:** maximum pressure in the artery produced as the heart contracts and blood begins to flow.

**trans fatty acids:** fats that are bad for human health.

**treatment plan:** a plan put together by a doctor or team of health care professionals working with a patient. The patient is responsible for following the plan, with the goal of eliminating a disease or health condition or of reducing or delaying its complications.

**unsaturated fatty acids:** a fatty acid whose carbon chain can carry additional hydrogen.

**vertical gastric banding:** weight-loss surgery that reduces the opening to the stomach.



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13: Scott Bauer/USDA

14: Scott Bauer/USDA

15: The National Women's Health Information Center

17: ADAM

19: ADAM

20: Karen Kasmauski/Corbis

23: Lawrence Migdale/Photo Researchers, Inc.

24: Harry Mullen

25: ADAM

27: Russell Curtis/Photo Researchers, Inc.

29: Karen Kasmauski/Corbis

31: Carolyn A. McKeone/Photo Researchers, Inc.

32: Iowa State University

33: CDC

34: Annie Griffiths Belt/Corbis

35: Kirstin Fearnley

36: Brian Bailey/Corbis

37: MyPyramid.gov

38: SSPL/The Image Works

41: Laurent/Dielundama/Photo Researchers, Inc.

43: ADAM

45: Sarah Takagi

47: Bruce Fritz/USDA

48: Penni Gladstone/San Francisco Chronicle/Corbis

49: Alix/Photo Researchers, Inc.

52: Lawrence Migdale/Photo Researchers, Inc.

55: David Grossman/Photo Researchers, Inc.

56: Gabe Palmer/Corbis