

# **Obesity: Medical Approaches to Treatment**

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### **Purpose**

The purpose of this course is to familiarize the health practitioner with the causes of obesity and various medical approaches to treatment, including diet, exercise, medications, and behavioral therapy.

### **Goals**

Upon completion of this course, the health practitioner should be able to:

- Describe trends in obesity over the past 20 years.
- List 3 commonly used measures of obesity.
- List and discuss 4 contributing causes of obesity.
- Explain the normal ranges for fasting glucose, A1C, and cholesterol.
- Discuss dietary recommendations, including issues related to low fat or low carbohydrate diets.
- Discuss exercise recommendations, including MET value.
- List at least 4 medications commonly used to treat obesity.
- Describe at least 4 behavioral strategies to help people cope with weight reduction efforts.

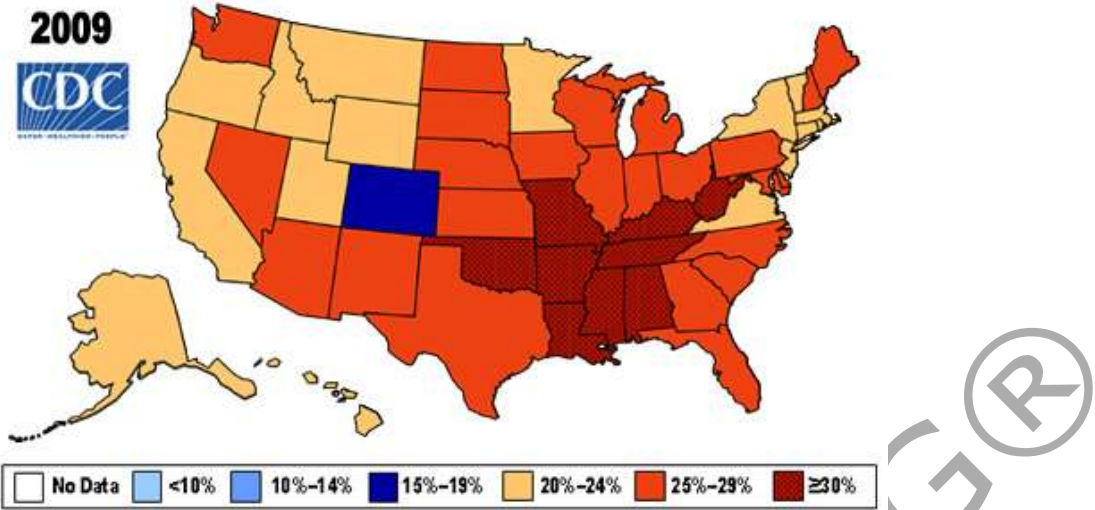
### **Introduction**



About two-thirds of American adults are overweight and a full third are obese, and children, currently at 17%, are catching up. Hospitals now provide oversized wheelchairs, airlines require some people to buy 2 seats instead of one, the market for plus-size clothes has skyrocketed, and fast food restaurants super-size almost everything. Signs of obesity are everywhere. The past 20 years has seen a major increase in obesity (BMI >30).

### CDC: 1990





Statistics paint a grim picture because the biggest impact of increased obesity is on health. As the population becomes more obese, rates of diabetes type 2, hypertension, heart disease, stroke, and hyperlipidemia, among many other diseases, have also increased. Rows of magazines at the checkout stands in grocery stores have headlines touting the latest “miracle” diets to lose weight while the shoppers carts are piled full of high carbohydrate, high fat foods. About 225,000 people a year resort to bariatric surgery (see *Obesity: Bariatric Surgical Options*), and many more have their bodies “sculpted” through liposuction. Can anything be done to help people control their weight?

Commonly-used assessments of obesity*			
<b>Body mass index (BMI)</b>			
<b>BMI</b>		<b>Weight Status</b>	
Below 18.5		Underweight	
18.5 – 24.9		Normal	
25.0 – 29.9		Overweight	
30.0 – 34.9		Obese	
35.0 – 39.9		Severe obesity	
≥40		Morbid obesity	
<b>Waist circumference (WC)</b>			
<b>Gender</b>	<b>Low risk</b>		<b>High risk</b>
<b>Male</b>	≤40 inches		>40 inches
<b>Female</b>	≤35 inches		>35 inches
<b>Waist-to-hip ratio (WHR)</b>			
<b>Gender</b>	<b>Ideal</b>	<b>Increased risk</b>	<b>High risk</b>
<b>Male</b>	0.9 to 0.95	0.96 to 1.0	>1.0
<b>Female</b>	0.7 to 0.8	0.81 to 0.85	>0.85

\* See *Obesity: Methods of Assessment*

## Why are people overweight?

Most healthcare providers agree that a high fat/high caloric diet and lack of exercise are the primary culprits in obesity, and that's probably true for the population at large, but when assessing the individual, it's not quite that simple.

### Metabolic rate

The basal metabolic rate (BMR), the amount of energy the body expends at rest, is the primary determinant of calorie expenditure and varies from one person to another. The basic life processes (organ function) take about 70% of total energy expenditure, physical activity 20%, and digestion of food 10%. Metabolism is primarily controlled by the hypothalamus, but other organs can affect the BMR.

The thyroid gland controls the rate at which cells work, so when thyroid cells begin to fail, such as occurs with hypothyroidism, the rate of metabolism slows. Because less energy is being expended, fewer calories are burned, and the person tends to slowly begin to gain weight.

The metabolic rate corresponds to muscle mass, so those with more muscle mass burn calories faster. Since males, in general, tend to have a larger muscle mass than females, their metabolic rate is usually higher.

Age is another consideration. Slowing of the metabolic rate appears to be one of the effects of aging. Unfortunately, this is often combined with a decrease in activity.

### Hormones

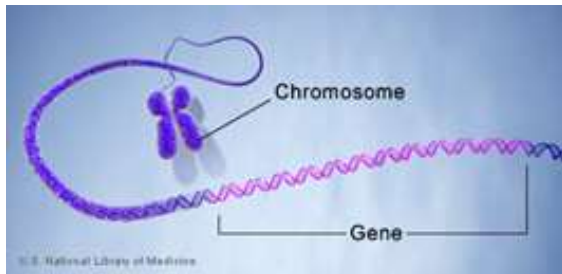
Cushing's syndrome, caused by tumor of the pituitary gland that causes increased production of cortisol, is characterized by central weight gain (trunk, face, upper back). Cushing's syndrome can be triggered by oral corticosteroids (such as prednisone). Additionally, studies indicate that stress increases production of cortisol, resulting in central obesity.

Females, on average, have 6 to 11% more body fat than males. The reason for this is that estrogen slows the burning of fat. Even with exercise, females tend to conserve fat better than males. During fertile years, this probably serves the purpose of storing fat for energy needs required for childbearing. Prior to menopause, women tend to deposit excess fat in the hip area (leaving the abdomen free to expand during pregnancy), but after menopause, as estrogen levels fall, weight tends to be deposited centrally, around the abdomen, and females often become more insulin resistant.

Males may experience a decrease in testosterone levels with aging, resulting in less energy and often less activity. As males become more sedentary, they begin to lose muscle mass, causing a reduction in energy expenditure, so fat deposits and weight tend to increase. Men tend to put on weight centrally more

than women, so as testosterone levels fall, the waist size increases.

## Genetics



It's clear that genetics plays a role in obesity. If parents are obese, there's a good chance the children will be obese. Studies of twins separated at birth show that individuals tend to store and gain weight in patterns that resemble the birth parents rather than the adoptive parents. Identical twins tend to be more similar in weight than fraternal twins.

No one can, however, assign percentages to these patterns with certainty. Do we inherit 20% 50%? 80%? Could genetics account for the marked increase in obesity over the past 20 to 30 years? Probably not, unless people are rapidly mutating. However, recent studies do show an association between genetic differences and obesity:

- 50 chromosomal locations that appear to have genes that can cause obesity have been identified.
- Mutations in melanocortin 4-receptor gene (controlling feeding behavior) is linked to about 5% of obesity cases.
- FTO, fat mass and obesity-associated gene may be responsible for 22% of cases of obesity (also associated with diabetes).
- Researchers from Stanford University and Interleukin Genetics found when studying response to different diets (A to Z study—Atkins-traditional Ornish-Zone) that the presence of three genes—ADP2, ADRB2, and PPAR-gamma—could predict weight loss with certain types of diets. That is, some people lost weight with a low carbohydrate diet and others with low fat, depending on their genotype: “Women assigned to a genotype-appropriate diet lost 5.3% of their body weight compared with just 2.3% among those not matched to genotype.” For example, in the group of women on the Atkins low carbohydrate diet, those matched for genotype averaged a 12-pound loss and those unmatched a 2-pound loss. The studies indicated that about 45% of those involved in the studies were genetically predisposed to a low carb diet, 39% to lowfat, and 16% combined.

## Environmental factors

While people may inherit a tendency to obesity, environmental factors, such as caloric intake and eating habits, appear to play a large role in obesity. According

to the US Department of Agriculture, in 2000 the average daily calorie consumption per person was 2700 calories, an increase of 530 calories per day (>24%) from 1970.

Distribution of extra (>24%) calories	
Percent	Food item
9.5	Grains (primarily refined)
9.0	Fats and oils
4.7	Sugars
1.5	Fruits and vegetables
1	Meats and nuts
-1.5 (decrease)	Eggs and dairy products

It only takes a brief review of the above chart to see that people are eating more refined carbohydrates and fats. This change in dietary habits directly relates to other changes, such as the trend toward eating out—especially in fast food restaurants—and increased availability of prepared foods.

### What treatments are available for obesity?

If people are 10 to 15 pounds overweight, often simple changes in diet or increase in exercise can help to reduce weight, but once people become obese, weight loss becomes much more challenging. These people are often veterans of diets, having lost and regained dozens (sometimes hundreds) of pounds and started and stopped numerous exercise regimens. One of the biggest difficulties for healthcare providers is to convince people who have given up or retreated into depression that it's even possible for them to lose weight.

### Control underlying diseases

The first step in managing obesity is a complete history and physical examination with laboratory studies to determine if there are underlying diseases, such as diabetes, hyperlipidemia, hypertension, heart failure, or hypothyroidism, which require treatment. Efforts must be made to manage symptoms, such as pain (which might interfere with exercise) and depression as well as to institute occupational therapy for people who find it difficult to prepare meals because of limited mobility.

Controlling diabetes is especially critical as diabetes type 2 often results from obesity, and there is a clear correlation between rates of diabetes type 2 and obesity.

Laboratory monitoring for diabetes	
Fasting glucose	<ul style="list-style-type: none"> <li>• Normal values: 70-99 mg/dL.</li> <li>• At risk: 100-125 mg/dL.</li> <li>• Hyperglycemic: <math>\geq 126</math> mg/dL.</li> </ul>
Hemoglobin A1C	<ul style="list-style-type: none"> <li>• Normal value: &lt;6%.</li> <li>• Elevated level: &gt;7%.</li> </ul>

Goals include:

- Fasting glucose <100 mg/dl
- Hemoglobin A1C for diabetics: <7%.
- Hemoglobin A1C for non-diabetics: 4-6%

Hyperlipidemia is common in those who are obese and is usually monitored to determine the effectiveness of diet. LDL levels often increase with protein and fat intake while triglyceride levels increase with high carbohydrate intake.

Cholesterol levels		
<b>Low-density lipoprotein (LDL)</b>	<ul style="list-style-type: none"><li>• &lt;100: Optimal</li><li>• 100-129: Near optimal</li><li>• 130-159: Borderline high</li><li>• 160-189: High</li><li>• ≥190: Very high</li></ul>	
<b>Total cholesterol</b>	<ul style="list-style-type: none"><li>• &lt;200: Optimal</li><li>• 200-239: Borderline high</li><li>• ≥240: High</li></ul>	
<b>High-density lipoprotein (HDL)</b>	<ul style="list-style-type: none"><li>• &lt;40: Low</li><li>• ≥60: High</li></ul>	
<b>Triglycerides</b>	<ul style="list-style-type: none"><li>• &lt;150: Normal</li><li>• 150-199: Borderline high</li><li>• 200-499: High</li><li>• ≥500: Very high</li></ul>	

Goals include

- Low levels of triglycerides and low-density lipoproteins.
- High levels of high-density lipoproteins.
- Total cholesterol <200.

## Diet

Crash diets, fad diets, and liquid diets should be avoided as they may lead to health problems and almost always result in people regaining weight because they haven't altered the basic eating problems that caused the weight gain. In some cases, physicians may prescribe a liquid diet of 600 to 800 (or even fewer) calories daily for a specific period of time, but this diet should only be used under strict medical supervision, usually during hospitalization. People who are diabetic should meet with a nutritionist to plan their optimal diet for controlling glucose levels.

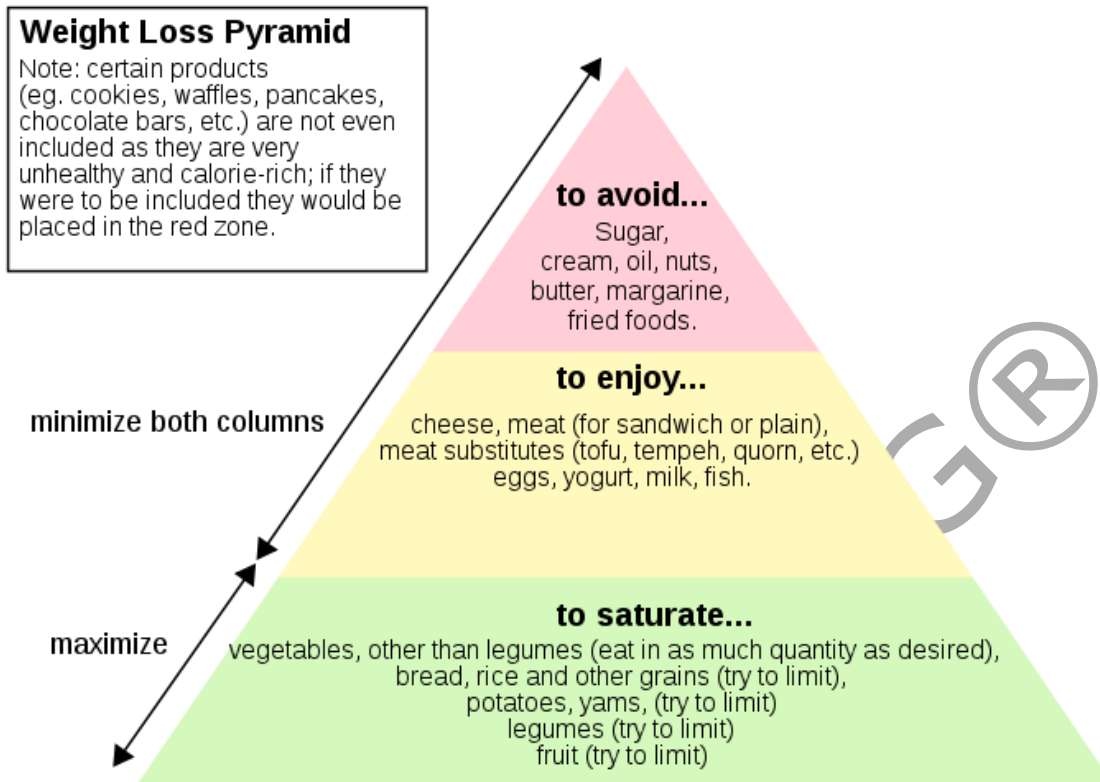
Diet plans should be individualized. Typical orthodoxy prescribes a low calorie (1000 to 1600), low fat diet, but this one-size-fits-all approach has not shown remarkable success. New research (see above) regarding genetic predispositions for certain types of diets suggests that genetic testing—available from the company involved in the research at Stanford (InherentHealth.com) and others—may be of value; however, since many people who are obese have had

abysmal diets for years, a few weeks of experimentation to determine which approach is most successful costs nothing and actively engages the dieter.

Whether a low carb, low fat, or some combination is chosen, the primary goal of diet instruction should be to help the person make wise choices. Even diet programs that do not require calorie counting, such as Atkins, advise against excess eating and promote eating methods designed to curb appetite. Ultimately, almost all people who are obese need to reduce overall caloric intake, but this reduction should be within a diet plan developed for the individual. The goal of weight loss is 1 to 2 pounds weekly although markedly obese people may lose more weight at the onset of dieting. Goals include:

- Sugar can easily be replaced with sugar substitutes—and there are now many choices available, including Equal®, Splenda®, and Truvia®, which are usually better tasting than earlier substitutes.
- Simple carbohydrates (refined sugars and grains, such as white flour) should be avoided and replaced with whole grains, which add fiber to the diet and help the person feel satiated.
- Low glycemia vegetables and fruit (asparagus, broccoli, apples) should be eaten more frequently than high glycemic vegetables and fruit (corn, bananas).
- Servings of high carbohydrate staples, such as potatoes, rice (whole grain preferred), and beans, should be limited.
- 5-7 daily servings of vegetables and 1-2 servings of fruit are recommended for most diets.
- Adequate protein (meat, soy products, dairy products, eggs) should be included daily.
- People should have adequate fiber in their diets, especially from large salads, which are low in calories and are filling.
- Most saturated fats should be replaced with heart-healthy fats, such as olive oil, canola oil, and flaxseed oil. Some fat in the diet helps to control hunger and improves palatability of foods. People on severely restricted low fat diets often feel hungry and have difficulty staying on the diet.
- Prepared foods and fast foods should be avoided as much as possible.





Keeping a daily food diary that lists all foods and fluids ingested is helpful for many people because it allows them to really take a look at what they are eating. (All those little bites and snacks can add up quickly!) While counting calories is not always the best way to diet, some people benefit from checking the caloric and nutritional content of food when planning their diet. People should be taught how to read food labels on prepared foods.

One important consideration is that obesity and good nutrition are often at odds. Some people become obese by eating too many “empty calories,” such as high sugar/carbohydrate foods such as desserts, candy, chips, and dip. Older adults may not be able to prepare nutritious meals without help and may subsist on inadequate diets. Thus, people may be morbidly obese and suffer from malnutrition.

Nutritional assessment tools	
<b>Mini-Nutritional Assessment (MNA®)</b>	Applicable only for adults >65 to evaluate malnutrition risk. Includes 15 questions and 4 measures (BMI, height and weight, mid-arm, and calf circumference).
<b>Nutritional Screening Initiative®</b>	Also applicable only for adults >65, Screens for information about diet as well as social and environmental factors that may interfere with nutrition.
<b>Subjective</b>	General assessment tool to determine risk (mild to severe) of

<b>Global Assessment®</b>	malnutrition. Includes history regarding diet, weight change, intake, functional limitations, and GI signs or symptoms.
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Assessment for malnutrition includes a complete blood count, which may show indications of anemia. However, other laboratory tests are also of value when determining the degree or type of malnutrition.

<b>Nutritional laboratory testing</b>	
<b>Hemoglobin</b>	Normal values: Male, 18-18 g/dL; Females, 12-16 g/dL. Hemoglobin may decrease with deficiency of amino acids, vitamins or minerals. Increase may indicate dehydration.
<b>Hematocrit</b>	Normal values: Male, 42-52%; Females, 37-48%. Hematocrit may decrease with anemia and increase with dehydration.
<b>Total protein</b>	Normal value: 6-8 g/dL. Many different factors (stress, infection) may affect total protein levels, so this test is not adequate alone.
<b>Albumin</b>	Normal values: 3.5-5.5 g/dL. This protein (produced by the liver) decreases with albumin. Because the half-life is 18-20 days, this test is more sensitive for long-term than short-term malnutrition.
<b>Prealbumin</b>	Normal values: 16-40 mg/dL. This protein, also produced in the liver, has a half-life of 2-3 days, so this test is valuable to monitor acute changes in nutritional statuses.
<b>Transferrin</b>	Normal values: 200-400 mg/dL. Transferrin, produced in the liver, carries iron from the intestines to the bone marrow, where it produces hemoglobin. Levels may fall rapidly with malnutrition, but transferrin levels can be affected by many different factors.

## **Exercise**

Exercise programs for obesity should always include advice of the physicians so that exercises are safe and take into account physical disease or disabilities that may interfere with exercise or preclude certain types of exercise. Fitness testing that identifies the resting heart rate and heart rate with different types of exertion can serve as a guide. Often people who are obese are physically inactive because of their obesity, so any exercise program should start with low intensity exercises of short duration, gradually increasing the duration and frequency prior to increasing intensity. Walking, cycling, and swimming are good exercises, but the key is to start slowly. High impact exercises, such as running, may cause injury to joints if people are severely overweight.

Considering the type of exercises people like to do is critical if people are to remain motivated to exercise, so people should take an active role in planning an exercise program. While exercise alone may not increase weight loss, it does

increase the feeling of wellbeing and helps to tone muscles and improve flexibility. The American Heart Association recommends that all adults exercise 30 minutes daily on most days of the week, so this is a good goal to work toward. Regular exercise correlates with increased HDL (levels below 40 mg/dL for men and 50 mg/dL for women are associated with increased coronary artery disease). Resistance training has shown benefits by increasing muscle strength and lean body mass, which may increase metabolism rate.

Exercises are commonly rated according the metabolic equivalent of task, commonly referred to as the MET value, which is the amount of energy expended in a task. Higher MET values correspond with higher burning of calories. MET values are based on averages and may not be exact for the individual, but they provide a useful guide. Full MET value charts ([http://prevention.sph.sc.edu/tools/docs/documents\\_compendium.pdf](http://prevention.sph.sc.edu/tools/docs/documents_compendium.pdf)) are available that list almost every conceivable activity (walking to the outhouse, washing the fence).

Activities	MET values
Sleeping	0.9
Watching television	1
Reading (sitting)	1
Self-care (bathing, dressing, toileting)	1 to 2
Sexual activity (kissing to intercourse)	1 to 1.5
Working on arts & crafts (sitting)	1.5-2
Watering lawn	1.5
Playing the piano	2.5
Housework (most)	2.5 to 3.5
Childcare	2.5 to 3
Walking (slow stroll on level ground)	2.3
Walking (2.5 to 3 mph)	2.9 to 3.3
Playing with animals (depending on intensity)	2.5 to 3.5
Riding stationary bike (50 watt to 100 watt)	3 to 5.5
Home repairs	3.5 to 5
Tai Chi	4
Golfing (walking and pulling clubs)	4.3
Golfing (riding in cart)	3.5
Mowing the lawn	5.5
Bicycling	6-8
Weight lifting (free weights or others)	6
Jogging	7 to 8
Swimming (depends on stroke and intensity)	7 to 11
Aerobics	6 to 8.5
Running (10min/mile)	10
Jumping rope	10

## Medications

People should not take over-the-counter dieting drugs. While some, such as those with ephedra (which increased metabolism), have been taken off the market because of side effects, there is little evidence that those still on the market are of any real value. Some increase fluid loss, but fluid is not fat. If the scales go down two pounds because of diuresis, the person did not get thinner. Some patients use diuretics and laxatives to try to bring about weight loss, so people should be educated about the harmful effects and general ineffectiveness of using these drugs for weight control. Medications should only be taken with medical supervision, combined with a diet, exercise program, and education regarding side effects and expected outcomes. Medications may be prescribed for those with BMI >30 or >27 if the person has health risks (diabetes type 2, hypertension, hyperlipidemia, sleep apnea, or coronary artery disease).

Medications to treat obesity		
<b>Sibutramine</b> (Meridia®)	Appetite suppressant	Increases levels of serotonin, norepinephrine, and dopamine by inhibiting reuptake, decreasing hunger and enhancing feeling of satiety. Treatment: 10 mg daily, up to 15 mg daily if necessary. Duration varies up to 2 years.
<b>Orlistat</b> (Xenical®) (also available OTC at half-dose as Alli®)	Lipase inhibitor (prevents absorption of fat)	Inhibits gastric and pancreatic enzymes that break down triglycerides into fatty acids, so the fats are excreted in the feces. (Also inhibits absorption of fat-soluble vitamins). Treatment: 120 mg three times daily (or 60 mg three times daily with OTC dosage) ≤4 years.
<b>Phentermine</b> (Adipex-P®, Ionamin®, Kraftobese®)	Appetite suppressant	Increases production of neurotransmitter (norepinephrine) that reduces hunger. Treatment: 37.5 mg for ≤12 weeks duration.
<b>Benzphetamine</b> (Didrex®)	Central nervous system stimulant	Decreases appetite but can be habit-forming. Treatment: 50 mg one time daily for a few weeks.
<b>Diethylpropion</b> (Tenuate®)	Central nervous system stimulant	Decreases appetite but can be habit-forming. Treatment: 25 mg 3 times daily or one time daily with controlled-release (75 mg) dose for a few weeks.

Additional medications may be prescribed, but they are not specific to obesity.

For example, antidepressants, such as Wellbutrin®, may be prescribed as depression is frequently associated with obesity.

## Behavioral therapy

While some people are clinically depressed and may require antidepressants and intensive therapy, almost all people who are obese benefit from some behavioral therapy, whether formal through counselling or informal through monitoring and general support. People often need to learn different coping strategies as they may have long histories of using food as reward or for emotional support, and these habits can be hard to break. Behavioral therapy can help people recognize habits that have contributed to weight gain and coping strategies to change these habits. People need to set small goals that are achievable rather than to focus simply on the end goal (being thin). People are often unaware of the reasons they overeat, but people can learn to recognize triggers for overeating and to develop alternatives. For example, some people who are obese respond to thirst by eating, so when they have the urge to eat, they can learn to first drink a glass of water.

Coping strategies	
<b>Meditation/relaxation</b>	Reduces stress.
<b>Self-monitoring (diet and exercise)</b>	Increases motivation, responsibility, and awareness,
<b>Problem-solving strategies</b>	Helps to identify problems and arrive at solutions.
<b>Rewards</b>	Provides goals and benefits for compliance. (May be a dessert, special meal, trip to a spa, or some other special treat).
<b>Cognitive behavioral strategies</b>	Teaches strategies of self-talk to cope with negative thoughts and develop realistic goals.
<b>Social network</b>	Provides emotional support and ability to vent. (May be family, friends, online message board, or weight loss group, such as Weight Watchers®.)
<b>Eating differently</b>	Includes chewing slowly, eating 4 or 5 small meals rather than 3 large, drinking adequate fluids, and eating a large salad before meals to decrease hunger.

## Conclusion

If losing weight were easy, most Americans would be thin, but they're not. Rates of obesity have skyrocketed over the last 20 years with two-thirds of adults overweight. While clearly Americans' penchant for high fat/high caloric diets and lack of adequate exercise have contributed to obesity, other factors must be considered: metabolic rate, hormones, genetics, and environmental factors. Medical approaches to treatment include control of underlying disease (such as diabetes and hypothyroidism), diet (low fat, low carbohydrate, or a combination),

exercise (with programs tailored for the individual), medications (primarily appetite suppressants or lipase inhibitor), and behavioral strategies to help people successfully stay on a program of diet and exercise to lose weight and keep weight off.

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