

# High Blood Pressure

Blood pressure is the force of blood against your artery walls as it circulates through your body. Blood pressure normally rises and falls throughout the day, but it can cause health problems if it stays high for a long time. Having high blood pressure raises your risk for heart disease and stroke, leading causes of death in the United States.

High blood pressure is called the "silent killer" because many people don't realize they have it. High blood pressure often has no warning signs or symptoms.

## Measuring Your Blood Pressure - Systolic and Diastolic

Measuring your blood pressure is quick and painless. A doctor or health professional wraps an inflatable cuff with a pressure gauge around your arm to squeeze the blood vessels. Then he or she listens to your pulse with a stethoscope while releasing air from the cuff and watching the gauge. The gauge measures blood pressure in millimeters of mercury, which is abbreviated as mmHg.

Blood pressure is measured using two numbers. The first (systolic) number represents the pressure in your blood vessels when your heart beats. The second (diastolic) number represents the pressure in your vessels when your heart rests between beats. If the measurement reads 120 systolic and 80 diastolic, you would say "120 over 80" or write "120/80 mmHg."

## Effects of High Blood Pressure

High blood pressure can damage your health in many ways.

For instance, it can harden the arteries, decreasing the flow of blood and oxygen to the heart. This reduced flow can cause

- Chest pain, also called angina.
- Heart failure, which occurs when the heart can't pump enough blood and oxygen to your other organs.
- Heart attack, which occurs when the blood supply to your heart is blocked and heart muscle cells die from a lack of oxygen. The longer the blood flow is blocked, the greater the damage to the heart.

High blood pressure can burst or block arteries that supply blood and oxygen to the brain, causing a stroke.

## Risk Factors

Some health conditions, as well as lifestyle and genetic factors, can put people at a higher risk for developing high blood pressure. However, everyone can take steps to lower their blood pressure.

Because blood pressure tends to rise as people get older, everyone's risk for high blood pressure increases with age. In addition, some medical conditions can also raise your risk of high blood pressure.

### Prehypertension

Prehypertension—blood pressure levels that are slightly higher than normal—increases the risk that you will go on to develop chronic high blood pressure.

Blood Pressure Levels	
<b>Normal</b>	Systolic: less than 120 mmHg Diastolic: less than 80 mmHg
<b>At Risk (Prehypertension)</b>	Systolic: 120–139 mmHg Diastolic: 80–89 mmHg
<b>High</b>	Systolic: 140 mmHg or higher Diastolic: 90 mmHg or higher

### Diabetes

Diabetes affects the body's use of a hormone called insulin. This hormone tells the body to remove sugar from the blood. With diabetes, the body either doesn't make enough insulin, can't use its own insulin as well as it should, or both. This causes sugars to build up in the blood. About 60% of people who have diabetes also have high blood pressure.

### Behavior

Healthy behaviors contribute to keeping your blood pressure low, which in turn decreases your risk of heart disease.

### Diet

**Sodium** is the element in salt that can raise blood pressure. Most of the sodium we eat comes from processed and restaurant foods. Eating too much sodium can increase blood pressure. Not eating enough potassium (from fruits and vegetables) can also increase blood pressure.

### Weight

Being overweight can cause high blood pressure.

## Physical Inactivity

Not getting enough exercise can make you gain weight, which can lead to high blood pressure.

## Alcohol Use

Drinking too much alcohol can raise your blood pressure.

## Tobacco Use

Smoking raises your risk for high blood pressure.

## Heredity

There are also several factors that you cannot change that affect your blood pressure, like heredity.

## Age

Blood pressure tends to rise as people get older.

## Family History

High blood pressure can run in families. People can inherit genes that make them more likely to develop the condition. The risk for high blood pressure can increase even more when heredity is combined with unhealthy lifestyle choices, such as smoking cigarettes and eating a poor diet.

## How to Prevent High Blood Pressure

Increases in blood pressure increases your risk for heart disease. People at any age can take steps each day to keep blood pressure levels normal.

## Lifestyle

- **Eat a healthy diet.** Eating healthfully can help keep your blood pressure down. Eat lots of fresh fruits and vegetables, which provide nutrients such as potassium and fiber. Also, eat foods that are low in saturated fat and cholesterol.  
**Avoid sodium** by limiting the amount of salt you add to your food. Be aware that many processed foods and restaurant meals are high in sodium.
- **Maintain a healthy weight.** Being overweight can raise your blood pressure. Losing weight can help you lower your blood pressure.  
To find out whether your weight is healthy, doctors often calculate a number called the body mass index (BMI). Doctors sometimes also use waist and hip measurements to measure a person's excess body fat.
- **Be physically active.** Physical activity can help lower blood pressure. It is recommended that adults should engage in moderate physical activities for at least 30 minutes on most days of the week.

## Key Definitions

- **Cholesterol** is a fat-like substance in the body. High levels in the blood can lead to heart disease and stroke.
- **Saturated fats** come largely from animal fat in the diet, but also from some vegetable oils such as palm oil.
- **Sodium** is the element in salt that can raise blood pressure. Most of the sodium we eat comes from processed and restaurant foods.
- **Diabetes** is a disease that affects the body's use of insulin. Insulin tells the body to remove sugar from the blood. People with diabetes either don't make enough insulin, can't use their own insulin as well as they should, or both.
- **Don't smoke.** Smoking injures blood vessels and speeds up the hardening of the arteries. Further, smoking is a major risk for heart disease and stroke. If you don't smoke, don't start. If you do smoke, quitting will lower your risk for heart disease and stroke. Your doctor can suggest programs to help you quit.
- **Limit alcohol use.** Drinking too much alcohol is associated with high blood pressure. If you drink alcohol, you should do so in moderation—no more than one drink per day for women or two drinks per day for men.

## What You Can Do

- **Check your blood pressure.** Getting your blood pressure checked is important because high blood pressure often has no symptoms. Your doctor can measure your blood pressure, or you can use a machine available at many pharmacies. You can also use a home monitoring device to measure your blood pressure.

Blood pressure is written as two numbers. The first (systolic) number represents the pressure in your blood vessels when your heart beats. The second (diastolic) number represents the pressure in your vessels when your heart rests between beats.

Blood Pressure Levels	
<b>Normal</b>	Systolic: less than 120 mmHg Diastolic: less than 80 mmHg
<b>At risk (prehypertension)</b>	Systolic: 120–139 mmHg Diastolic: 80–89 mmHg
<b>High</b>	Systolic: 140 mmHg or higher Diastolic: 90 mmHg or higher

- **Monitor Sodium Intake**

Most of the sodium we consume is in the form of salt, and the vast majority of sodium we consume is in processed and restaurant foods. Too much sodium is bad for your health. It can increase your blood pressure and your risk for a heart attack and stroke. Heart disease and stroke are the first and third killers of men and women each year.

Current dietary guidelines recommend that adults in general should consume no more than 2,300 mg of sodium per day. At the same time, consume potassium-rich foods, such as fruits and vegetables. However, if you are in the following population groups, you should consume no more than 1,500 mg of sodium per day, and meet the potassium recommendation (4,700 mg/day) with food.

- You are 51 years of age or older.
- You have high blood pressure.
- You have diabetes.
- You have chronic kidney disease.

The 1,500 mg recommendation applies to majority of adults. Nearly everyone benefits from reduced sodium consumption. Eating less sodium can help prevent, or control, high blood pressure.

Most of the sodium we eat comes from packaged, processed, store-bought, and restaurants foods. Only a small amount comes from salt added during cooking and from being added at the table, and most of us have already exceeded their daily limit of sodium before cooking or adding salt at the table. You can find out how much sodium you are eating by checking the labels on food products and adding up the milligrams of sodium. If at a restaurant, ask for nutritional information facts that include sodium.

- **Choose a Heart-Healthy Diet**

The DASH eating plan (Dietary Approaches to Stop Hypertension)\* is a simple heart healthy diet that can help prevent or lower high blood pressure.

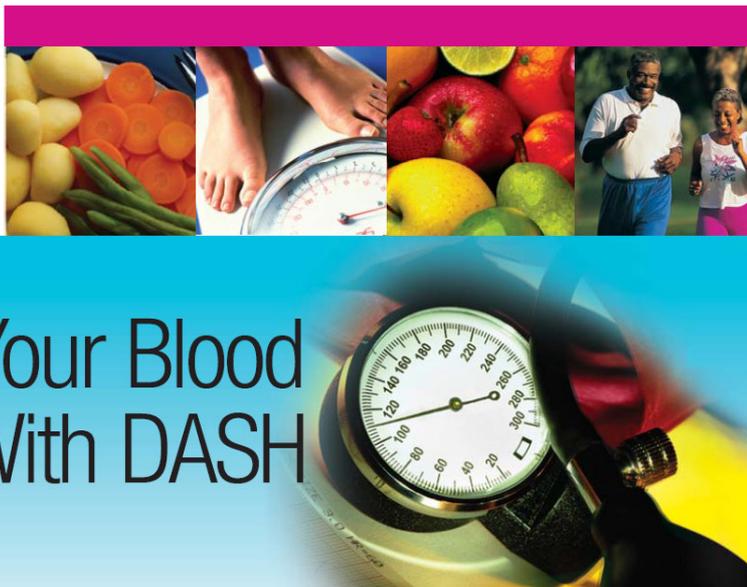
This diet is **LOW** in sodium, cholesterol, saturated and total fat, and **HIGH** in fruits and vegetables, fiber, potassium, and low-fat dairy products.

Making other lifestyle changes, like getting more physical activity, while on the DASH eating plan gives you the biggest benefits.

\*Detailed below

IN BRIEF:

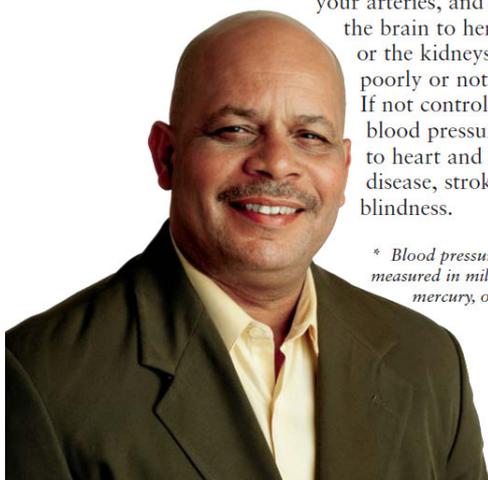
# Your Guide To Lowering Your Blood Pressure With DASH



What you eat affects your chances of developing high blood pressure (hypertension). Research shows that high blood pressure can be prevented—and lowered—by following the Dietary Approaches to Stop Hypertension (DASH) eating plan, which includes eating less salt and sodium.

High blood pressure, which is blood pressure higher than 140/90 mmHg,\* affects more than 65 million—or 1 out of every 3—American adults. Another 59 million Americans have prehypertension, which is blood pressure between 120/80 and 140/89 mmHg. This increases their chances of developing high blood pressure and its complications.

High blood pressure is dangerous because it makes your heart work too hard, hardens the walls of your arteries, and can cause the brain to hemorrhage or the kidneys to function poorly or not at all. If not controlled, high blood pressure can lead to heart and kidney disease, stroke, and blindness.



\* Blood pressure is usually measured in milligrams of mercury, or mmHg.

But high blood pressure can be prevented—and lowered—if you take these steps:

- Follow a healthy eating plan, such as DASH, that includes foods lower in salt and sodium.
- Maintain a healthy weight.
- Be moderately physically active for at least 30 minutes on most days of the week.
- If you drink alcoholic beverages, do so in moderation.

If you already have high blood pressure and your doctor has prescribed medicine, take your medicine, as directed, and also follow these steps.

## The DASH Eating Plan

The DASH eating plan is rich in fruits, vegetables, fat-free or low-fat milk and milk products, whole grains, fish, poultry, beans, seeds, and nuts. It also contains less salt and sodium; sweets, added sugars, and sugar-containing beverages; fats; and red meats than the typical American diet. This heart healthy way of eating is also lower in saturated fat, *trans* fat, and cholesterol and rich in nutrients that are associated with lowering blood pressure—mainly potassium, magnesium, and calcium, protein, and fiber.



U.S. Department of Health and Human Services  
National Institutes of Health  
National Heart, Lung, and Blood Institute

## How Do I Make the DASH?

The DASH eating plan requires no special foods and has no hard-to-follow recipes. It simply calls for a certain number of daily servings from various food groups.

The number of servings depends on the number of calories you're allowed each day. Your calorie level depends on your age and, especially, how active you are. Think of this as an energy balance system—if you want to maintain your current weight, you should take in only as many calories as you burn by being physically active. If you need to lose weight, eat fewer calories than you burn or increase your activity level to burn more calories than you eat.

What is your physical activity level? Are you mostly:

- Sedentary? You do only light physical activity that is part of your typical day-to-day routine.
- Moderately active? You do physical activity equal to walking about 1.5–3 miles a day at 3–4 miles per hour, plus light physical activity.
- Active? You do physical activity equal to walking more than 3 miles per day at 3–4 miles per hour, plus light physical activity.

Use the chart below to estimate your daily calorie needs.

## Your Daily Calorie Needs

Gender	Age (years)	Calories Needed for Each Activity Level		
		Sedentary	Moderately Active	Active
Female	19–30	2,000	2,000–2,200	2,400
	31–50	1,800	2,000	2,200
	51+	1,600	1,800	2,000–2,200
Male	19–30	2,400	2,600–2,800	3,000
	31–50	2,200	2,400–2,600	2,800–3,000
	51+	2,000	2,200–2,400	2,400–2,800

Now that you know how many calories you're allowed each day, find the closest calorie level to yours in the chart on page 3 called "Following the DASH Eating Plan." This shows roughly the number of servings from each food group that you can eat each day.

Next, compare DASH with your current eating pattern. Fill in the "What's on Your Plate and How Much Are You Moving?" chart on page 4 for 1–2 days to compare what you usually eat with the DASH plan—and note how active you are. This should help you decide what changes you need to make in your food choices—and in the sizes of the portions you eat.

"A Day With the DASH Eating Plan" on page 6 shows a sample menu based on about 2,000 calories a day. Increase or decrease the serving sizes for your own calorie level. This chart also shows the two levels of sodium, 2,300 and 1,500 milligrams, that DASH allows each day. Because fruits and vegetables are naturally lower in sodium than many other foods, DASH makes it easier to eat less sodium. Try it at the 2,300-milligram level (about 1 teaspoon of table salt). Then, talk to your doctor about gradually lowering it to 1,500 milligrams a day. Keep in mind: The less salt you eat, the more you may be able to lower your blood pressure.

Choose and prepare foods with less salt, and don't bring the salt shaker to the table. Be creative—try herbs, spices, lemon, lime, vinegar, wine, and salt-free seasoning blends in cooking and at the table. And, because most of the salt, or sodium, that we eat comes from processed foods, be sure to read food labels to check the amount of sodium in different food products. Aim for foods that contain 5 percent or less of the Daily Value of sodium. Foods with 20 percent or more Daily Value of sodium are considered high. These include baked goods, certain cereals, soy sauce, some antacids—the range is wide.

## DASH Tips for Gradual Change

Make these changes over a couple of days or weeks to give yourself a chance to adjust and make them part of your daily routine:

- Add a serving of vegetables at lunch one day and dinner the next, and add fruit at one meal or as a snack.
- Increase your use of fat-free and low-fat milk products to three servings a day.
- Limit lean meats to 6 ounces a day—3 ounces a meal, which is about the size of a deck of cards. If you usually eat large portions of meats, cut them back over a couple of days—by half or a third at each meal.
- Include two or more vegetarian-style, or meatless, meals each week.

# Following the DASH Eating Plan

Use this chart to help you plan your menus—or take it with you when you go to the store.

Food Group	Servings Per Day			Serving Sizes	Examples and Notes	Significance of Each Food Group to the DASH Eating Plan
	1,600 Calories	2,000 Calories	2,600 Calories			
Grains*	6	6–8	10–11	1 slice bread 1 oz dry cereal† ½ cup cooked rice, pasta, or cereal	Whole wheat bread and rolls, whole wheat pasta, English muffin, pita bread, bagel, cereals, grits, oatmeal, brown rice, unsalted pretzels and popcorn	Major sources of energy and fiber
Vegetables	3–4	4–5	5–6	1 cup raw leafy vegetable ½ cup cut-up raw or cooked vegetable ½ cup vegetable juice	Broccoli, carrots, collards, green beans, green peas, kale, lima beans, potatoes, spinach, squash, sweet potatoes, tomatoes	Rich sources of potassium, magnesium, and fiber
Fruits	4	4–5	5–6	1 medium fruit ¼ cup dried fruit ½ cup fresh, frozen, or canned fruit ½ cup fruit juice	Apples, apricots, bananas, dates, grapes, oranges, grapefruit, grapefruit juice, mangoes, melons, peaches, pineapples, raisins, strawberries, tangerines	Important sources of potassium, magnesium, and fiber
Fat-free or low-fat milk and milk products	2–3	2–3	3	1 cup milk or yogurt 1½ oz cheese	Fat-free (skim) or low-fat (1%) milk or buttermilk; fat-free, low-fat, or reduced-fat cheese; fat-free or low-fat regular or frozen yogurt	Major sources of calcium and protein
Lean meats, poultry, and fish	3–6	6 or less	6	1 oz cooked meats, poultry, or fish 1 egg‡	Select only lean; trim away visible fats; broil, roast, or poach; remove skin from poultry	Rich sources of protein and magnesium
Nuts, seeds, and legumes	3 per week	4–5 per week	1	⅓ cup or 1½ oz nuts 2 Tbsp peanut butter 2 Tbsp or ½ oz seeds ½ cup cooked legumes (dry beans and peas)	Almonds, hazelnuts, mixed nuts, peanuts, walnuts, sunflower seeds, peanut butter, kidney beans, lentils, split peas	Rich sources of energy, magnesium, protein, and fiber
Fats and oils <sup>f</sup>	2	2–3	3	1 tsp soft margarine 1 tsp vegetable oil 1 Tbsp mayonnaise 2 Tbsp salad dressing	Soft margarine, vegetable oil (such as canola, corn, olive, or safflower), low-fat mayonnaise, light salad dressing	The DASH study had 27 percent of calories as fat, including fat in or added to foods
Sweets and added sugars	0	5 or less per week	≤ 2	1 Tbsp sugar 1 Tbsp jelly or jam ½ cup sorbet, gelatin 1 cup lemonade	Fruit-flavored gelatin, fruit punch, hard candy, jelly, maple syrup, sorbet and ices, sugar	Sweets should be low in fat

\* Whole grains are recommended for most grain servings as a good source of fiber and nutrients.

† Serving sizes vary between ½ cup and 1¼ cups, depending on cereal type. Check the product's Nutrition Facts label.

‡ Since eggs are high in cholesterol, limit egg yolk intake to no more than four per week; two egg whites have the same protein content as 1 oz of meat.

<sup>f</sup> Fat content changes serving amount for fats and oils. For example, 1 Tbsp of regular salad dressing equals one serving; 1 Tbsp of a low-fat dressing equals one-half serving; 1 Tbsp of a fat-free dressing equals zero servings.

Abbreviations: oz = ounce; Tbsp = tablespoon; tsp = teaspoon.

# What's on Your Plate and How Much Are You Moving?

Use this form to track your food and physical activity habits before you start on the DASH eating plan or to see how you're doing after a few weeks. To record more than 1 day, just copy the form. Total each day's food groups and compare what you ate with the DASH eating plan at your calorie level.

Date:			Number of Servings by DASH Food Group							
Food	Amount (serving size)	Sodium (mg)	Grains	Vegetables	Fruits	Milk products	Meats, fish, and poultry	Nuts, seeds, and legumes	Fats and oils	Sweets and added sugars
<b>Example:</b> whole wheat bread, with soft (tub) margarine	2 slices 2 tsp	299 52	2						2	
<b>Breakfast</b>										
<b>Lunch</b>										
<b>Dinner</b>										
<b>Snacks</b>										
<b>Day's Totals</b>										
2,000 calorie level example: Compare yours with the DASH eating plan at your calorie level.		2,300 or 1,500 mg per day	6-8 per day	4-5 per day	4-5 per day	2-3 per day	6 or less per day	4-5 per week	2-3 per day	5 or less per week
Enter your calorie level and servings per day:										
<b>Physical Activity Log</b> Aim for at least 30 min of moderate-intensity physical activity on most days of the week. When your heart is beating noticeably faster, the activity is probably moderately intense.			30 min 5 min	Moderate walking Cleaning						
Record your minutes per day for each activity:		Time:	Type of activity:							

- Increase servings of vegetables, brown rice, whole wheat pasta, and cooked dry beans. Try casseroles and stir-fry dishes, which have less meat and more vegetables, grains, and dry beans.
- For snacks and desserts, use fruits or other foods low in saturated fat, *trans* fat, cholesterol, sodium, sugar, and calories—for example, unsalted rice cakes; unsalted nuts or seeds, raisins; graham crackers; fat-free, low-fat, or frozen yogurt; popcorn with no salt or butter added; or raw vegetables.
- Use fresh, frozen, or low-sodium canned vegetables and fruits.

## DASH Hints

- Be aware that DASH has more servings of fruits, vegetables, and whole grain foods than you may be used to eating. These foods are high in fiber and may cause some bloating and diarrhea. To avoid these problems, gradually increase the amount of fruit, vegetables, and whole grain foods that you eat over several weeks.
- If you have trouble digesting milk products, try taking lactase-enzyme pills (available at drug stores and groceries) with milk products. Or buy lactose-free milk, which includes the lactase enzyme.
- If you don't like or are allergic to nuts, use seeds or legumes (cooked dried beans or peas).
- If you take medicines to control your high blood pressure, keep taking them. But tell your doctor that you are now eating the DASH way.

## Other Lifestyle Changes

Making other lifestyle changes while following the DASH eating plan is the best way to prevent and control high blood pressure.

**Lose Weight, If Necessary, While Following DASH**  
DASH is rich in lower calorie foods, such as fruits and vegetables, so it can easily be changed to support weight loss. You can reduce calories even more by replacing higher calorie foods, such as sweets, with more fruits and vegetables. The best way to take off pounds is to do it slowly, over time, by getting more physical activity and eating fewer calories. To develop a weight-loss or weight-maintenance program that's tailored for you, talk to your doctor or registered dietitian.

## Be Physically Active While Following the DASH Eating Plan

Combining DASH with a regular physical activity program, such as walking or swimming, will help you shed pounds and stay trim for the long term. Start with a simple 15-minute walk during your favorite time of day and gradually increase the amount of time you are active. You can do an activity for 30 minutes at one time, or choose shorter periods of at least 10 minutes each. The important thing is to total about 30 minutes of moderate activity on most days. To avoid weight gain or sustain weight loss, try for 60 minutes of moderate-to-vigorous activity each day.

## Make the DASH for Life

DASH can help you prevent and control high blood pressure. It can also help you lose weight, if you need to. It meets your nutritional needs and has other health benefits for your heart. So get started today and make the DASH for a healthy life.

## To Learn More

Contact the National Heart, Lung, and Blood Institute (NHLBI) for information on heart disease and heart health.

NHLBI Health Information Center  
P.O. Box 30105  
Bethesda, MD 20824-0105  
Phone: 301-592-8573  
TTY: 240-629-3255  
Fax: 301-592-8563

Also check out these heart health resources:

NHLBI Web site: [www.nhlbi.nih.gov](http://www.nhlbi.nih.gov)

“Dietary Guidelines for Americans 2005” and “A Healthier You”: [www.healthierus.gov/dietaryguidelines/](http://www.healthierus.gov/dietaryguidelines/)

“Your Guide to Lowering Blood Pressure With DASH”: <http://www.nhlbi.nih.gov/health/public/heart/hbp/dash/index.htm>

“Your Guide to Lowering High Blood Pressure”: [www.nhlbi.nih.gov/hbp/index.html](http://www.nhlbi.nih.gov/hbp/index.html)

“Aim for a Healthy Weight”: [www.nhlbi.nih.gov/health/public/heart/obesity/lose\\_wt/index.htm](http://www.nhlbi.nih.gov/health/public/heart/obesity/lose_wt/index.htm)

## A Day With the DASH Eating Plan

2,300 mg Sodium (Na) Menu	Substitution To Reduce Sodium to 1,500 mg
<b>Breakfast</b> 1/2 cup instant oatmeal 1 mini whole wheat bagel: 1 Tbsp peanut butter 1 medium banana 1 cup low-fat milk	1/2 cup regular oatmeal with 1 tsp cinnamon
<b>Lunch</b> chicken breast sandwich: 2 slices (3 oz) chicken breast, skinless 2 slices whole wheat bread 1 slice (3/4 oz) natural cheddar cheese, reduced-fat 1 large leaf romaine lettuce 2 slices tomato 1 Tbsp mayonnaise, low-fat 1 cup cantaloupe chunks 1 cup apple juice	1 slice (3/4 oz) natural Swiss cheese, low-sodium
<b>Dinner</b> 1 cup cooked spaghetti: 3/4 cup low-salt vegetarian spaghetti sauce 3 Tbsp Parmesan cheese Spinach salad: 1 cup fresh spinach leaves 1/4 cup fresh carrots, grated 1/4 cup fresh mushrooms, sliced 1 Tbsp vinegar and oil dressing 1/2 cup corn, cooked from frozen 1/2 cup canned pears, juice pack	
<b>Snacks</b> 1/3 cup almonds, unsalted 1/4 cup dried apricots 1 cup fruit yogurt, fat-free, no sugar added	

Nutrients Per Day	2,300 mg	1,500 mg
Calories	2,027	2,078
Total fat	64 g	68 g
Calories from fat	28%	30%
Saturated fat	13 g	16 g
Calories from saturated fat	6%	7%
Cholesterol	114 mg	129 mg
Sodium	2,035 mg	1,560 mg
Calcium	1,370 mg	1,334 mg
Magnesium	535 mg	542 mg
Potassium	4,715 mg	4,721 mg
Fiber	34 g	34 g

Abbreviations: mg = milligram; Tbsp = tablespoon;  
tsp = teaspoon; oz = ounce; g = gram.



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National Institutes of Health



National Heart  
Lung and Blood Institute  
People Science Health

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## Reference

1. Miniño AM, Murphy SL, Xu J, et al. Deaths: Final data for 2008. National Vital Statistics Reports; vol 59 no 10. Hyattsville, MD: National Center for Health Statistics. 2011.
2. NIH. The Seventh Report of the Joint National Committee on Prevention, Detection, Evaluation, and Treatment of High Blood Pressure.  [PDF-223K]  Bethesda, MD: National Heart, Lung, and Blood Institute; 2003.
3. Source: Mattes, RD, Donnelly, D. Relative contributions of dietary sodium sources. *Journal of the American College of Nutrition* 1991;10(4):383–393.

Adapted from : Centers for Disease Control and Prevention  
: World Health Organization