



American  
Institute for  
Cancer  
Research

# A Closer Look At



## ENERGY BALANCE

CONCEPTS IN  
CANCER RESEARCH

## What Is Energy Balance?

Think about a set of scales: When the weight on one side equals the weight on the other side, the scales are in balance. When the weight is heavier on one side than on the other, the scales are out of balance.

Energy balance is like a set of scales. “Energy” refers to two things: What food people take into their bodies to stay alive and function; and what they use up through living and being active. When the energy taken in equals the energy used up, energy balance is achieved.

People take in energy by consuming it as calories in food and drink. The human body uses energy in three ways. The first is by digesting food, which uses up about one-tenth of the energy people take in. Next, the body uses energy to perform the functions needed for staying alive, such as breathing, growing, blood circulation and healing. This is the most basic level of the process called “metabolism,” and it uses about 60 to 75 percent of the energy people take in.

Finally, people use energy through physical activity, like walking, doing yard work and so on. Physical activity is the only way of using energy over which we have a great deal of control.

Energy balance isn't just a matter of “calories in” vs. “calories out.” Other factors – for example, genes, metabolism, body size, amount of muscle and the kind of foods eaten – influence the total amount of energy used. However, the number of calories consumed, compared with the number used up, is probably the most important factor in maintaining energy balance and a healthy weight.

## What's the Connection Between Energy Balance and Cancer?

It's easy in the modern world for people to take in more energy than they use. Thanks to cars, computers, fast food and labor-saving machines, people no longer need to exert themselves physically as they go about their daily lives. When a person uses less energy than he or she takes in, the excess energy is stored in fat cells. (Scientists call it “positive energy balance”; most people call it weight gain.) Today nearly two-thirds of American adults are overweight or obese.

Many people know that obesity increases risk for health problems such as heart disease, stroke and type 2 diabetes. Fewer people know that obesity also increases cancer risk. Scientists at the World Health Organization estimate that being overweight and inactive accounts for one-fifth to one-third of *all* cases of five types of cancer.\* In the United States alone, that equals between 102,000 and 135,000 cases every year.

How do overweight and inactivity increase cancer risk? Research shows that fat cells constantly release hormones and other “growth factors” into the bloodstream. The more fat cells a person has, the more of these substances are produced.

An oversupply of certain hormones and growth factors stimulates cells to grow and divide at a faster rate than normal, which increases the likelihood of cancer occurring.

\* Cancers of the breast, colon, endometrium, esophagus and kidneys.



## Restoring Energy Balance, Reducing Cancer Risk

How can people restore their energy balance and reduce cancer risk? To start with, they can make changes in the way they eat to take in *less* energy. And they can make changes in their everyday habits to use up *more* energy through regular physical activity.

### Eat More Vegetables and Fruits

The typical American dinner plate is half filled with meat, poultry, or (once in a while) fish. The other half is usually filled with a hearty serving of mashed potatoes or French fries and (maybe) a small serving of peas or carrots. That typical plate is high in both fat and calories.

By changing the *proportions* of food on their plate, people can eat a satisfying meal that delivers less fat and fewer calories and helps maintain energy balance. The basic rule of thumb is this: Instead of filling half of the plate with meat, poultry, or fish, AICR recommends filling just one-third (or less) with these foods. Fill the other two-thirds (or more) with vegetables, fruits, whole grains and beans.

Plant foods like vegetables and fruits contain a lot of water and fiber. They are filling, but they are lower in calories than animal foods like meat and dairy products. As a result, these foods are satisfying even though they have

fewer calories. In other words, less energy is taken in.

Vegetables and fruits also provide vitamins, minerals and natural substances (known as “phytochemicals”) found only in plants that protect the body’s cells from damage by cancer-causing agents.

“Research suggests that consuming more vegetables and fruits will help people restore their energy balance at the same time as reducing their cancer risk,” says Dr. Ritva Butrum, AICR Senior Science Advisor.

### Keep an Eye on Portion Size

It’s not just *what* people eat that matters, but how much. Over the last 20 years or so, food portions have grown enormously. Fast food chains started the trend by offering “value meals” and “super-sized” portions. In time, the trend toward larger portions spread to table-service restaurants and the home.

The average American now consumes 250 more calories every day than he or she did 20 years ago. Unless he or she is using up that additional energy by being more active, the outcome is going to be a gain in weight – and an increase in cancer risk.

It’s important not to confuse a “portion” with a “serving.” The U.S. Department of Agriculture has established standard serving sizes for most foods. For example, a standard serving of meat, poultry, or fish weighs 3 oz. and is about the size of a deck of cards. By that measure, a 12-oz. steak – a portion served in many restaurants – equals four servings.

Understanding how much food is in a standard serving can help people manage their

## Standard Serving Sizes for Average Adult

Food	Serving	Looks Like
Chopped Vegetables	½ cup	½ baseball or rounded handful
Raw Leafy Vegetables (such as lettuce)	1 cup	1 baseball or handful
Fresh Fruit	1 medium piece	1 baseball
	½ cup chopped	½ baseball or rounded handful
Dried Fruit	¼ cup	1 golf ball or scant handful
Pasta, Rice, Cooked Cereal	½ cup	½ baseball or rounded handful
Ready-to-Eat Cereal	1 oz. which varies from ¼ cup to 1 ¼ cups (check label)	
Meat, Poultry, Seafood	3 oz. (boneless cooked weight from 4 oz. raw)	Deck of cards
Dried Beans	½ cup cooked	½ baseball or rounded handful
Nuts	⅓ cup	Level handful
Cheese	1 ½ oz. (2 oz. if processed cheese)	1 oz. looks like 4 dice

Source: U.S. Department of Agriculture

weight. By knowing what a standard serving looks like on the plate, it is easier to get a better handle on how much to eat. At restaurants that serve huge portions, AICR recommends dividing the plate of food in half and taking home the extra half.

## Use Up More Energy

Eating more vegetables and fruits and eating smaller portions are two important strategies for maintaining energy balance. The third is being more physically active. Remember, physical activity is the only way of using energy that can be controlled.

Physical activity means more than just exercise. It means any body movement that uses up energy. Physical activity is of three distinct types:

- In *resistance* activity, the muscles move a weight, or work against a resistant load. Lifting heavy boxes and working out with weights are examples of resistance activity. Increasing muscle mass by lifting weights helps raise metabolism and burn more fat.
- In *aerobic* activity, large muscle groups are moved in ways that increase heart rate and boost energy use. Running, walking and swimming laps are examples of aerobic activity.
- In *flexibility* activity, the muscles stretch and relax, making other types of exercise easier.

Three aspects of each physical activity are important: how often (*frequency*), time spent (*duration*), and level of difficulty (*intensity*). Intensity for weight lifting and aerobic activity can be *light*, *moderate*, or *vigorous*.

- *Light* activity does not make you breathe much harder or make your heart pound. Examples are strolling down the hall or around the block.
- *Moderate* activity increases breathing and heart rate somewhat. Examples are walking briskly and doing housework.

- *Vigorous* activity boosts the heart rate and makes breathing hard enough so that it's difficult to talk. Examples are jogging, bi-cycling uphill and mowing the lawn with a push-mower.

### More Physical Activity = Reduced Cancer Risk

Many scientific studies have assessed whether a link exists between physical activity and cancer prevention. So far, they have found convincing evidence that physical activity reduces the risk of colon cancer by close to half and the risk of breast cancer by at least a third.

Physical activity probably reduces the risk of cancer of the endometrium (the lining of the womb) by about a third. It may also reduce risk for prostate and lung cancers, although as yet the evidence is less clear for these diseases.

How might physical activity prevent cancer? One possibility is that being physically active makes it less likely you'll develop fat around the abdomen. Remember, fat cells are metabolically active, releasing substances into the bloodstream that stimulate cells to grow and divide faster, which increases the risk of cancer.

Studies show that abdominal fat is more metabolically active than fat in other parts of the body (for example, on the hips or buttocks). So having a lot of fat around the middle may increase cancer risk more than having fat elsewhere on the body. Some studies suggest that physical activity helps to reduce abdominal fat in particular.

Another possibility is that excess weight and inactivity alter the body's hormone levels, setting off a series of changes that lead to increased risk

for some types of cancer, as well as for conditions such as diabetes. Studies have shown, for example, that obesity boosts the body's levels of the hormone estrogen and increases resistance to insulin. High estrogen levels are a known risk factor for breast cancer.

*How much physical activity do you need to reduce your cancer risk?* The American Institute for Cancer Research recommends one hour a day of moderate activity and one hour a week of vigorous activity. For general good health, the U.S. Department of Health and Human Services suggests that all adults do at least 30 minutes of moderate physical activity most days of the week, with one hour of vigorous activity at least once per week.

These goals are not as difficult to achieve as they may seem. It is possible to slowly add more physical activity to a daily schedule. Taking the stairs instead of the elevator is one possibility. Parking farther away from the store and walking the rest of the way is another. The more active a person is, the more energy he or she uses – and the easier it is to maintain energy balance.

Scientists believe it's never too late to start. For example, women who become more active after menopause still benefit from a reduced risk of breast cancer. AICR advises always checking with a doctor before starting or changing an exercise program.



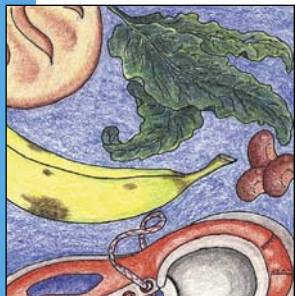
## The Bottom Line

Maintaining energy balance is a classic “win-win” situation. Eating more vegetables and fruits, reducing portion size and increasing physical activity are a basic prescription

for restoring energy balance and avoiding weight gain, overweight and obesity. Avoiding overweight and obesity means reduction of cancer risk.

But it is important to note that each of these changes in your daily life is also linked directly to reduced cancer risk. Higher intake of vegetables and fruits means greater intake of the phytochemicals, vitamins and minerals that are believed to fight cancer. Smaller portion size means reduced calorie intake, which has also been associated with less cancer. Finally, increased physical activity seems to reduce cancer risk in several ways beyond reducing the number of fat cells stored at the waist. Activity seems to increase the speed of digestion, which some scientists believe lowers colon cancer risk. Physical activity also lowers hormone levels, which reduces risk of hormone-related cancers.

The bottom line is: By maintaining energy balance, people can achieve two desirable goals at the same time – keeping off unwanted pounds and helping to protect themselves against cancer.



## Examples of Physical Activities and Calories Burned

Calorie expenditures listed below are approximate for a 154-pound person doing the activity at moderate intensity or speed.

- Aerobics (20 minutes): 150 calories
- Ballroom dancing (30 minutes): 155 calories
- Cycling at 10 miles per hour (30 minutes): 200 calories
- Gardening (30 minutes): 180 calories
- Rowing (30 minutes): 250 calories
- Sweeping the floor (30 minutes): 90 calories
- Swimming laps (20 minutes): 190 calories
- Walking (1 hour): 250 calories
- Weight lifting (20 minutes): 75 calories



## For More Information

For free publications, to reach the Institute's Nutrition Hotline, or to make a memorial donation, call toll-free or write:

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You can request single copies of the following AICR brochures for free. (Bulk order discounts are available for health professionals.)

- Healthy Living and Lower Cancer Risk series: *Simple Steps to Prevent Cancer; Moving Toward a Plant-Based Diet; A Healthy Weight for Life; Getting Active, Staying Active*
- The New American Plate series: *The New American Plate; One-Pot Meals; Veggies; Comfort Foods; For Breakfast*

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