

Levels--Calories--NB

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## **HED: How to think about calories and when they matter**

**DEK:** Understanding the complexity of calories can help you better assess how many and what sources you need to reach your health and fitness goals.

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[slug] why-calories-matter

Key Highlights:

The math of managing body weight is seemingly straightforward: eat more calories than you burn, you gain weight; eat fewer, you lose weight. But anyone who's tried to lose weight by counting calories alone has probably noticed something frustrating—it often doesn't work as cleanly as the math suggests. The story is more complicated than pure numbers.

Calories are units of energy; that energy fuels every process in your body, from powering your workouts and everyday movements to supporting cellular repair and the functions that create muscle and fat. But what those calories become, how hungry they make you feel, and how efficiently your body uses that energy depends on more than the number on a nutrition label.

The source of your calories—their nutrient density, energy density, and macronutrient composition—significantly affects how your body metabolizes and uses that energy. This creates real tension in our thinking about nutrition.

Rather than choosing between “calories count” or “food quality matters,” the smarter approach is understanding how both work together. This guide will help you think about calories in context, recognizing their central role in weight management while using what we know about metabolism and hunger to make those calories work better for your health and body composition goals.

## Understanding calories as energy

Simply put, a calorie isn't a tangible thing; it's not a molecule, like an amino acid. It's a unit of measurement, like an inch or a liter. Calories are a scientific measurement of energy. A food calorie (technically a kilocalorie or kcal) is the amount of energy necessary to raise the

temperature of 1 kilogram (kg) of water by 1 degree Celsius at 1 atmosphere of pressure. But for the sake of convenience, we talk about them as a shorthand for the energy we get from food.

The three main macronutrients that provide calories have different energy densities, meaning they contain different amounts of energy per gram:

- **Protein:** 4 kcal/gram
- **Carbohydrate:** 4 kcal/gram
- **Fat:** 9 kcal/gram

Food components such as fiber aren't absorbed into the bloodstream and don't contribute calories, so they're not part of the calculation. Although not one of the primary macronutrient categories, alcohol has 7 kcal/gram.

## Why calories matter for body composition

When you consume more calories than your body needs at that moment, the excess food energy is either stored as glycogen in your liver and muscles so it can be called upon when energy is required, or it's converted into triglycerides and stored as fat tissue.

Calories can also support muscle growth, but only if you exercise appropriately, consume enough protein, and maintain a positive energy balance without excessive surplus.

When you consume fewer calories than your body needs to support your energy expenditure, you're in a negative energy balance. To get the fuel it needs, your body taps into your energy reserves: first glycogen, which causes small but rapid initial weight loss of mostly water, and then fat. After an extended period, the body will burn a smaller amount of muscle in addition to fat for fuel.

The challenge comes with prolonged calorie restriction. If you sustain a too-large deficit (specific amounts vary by person), your body eventually goes into energy conservation mode, prioritizing essential functions (like keeping the heart and brain going, albeit at reduced functionality) and reducing energy expenditure on less critical body system processes. This can lead to hormonal changes. Healthy men who engage in calorie restriction may experience decreased testosterone, which is linked to an increased risk of metabolic syndrome and cardiovascular disease (although men with overweight or obesity who restrict calories may have increased testosterone). In women, hormonal shifts caused by large energy deficits can cause menstrual irregularities or cessation.

After months of a negative energy balance, your body's metabolic adaptation kicks in to defend its preferred weight "set point." When this happens:

- Your basal metabolic rate, or the minimum energy your body needs to function at rest, decreases. This means you'd need to restrict calories even more for continued weight loss

- Production of ghrelin (the hormone that causes feelings of hunger) increases, and leptin (which triggers satiety) decreases
- Metabolic efficiency (how well your body uses calories as energy) improves to reduce calorie expenditure
- You may engage in subconscious behavior changes that conserve energy, such as fidgeting less or taking fewer steps throughout the day

These natural responses explain why many people hit weight-loss plateaus or regain weight after dieting. Your body is actively protecting what it considers your “normal” weight.

Understanding these mechanisms can help you set realistic expectations and develop more effective strategies for managing your weight and health.

## How macronutrients affect your calorie equation

While all calories provide energy, the macronutrient source of those calories dramatically affects how your body processes and uses them. You’ve probably heard about “counting macros”—tracking the grams of fat, protein, and carbohydrates you eat daily. This approach has gained popularity as a way to manage weight and improve body composition because your diet’s overall balance of macronutrients affects your hormones, muscle mass, metabolism, and appetite.

### Protein provides a metabolic advantage

Protein packs four calories per gram, but it requires more energy to digest and process than other macronutrients—this is called the thermic effect of food. This means your body actually burns more calories processing protein than it does processing fats or carbohydrates.

Protein also helps build and maintain muscle mass, supports immune function, and creates hormones and enzymes your body needs. Perhaps most importantly for weight management, protein is highly satiating—it helps you feel full longer than fats or carbs, and may naturally reduce your total calorie intake without conscious restriction.

Current protein recommendations may be too low for optimal body composition. Metabolic health experts believe the optimal daily protein intake, especially for active people and older adults, is higher than the recommended dietary allowance (RDA) of 0.8 grams of protein per kilogram of body weight (0.36 grams per pound). Research suggests active adults require 1.2 to 2 grams of protein daily per kilogram of body weight, and older adults need 1.2 to 1.6g/kg to preserve muscle mass.

This translates to about 13 to 22 grams of protein per meal for a 120 lb (54.4 kg) active adult who eats five times per day, or 26 to 43 grams of protein per meal for a 240 lb (109 kg) active adult. The science isn’t yet settled, but some evidence suggests that protein’s muscle-building effects may max out at 30 to 40 grams of protein per meal. As for where this protein comes

from, animal proteins tend to be higher quality than plant proteins in terms of amino acid profiles and bioavailability.

High-protein diets offer particular advantages for weight loss. Studies show that maintaining higher protein intake while in a calorie deficit when combined with exercise helps preserve muscle mass and improve body composition. The combination of protein's satiating effect, muscle-preserving properties, and higher thermic effect makes it a powerful tool for sustainable weight management.

## Carbohydrates fuel your body

Carbohydrates also provide four calories per gram but serve as your body's preferred fuel source, especially for your brain and muscles during exercise, as they're more easily converted to energy than protein. The type of carbs matters significantly in how their calories affect your body.

Complex carbohydrates from whole grains, vegetables, and legumes provide fiber, vitamins, and minerals, while promoting steady blood sugar levels. The fiber content slows digestion and absorption, leading to more stable energy levels and better appetite control. Simple carbs like sugar and refined flour from processed foods can cause blood sugar spikes and crashes that trigger hunger and cravings, potentially leading to overeating.

Lower-carb diets support weight loss and metabolic health improvements, at least in the short term. On very low-carb diets, your body enters a state of ketosis, shifting from glucose to fat as its primary energy source. Ketosis or "keto" diets are high in fat (about 70% to 85%) and very low in carbohydrates (less than 50 grams per day or 5-10% of total energy intake).

Athletes and highly active people need to think about carbohydrates differently because of how carbs fuel exercise performance. Current evidence suggests a personalized approach to carbohydrate recommendations based on training goals and demands, potentially supported by tools like continuous glucose monitoring. For example:

- Some research suggests that athletes training at moderate to high intensities ( $\geq 70\%$  VO2max) for more than 12 hours per week need eight to 10 grams of carbohydrates per kilogram of body weight daily—significantly more than the average person.
- Pre-exercise fueling should include one to four grams of carbs per kilogram of body weight for several hours before higher-intensity, longer-duration (> 90 minutes) exercise, and additional carbohydrate fueling is recommended during endurance exercise.
- Post-resistance training nutrition should involve both carbohydrates for glycogen replenishment and protein for muscle recovery, ideally within two hours of exercise—particularly if exercising in a fasted state.

## Fat is essential but high in calories

Fat contains more than twice the calories per gram (9) compared to protein or carbs, making it the most energy-dense macronutrient. This means fat has the most significant impact on a food's total calorie content. Despite its negative reputation in the past, your body requires fat for essential functions.

Fat serves as insulation to protect our organs, and it helps our body absorb fat-soluble vitamins A, D, E, and K. Anti-inflammatory omega-3 fatty acids, a type of polyunsaturated fat, support metabolic health. In contrast, although the evidence is mixed, excessive omega-6s, also a type of polyunsaturated fat, may promote inflammation and increase cardiovascular risk.

According to the National Institutes of Health, men should aim to get at least 1.6 grams of the omega-3 ALA daily, and women who aren't pregnant or nursing should get at least 1.1 grams. A 2022 analysis recommends consuming between 2 to 3 grams of EPA and DHA (the other two major types of omega-3s) daily, although other recommendations are much lower, at about 250 to 500 mg per day.

Beyond omega-3 fats, it's helpful to understand the different types of dietary fat and their possible effects on weight and health.

- Unsaturated fats, including monounsaturated and polyunsaturated fats, have chemical structures with one or more double bonds, typically making them liquid at room temperature. They are generally considered heart-healthy, as they can improve blood lipid profiles and enhance insulin sensitivity.
- Monounsaturated fats (MUFA), found in olive oil, avocados, and some nuts, are associated with improved satiety and reduced risk of cardiovascular disease.
- Polyunsaturated fats (PUFA), such as omega-3s from fish and omega-6s from vegetable oils and some nuts and seeds, play critical roles in modulating inflammation and supporting heart and brain health.
- Saturated fats have no double bonds, typically making them solid at room temperature. Excessive intake is linked to elevated LDL cholesterol and potential metabolic dysregulation. Replacing saturated fats with unsaturated fats in the diet is consistently associated with improved weight management and lower risk of chronic disease.

Saturated and trans fats influence health and weight differently. Saturated fats (found in foods like butter, red meat, and coconut oil) are calorie-dense and, when consumed in excess, can contribute to weight gain. Some studies suggest that high saturated fat intake may alter satiety signals and encourage overeating and weight gain. Trans fats, on the other hand, are linked to increased cardiovascular risk and greater weight gain. These findings reinforce the recommendation to limit saturated fats to no more than 10% of total daily calories—according to the Dietary Guidelines for Americans, or 6% according to the American Heart Association—and to eliminate industrial trans fats entirely, focusing instead on healthier unsaturated fat sources.

There is no single optimal macronutrient ratio—the best balance depends on your specific goals, health status, and individual response.

## Choosing foods considering both nutrients and calories

A food's nutritional value—its fiber content, essential vitamins and minerals, and overall nutrient density—matters more for long-term health and body composition than its calorie count alone. Understanding how to evaluate foods based on their calorie content and nutritional quality helps you make informed choices that support your goals.

### Consider nutrient density to get more nutrition per calorie

Some foods provide more nutrition for your calorie intake than others. Those with high nutrient density provide essential vitamins, minerals, fiber, antioxidants, and phytonutrients that support metabolic function and hormone regulation, which can impact weight and body composition.

The Dietary Guidelines for Americans (DGA) considers these foods nutrient-dense when they are prepared without added sugars, saturated fat, and sodium:

- Vegetables
- Fruits
- Whole grains
- Fat-free or low-fat milk and milk products
- Seafood
- Lean meats and poultry
- Eggs
- Beans, peas, and lentils (legumes)
- Nuts and seeds

Research consistently shows that higher intake of nutrient-dense foods is associated with healthier aging and lower risk of death from all causes. Studies also show that people who eat a nutrient-dense diet have a lower risk of diabetes, cardiovascular disease, and dementia.

Conversely, energy-dense nutrient-poor (EDNP) foods contribute to inflammation and metabolic dysfunction. These include:

- Cake
- Cookies and biscuits
- Chocolate
- Candy
- Sweet and salty snacks
- Sugar-sweetened and artificially sweetened drinks
- Alcoholic drinks

## Energy density: The volume-to-calorie relationship

Energy density measures the number of calories in each gram of food—it's different from nutrient density, which focuses on vitamins and minerals.

Lower-energy-density foods give you more food for fewer calories, which can help you feel full on fewer calories. This includes nonstarchy vegetables (like leafy greens, tomatoes, bell peppers, cucumbers, and broccoli) and lean proteins. These foods help you feel full while keeping blood sugar and insulin levels stable.

High-energy-density foods pack more calories into the same amount of food. This category includes both healthy whole foods (olive oil, nuts, avocados) and processed foods (ice cream, fast food, baked goods).

Here's the crucial distinction: Unprocessed high-energy foods like nuts and avocados support health and weight loss when eaten in appropriate portions. They deliver beneficial nutrients—healthy fats, fiber, vitamins, and minerals—alongside their calories. They help regulate appetite naturally.

Processed high-energy foods, however, tend to promote overeating and fat storage, even when you're trying to control calories. They lack the beneficial nutrients that help regulate appetite and metabolism, making it easy to consume excess calories without feeling satisfied.

The strategic approach combines unprocessed nutrient- and energy-dense foods: Use lower-energy-density foods as the foundation of meals to increase food volume, promoting a feeling of fullness. At the same time, incorporate moderate amounts of nutrient-dense, higher-energy foods for essential nutrients that help promote satiety.

## Weighing all the facts about calories

From a purely thermodynamic point of view, a calorie is a calorie. And calorie counting can be a component of health and fitness goals—energy balance matters.

But optimal body composition and metabolic health require looking beyond simple calorie math. Each food's nutritional profile and macronutrient composition significantly influence how your body uses those calories—whether for immediate energy, muscle building, or fat storage. Different foods affect your hunger, energy levels, and metabolic processes differently.

Rather than fixating on strict calorie targets, focus on choosing nutrient-dense foods in appropriate portions, balancing macronutrients to support your goals, and developing sustainable eating patterns that work with your body's natural hunger and satiety signals.

Remember that your caloric needs will evolve throughout your life based on changes in activity level, muscle mass, age, and health status. The most effective approach combines respect for

the fundamental role of energy balance with strategic food choices that optimize how your body uses that energy.

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