Calories and energy balance

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Weight change follows the gap between calories eaten and burned, and your weight trend is the best way to measure that gap.

Why it matters: Calculators, food logs and fitness watches all produce precise-looking numbers. When those numbers and your results disagree, knowing where the errors come from helps you adjust instead of giving up.

The details: Every tool for estimating calories, from calculators to watches to food logs, carries real error.

Go deeper

The big picture: You burn calories by keeping your body running at rest, digesting food and moving. Those needs also shift as your weight changes, so any estimate drifts over time.

What people believe: The Harris-Benedict equation is the standard way to estimate calories. Cutting 500 calories a day always means losing a pound a week, because a pound of fat equals 3,500 calories.

Calculators:

- The Mifflin-St Jeor equation, published in 1990, estimates resting calories from weight, height, age and sex [1].
- A 2005 systematic review compared common equations against measured resting rates. Mifflin-St Jeor came within 10% of the measured value in more people, with and without obesity, than any other equation [2].
- The authors still warned that it can miss by a wide margin for some individuals.
- The older Harris-Benedict equation, from 1919, is still used in many gyms and textbooks. The same review found it less accurate than Mifflin-St Jeor [2]. Our tools use Mifflin-St Jeor.

Fitness watches:

- A 2017 study tested seven wrist-worn devices on 60 adults while they sat, walked, ran and cycled [3].
- Most measured heart rate well. None of the seven estimated calories burned within 20%, and the most accurate was off by a median of 27%.
- Devices have changed since 2017, so newer models may do better or worse.

Food logs:

- A 1992 study examined people with obesity who reported eating fewer than 1,200 calories a day without losing weight [4].
- Their metabolisms were normal for their body composition.
- On average, they underreported what they ate by about 47% and overreported how much they exercised.

Between the lines: Measurement error is common and easy to miss, even for careful people. That is a separate issue from metabolic changes during weight loss, which are also real.

The 3,500-calorie rule:

- A popular rule says cutting 3,500 calories removes one pound.
- Researchers who model weight change say the rule overestimates weight loss over time, because it treats the calorie gap as fixed [5].
- As you lose weight, you burn less, so the same diet produces a smaller gap.

Eating for your goal weight:

- A common approach is to eat what a person at your goal weight would need to maintain that weight.
- A 2011 model of weight change found that, for an average overweight adult, each lasting cut of about 10 calories a day eventually lowers weight by about 1 pound [8].
- Weight responds slowly. About half the total change comes in the first year, and 95% takes about 3 years [8].
- So eating for a body 40 lb lighter means eating roughly 400 calories a day less. It works, but loss slows as you near the goal, and getting most of the way there can take about three years. A larger gap at first speeds things up.

Metabolic adaptation:

- A 2016 study followed 14 contestants from the TV show "The Biggest Loser" for six years [6].
- They lost an average of 128 lb (58 kg) in 30 weeks, then regained about 90 lb (41 kg).
- Six years later, they burned about 500 fewer calories a day at rest than expected for their size.
- These were extreme losses in a small group, and most dieters lose far less, more slowly.

Reality check: Every number in calorie math is an estimate. Errors in the equation, the watch and the food log can stack.

How sure are we: Strong that weight follows the balance of calories in and out over time. Moderate on how accurate the estimating tools are, since the device and food-log studies are few and some are old.

Run the numbers

Step 1: Estimate resting calories. Using pounds and inches, the Mifflin-St Jeor equation is:

- Men: (4.536 × weight) + (15.88 × height) − (5 × age) + 5
- Women: (4.536 × weight) + (15.88 × height) − (5 × age) − 161

Example: A 45-year-old man who weighs 200 lb and stands 5 feet 10 inches (70 inches) comes out to about 1,800 calories a day at rest.

Step 2: Pick your activity level. Online calculators multiply resting calories by an activity factor, usually from about 1.2 for inactive people to about 1.9 for very active ones. At 1.5, the man above lands near 2,700 calories a day. Labels vary between calculators. The U.S. Dietary Guidelines describe the levels this way [9]:

- **Sedentary:** only the light activity of daily life, such as a desk job, driving and household chores.
- **Moderately active:** daily life plus activity equal to walking about 1.5 to 3 miles a day at 3 to 4 miles per hour.
- **Active:** daily life plus activity equal to walking more than 3 miles a day at that pace.

If you're unsure, pick the lower level. Step 3 corrects the guess either way.

Step 3: Test the guess. Eat about the same amount each day for two to three weeks and weigh yourself several times a week. If your weekly average holds steady, you are close to maintenance.

Step 4: Adjust gradually. Set a calorie gap to suit your goal, and recheck every few weeks as your weight changes. If you also want to build muscle, keep the deficit modest. In lifters, a model predicted no average lean mass gain at a deficit of about 500 calories a day [7].

Also worth knowing: Use watch calorie estimates with caution rather than eating them back in full. Weighing food for a few weeks shows how your portion estimates compare with reality.

If food or weight feels out of control: If you're restricting hard, bingeing, purging, or exercising to make up for eating, talk to your doctor or call the National Alliance for Eating Disorders helpline at 1-866-662-1235 (weekdays, staffed by licensed therapists).

Sources

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