

Normal body temperature found to vary between people

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You might think you know what a normal body temperature is, but there

is no such thing.

Analyzing the age-old belief that 98.6 Fahrenheit is normal human temperature, scientists at Stanford Medicine found that your temperature is personal.

It also depends on age, sex, height and weight, and changes throughout the day.

"Most people, including many doctors, still think that everyone's normal temperature is 98.6 F. In fact, what's normal depends on the person and the situation, and it's rarely as high as 98.6 F," said senior study author, Dr. Julie Parsonnet, a professor of medicine.

The normal temperature of a tall, underweight 80-year-old man in the morning could be a degree lower than the afternoon temperature of a 20-year-old woman who is obese, she explained in a Stanford news release.

Past research at Stanford found that Americans' average body temperature has dropped from 98.6 F by about 0.05 F every decade since the 19th century. This is likely due to better health and living conditions that reduce inflammation.

Today, a so-called [normal body temperature](#) is nearer to 97.9 F, the researchers noted.

The idea of 98.6 F comes from a German study published in the 1860s. But even then, researchers noted that men and the elderly had [lower temperatures](#) than women and [young adults](#). Temperatures in that study were also higher in the afternoon.

"Instead of thinking about a distribution in temperatures, which is what

the initial study showed, we've taken a mean of 98.6 F and used it as a cutoff value," said lead author Catherine Ley, a senior research scientist. "We've used an average value to create a false dichotomy of what's normal and what's not."

To provide updated research on this, Stanford scientists analyzed more than 618,000 oral temperature measurements from adult outpatients seen at Stanford Health Care from 2008 to 2017.

The research tracked time of day, along with each patient's age, sex, weight, height, medications and health conditions.

The investigators also applied a machine learning algorithm to identify diagnoses and medications that were disproportionately associated with extremely high or extremely low temperatures, to keep the data from being distorted by illness.

About one-third of patients were excluded from the analysis for having these diagnoses. These included [infectious diseases](#) linked to high temperature and type 2 diabetes linked to low temperature, which was a new finding.

The upshot: Adults have normal temperatures ranging from 97.3 F to 98.2 F, with an overall average of 97.9 F.

Men tended to have lower temperatures than women. Temperatures decreased with age and with height, and increased with weight.

Time of day exerted the biggest influence with temperatures coolest in the early morning and warmest around 4 p.m.

About one-quarter of temperature variability from person to person could be credited to age, sex, height, weight and time of day.

That means other factors not studied account for the remainder. This might include clothing, [physical activity](#), [menstrual cycle](#), measurement error, weather, and drinking a hot or cold beverage.

These individualized benchmarks could make body temperature a more accurate and useful vital sign, Parsonnet said, recalling her elderly mother-in-law's experience.

In her case, she was not diagnosed with a serious heart infection for weeks because her temperature never reached a conventional fever, usually defined as higher than 100.0 F or 100.4 F.

Future studies could look at personalized definitions of fever and whether having a consistently higher or lower normal temperature affects life expectancy, Parsonnet said.

"There's a lot of temperature data in the world, so there's a lot of opportunity to actually learn something about it," she said.

The study was published Sept. 5 in *JAMA Internal Medicine*.

More information: Catherine Ley et al, Defining Usual Oral Temperature Ranges in Outpatients Using an Unsupervised Learning Algorithm, *JAMA Internal Medicine* (2023). [DOI: 10.1001/jamainternmed.2023.4291](#)

The U.S. National Library of Medicine has more on [fever](#).

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