Why global warming could lead to a rise of 100,000 diabetes cases a year in the U.S.

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If the average temperature rises by 1 degree Celsius, sea levels will rise, crop yields will fall and vulnerable species will see their habitat shrink or disappear.

And, a new study suggests, the number of American adults suffering from [diabetes](http://www.latimes.com/topic/health/diseases-illnesses/diabetes-HEDAI0000022-topic.html) would rise by more than 100,000 a year.

Experts have previously predicted that climate change could fuel the spread of conditions such as malaria and dengue fever, because rising temperatures will broaden the range of disease-spreading mosquitoes. Likewise, as extreme weather becomes more of the norm, so will cholera and other water-borne illnesses.

But [diabetes](https://www.niddk.nih.gov/health-information/diabetes/overview/symptoms-causes) is different. It doesn’t spread like an infectious disease. People develop type 2 diabetes when their extra pounds and sedentary lifestyle make their bodies less sensitive to insulin. That, in turn, causes their blood sugar to rise and can eventually lead to heart disease, nerve damage, kidney problems and other serious health issues.

Researchers thought they might find a link between rising temperatures and diabetes for a completely different reason — the activity of brown fat.

Also known as brown adipose tissue, or BAT, this fat kicks into gear when temperatures are low and the body needs heat to stay warm.

A 2015 [study](https://www.ncbi.nlm.nih.gov/pubmed/26147760) of eight adults with Type 2 diabetes found that after spending 10 days in moderately cold weather, their metabolisms improved and they became more sensitive to insulin, reversing a key symptom of the disease.

A 2016 [study](https://www.ncbi.nlm.nih.gov/pubmed/26972823) found a correlation between outside temperature and a measure of blood sugar called HbA1c — when the first was higher, so was the second.

Findings like these led Dutch researchers to wonder whether climate change could explain some of the [worldwide increase in diabetes](http://www.who.int/mediacentre/factsheets/fs312/en/). Back in 1980, 108 million adults had the disease; by 2014, that figure was 422 million, according to the World Health Organization.

The researchers turned to the U.S. Centers for Disease Control and Prevention to gather data on the prevalence of diabetes in all 50 states for each year between 1996 and 2013. They also found the average temperature for each state in each year from the [National Centers for Environmental Information](https://www.ncei.noaa.gov/).

Comparing the two, they found that the higher the average temperature in a particular time and place, the higher the age-adjusted incidence of diabetes. Overall, as the average annual temperature rose by 1 degree Celsius (or 1.8 degrees Fahrenheit), the number of diabetes cases rose by 3.1 per 10,000 people.

Obesity is a risk factor for Type 2 diabetes, and the researchers also found that each 1-degree Celsius temperature increase was associated with a 0.173% increase in the prevalence of obesity.

Even when the researchers adjusted for the prevalence of obesity in each state, they found that each 1-degree temperature increase was associated with 2.9 additional cases of diabetes per 10,000 people.

Overall, the warmer the place, the higher the incidence of diabetes. “There is no apparent geographical pattern which could explain this association,” the researchers wrote.

The team also looked beyond the United States to examine the connection between temperature and conditions related to Type 2 diabetes. Sure enough, they found that as the temperature rose by 1 degree C, the prevalence of high fasting blood sugar (a marker for diabetes) rose by nearly 0.2% and the prevalence of obesity rose by just under 0.3%.

The [results](http://drc.bmj.com/content/5/1/e000317) were published Monday in the journal BMJ Open Diabetes Research & Care.

The study wasn’t designed to show why temperatures were linked to diabetes. But the authors speculated that brown fat was the key — the warmer it was, the less work there was for brown fat to do.

“Our data are consistent with the hypothesis that a decrease in BAT activity with increasing environmental temperature may deteriorate glucose metabolism and increase the incidence of diabetes,” they wrote.