How well do Germans understand weather risks?

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In a representative survey on weather and climate literacy in Germany only one fifth of respondents correctly estimtated that a 30-second gap between a lightning flash and the sound of thunder means that a thunderstorm is about 10 kilometers away. Credit: Lucy Chian on Unsplash

Many Germans have difficulty gauging the negative impact of weather conditions such as ground frost, heat, or UV radiation. This is one of the key results of a representative survey conducted by researchers at the Max Planck Institute for Human Development, published in *Weather, Climate, and Society*. The study's authors advocate new impact forecasts that predict not only what the weather will be, but also what it will do.

Although the current focus is on coronavirus, it is important not to forget a crisis that poses an even greater threat in the long term: climate change. As climate change unfolds, the number of extreme weather events is increasing worldwide. These events require effective responses not only on the part of the authorities, but also on the part of every individual. Only those who can gauge weather risks correctly are able to take the necessary precautions. But how savvy is the general population when it comes to weather risks? How well do we understand the uncertainty of weather forecasts? And how aware are we of climate change, which will further intensify weather risks in the future?

To answer these questions, researchers from the Max Planck Institute for Human Development and the Hans Ertel Centre for Weather Research surveyed 1,004 Germans aged between 14 and 93 years. The respondents answered 62 factual questions about weather conditions such as heat, UV radiation, thunderstorms, heavy rain, and ground frost and their impacts, as well as on forecast uncertainty and climate change in Germany to date.

Respondents had difficulties judging weather risks in several areas. For example, 44% of participants believed that ground frost, which may cause icy conditions on roads and pavements, is only possible at air temperatures of 0 degrees Celsius and below—a misconception that can be treacherous. In fact, the temperature just above ground level can drop below zero even when the air temperature reported in the weather forecast is above zero: Air temperature is typically measured two meters above the ground. What's more, 66% of respondents falsely believed that higher temperatures mean higher UV radiation levels. UV radiation is actually highest around midday, whereas temperatures tend to continue rising over the course of the day. And if a thunderstorm were approaching, many respondents would probably not take shelter in time: Only one fifth of respondents correctly estimated that a 30-second gap between a lightning flash and the sound of thunder means that a thunderstorm is about 10 kilometers away. More than a quarter of respondents thought it was about 30 kilometers away, thus severely underestimating their distance from the storm.

At the same time, there was uncertainty about how to interpret probabilistic forecasts. Only one fifth of respondents knew that a forecast predicting a 30% chance of rain in Berlin means that it will rain in Berlin on 30% of all days with that forecast. Many respondents mistakenly thought it meant that it will rain in 30% of the area or for 30% of the day. According to the study's authors, it is up to weather communicators to resolve this uncertainty. It is their responsibility to make clear and transparent what the probabilities refer to.

With regard to evidence for climate change in Germany since 1880, 70% of respondents were aware that the average temperature in Germany has risen. But 80% believed that storm intensity has increased, whereas in fact there is no evidence for any long-term change in Germany in this respect. "This perception could be influenced by recent extreme events and the broad media coverage of them," says lead author Nadine Fleischhut, researcher at the Max Planck Institute for Human Development, and principle investigator of the WEXICOM project on the communication of weather warnings at the Hans Ertel Centre for Weather Research. As co-author Ralph Hertwig, Director at the Max Planck Institute for Human Development, adds: "If people don't properly understand weather risks in the here and now, it is unlikely that they will be able to grasp the impact that climate change will have in the future. Daily weather forecasts could be an opportunity for a literacy offensive, helping us all to become a little smarter every day in our understanding of weather, climate, and uncertainty."

The study's authors call for efforts to further improve the communication of extreme weather events and their impacts. Forecasts should not focus exclusively on the weather event itself, but also predict its impacts, such as traffic jams or economic damage to buildings. At the same time, the certainty of forecasts should be communicated more transparently. "Impact forecasts must be carefully designed and tested to avoid unintended consequences, such as overreaction or trivialization of risks," says co-author Stefan Herzog, head of the Boosting Decision Making research area in the Center for Adaptive Rationality at the Max Planck Institute for Human Development. The authors call on experts from meteorology, psychology, and journalism to cooperate in designing effective communication formats.

More information: Nadine Fleischhut et al. Weather Literacy in Times of Climate Change, *Weather, Climate, and Society* (2020). DOI: 10.1175/WCAS-D-19-0043.1

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