

WRITING SAMPLES

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1. Geneticists map the spread of a lesser-known malaria parasite across the world

Researchers mapped the genetics of one of the parasites that cause malaria to track how different variants may be spreading across the globe. They say the parasite, *Plasmodium vivax*, likely originated in Africa.

Researchers previously thought that rates of malaria caused by this parasite were low. But, it seems that cases are dramatically increasing in East Africa and other parts of the world.

Plasmodium vivax (PV) malaria cases are usually not severe, but recent studies show that PV can lie dormant in people and repeatedly reinfect them, causing them to miss work. This, along with the need for repeated treatment, can slow economies.

In this study, researchers wanted to analyse the genetics of PV parasites detected at various places globally. This genetic and geographical data can help health authorities to limit the spread of PV and better treat malaria.

The researchers extracted DNA from finger-prick blood samples collected from patients with PV malaria in New Halfa and Khartoum, both in Sudan. They also used data from samples collected in other parts of Africa, South America, and Asia. They compared the samples to find similarities and differences across the locations.

The researchers found that the genetics of PV samples were generally more similar to other samples from the same continent. This means they could potentially tell where a sample came from based on its genetics.

Interestingly, they saw that samples collected in Africa were more genetically diverse than samples from other continents. In other words, samples collected in Asia, for example, were more similar to other Asian samples than African samples were to other African samples.

The genetic diversity in Africa suggests that PV came from Africa. They also saw that African samples were more similar to Asian samples than South American samples.

This means people or animals infected with PV probably recently moved between Africa and Asia.

Mapping the genetics of a parasite in this way gives scientists insights into how the pathogen spreads to different locations.

The researchers say future studies could use this information to identify geographical characteristics, like mountains, that separate different PV variants.

The researchers that performed this study were based in Sudan, Eritrea, France, and the USA.

Terms for understanding the summary:

- Geography: the science of how the environment and land formed (and how they currently are).
- Economy: the science of how we manage (make, move, use, etc.) resources (like money and medicine).
- Parasite: an organism that has adapted to live on or inside another organism (this usually harms the other organism).
- Sample: something gathered from a specific group (for example, if you pick a leaf from a tree, you have collected a leaf sample from that tree).
- Dormant: in biology, an organism is dormant if it seems to do nothing or drastically slows down for some time.
- Pathogen: any organism that can produce disease. A pathogen may also be referred to as an infectious agent, or simply a germ.

Original paper: Extensive genetic diversity in Plasmodium vivax from Sudan and its genetic relationships with other geographical isolates

Terms for understanding the abstract of the paper:

- Plasmodium vivax (PV): a parasite that can lie dormant in a person's body and infect them with malaria many times.
- Malaria: a sometimes deadly disease caused by a parasite that lives in a specific type of mosquito that feeds on humans.
- Microsatellite marker: a piece of DNA that has repeating parts that we can use to identify a species.
- Clinical: this refers to actual patients instead of lab tests.
- Haplotype: a group of mutations in DNA that is from one of the parents.
- Isolates: a group separated from the main one by a land barrier (like a mountain or river).
- Principal component analysis (PCA): a method in statistics for estimating the most important aspects of data.
- Phylogenetic tree: a diagram that resembles a tree that shows the relationships between species as they evolved.
- Locus (plural: loci): a specific fixed position on DNA where a particular gene is.
- Linkage disequilibrium: a pattern of mutations that happen at different fixed positions in DNA.

2. Climate models optimised for East Africa say 2100 will be much hotter

Researchers optimised existing computer-based climate models for East Africa to better predict how temperatures might increase by 2100. This information will help regional authorities plan for and adapt to climate change effects, like food shortages or natural disasters.

Average temperatures are rising due to global warming, causing more extreme weather events like droughts and floods, which in turn spreads disease and disrupts farming. Such unpredictable events make it challenging to plan and adapt to climate change, so researchers are working on models to better predict climate change.

In this study, researchers wanted to identify existing climate models that best predict changes in East Africa, specifically over the years 2021 to 2100.

The researchers fed temperature recordings from Kenya, Uganda, Tanzania, Burundi, and Rwanda into 13 existing computer-based climate models. The temperature recordings spanned the years 1970 to 2014.

They combined the 5 models that were the most accurate on other data from East Africa. They used this combined model to predict how the climate in East Africa will change over time until 2100. They made predictions for two different scenarios: one where no new policies are implemented to slow climate change, and the other where policies moderately slow it.

The researchers predicted that the average temperature in East Africa will increase slowly from 2021 to 2049, by 1 degree Celsius. But, they expected the temperature to increase faster from 2080 to 2100, by 2.4 to 4.4 degrees Celsius.

They also predicted that the average temperature will increase almost 3 times more quickly if no policies are introduced to slow climate change, compared to policies that might moderately slow climate change.

These findings identified the best existing climate models for East Africa, and the most accurate average temperature predictions for the region as of 2021. This information will help future researchers improve climate models and predictions tailored to this area.

The researchers suggest starting with improving the ability of the models to predict extreme weather events, like droughts and floods. They also say the accuracy of the models over complex terrain like mountains or lakes should be improved.

This study was done by researchers from Uganda, Rwanda, Morocco, and China.

Terms for understanding the summary:

- Terrain: in geography, "complex terrain" is almost any area other than flat ground. Examples of complex terrain are mountains and coastlines.
- Model: in science, a model is an estimate of something. For example, we call a computer program that predicts the weather a "weather model".
- Climate: the long-term (usually at least 30 years) weather pattern in an area.
- Policy: guidelines to help people make decisions towards a specific goal.

Original paper: Evaluation and Projection of Mean Surface Temperature Using CMIP6 Models Over East Africa

Terms for understanding the abstract of the paper:

- Mean: in statistics, the "mean" is the "average" or "expected" outcome.
- Surface: in climate science, "surface" refers to the earth's ground or the outer layer or something.
- T2m: the average ground temperature of an area.
- Coupled Model Intercomparison Project (CMIP6): the 6th phase of the worldwide project to share data and techniques to predict climate change.
- State: the way something is at a particular point in time.
- Metric: a way of measuring the difference between things. In statistics, we use metrics to measure the difference between our predictions and the recorded values to tell us how good our predictions are.
- Bias: in statistics, a model's bias is the difference between its average prediction and the recorded value.
- Correlation: in statistics, the correlation is a way of measuring the similarities between things. If the correlation is close to 1, they are very similar. If the correlation is close to -1, they are almost opposites. If the correlation is close to 0, they do not have any relationship.
- Root Mean Square Difference: an example of a (metric) way to measure the difference between numbers.
- Taylor skill score: a way of combining (metrics) different measurements of how well a model is performing into one number.
- Projection: a prediction of a future trend.
- Simulation: in climate science, a simulation is a prediction of what will happen.
- Socioeconomic: relating to people and the economy or how human behaviours affect the flow of resources, such as money.
- SSP2-4.5: a scenario where we enforce a group of moderate policies that aim to limit climate change.
- SSP5-8.5: a scenario where we enforce no policies to limit climate change.
- Overestimation: a prediction that is higher than the recorded value.
- Underestimation: a prediction that is lower than the recorded value.
- Spatial: relating to space. Spatial awareness is how aware you are of the things around you, for instance.
- Temporal: relating to time. Temporal trends are trends over time, for instance.
- Slice: in computer science, we call a section of something, such as time or space, a slice.
- Multi-Model Ensemble (MME): in statistics, we often combine multiple computer programs that try to make the same predictions into one program, an MME, because this makes the prediction of the MME more accurate than any of the single programs.
- Expected (expectation): in statistics, we use the word "expectation" to mean "average". The expected outcome is the average outcome.
- Magnitude: in mathematics, the magnitude of a number is how far it is away from zero. The numbers 5 and -5, for example, both have a magnitude of 5.
- Sen's slope estimator: a statistical method to find patterns in recordings over time.
- Mann-Kendall test: a statistical method to assess whether recorded values generally increase or decrease.
- Significant: in statistics, a result is significant when it is unlikely to occur by random chance and is likely to have a specific cause.
- Decade-1: "per decade".
- Output: the prediction the computer program makes.
- Predecessor: a previous version of this computer program or the programs that came before this one.
- Instantaneous Radiative Forcing: the amount of energy leaving or staying in the atmosphere because of a change in the atmosphere (an increase in energy staying because of an increase in carbon dioxide, for instance).