

Vector-borne diseases shaped human history and reveal race disparities

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In December 2015, a yellow fever outbreak began in Luanda, Angola. This outbreak was the largest reported in Angola during the last 30-years. In a new study, researchers examine the ways in which vector-borne diseases, like yellow fever, have shaped society and culture. Credit: Rebecca Hall, CDC

Vector-borne diseases (VBDs), such as plague, malaria and yellow fever,

have significantly shaped society and culture, according to an international team of researchers. In a study published in *Ecology Letters* on Jan. 27, the team used historical evidence interpreted through an ecological lens to illustrate how VBDs have influenced human history, with particular attention to how VBDs have reinforced and exacerbated racism.

"The disproportionate impact of the COVID-19 pandemic on communities of color in America opened a lot of people's eyes to [health inequities](#) and the importance of structural racism in health outcomes and vulnerabilities," said author Nita Bharti, assistant professor of biology, Penn State. "Importantly, links between race and health inequities are not new. In this paper, we showed that socially constructed systemic racism and the resulting power hierarchies create and maintain health inequities. This pattern has arisen repeatedly throughout history, and it persists into modern times. We highlighted these links for vector-borne diseases."

According to the team, VBDs have affected [human history](#) via multiple socio-ecological mechanisms, including:

- Killing or debilitating large numbers of people, with demographic and population-level impacts.
- Differentially affecting populations based on prior history of disease exposure, immunity and resistance.
- Being weaponized to promote or justify hierarchies of power, colonialism, racism, classism and sexism.
- Catalyzing changes in ideas, institutions, infrastructure, technologies and social practices in efforts to control disease outbreaks.
- Changing human relationships with the land and environment.

In their paper, the team examined these mechanisms and presented [case](#)

[studies](#) from four major diseases—plague, malaria, yellow fever and trypanosomiasis—that have profoundly influenced humans over the course of history.

Through their work, the researchers discovered recurring themes across societies throughout time. One theme was that diseases don't affect all populations equally—a simple fact that had major ramifications throughout history. For example, during the American Revolution, many Americans had grown up in the South and were exposed to malaria at a young age, which allowed them to develop immunity. This granted them a strategic advantage over the less-immune British army, which was decimated by the disease.

A more sobering trend unearthed by the group's investigations was that disease tended to prey on inequities in societies, leaving marginalized groups most at risk. Both intentionally and unintentionally, it was weaponized time and again to enforce unjust hierarchies of power, report the researchers. In the American South, for instance, enslaved Black people were often forced to work in conditions that left them exposed to mosquitoes and made them much more vulnerable to malaria. To make matters worse, this inequity was used by white people to encourage the racist belief at the time that Black Americans were morally inferior and to justify Jim Crow segregation laws in the South.

"There are significant gaps in the teaching and learning of disease ecology because it is often separated from the aspects of social sciences that are critical driving factors in epidemiology," said Bharti, noting that her role in the project was to bring the topic of racial inequities in power and health to the discussion of disease ecology and vector borne diseases. "Unfortunately, it is not unusual for scientists to have only minimal knowledge across fields and disciplines. But it's important to broaden our understanding of [health outcomes](#) to highlight when they are strongly driven by interlinked social factors. This helps us identify all the

root causes of diseases, which is important for addressing them directly."

Structural racism, including what neighborhoods people can live in and their access to intergenerational wealth, is linked to disparities in rates of diabetes, hypertension and other chronic diseases associated with stress, added Erin Mordecai, assistant professor of biology, Stanford University. These disparities are also apparent in the COVID-19 pandemic, where the disease's outcomes are more serious for individuals suffering with these conditions. This disproportionate burden further amplifies the vulnerability of already disadvantaged communities.

"When you layer on an emerging pandemic with existing health disparities, it disproportionately affects Black and Hispanic communities," said Mordecai.

Racial disparities also put historically marginalized communities at greater risk of exposure to the virus. For example, outbreaks of leishmaniasis, a vector-borne disease spread by phlebotomine sand flies, have impacted hundreds of thousands of Syrians within refugee camps, a result of overcrowding in areas with poor sanitation. And when the first few cases of the Ebola outbreak popped up in 2014 in Africa, scientists in the United States were slow in finding ways to combat it until it showed up closer to home.

The authors said they hope that the paper will motivate scientists to be more proactive in protecting people in historically disadvantaged communities from [disease](#).

"Moving forward, it's imperative that research explicitly recognizes and combats the structural racism, classism and sexism that continue to perpetuate environmental and health inequities," said Tejas Athni, an undergraduate student at Stanford University and first author of the paper. "Equity must be brought to the center of ecology and global

health in order to make meaningful progress for all of humanity."

More information: Tejas S. Athni et al. The influence of vector-borne disease on human history: socio-ecological mechanisms, *Ecology Letters* (2021). [DOI: 10.1111/ele.13675](https://doi.org/10.1111/ele.13675)

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