

Raised buildings may help reduce malaria transmission in Africa

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There is growing evidence that house design can decrease the force of malaria infection.

The world's most deadly assassin is Africa's malaria mosquito: *Anopheles gambiae*. In 2019, the World Health Organisation estimated that malaria killed 386,000 people in sub-Saharan Africa, mainly children.

Whilst we think of the home as a sanctuary, in Africa, around 80% of the malaria bites occur indoors at night. Preventing mosquitoes from getting indoors is a simple way of protecting people from this often lethal disease.

As most mosquitoes fly low to the ground, a team of researchers led by Durham University wondered whether if, by raising a [house](#), malaria mosquitoes would struggle to find the occupants.

The findings are published in the *Journal of the Royal Society Interface*.

Using four experimental houses, the researchers found that the number of female *An. gambiae* mosquitoes collected in the huts declined with

increasing height, decreasing progressively as the hut's floor moved further from the ground.

Huts with floors 3 meters above the ground had 84% fewer mosquitoes than those on the ground. Interestingly, if this reduction correlates to a similar reduction in malaria transmission, it would be comparable to that of an insecticide-treated net that can reduce malaria transmission by 40-90%.

Research lead author Professor Steve Lindsay, from the Durham University Department of Biosciences, said: "Working with a team of architects and builders from the Royal Danish Academy—Architecture, Design and Conservation, we constructed four experimental houses in The Gambia, each of which could be raised or lowered. Each week, one hut was on the ground, whilst the bottoms of the other huts were at 1m, 2m and 3m.

"Each night two men slept under separate mosquito nets in each hut and mosquitoes were collected indoors using a light trap. We changed the height of each house weekly so that, at the end of the 40 night experiment, each hut had been at each of the four heights for 10 nights.

"After analyzing the results, we found that increasing the height of a hut progressively reduced the number of mosquitoes entering the hut and we think there are two reasons for this.

"First, malaria mosquitoes have evolved to find humans on the ground. Second, at higher heights, the carbon dioxide odor plumes coming out of the huts are rapidly dispersed by the wind, so mosquitoes find it more difficult to find a person to bite.

Study lead, Durham University Ph.D. Student Ms Majo Carrasco-Tenezaca said: "These findings have real-world implications for the growing population of sub-Saharan Africa where *An. gambiae* s.l. is the major vector of [malaria](#) and

places where high temperatures reduce the use of bed nets.

"Raising houses off the ground, like any intervention, is not evolutionary proof, and over time, [mosquitoes](#) may adapt and feed higher off the ground than before.

"Nonetheless, we recommend elevating houses off the ground since they are likely to reduce mosquito biting and keep the occupants cooler at night, and therefore more likely to sleep under an insecticide-treated net at night."

The United Nations has projected that the population of sub-Saharan Africa will more than double between 2019 and 2050, and the region will become the world's most populated by 2062.

Coincident with the increasing growth rate, there has been an unprecedented improvement in the housing stock in sub-Saharan Africa. With an additional 1.05 billion people by 2050, there has never been a better time to make houses healthier for people.

More information: Majo Carrasco-Tenezaca et al, The relationship between house height and mosquito house entry: an experimental study in rural Gambia, *Journal of The Royal Society Interface* (2021). [DOI: 10.1098/rsif.2021.0256](https://doi.org/10.1098/rsif.2021.0256)

Provided by Durham University

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