Will raised buildings reduce malaria transmission in sub-Saharan Africa and keep buildings cool?

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1 Background:

Nearly all traditional rural African Houses are single-storey buildings built on the ground. Since most Anopheles gambiae s.l. fly less than one metre above the ground[1][2], raising a house off the ground may reduce mosquito-house entry and mosquito biting.

This proof-of-concept study will explore this critical height using four identical experimental huts in rural Gambia during the rainy season (August to October).

2 Objectives:

- Determine whether raising single-roomed Gambian huts above the ground reduces the number of malaria vectors entering the huts compared with those built at ground level.
- Find out whether raising huts off the ground keeps them cooler at night than those constructed on the ground.
- Explore the acceptability of elevated buildings amongst Gambian villagers.

3 Experiment Design:

The study site will be carried out in Wellingara Village on the south bank of the River Gambia, Central River Region (Fig.1). There is an intense rainy season from June to November, followed by a long dry season. Malaria is endemic and transmission is mainly at the end of the rainy season. Members of An. gambiae s.l. are the principal malaria vectors in the area[3].

The experiment is an outcome of traditional knowledge in combination with academic approaches. Houses in other geographical contexts are built raised from the ground (Fig. 2A). While it is not common for African houses to be raised from the ground, some people in sub-Saharan Africa mentioned that being “up from the ground”

![Fig 1. Study site showing position of experimental huts.](image)

![Fig 2. (A) Elevated house in Laos PDR, (B) Man sitting on an elevated structure.](image)

The experimental huts are modelled on a typical rural Gambian house. To simulate the design of traditional houses the huts have metal roofs with 5 cm high eaves and metal doors with a 2 cm gap along the top of each door. The materials for constructing the walls and floors are plywood panels mounted on a timber frame. The overall structure of the huts is made up of steel columns and beams (Fig. 4).

![Fig 3. Two-storey houses in Tanzania.](image)

![Fig 4. Experimental Hut 3D Model](image)

![Fig 5. Experimental huts (1-4) allocated at random heights to conduct experiment in week “x”](image)

4 Methods:

At the start of the experiment, each house will be randomly allocated, using computer software, to being positioned at one of four heights: 0, 1, 2, or 3 m (Fig.5). Two volunteer men will sleep under bednets in each house for 4 nights a week for 8 weeks. Each night mosquitoes will be collected with light traps and identified next morning. Temperature and relative humidity will be measured with data loggers in each house.

5 Qualitative-Acceptability assessment:

To have insight from community members and evaluate the acceptability that raised houses would have we will conduct ethnographic observation, focus group discussions and semi-structured interviews. Ethnographic observations will be used to determine and reformulate general topics to be discussed in the focus group discussions and interviews.

Additionally, we will conduct focus group discussions with students from the Community Building and Design Department from the School of Engineering & Architecture at the University of The Gambia.

6 Outcomes:

This research will provide fundamental information on how the height of a building will reduce the number of mosquitoes entering it and how this could provide a cooler house. It will also give researchers and community members an opportunity to raise questions and contribute to future project designs.

The study will allow researchers to have a better understanding of the economic necessities, availability of material and willingness of participation related to building raised houses.

References:


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