

1 **Letter to the editor of 'Travel Medicine and Infectious Disease' journal**

2
3 *Keywords:* electricity, malaria, households, development policy

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5 **The electrification malaria nexus**

6 Dear Madam, I am writing this letter to the editor of 'Travel Medicine and Infectious Disease' journal to
7 appraise the readers of the existence of a possible nexus between the use of electricity in private dwellings
8 and malaria occurrence in malaria endemic countries.

9 Sub-Saharan countries are currently facing a number of similar challenges which, among others, include the
10 need to increase access to electricity and to reduce the morbidity and the mortality rate related to malaria.

11 This letter has two main interrelated objectives; on one hand, it has the ambition to raise everyone's
12 attention –in particular that of the Governments of countries where malaria is still an endemic disease and
13 the electrification process is undergoing- about the possible existence of this nexus. On the other, this work
14 points out the fact that collecting household level data with the purpose of assessing the existence and the
15 magnitude of the electrification malaria nexus would help to better understand the nature and magnitude
16 of this link.

17 Electrification is considered a *sine-qua-non* condition needed to foster the economic development of the
18 country and to improve citizens' lives [1]. At the household level, electricity brings a number of benefits
19 ranging from time savings when cooking to greater security in and around the house, from extended study
20 time for children to access to mass-media, from extended hours for businesses to better hygienic
21 conditions in the dwellings [2]. While the benefits stemming from electricity access are acknowledged in
22 advance, the analysis of the complete spectrum of impacts has to take into account a number of potential
23 negative aspects as well, with the possible increase of malaria occurrence being one of those.

24 The electricity-malaria nexus has not been exhaustively investigated, not at the theoretically nor at the
25 empirical level even if few available studies try to disentangle the potential mechanisms underlying this
26 nexus. On one hand, artificial light is a powerful insect attractant and both entomologists and

1 epidemiologists have used light traps to capture insects [3]. Furthermore, the use of electricity can
2 potentially alter household's members lifestyles; as an example, artificial light available at night can
3 increase outdoor activities –i.e. friends gathering, sports and business activities- and hence exposure to
4 malaria vectors. At the same time, access to electricity can also increase access to mass media and to anti-
5 malaria and prevention campaigns, which create awareness among households. Furthermore, electricity
6 used for cooking purposes replaces biomass and reduces indoor smoke, resulting in substantially improved
7 indoor air quality. However, smoke is an insect repellent and improved air quality can increase the density
8 of malaria vectors.

9 The effects electricity may have in terms of malaria occurrence is not only a theoretical matter but also an
10 empirical exercise; availability of household level data with records of malaria occurrence and of energy
11 source used becomes a key factor for measuring the link.

12 In light of the existing literature available, the electrification-malaria nexus can be modeled according to
13 formula (1):

14 (1) $MI = f(\text{vector density}, \text{exposure})$

15 which indicates that malaria incidence (*MI*) relates to the amount of malaria vectors in a given area –*vector*
16 *density*- and to the *exposure* channel -indicating the time household members spend in places where
17 malaria vectors are present [4].

18 There are several studies showing that mosquitoes are attracted to light suggesting that indoor use of lights
19 after sunset is likely to increase the density of malaria vectors (*vector density* channel).

20 The *exposure* channel refers to the fact that electrification may alter people's life; for what concerns the
21 impacts electricity use may have on malaria related matters, it has to be noted that electricity allows
22 household members to spend time outside the house after the sunset when malaria vectors are more
23 active.

24 In light of what it has been previously argued, it is important to stress that the purpose of this work is to
25 point out the existence of a potential electricity-malaria nexus and not to discourage electrification project.

1 The nexus could be better measured using ad-hoc malaria-electricity related household level surveys which
2 are not available to date.

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