

The intersection between malaria and food security

Malaria control needs an integrated development plan. As Prof William R Brieger describes, the agro-social axis carries many important influences

Malaria and food security are health and development issues that have appeared together in global frameworks since at least 1978. This paper starts by reviewing the three most well-known frameworks, and then continues by examining the functional connections as to how these affect people and programmes in malaria endemic areas.

Declarations and frameworks

Forty years ago the Alma Ata Declaration on Primary Health Care became one of the first global frameworks to consider health in the context of development.¹ Specifically the Declaration stated that, 'Economic and social development, based on a New International Economic Order, is of basic importance to the fullest attainment of health for all and to the reduction of the gap between the health status of the developing and developed countries.' Within that, eight essential services were articulated. One was 'Promotion of food supply and proper nutrition,' and another emphasised, 'Prevention and control of locally endemic diseases.' This set the stage for future efforts that could place malaria control and food security on an integrated platform.

Twenty years later world leaders came together to establish the Millennium Development Goals (MDGs),² an 8-goal framework for tackling the most pressing development challenges. As part of Goal 1, Eradicate extreme poverty and hunger, Target 1.C aimed to halve, between 1990 and 2015, the proportion of people who suffer from hunger, which was thought to be best understood by analysing the different dimensions of food security. One dimension was 'Nutritional failures are the consequence not only of insufficient food access but also of poor health conditions and the high incidence of diseases such as diarrhoea, malaria, HIV/AIDS and tuberculosis.' Thus Goal 6, Combat HIV/AIDS, malaria and other diseases, set Target 6.C to have halted by 2015 and begun to reverse the incidence of malaria and other major diseases.

While recognising some major successes in the MDGs, the global community again came together to conceptualise a new framework to take off after the MDG process ended in 2015. The new Sustainable Development Goals (SDGs) had 17 components and many sub-goals with the purpose of painting as full a picture

of a desired social, economic, environmental, health and political landscape as possible.³ Goal 2 focused on ending hunger, achieving food security and improving nutrition, and promoting sustainable agriculture. Unlike Alma Ata and the MDGs, the health goal appears a bit diffuse: Goal 3 was to ensure healthy lives and promote well-being for all at all ages. Among 13 sub-goals was 3.3 that stated by 2030, end the epidemics of AIDS, tuberculosis, malaria and neglected tropical diseases and combat hepatitis, water-borne diseases and other communicable diseases.

A thorough reading of the three mentioned documents importantly shows that malaria and food security do not exist in isolation. Their potential interaction and intersection happen in a context of poverty, the environment and climate change.

Malaria affects food security

Lewnard and colleagues reported that severe food insecurity was associated with increased risk for positive malaria tests among the Batwa pygmies in Uganda.⁴ Also malaria control interventions were associated with decreases in child mortality, accounting for the effect of rainfall and food security in central Tanzania. The authors concluded that achieving targets like the MDGs,⁵ 'requires the contribution of many health interventions, as well as more general improvements in socio-environmental and nutritional conditions,' i.e. an integrated development approach.

A study in Niger hypothesised that Unconditional Cash Transfers (UCT) would have a positive impact on food security.⁶ Two different UTC regimens were tested along with a supplemental food package, but ironically the study found no difference in endline food security between arms. The group felt that the results were possibly driven by increased fever/malaria in children, and thus nonfood related drivers of malnutrition, such as disease, may limit the effectiveness of UCTs.

Tusting and co-researchers recognise that agricultural development interventions reduce poverty.⁷ They also documented that relative agricultural success was associated with higher socio-economic position, which in turn, was associated with lower human biting rate of malaria-infected mosquitoes. They conclude that 'Further interdisciplinary research is needed to understand fully the complex pathways between poverty and malaria and to develop strategies for sustainable malaria control.' One possible pathway would be malaria prevention interventions. A study in Ghana reported that, 'Children who slept under a bednet were also more

William R Brieger is a Professor for the Department of International Health, the Johns Hopkins Bloomberg School of Public Health, and Senior Malaria Specialist, Jhpiego, an affiliate of the Johns Hopkins University.



Shared interest: both agriculture and mosquitoes need water

likely than those who did not to live in a food secure household.⁸

Malaria interventions can also affect agricultural productivity. In a Zambian experiment, access to subsidised bed nets was randomly assigned at the community level, and 516 farmers were followed over a one-year farming period. The researchers found 'large positive effects of preventative health investment on productivity: among farmers provided with access to free nets, harvest value increased by US\$ 76, corresponding to about 14.7% of the average output value.'⁹

Studying the effects of malaria on employees of an oil palm plantation in Papua New Guinea, Pluess and team found that, 'on average, an employee sick with malaria was absent for 1.8 days, resulting in a total of 9,313 workdays lost.'¹⁰ This is an indirect influence on a family's food security.

Seeking malaria care can have untoward effects when fees are attached to health services. Johnson and co-researchers report that, 'The qualitative data reveal multi-faceted health and socioeconomic effects of user fees, and illustrate that user fees for health care may impact quality of care, health outcomes, food insecurity, and gender inequality, in addition to impacting health care utilisation and household finances.'¹¹

Food security affects malaria

A common complaint with programmes that distribute insecticide-treated bednets to prevent malaria is that the nets may be used for other purposes than the intended effort to prevent infected mosquitoes from biting people. All informants interviewed for a study in Western Zambia reported that ITNs are regularly used for fishing and the misuse is widespread.¹² Unsustainable fishing practices, drought and population pressure were mentioned as reasons for fishery decline. The implication was that the use of free ITNs for fishing at least saved the population money in a time of declining fortunes.

A broader review of the ITNs for fishing issue was done through contacting expert witnesses across Af-

rica.¹³ Mosquito net fishing was found to be a broadly pan-tropical activity, particularly prevalent in sub-Saharan Africa. The authors found that, 'Perceived drivers of MNF were closely related to poverty, revealing potentially complex and arguably detrimental livelihood and food security implications.'

The mosquito breeding potential of dams cuts across Africa with the number of dams located in malarious areas projected to increase according to Kibret and colleagues.¹⁴ This is because 'The population at risk of malaria around existing dams and associated reservoirs, is estimated to increase from 15 million in 2010 to 21-23 million in the 2020s, 25-26 million in the 2050s and 28-29 million in the 2080s.' In addition, areas with dams but without malaria transmission at present, will likely transition to regions of unstable transmission due to climate change.

Likewise, a study in Ethiopia starts with the assertion that, 'Dams are important to ensure food security and promote economic development in sub-Saharan Africa,' and then stresses the importance of understanding the consequences of these projects.¹⁵ The researchers found that 'the mean monthly malaria incidence and anopheline larval density was generally higher in the dam villages than in the non-dam villages' in all the three dam settings studied. So while dams can increase agricultural production, the authors concluded that, 'the presence of dams intensifies malaria transmission in lowland and midland ecological settings.'

Hydro-agricultural projects include dams and irrigation. Human bait mosquito captures volunteers in hydro-agricultural and river bank sites in Cameroon Akono et al. found that mosquito biting rates were higher in hydro-agricultural sites of less urbanised and urban settings than in natural river banks sites.¹⁶ An additional implication is that urban farming, an important component of food security, may influence mosquito and malaria prevalence.

Stoler and colleagues pursued this question of urban agriculture. The odds of self-reported malaria are signifi-

cantly higher for women in Accra, Ghana who are living within 1 km of urban agriculture compared with all women living near an irrigation source, the association disappearing beyond this critical distance.¹⁷ Likewise in Kumasi, Afrane et al. learned that 'adult and larval mosquito abundance and larval survival were high in the irrigated fields in the irrigated (urban) vegetable farm. This therefore, contributed significantly to adult mosquito populations and hence malaria transmission in the city.'¹⁸

Even agricultural practices in smaller subsistence farms can foster malaria mosquito breeding. Practices found in southwest Nigeria include collection of pools of water in the farms for soaking cassava tubers, digging of trenches, irrigation of farms, and the presence of fish ponds.¹⁹

Communities can perceive how agricultural practices may contribute to malaria. In Tanzania a fair number of rural respondents associated growing of rice with malaria.²⁰ They also noted that the need to sleep on their farms at times meant they could not benefit from the mosquito nets hanging back in their house, some hours walk away. The idea of rice cultivation and malaria was tested in central Kenya. Mwangangi and co-researchers found that, 'Rice fields and associated canals were the most productive habitat types,' for malaria mosquito breeding. Overall, Mboera et al. found, 'evidence that malaria transmission risk varies even between neighbouring villages and is influenced by agro-ecosystems.'²¹

Conclusions

There is a fairly long history of considering both malaria/other disease control efforts and nutrition/food security as part of a comprehensive and integrated primary health care and national development package. Malaria infections lead to food insecurity of household members directly as well as loss of productivity of household members whose income and work contribute to food security. On the positive side, malaria interventions such as insecticide treated bednets improves food security and productivity.

Efforts to improve food security through enhanced food production in both rural and urban communities can contribute to malaria through mosquito breeding. This may be formal projects like dams and irrigation or even on a smaller scale on subsistence farms. Again, this can be mitigated through malaria prevention interventions.

Although we can establish the two-way link or intersection between malaria and food security, we can see that recommended joint or integrated programming may not be optimal at various levels from the nation to the community. Greater collaboration between health and agricultural ministries and agencies is needed, supported by national policies that see malaria and food production as part of overall national development goals.

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