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URBAN MALARIA IN GHANA

KEY FINDINGS FROM A STUDY



Schoolchildren smile out the window of a school in Accra, Ghana's capital and largest city.

The Ghana Urban Malaria Study began by convening a group of stakeholders to identify key questions about malaria in Ghana's cities. These questions were then addressed through a triangulation approach¹ that involved the compilation and analysis of existing data from household surveys, routine data from the Ghana Health Service, and previously published research.

Until now, clinical practice and national policy in Ghana have been informed by routine health service data suggesting that malaria is universally prevalent throughout the country. A different picture emerges, however, from the results of the Ghana Urban Malaria Study. This document summarizes the main findings of the study.

The burden of malaria is substantially lower in Ghana's large cities than in surrounding rural areas.

Published research as well as the 2011 Multiple Indicator Cluster Survey (MICS²) show that children living in Accra, Kumasi, and Tamale are significantly less likely to be infected with malaria compared to children living in smaller communities of the same ecological zone (Figure 1).

Historically, most malaria cases have been diagnosed presumptively – based upon presence or history of fever. However, data from the 2011 MICS show that while fever is closely associated with malaria infection in rural areas, less than 7% of children living in Accra and Kumasi reporting fever in the last two weeks actually tested positive for malaria (Figure 2).

Data on malaria testing that are routinely reported to the Ghana Health Service are often incomplete and internally inconsistent³. This is especially true of data reported from Ghana's largest cities. Limiting the analysis to monthly reports for which consistent data are available, roughly one-quarter of malaria cases reported nationwide and less than 10% of malaria cases reported from the metropolitan districts of Accra and Kumasi are laboratory-confirmed (Figure 3).

One consequence of the prevailing practice of presumptive diagnosis is that the true epidemiology of malaria in Ghana may be inadequately appreciated by some policy makers, public health programmers, and clinicians. Figure 4 shows that, in spite of well-documented variation in the incidence of malaria between seasons and between large cities and rural areas, Ghana Health Service data reports roughly 40% of pediatric outpatients are diagnosed with malaria throughout the year in Accra as well as in smaller communities. Thus, **malaria data routinely reported by health facilities in Ghana do not provide a reliable indication of the burden of malaria.**

FIGURE 1: Proportion of children under five with malaria parasites, by community size and ecological zone, 2011 MICS

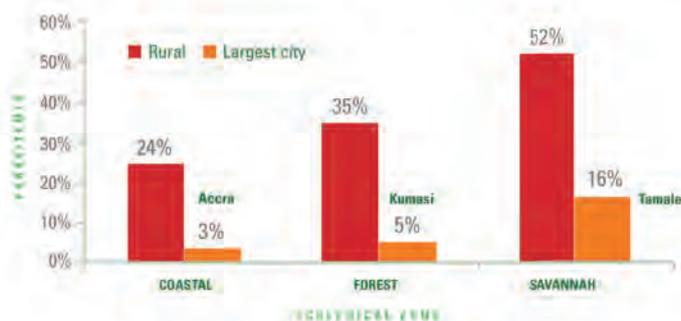


FIGURE 2: Proportion of children with a recent fever who tested positive for malaria, 2011 MICS

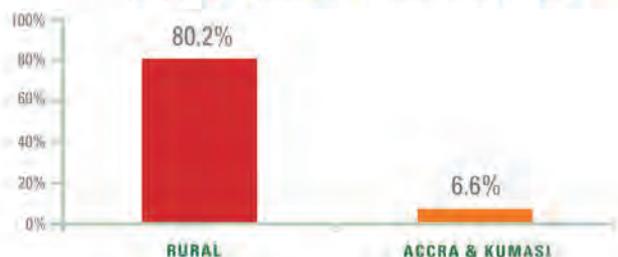


FIGURE 3: Percent of reported malaria cases that are lab-confirmed, by district, DHIMS, January to October 2012

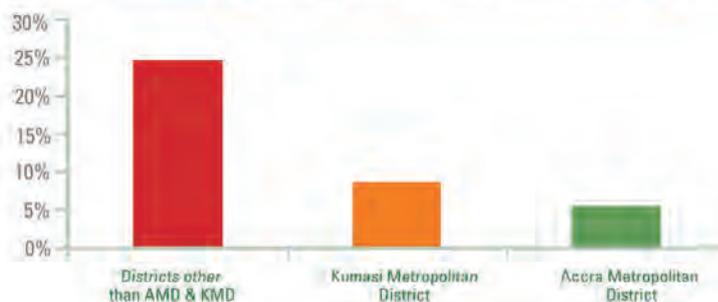


FIGURE 4: % of outpatients < 5 diagnosed with malaria, Accra vs. smaller coastal communities, DHIMS, Jan. - Oct. 2012



FIGURE 5: Malaria transmission intensity in various locations of Ghana's coastal and forest zones

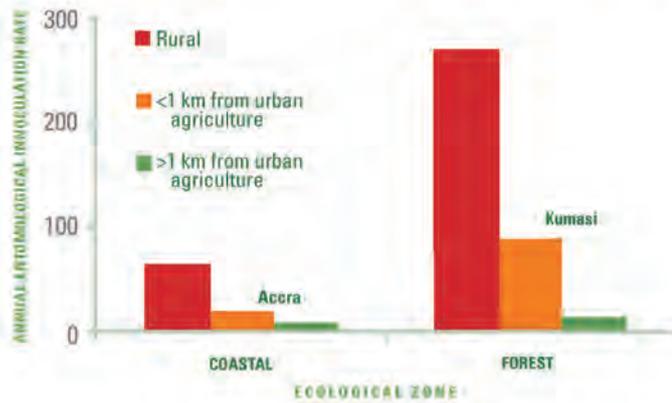
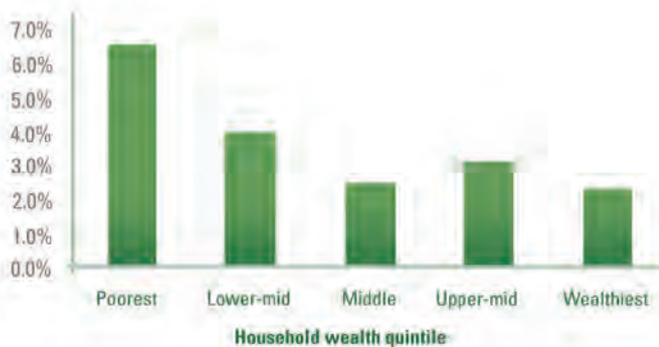


FIGURE 6: Proportion of children <5 in Accra and Kumasi with malaria parasites, by household wealth, 2011 MICS



In large cities, neighborhoods close to urban agriculture and the poorest households bear the greatest burden of malaria.

Entomological studies suggest that the burden of malaria is lower in the large cities of Ghana, largely because of environmental changes. Pollution or elimination of bodies of water and decline in tree cover have reduced the breeding and survival of *Anopheles* mosquitoes. Research^{4,5} has shown that the intensity of malaria transmission is lower in neighborhoods of Accra and Kumasi than in surrounding rural areas (Figure 5). Transmission is especially low in urban neighborhoods that are distant from urban agricultural plots.

As shown in Figure 6, the prevalence of malaria infection is higher for children living in the poorest urban households (6%) compared to those living in the wealthiest households (2%). This may be due to less frequent use of protective measures such as household screening, insecticides, insecticide-treated nets (ITNs), and anti-malarials. Further research is required to determine the main factors driving the association between household poverty and malaria.

Even in the neighborhoods of Accra and Kumasi with the highest burden of malaria, the prevalence of malaria parasitemia in children is lower than in rural areas of the surrounding ecological zone.

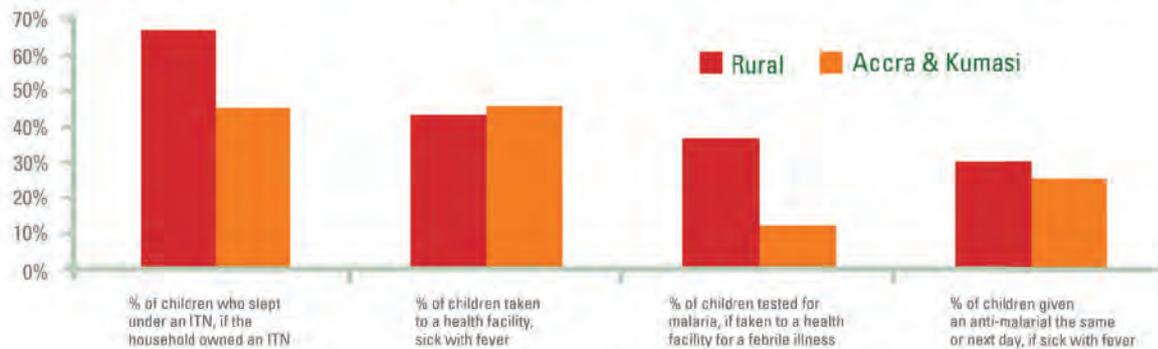
Rural areas should be prioritized for malaria prevention interventions, such as large-scale distribution of ITNs.

In cities, malaria control interventions should be targeted to urban neighborhoods known to have higher levels of *Anopheles* breeding and to poorer urban households. This is particularly true given research findings that poorer urban households are less likely than wealthier urban households to own an ITN, get tested for malaria, or treat with an appropriate anti-malarial.

There are important household and health system constraints to better management of febrile illnesses in Ghana's cities.

First, **given the generally higher wealth and level of education in Accra and Kumasi, it is surprising that the proportions of children benefiting from appropriate malaria control practices are no higher in these cities than in rural areas of Ghana (Figure 7).**

FIGURE 7: Proportion of children benefitting from appropriate malaria control practices, rural vs large city, MICS 2011



Second, **laboratory confirmation of suspected malaria is least common in Accra where the prevalence of malaria is the lowest and presumptive diagnosis of fever is least reliable.** This finding should be of considerable concern for policy makers, public health programmers, and clinicians. Presumptive diagnosis of suspected malaria results in massive misdiagnosis of individual febrile patients in urban areas. For example, Malm *et al*⁶ found that only 11% of 605 sick children presenting with fever at a hospital in Accra had malaria parasites detected by microscopy. Yet 80% of these children were diagnosed as having malaria. Misdiagnosis of severe febrile illness can lead to a fatal outcome. Other consequences of presumptive diagnosis include unnecessary expenditures, side-effects from anti-malarials, and increased opportunity for development of drug resistance.

Health staff working in Ghana's major cities are crucially important agents for strengthening the control of urban malaria and promoting more appropriate diagnosis and treatment of febrile illnesses. In a setting with a low prevalence of malaria, additional effort is required on the part of clinicians and laboratory staff to diagnose and appropriately care for other febrile illnesses. This transition in clinical practice must be supported both with essential laboratory capacities as well as training, supervision, monitoring, and feedback. Efforts to provide for the last two of these requirements (monitoring and feedback) will require strengthening of the completeness and quality of data reported routinely to the Ghana Health Service.

KEY REFERENCES FOR THE GHANA URBAN MALARIA STUDY

- ¹ Rutherford, GW, et al. (2010) Public health triangulation: approach and application to synthesizing data to understand national and local HIV epidemics; *BMC Public Health*, 10: 447
- ² Ghana Statistical Service (2011) Multiple Indicator Cluster Survey
- ³ Nationwide, for the period of January to October 2012, only 2,187 out of 3,043 health facilities reported any data on malaria testing. For 957 of these 2,187 health facilities, the total number of malaria tests reported to have been performed during this period was less than the number of laboratory-confirmed cases of malaria reported during this period. Source: District Health Information and Management System (DHIMS) of the Ghana Health Service.
- ⁴ Klinkenberg *et al* (2008) *Malaria Journal* 2008, 7:151
- ⁵ Afrane *et al* (2004) *Acta Tropica* 89 (2004) 125–134
- ⁶ Malm *et al* (2012) Poster no. 1377 at the annual meeting of the American Society of Tropical Medicine and Hygiene. Atlanta, GA. November 11 – 15, 2012

The full report of the Ghana Urban Malaria Study can be downloaded at <http://www.jsi.com/Independent/Docs/GhanaUrbanMalariaStudy.pdf>.

The Ghana Urban Malaria Study was fully funded by the President's Malaria Initiative (PMI) through the USAID Focus Region Health Project (USAID/FRHP), which is a four-year (2009 – 2013) project funded by the United States Agency for International Development (USAID) through Cooperative Agreement #641-A-00-09-00030-00 and implemented by JSI Research & Training Institute, Inc. The Ghana Urban Malaria Study, and its use of the triangulation methodology, was proposed by the CDC PMI Resident Advisor in Accra, Dr. Paul Psychas.

USAID/FRHP works closely with the Ministry of Health and the Ghana Health Service as well as the private sector to strengthen access to and use of quality maternal, newborn and child health, family planning, malaria, and HIV prevention and treatment services in the Greater Accra, Central, Western, Eastern, and Ashanti Regions of Ghana. The project also seeks to strengthen health systems and management of services in these regions.

This study is made possible by the generous support of the American people through the United States Agency for International Development (USAID) and the U.S. Centers for Disease Control and Prevention (CDC). The contents are the responsibility of JSI Research & Training Institute, Inc. and do not necessarily reflect the views of USAID, CDC, or the United States government.

Recommendations Emerging from the Ghana Urban Malaria Study

1. Rural areas should be prioritized for malaria prevention interventions such as large scale distribution of insecticide treated nets (ITNs).
2. In cities, malaria control interventions should be targeted to urban neighborhoods proven to have higher levels of *Anopheles* breeding and to poorer urban households.
3. Health professionals should become more aware of the low prevalence of malaria parasitemia in Accra and Kumasi in order to:
 - ◆ Perform malaria tests on all suspected cases
 - ◆ Modify current practices for diagnosis and treatment of febrile illness
4. To expand the number of malaria tests performed, laboratory capacity and supplies for microscopy and rapid diagnostic testing must be assured.
5. For health facilities in Ghana's cities, records of malaria tests should capture information about the residence of the patient. These records should be periodically analyzed to identify neighborhoods with a higher than average malaria burden.
6. The Center for Health Information Management (CHIM) and others within the Ghana Health Service (GHS) should work with health facility staff to improve the completeness and quality of data on malaria cases and malaria testing that are routinely reported. The electronic database of the GHS (DHIMS) should reliably capture all data on malaria testing (now recorded on the case reporting form), as well as the data on malaria cases (recorded on the outpatient morbidity report).
7. Mass media and other behavior change communication strategies targeting residents of Ghana's cities should:
 - ◆ Encourage prompt laboratory diagnosis of children sick with fevers
 - ◆ Encourage treatment with artemisinin-based combination therapy (ACT) in instances where children are sick with a fever and laboratory confirmation is not obtained
 - ◆ Promote the use of ITNs by children and pregnant women
8. Every five to ten years, the nationwide distribution of malaria parasitemia should be assessed as part of a household health survey (e.g. MICS or DHS). These surveys should include additional questions to characterize the environment (e.g. proximity to agricultural plots and pools of water) and housing characteristics (e.g. screening).
9. The National Malaria Control Programme (NMCP) should continue efforts to compile reports from all research studies (including unpublished studies) that have measured malaria parasitemia, intensity of malaria transmission (EIR), or mosquito breeding in various locations in Ghana. The NMCP should serve as a clearinghouse for such reports.
10. Ghana's universities and research institutions should be supported to conduct additional studies measuring the prevalence of malaria parasitemia, the intensity of malaria transmission (EIR), and/or intensity of mosquito breeding in specific neighborhoods. In particular, additional research should assess the burden of malaria in areas adjacent to urban agriculture and pools of water in cities.

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