ABSTRACT FOR PROCEEDINGS OF IDRC FORUM ON ECOSYSTEM APPROACHES TO HUMAN HEALTH
MONTREAL, CANADA, 18-23 MAY, 2003

Impact of urban agriculture on malaria prevalence in young children in two cities of Ghana

Klinkenberg, E.1,2, McCall, P. J.3, Wilson, M.D.1, Akoto, A.4 and Donnelly, M.J.2

1International Water Management Institute, Ghana; 2Liverpool School of Tropical Medicine, UK;
3Noguchi Memorial Institute for Medical Research, Ghana; 4School of Medical Science, University of
Science and Technology, Ghana

In Africa, malaria is usually considered a rural disease, as the Anopheles vectors prefer pools with
relatively clean water, a habitat type that is uncommon in densely populated city environments. With
increasing population growth driving more people into the city - in West Africa today more people
live in cities than in rural areas - urban agriculture is being promoted as a means to increase food
security for the growing urban population. But by creating favourable breeding sites for malaria
vectors, there is concern that urban agriculture might result in an increased human health risk. Based
on a pilot study by IWMI and collaborators indicating differences in entomological parameters
between areas with and without urban agriculture (Afrane et al., in prep.) we have initiated a project in
two cities in Ghana West Africa, to establish whether or not practicing of urban agriculture will result
in increased malaria transmission. We report here on preliminary analyses of the epidemiological and
sociological baseline study.

Prevalence of malaria parasitaemia and anaemia was assessed in children under five years old, in areas
close to and distant from urban agriculture sites. Preliminary analysis showed that in 14.7% and 6.5%
of children had malaria parasitaemia in Accra and Kumasi respectively. In both cities, significantly
more children in communities around cultivated sites than children in communities without irrigated
urban agriculture were parasitaemic (16.7% vs. 12.7%; p<0.05; 8.4% vs. 4.9%, p<0.01 for Accra and
Kumasi respectively). To investigate the effect of distance from cultivated sites on malaria prevalence,
a spatial analysis using buffer analysis was carried out to compare households located closer to
cultivated sites with those further away. Households living within 500 m of cultivated sites had a
significantly greater proportion of parasitaemic children than those outside (RR 1.28; p<0.05).
Analyses are continuing to investigate whether these differences are the result of urban agriculture or
other factors. It is hoped that the significance of urban agriculture in urban malaria in Africa can be
elucidated and if necessary, a suitable control strategy devised, taking into account the different
interest of the different stakeholders, i.e. farmers, urban communities, health and agriculture
authorities.
Impact of urban agriculture on malaria prevalence in young children in two cities in Ghana

Eveline Klinkenberg, Martin Donnelly, Philip McCall, Michael D. Wilson and Alex Osie Akato

Background
- Rapid increase in city populations
  (by the year 2020 2 out of 3 West Africans will live in urban areas)
- Urban agriculture (UA) presents a food-growing opportunity, improves nutrition and livelihoods;
- Roles considered a health hazard and low urban areas
- UA could create breeding sites for vectors
- Pilot study in city of Accra, Ghana confirmed Anopheles breeding in UA sites and higher Anopheles densities in communities living near UA sites.

Question
- Does extended urban agriculture allow Anopheles populations to expand, or is there a threshold in the city and increase the malaria risk for communities living near those sites?

Methods
- Lead to a decrease in urban agriculture
- Monitor the prevalence of disease vectors for integration. Leading to the control of urban waste management, mosquito control, and a decrease in urban agriculture.
- Therefore, there is a need to establish risk and, if necessary, to develop urban agriculture measures.

Results (preliminary)
- No significant differences in the socio-economic status of urban communities around urban agriculture sites (UA) and urban communities without urban agriculture (t0).
- For Accra, the spatial analyses calculated placed all communities in the same wealth quartile for Ghana and averaged household size and 9 residents in both areas.
- In Accra, 14.7% of the children had malaria infections while only 6.5% had infections in Kumasi (Table 1).
- Age profiles and mosquito levels were similar in Accra and Kumasi (Table 1).
- In both sites, significantly more children in communities with UA were found positive.
- A decrease in the proportion of children living in communities with UA (Kumasi: 0.005; Accra: 0.012; Chi-square 0.005, P<0.05).

Table 1: Malaria data characteristics for the two cities

<table>
<thead>
<tr>
<th>Gender</th>
<th># positive</th>
<th>% positive</th>
<th>t0 (m)</th>
<th>t1 (m)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Male</td>
<td>107</td>
<td>12.7</td>
<td>0.07</td>
<td>0.03</td>
</tr>
<tr>
<td>Female</td>
<td>100</td>
<td>12.7</td>
<td>0.10</td>
<td>0.03</td>
</tr>
<tr>
<td>Female</td>
<td>100</td>
<td>13.7</td>
<td>0.03</td>
<td>0.03</td>
</tr>
</tbody>
</table>

Figure 1: Urban agriculture sites.
- Two cities, Accra & Kumasi, Ghana
- Epidemiological & ecological baseline survey
- 5 communities around UA sites; 5 communities without UA
- Children 6 months to 5 years
- Bloodfilms and hemoglobin level
- Household questionnaires on socio-economic characteristics, use of preventive measures and knowledge of malaria
- Use of WorldBank seed factories have for economic benefit
- Increase of urban agriculture measures

Figure 2: Scouring of farming in Accra, Ghana
- Children and urban agriculture
- Longest accurate produce sites scattered throughout the cities
- Impact of urban agriculture: attainment of the 500 UA in Accra and 100 UA in Kumasi
- For the city of Kumasi, it is estimated that 90% of the households contained in the city are produced in the city.

Figure 3: Urban agriculture sites in Accra
- Two cities, Accra & Kumasi, Ghana
- Epidemiological & ecological baseline survey
- 5 communities around UA sites; 5 communities without UA
- Children 6 months to 5 years
- Bloodfilms and hemoglobin level
- Household questionnaires on socio-economic characteristics, use of preventive measures and knowledge of malaria
- Use of WorldBank seed factories have for economic benefit in
- Increase of urban agriculture measures

Figure 4: Urban agriculture sites in Kumasi
- Two cities, Accra & Kumasi, Ghana
- Epidemiological & ecological baseline survey
- 5 communities around UA sites; 5 communities without UA
- Children 6 months to 5 years
- Bloodfilms and hemoglobin level
- Household questionnaires on socio-economic characteristics, use of preventive measures and knowledge of malaria
- Use of WorldBank seed factories have for economic benefit in
- Increase of urban agriculture measures

Figure 5: Urban agriculture sites in Accra
- Two cities, Accra & Kumasi, Ghana
- Epidemiological & ecological baseline survey
- 5 communities around UA sites; 5 communities without UA
- Children 6 months to 5 years
- Bloodfilms and hemoglobin level
- Household questionnaires on socio-economic characteristics, use of preventive measures and knowledge of malaria
- Use of WorldBank seed factories have for economic benefit in
- Increase of urban agriculture measures

Figure 6: Urban agriculture sites in Kumasi
- Two cities, Accra & Kumasi, Ghana
- Epidemiological & ecological baseline survey
- 5 communities around UA sites; 5 communities without UA
- Children 6 months to 5 years
- Bloodfilms and hemoglobin level
- Household questionnaires on socio-economic characteristics, use of preventive measures and knowledge of malaria
- Use of WorldBank seed factories have for economic benefit in
- Increase of urban agriculture measures

Figure 7: Urban agriculture sites in Accra
- Two cities, Accra & Kumasi, Ghana
- Epidemiological & ecological baseline survey
- 5 communities around UA sites; 5 communities without UA
- Children 6 months to 5 years
- Bloodfilms and hemoglobin level
- Household questionnaires on socio-economic characteristics, use of preventive measures and knowledge of malaria
- Use of WorldBank seed factories have for economic benefit in
- Increase of urban agriculture measures

Figure 8: Urban agriculture sites in Kumasi
- Two cities, Accra & Kumasi, Ghana
- Epidemiological & ecological baseline survey
- 5 communities around UA sites; 5 communities without UA
- Children 6 months to 5 years
- Bloodfilms and hemoglobin level
- Household questionnaires on socio-economic characteristics, use of preventive measures and knowledge of malaria
- Use of WorldBank seed factories have for economic benefit in
- Increase of urban agriculture measures

Figure 9: Urban agriculture sites in Accra
- Two cities, Accra & Kumasi, Ghana
- Epidemiological & ecological baseline survey
- 5 communities around UA sites; 5 communities without UA
- Children 6 months to 5 years
- Bloodfilms and hemoglobin level
- Household questionnaires on socio-economic characteristics, use of preventive measures and knowledge of malaria
- Use of WorldBank seed factories have for economic benefit in
- Increase of urban agriculture measures

Figure 10: Urban agriculture sites in Kumasi
- Two cities, Accra & Kumasi, Ghana
- Epidemiological & ecological baseline survey
- 5 communities around UA sites; 5 communities without UA
- Children 6 months to 5 years
- Bloodfilms and hemoglobin level
- Household questionnaires on socio-economic characteristics, use of preventive measures and knowledge of malaria
- Use of WorldBank seed factories have for economic benefit in
- Increase of urban agriculture measures

Figure 11: Urban agriculture sites in Accra
- Two cities, Accra & Kumasi, Ghana
- Epidemiological & ecological baseline survey
- 5 communities around UA sites; 5 communities without UA
- Children 6 months to 5 years
- Bloodfilms and hemoglobin level
- Household questionnaires on socio-economic characteristics, use of preventive measures and knowledge of malaria
- Use of WorldBank seed factories have for economic benefit in
- Increase of urban agriculture measures

Figure 12: Urban agriculture sites in Kumasi
- Two cities, Accra & Kumasi, Ghana
- Epidemiological & ecological baseline survey
- 5 communities around UA sites; 5 communities without UA
- Children 6 months to 5 years
- Bloodfilms and hemoglobin level
- Household questionnaires on socio-economic characteristics, use of preventive measures and knowledge of malaria
- Use of WorldBank seed factories have for economic benefit in
- Increase of urban agriculture measures

Figure 13: Urban agriculture sites in Accra
- Two cities, Accra & Kumasi, Ghana
- Epidemiological & ecological baseline survey
- 5 communities around UA sites; 5 communities without UA
- Children 6 months to 5 years
- Bloodfilms and hemoglobin level
- Household questionnaires on socio-economic characteristics, use of preventive measures and knowledge of malaria
- Use of WorldBank seed factories have for economic benefit in
- Increase of urban agriculture measures

Study sites Accra & Kumasi
- Longest accurate produce sites scattered throughout the cities
- Impact of urban agriculture: attainment of the 500 UA in Accra and 100 UA in Kumasi
- For the city of Kumasi, it is estimated that 90% of the households contained in the city are produced in the city.

Figure 4: Urban agriculture sites in Accra
- Two cities, Accra & Kumasi, Ghana
- Epidemiological & ecological baseline survey
- 5 communities around UA sites; 5 communities without UA
- Children 6 months to 5 years
- Bloodfilms and hemoglobin level
- Household questionnaires on socio-economic characteristics, use of preventive measures and knowledge of malaria
- Use of WorldBank seed factories have for economic benefit in
- Increase of urban agriculture measures

Figure 5: Urban agriculture sites in Kumasi
- Two cities, Accra & Kumasi, Ghana
- Epidemiological & ecological baseline survey
- 5 communities around UA sites; 5 communities without UA
- Children 6 months to 5 years
- Bloodfilms and hemoglobin level
- Household questionnaires on socio-economic characteristics, use of preventive measures and knowledge of malaria
- Use of WorldBank seed factories have for economic benefit in
- Increase of urban agriculture measures

Table 1: Malaria data characteristics for the two cities

<table>
<thead>
<tr>
<th>Gender</th>
<th># children</th>
<th>% positive</th>
<th>Village</th>
<th>Urban</th>
</tr>
</thead>
<tbody>
<tr>
<td>Female</td>
<td>140</td>
<td>12.7</td>
<td>0.03</td>
<td>0.03</td>
</tr>
<tr>
<td>Female</td>
<td>100</td>
<td>13.7</td>
<td>0.03</td>
<td>0.03</td>
</tr>
</tbody>
</table>

Prevalence analysis
- In Accra, 14.7% of the children had malaria infections while only 6.5% had infections in Kumasi (Table 1).
- Age profiles and mosquito levels were similar in Accra and Kumasi (Table 1).
- In both sites, significantly more children in communities with UA were found positive.
- A decrease in the proportion of children living in communities with UA (Kumasi: 0.005; Accra: 0.012; Chi-square 0.005, P<0.05).

References