Introduction

- Durability of long-lasting insecticidal nets (LLIN) is increasingly coming into focus since longer net survival is associated with significant public health savings.
- However, there are very little data on the extent to which damages to an LLIN limit its protective effect.
- Such knowledge is needed to determine the end of the “useful life” of an LLIN in the field.

Methods

Study site

A comprehensive program to support malaria control is implemented in nine districts in Western Uganda with an estimated population of approximately 2.2 million. Interventions include distribution and promotion of long-lasting insecticidal nets (LLIN), community-based treatment of malaria and other childhood illnesses and introduction of laboratory confirmed diagnosis using rapid diagnostic tests.

Data collection

As part of the program evaluation representative, two-stage cluster sampling household surveys were carried out in October 2009 (baseline), July 2011 (midterm) and October 2012 (endline) that included assessment of malaria parasitemia and anemia in children under five with standard microscopy. In addition, at midterm and endline surveys one LLIN used by a child under five was assessed for its physical condition in a random sub-sample of households. Holes in the nets were counted in three size categories, namely 0.5-2 cm diameter, 2-10 cm and >10 cm.

Analysis

For the analysis of the physical condition of the nets a proportional Hole Index (pHI) was created by multiplying the number of holes in each size category by the weights 1, 23 and 196 respectively, reflecting the approximate ratio in hole sizes. Results were then categorized as shown in the table following most recent WHO guidance.1

<table>
<thead>
<tr>
<th>Category</th>
<th>pH value range</th>
<th>Total hole surface area in cm²</th>
</tr>
</thead>
<tbody>
<tr>
<td>Good</td>
<td>0-64</td>
<td>&lt;100</td>
</tr>
<tr>
<td>Acceptable</td>
<td>65-642</td>
<td>100-1,000</td>
</tr>
<tr>
<td>Serviceable</td>
<td>0-642</td>
<td>&lt;1,000</td>
</tr>
<tr>
<td>Torn</td>
<td>643+</td>
<td>&gt;1,000</td>
</tr>
</tbody>
</table>


Discussion and conclusions

Data on the epidemiological impact of damaged nets or LN are scarce, with only three published studies all of which look at the parasitemia of children as a function of the condition of the net they used. These were done in The Gambia [1], Tanzania [2] and Equatorial Guinea [3] and only in the last [3] was there some evidence that damaged nets gave less protection than new nets, but the assessment of physical condition grouped all nets with any holes larger than 3.3 cm together as “torn”.

These data suggest that, in the setting of Western Uganda with high level of community coverage, even seriously torn LN still provide sufficient protection for children, and nets are likely to be discarded before they lose their protective effect.

Acknowledgements

This study was funded by CIDA and Comic Relief, UK.

The authors thank all organisations and individuals that participated in this project for field support, discussion, comments, and participation.