Cost-effectiveness analysis of new diagnostic tools for cutaneous leishmaniasis in Afghanistan

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Introduction
- Cutaneous Leishmaniasis (CL) is endemic in 98 countries but approximately 75% of the cases are concentrated in 10 countries.
- Afghanistan is one of the countries with the highest burden.
- The disease produces lesions on exposed parts of the body (sometimes up to 200). It is responsible for chronic and disfiguring skin lesions resulting in mortality and social stigma.

What about the economics of CL?
In general, the literature on the economics of CL is very poor. The economic loss due to CL at the national and individual level is unclear. Similarly, the social burden inherent to this disease is not well quantified and has largely been underestimated.

Research question
**Can any of these tools (RDT or LAMP) be a cost-effective alternative to microscopy?**

An economic evaluation of these new diagnostic tools under different plausible scenarios (e.g., varying the sensitivity and specificity estimates, adherence to treatment, disability burden attributed to CL, etc.) can go some way towards achieving accurate and early diagnosis and treatment, which are essential to reduce the reservoir of infection and control CL, thereby limiting economic loss and social burden.

Data and Model
Data were collected between March and July 2016 among individuals presenting themselves at the health facility (The National Malaria and Leishmaniasis Control Program) in Kabul, with suggestive signs of CL.

Cost estimates: were taken from 2 questionnaires:
1. “Patient cost questionnaire”
2. “Laboratory and medical staff questionnaire”
3. “Drug and treatment questionnaire”

Effectiveness estimates: sensitivity and specificity of the tools AND Disability Adjusted Life Years (DALYs)

The natural history of the disease was represented through a Markov model (Annual cycles of graph below), which was combined with a bigger decision tree designed in TreeAge.

Measurement of cost-effectiveness
- How do we know if the new tool is cost-effective?

If the incremental cost-effectiveness ratio (ICER) is acceptable (willingness-to-pay threshold)

\[ \text{ICER} = \frac{\text{cost}_{\text{new strategy}} - \text{cost}_{\text{old strategy}}}{\text{effectiveness}_{\text{new strategy}} - \text{effectiveness}_{\text{old strategy}}} \]

1. Less the GDP per cap (561 USD)
2. 3 times the GDP per cap (1603 USD)

Deterministic results (1)
For deterministic analysis, we use the mean or the median value for each parameter

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Cost (2016 USD)</th>
<th>ICER (DAILY)</th>
<th>Outcome</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Microscopy</strong></td>
<td>67.19</td>
<td>3.63</td>
<td>undominated</td>
</tr>
<tr>
<td><strong>LAMPAMC</strong></td>
<td>74.93</td>
<td>3.60</td>
<td>309.32 &lt;WTP</td>
</tr>
<tr>
<td><strong>RDT</strong></td>
<td>67.41</td>
<td>3.65</td>
<td>-10.15</td>
</tr>
<tr>
<td><strong>LAMPR</strong></td>
<td>76.09</td>
<td>3.61</td>
<td>-22.38</td>
</tr>
</tbody>
</table>

The ICER is below WTP thresholds: LAMPAMC is a cost-effective alternative to microscopy

Conclusion
This study shows the potential of the LAMP to replace microscopy in the Afghan context. However, this potential is weakened by the significant uncertainty surrounding its cost-effectiveness, as demonstrated by sensitivity analyses.