First VMMC Cost and Impact Models

• First models of VMMC impact published 2006 – 2009
• Njeuhmeli et al. (2011) estimated from DMPPT model
  – 20.3 million circumcisions required to achieve 80% coverage in 15-49 yr age group by 2015 and maintain 80% coverage through 2025
  – Would cost US$ 2bn, avert 3.36 m HIV infections, and avert US$ 16.5 bn treatment costs
• Rapid expansion of VMMC programmes 2011 – 2016 with estimated total ~14 m MCs
Updated VMMC Models 2015-17

• Updated models
  – Revised (DMPPT) and new (World Bank, Weill-Cornell, CDC) models
  – Key differences from earlier models
    • Non-uniform circumcision coverage by age group
    • Updated HIV incidence estimates
    • Lower annual ARV treatment costs
    • Slower and non-uniform circumcision scale-up

• WHO-UNAIDS consolidated review of all models
  – Implications for optimal use of resources 2016-21 and sustainability of VMMC programmes into future
Age Targeting

• Updated models can assess relative impact of targeting different 5-year age bands
• Results very consistent across models and priority countries
Relative Impact of Scaling up in Specific 5-year Age Strata

Reduction in HIV incidence by age group, 2014–2050. Each line represents HIV incidence ratio under scenario in which only indicated 5-year age group circumcised.

Marker a represents 5-yr period from 2014.

Marker b represents a 15-yr period from 2014.

(doi:10.1371/journal.pone.0157071.g001)
Relative Impact of Scaling up in Specific 5-year Age Strata

• Short-term impact
  – Greatest if circumcise age groups at highest current HIV risk

• Medium-term impact
  – Greatest if circumcise age groups soon to enter highest HIV risk
  – Least if circumcise men 30 years or older

• Example from South Africa, but similar results obtained in other priority countries
Early infant male circumcision (EIMC) has similar relative impact as circumcising 10-14 year age stratum, but delayed by about 20 years.

(doi:10.1371/journal.pone.0159167.g001)
Early Infant Male Circumcision (EIMC)

• With no EIMC programme, maintaining circumcision coverage requires fewer total annual circumcisions but concentrated in a single age stratum (e.g. 10-14 years, ‘adolescent programme’)
• Once EIMC coverage is 80%, adolescent programme phases out approx. 15 years later
• With partial EIMC programme, smaller adolescent programme, but is required indefinitely
Prioritizing Region and/or Risk Group

• Region
  – In most countries data not sufficiently detailed to explore prioritization by age and region
  – Clear regional differences in HIV incidence in Kenya and Malawi which lead to obvious prioritization
  – Urban areas in general have higher HIV incidence than rural areas

• Risk group
  – Models show substantial impact of prioritizing men at higher sexual risk (e.g. multiple partners). Implies should focus on e.g. STI clinic patients, (some) occupational groups, ...
## UNAIDS Fast Track Target Circumcision Numbers

Estimated number of circumcisions required by country to achieve 80% or 90% coverage in 10-29 yr age group by 2020

<table>
<thead>
<tr>
<th>Country</th>
<th>% in 2015</th>
<th>Target 80%</th>
<th>Target 90%</th>
</tr>
</thead>
<tbody>
<tr>
<td>Botswana</td>
<td>31%</td>
<td>240,000</td>
<td>280,000</td>
</tr>
<tr>
<td>Ethiopia (Gambela)</td>
<td>75%</td>
<td>10,000</td>
<td>19,000</td>
</tr>
<tr>
<td>Kenya (Nyanza)</td>
<td>72%</td>
<td>290,000</td>
<td>505,000</td>
</tr>
<tr>
<td>Lesotho</td>
<td>69%</td>
<td>55,000</td>
<td>100,000</td>
</tr>
<tr>
<td>Malawi</td>
<td>26%</td>
<td>2.5 million</td>
<td>3.0 million</td>
</tr>
<tr>
<td>Mozambique</td>
<td>57%</td>
<td>2.2 million</td>
<td>2.9 million</td>
</tr>
<tr>
<td>Namibia</td>
<td>27%</td>
<td>310,000</td>
<td>370,000</td>
</tr>
<tr>
<td>Rwanda</td>
<td>35%</td>
<td>1.3 million</td>
<td>1.6 million</td>
</tr>
<tr>
<td>South Africa</td>
<td>56%</td>
<td>2.7 million</td>
<td>3.9 million</td>
</tr>
<tr>
<td>South Sudan</td>
<td>26%</td>
<td>1.8 million</td>
<td>2.1 million</td>
</tr>
<tr>
<td>Swaziland</td>
<td>32%</td>
<td>150,000</td>
<td>180,000</td>
</tr>
<tr>
<td>Uganda</td>
<td>53%</td>
<td>3.6 million</td>
<td>4.6 million</td>
</tr>
<tr>
<td>Tanzania</td>
<td>84%</td>
<td>1.1 million</td>
<td>2.4 million</td>
</tr>
<tr>
<td>Zambia</td>
<td>37%</td>
<td>2.0 million</td>
<td>2.4 million</td>
</tr>
<tr>
<td>Zimbabwe</td>
<td>22%</td>
<td>2.2 million</td>
<td>2.6 million</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>20.4 million</strong></td>
<td><strong>26.8 million</strong></td>
<td></td>
</tr>
</tbody>
</table>

Source: UNAIDS