Achieving HIV epidemic control – the importance of HIV prevention in women

CFAR Biannual meeting, Durban 2016

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Overview

• Is epidemic control achievable?

• Can treatment alone end the AIDS epidemic?

• What is combination prevention?

• The evolving HIV epidemic:
  o Where are new infections occurring?
  o Where and what are the challenges for epidemic control?

• Conclusion
What is Epidemic Control?

• Reduction of disease incidence, prevalence, morbidity or mortality to a locally acceptable level as a result of deliberate intervention measures

• Point where HIV no longer represents a public health threat and is no longer among the leading causes of country’s disease burden

• Mathematically defined as the point at which the reproductive rate of infection ($R_0$) is below 1
Can treatment alone end the AIDS epidemic?  

The case of Botswana

Despite being very close to the UNAIDS targets of 90-90-90, Botswana still has unacceptably high community HIV incidence rates. … at 3.1%.
What is combination prevention?

“Prevention packages that… combine various arrays of evidence-based strategies… tailored to the needs of diverse subgroups and… targeted to achieve high coverage… for a measurable reduction in population-level HIV transmission”

Source: Kurth et al, Current HIV/AIDS Reports 2011
Tools for preventing sexual transmission of HIV

- Treatment for prevention
  - Cohen M, NEJM, 2011
  - Donnell D, Lancet 2010
  - Tanser, Science 2013

- Oral pre-exposure prophylaxis
  - Grant R, NEJM 2010 (MSM)
  - Baeten J, NEJM 2012 (Couples)
  - Thigpen L, NEJM 2012 (Heterosexuals)
  - Choopanya K, Lancet 2013 (IDU)

- Male circumcision
  - Gray R, Lancet 2007

- Treatment of STIs
  - Grosskurth H, Lancet 2000

- Male Condoms

- Female Condoms

- Male Condoms

- HIV Counselling and Testing
  - Coates T, Lancet 2000
  - Sweat M, Lancet 2011

- Behavioural Intervention
  - Abstinence
  - Be Faithful

Post Exposure prophylaxis (PEP)
- Scheckter M, 2002

Note: PMTCT, Screening transfusions, Harm reduction, Universal precautions, etc. have not been included – this is on sexual transmission
The world has made impressive progress in the HIV response, but the spread of HIV has yet to be controlled!

In 2015, worldwide there were:

1.2 million HIV deaths

37 million living with HIV

2 million new infections

About 6,000 new HIV infections each day

Source: UNAIDS Global Report 2016
Global HIV epidemic at a glance

About 6,000 new HIV infections each day

2 out of 3 new HIV infections are in sub-Saharan Africa

1 out of 3 new HIV infections are in youth (15-24yr)

Source: UNAIDS Global Report 2015
With <1% of the world’s population, South Africa has 18% of the HIV infections globally.

Top 10 countries: People living with HIV

1. South Africa 18%
2. Nigeria 9%
3. India 6%
4. Kenya 5%
5. Mozambique 4%
6. Uganda 4%
7. Tanzania 4%
8. Zimbabwe 4%
9. USA 4%
10. Zambia 3%

Remaining countries: 39%

35 countries account for 90% of new HIV infections globally.

Source: UNAIDS Global Report 2014
**Young Women at High Risk**

**HIV Incidence among Young Women**
More than 1/3 New HIV Infections Globally Occur among Young Women in Africa

**Estimated number of new HIV infections per week among young women aged 15-24 years in East and Southern Africa, 2012**

Data source: UNAIDS 2013

<table>
<thead>
<tr>
<th>Country</th>
<th>Number per week</th>
</tr>
</thead>
<tbody>
<tr>
<td>South Africa</td>
<td>570</td>
</tr>
<tr>
<td>Uganda</td>
<td>494</td>
</tr>
<tr>
<td>Mozambique</td>
<td>491</td>
</tr>
<tr>
<td>Tanzania</td>
<td>468</td>
</tr>
<tr>
<td>Kenya</td>
<td>287</td>
</tr>
<tr>
<td>Zimbabwe</td>
<td>262</td>
</tr>
<tr>
<td>Malawi</td>
<td>185</td>
</tr>
<tr>
<td>Zambia</td>
<td>110</td>
</tr>
<tr>
<td>Lesotho</td>
<td>79</td>
</tr>
<tr>
<td>Swaziland</td>
<td>64</td>
</tr>
<tr>
<td>Ethiopia</td>
<td>54</td>
</tr>
<tr>
<td>Botswana</td>
<td>42</td>
</tr>
<tr>
<td>Namibia</td>
<td>25</td>
</tr>
</tbody>
</table>

Over 7,000 new HIV infections every week among young women globally
The South African HIV Epidemic: A diversity of epidemics at a district level
HIV in South Africa: Disproportionate burden of HIV in young women

Seroprevalence of HIV infection in rural South Africa
AIDS 1992, 6:1535-1539
Quarraisha Abdool Karim, Salim S. Abdool Karim, Bipraj Singh*, Richard Short† and Sipho Ngxongo‡

Young women have up to 8 times more HIV than men

[Graph showing comparison of HIV prevalence between men and women in South Africa, with a peak in young women aged 15-19]
Worsening of the HIV epidemic in young women in South Africa from 1990 to 2005

HIV prevalence (%)

In KwaZulu-Natal, HIV prevalence declining too slowly in young women

Moving average HIV prevalence in pregnant women in Vulindlela

<table>
<thead>
<tr>
<th>Year</th>
<th>01</th>
<th>02</th>
<th>03</th>
<th>04</th>
<th>05</th>
<th>06</th>
<th>07</th>
<th>08</th>
<th>09</th>
<th>10</th>
<th>11</th>
<th>12</th>
<th>13</th>
</tr>
</thead>
<tbody>
<tr>
<td>HIV prevalence (%)</td>
<td>32</td>
<td>35</td>
<td>41</td>
<td>43</td>
<td>37</td>
<td>38</td>
<td>34</td>
<td>41</td>
<td>37</td>
<td>40</td>
<td>35</td>
<td>40</td>
<td>44</td>
</tr>
<tr>
<td>National HIV prevalence (%)</td>
<td>25</td>
<td>27</td>
<td>28</td>
<td>30</td>
<td>30</td>
<td>29</td>
<td>29</td>
<td>29</td>
<td>29</td>
<td>30</td>
<td>30</td>
<td>30</td>
<td>30</td>
</tr>
</tbody>
</table>

Overall HIV prevalence in rural Vulindlela (2001-2013)

<table>
<thead>
<tr>
<th>Age Group (Years)</th>
<th>HIV Prevalence (N=4818)</th>
</tr>
</thead>
<tbody>
<tr>
<td>≤16</td>
<td>11.5%</td>
</tr>
<tr>
<td>17-18</td>
<td>21.3%</td>
</tr>
<tr>
<td>19-20</td>
<td>30.4%</td>
</tr>
<tr>
<td>21-22</td>
<td>39.4%</td>
</tr>
<tr>
<td>23-24</td>
<td>49.5%</td>
</tr>
<tr>
<td>&gt;25</td>
<td>51.9%</td>
</tr>
</tbody>
</table>

Source: Kharsany ABM et al, JAIDS 2015
### Highest Priority: Reducing HIV in young girls

**HIV in rural South Africa (Grade 9/10)**

- **Prevalence of HIV, HSV-2 and pregnancy among high school students in rural KwaZulu-Natal, South Africa: a bio-behavioural cross-sectional survey**

  - **Quarraisha Abdool Karim,1,2 Ayesha B M Kharsany,1 Kerry Leask,1 Fanelisibonge Ntombela,1 Hilton Humphries,1 Janet A Frohlich,1 Natasha Samsunder,1 Anneke Grobler,1 Rachael Dellar1 Salim S Abdool Karim1,2**

<table>
<thead>
<tr>
<th>Age Group (years)</th>
<th>HIV Prevalence (2010) % (95% Confidence Interval)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Male (n=1252)</td>
</tr>
<tr>
<td>≤15</td>
<td>1.0 (0.0 - 2.2)</td>
</tr>
<tr>
<td>16-17</td>
<td>1.1 (0.2 - 2.0)</td>
</tr>
<tr>
<td>18-19</td>
<td>1.5 (0 - 3.7)</td>
</tr>
<tr>
<td>≥20</td>
<td>1.8 (0 - 3.9)</td>
</tr>
</tbody>
</table>
## HIV & HSV-2 prevalence in students by age

<table>
<thead>
<tr>
<th>Age Group (years)</th>
<th>HIV Prevalence</th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>% (95% CI)</td>
<td>Male (n=1252)</td>
<td>Female (n=1423)</td>
</tr>
<tr>
<td>≤15</td>
<td>1.0</td>
<td>2.6</td>
<td></td>
</tr>
<tr>
<td>16-17</td>
<td>1.1</td>
<td>6.1</td>
<td></td>
</tr>
<tr>
<td>18-19</td>
<td>1.5</td>
<td>13.6</td>
<td></td>
</tr>
<tr>
<td>≥20</td>
<td>1.8</td>
<td>24.7</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Age Group (years)</th>
<th>HSV-2 Prevalence</th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>≤15</td>
<td>0.7</td>
<td>3.5</td>
<td></td>
</tr>
<tr>
<td>16-17</td>
<td>2.0</td>
<td>9.3</td>
<td></td>
</tr>
<tr>
<td>18-19</td>
<td>6.6</td>
<td>30.2</td>
<td></td>
</tr>
<tr>
<td>≥20</td>
<td>3.5</td>
<td>43.3</td>
<td></td>
</tr>
</tbody>
</table>
## Risk factors for HIV acquisition in female high school students

<table>
<thead>
<tr>
<th>Risk factor</th>
<th>Adjusted OR</th>
<th>p-value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Age &lt;18 years</td>
<td>2.67 (1.67-4.27)</td>
<td>&lt;0.001</td>
</tr>
<tr>
<td>HSV-2 seropositive</td>
<td>4.35 (2.61-7.24)</td>
<td>&lt;0.001</td>
</tr>
<tr>
<td>Experience of pregnancy</td>
<td>1.66 (1.10-2.51)</td>
<td>0.016</td>
</tr>
<tr>
<td>Experience of &gt;1 adult deaths in household</td>
<td>1.97 (1.13-3.44)</td>
<td>0.016</td>
</tr>
</tbody>
</table>

**SOCIAL as well as BIOLOGICAL vulnerability to infection**

HSV-2 infection increases HIV risk in CAPRISA 004 women

<table>
<thead>
<tr>
<th>HSV-2 incident infections</th>
<th>HSV-2 positive n=58</th>
<th>HSV-2 Negative n=164</th>
</tr>
</thead>
<tbody>
<tr>
<td># HIV infections</td>
<td>11</td>
<td>13</td>
</tr>
<tr>
<td>HIV incidence / 100 person-yrs</td>
<td>12.3</td>
<td>5.3</td>
</tr>
</tbody>
</table>

HR for HIV risk in incident HSV-2: **2.4** (CI: 1.1-5.4), \( p = 0.03 \)

Prevalent HPV infection increases HIV risk

<table>
<thead>
<tr>
<th>Prevalent HPV</th>
<th>Women-years (n/N)</th>
<th>HIV Incidence rate (95% CI)</th>
</tr>
</thead>
<tbody>
<tr>
<td>HPV-</td>
<td>330.5 (8/204)</td>
<td>2.4 (1.1 - 4.8)</td>
</tr>
<tr>
<td>HPV+</td>
<td>880.3 (59/575)</td>
<td>6.7 (5.1 - 8.6)</td>
</tr>
</tbody>
</table>

HR for prevalent HPV: **2.8** (CI: 1.3 – 5.9), \( p=0.007 \)

*Multivariate model fitted to HIV incidence adjusting for Study arm, Self-reported condom use, Age, Baseline HSV-2 status, Self-reported sex acts in the last month, and Age at sexual debut.*
New WHO policy on ARVs to prevent the spread of HIV by sex (Pre-exposure prophylaxis - PrEP):

PrEP recommended as global standard for all at high risk

New WHO PrEP guidelines
“..the use of daily oral pre-exposure prophylaxis is recommended as an additional prevention choice for people at substantial risk of HIV infection as part of combination prevention approaches..”
Summary

• Diversity of epidemics
• Responses have to be shaped by knowledge of epidemic, drivers of epidemic & target populations
• Need to define optimal combinations of known interventions appropriate for target population and epidemic
• More than a health issue - social mobilization is effective
• Treatment scale up and PrEP are creating new opportunities for prevention – increase male engagement; 3 zeroes
• HIV prevention is complex challenge - no quick fix, no magic bullets, no one size fits all
• Major gap is HIV prevention technologies for young women – daily Truvada is a start.
• M&E and keep track of new knowledge
Conclusion

- Impressive progress in scientific research, political commitment & implementation globally:
  - created a favourable HIV trajectory
  - but, young women in SSA still have high HIV rates

- SSA is important and critical in impacting the global

- There are many challenges but it should not deter us!

- We won’t stop HIV in young women tomorrow....
  .... but social and biomedical innovation has to be part of our long-term vision
Acknowledgements

- CAPRISA is funded by:
  - DAIDS, NIAID, National Institutes of Health
  - US Agency for International Development (USAID)
  - President’s Emergency fund for AIDS Relief (PEPFAR)
  - US Centers for Disease Control and Prevention (CDC)
  - South African Department of Science and Technology (DST)
  - National Research Foundation (NRF)
  - Fogarty International Center, NIH
  - Gilead Sciences (tenofovir API)
  - MACAIDS Fund (via Tides Foundation)
  - Medical Research Council (MRC)
  - CONRAD

- CAPRISA hosts a DST-NRF Centre of Excellence in HIV Prevention (jointly with the University of KwaZulu-Natal)
Who is infecting who?

Africa Centre identified phylogenetically linked HIV transmission networks in Hlabisa

High HIV incidence men
mean age 27 years (range 23-35 years)

Very young women acquire HIV from men, on average, 8 years older

Men and women > 24 years usually acquire HIV from similarly aged partners

High HIV risk women
Mean age 18 years (range 16-23 years)

High HIV prevalence women
Mean age 26 years (range 24-29 years)

When teen women reach mid-20s they continue the cycle

Is HIV epidemic control achievable?

Yes, HIV epidemic control is achievable!

Source: Cremin I. et al. AIDS 2013
A

HIV incidence (%) by age and sex

<table>
<thead>
<tr>
<th>Age and sex</th>
<th>HIV incidence%</th>
</tr>
</thead>
<tbody>
<tr>
<td>Female 15-24</td>
<td>2.6</td>
</tr>
<tr>
<td>Male 15-24</td>
<td>0.5</td>
</tr>
<tr>
<td>Female 25+</td>
<td>2.4</td>
</tr>
<tr>
<td>Male 25+</td>
<td>1.1</td>
</tr>
</tbody>
</table>

B

Proportion of new HIV infections by age and sex

- Female 15-24: 26%
- Male 15-24: 40%
- Female 25+: 6%
- Male 25+: 28%