Analysis of Cost-Effectiveness of HIV Prevention

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Objectives

- Cost-effectiveness of Prevention
- Review HIV epidemic trends
- Resource Limitations
- Priorities
Global HIV Prevalence

Adult HIV Prevalence Rate, 2011

Global HIV Prevalence Rate = 0.8%

NOTES: Data are estimates. Prevalence rates include adults ages 15-49. The estimate for Sudan represents data for South Sudan. An estimate was provided for Sudan and is <1%.
HIV Epidemic Status

- 34 Million infected people
- 97% of Cases in Low & Middle Income Countries
- 2.5 Million New Cases in 2011
- New Cases 25% fewer than in 2001
- 58% Women
HIV Global Burden of Disease 1990 – 2010

- Annual Deaths rose 300,000 to 1,400,000
  ✓ 400% increase
- Death rates rose 6 to 21/100,000
  ✓ 250% increase
- 14% of all Female Deaths & 11% of all Male Deaths
- Ranked 6th in Global Cause of Deaths and Years of Life Lost, 5th in Disability Adjusted Life-Years (DALYs)
- Ranked 1st in South & East SubSaharan Africa
  ✓ South Africa 17% prevalence  15-49 year old
- Sexual Transmission 80-90% - More women infected
Decline in Perinatal Transmission

New HIV infections among children
(0-14 years old) 2003-2011
Source: UNAIDS 2012 Global Report

USA: > 90% Decline: Fewer than 200 infants in 2011

North Africa is the only region that has yet to see a reduction in the number of children newly infected.
1.12.1. HIV and AIDS incidence rates in 2010

Source: ECDC and WHO Regional Office for Europe (2011).
HIV Burden of Disease France and USA

- **France 150,000 HIV infected people**
  - 50% new infections in Men who have Sex with Men (MSM)

- **USA 1.1 Million infected**
  - 50,000 new infections 60% in MSM
  - Highest infection rate in 13-24 year old MSM [37/100,000]
  - Annual incidence rate not substantially changing

- **California 212,000 HIV infected**
  - 67% MSM
Diagnoses of HIV Infection among Adults and Adolescents, by Transmission Category, 2008–2011—United States and 6 Dependent Areas

Note. Data include persons with a diagnosis of HIV infection regardless of stage of disease at diagnosis. All displayed data have been statistically adjusted to account for reporting delays and missing transmission category, but not for incomplete reporting.

a Heterosexual contact with a person known to have, or to be at high risk for, HIV infection.

b Includes hemophilia, blood transfusion, perinatal exposure, and risk factor not reported or not identified.
Diagnoses of HIV Infection among Adults and Adolescents, by Sex and Transmission Category, 2011—United States and 6 Dependent Areas

Males
- Male-to-male sexual contact: 78%
- Injection drug use (IDU): 12%
- Male-to-male sexual contact and IDU: 6%
- Other: <1%
- N = 39,495

Females
- Heterosexual contact: 86%
- Other: 14%
- N = 10,512

Note. Data include persons with a diagnosis of HIV infection regardless of stage of disease at diagnosis. All displayed data have been statistically adjusted to account for reporting delays and missing transmission category, but not for incomplete reporting.

a Heterosexual contact with a person known to have, or to be at high risk for, HIV infection.
b Includes hemophilia, blood transfusion, perinatal exposure, and risk factor not reported or not identified.
Many prevention methods

Sexual transmission prevention

• Male Circumcision – Heterosexual Transmission? MSM?
• Routine Condom Use - male or female condoms
• Education to Delay Age for Initiation of Sexual Activity & Limit Sexual Partners
• Diagnosis & Treatment Sexually Transmitted Infections in Sex workers and/or general population
• Antiretroviral therapy
• Vaginal microbicide antiretrovirals
• Pre-exposure Prophylaxis (PreP)
• Treatment as Prevention (TasP)
More Prevention Methods

• **Intravenous Drug Users**
  ✓ Needle exchange for Intravenous Drug Users
  ✓ Oral Opioid substitution

• **Mother –to – Child Transmission (MTCT)**
  ✓ Family Planning - protects those who do not know they are HIV infected
  ✓ Maternal Antiretroviral treatment

• **Health Facilities Infected Blood**
  ✓ Universal precautions in health facilities
  ✓ Non-reusable needles
  ✓ Blood safety
Enabling Methods

• Voluntary testing and counselling
• Community mobilization
• Health workforce development & Task shifting
• Surveillance and information system
• Laboratory development
• Logistics & Supply
Cost-effectiveness of HIV Prevention Interventions – examples (1)

- Compared with NO Intervention in Africa and South Asia - Hyperendemic or Generalized HIV

<table>
<thead>
<tr>
<th>Intervention</th>
<th>$/DALY averted</th>
</tr>
</thead>
<tbody>
<tr>
<td>Male Circumcision (after 7 years)</td>
<td>0</td>
</tr>
<tr>
<td>Family Planning for HIV+ women</td>
<td>0</td>
</tr>
<tr>
<td>Mass media campaigns</td>
<td>&lt;20</td>
</tr>
<tr>
<td>Condom distribution</td>
<td>&lt;20</td>
</tr>
<tr>
<td>Sex Workers Rx STI &amp; Peer Education</td>
<td>&lt;20</td>
</tr>
<tr>
<td>Blood &amp; Injection Safety</td>
<td>600</td>
</tr>
<tr>
<td>School-based Sex Education</td>
<td>1600</td>
</tr>
</tbody>
</table>
## Cost-effectiveness of HIV Prevention Interventions (2)

<table>
<thead>
<tr>
<th>Intervention</th>
<th>$/DALY</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mother-to-Child Antenatal Treatment</td>
<td>$ 70</td>
</tr>
<tr>
<td>Needle Exchange</td>
<td>500</td>
</tr>
<tr>
<td>Antiretroviral vaginal microbicides</td>
<td>550</td>
</tr>
<tr>
<td>Antiretroviral Therapy (CD4 &lt;350)</td>
<td>1200</td>
</tr>
<tr>
<td>Treatment as Prevention (TasP)</td>
<td>4000</td>
</tr>
<tr>
<td>Pre-Exposure Prophylaxis</td>
<td>9000</td>
</tr>
</tbody>
</table>

Assume 90+% Adherence – Wildly Optimistic
Adherence to ART

- 80+% Adherence for CD4 Count Improvement
- USA 70-80% Adherence among MSM
- SubSaharan Africa only 40% after 1 year
  - Sick Patients with low CD4 Counts
  - Frequent Supervision
  - Highly selected populations

- Africa - 20% know HIV serology
People receiving ART in Low and Middle-Income Countries

Number of people receiving antiretroviral therapy in low- and middle-income countries, by region, 2002–2011

Child Health Cost-effectiveness for Low-Income Countries

$\$/DALY

WHO recommended vaccines 1-25
Vitamin A Supplements for deficiency 15-50
Oral rehydration for Diarrhea 10-100
Antibiotics for Pneumonia 50-500
Malaria control 4-45
Determinants of Cost-effectiveness

- Incidence in population studied & Type of Epidemic
  - Concentrated - North America, Europe, Latin America, Central Asia
  - Hyperendemic - South and East Africa
  - Generalized Low Level - North and West Africa, Asia

- Adherence: ART 40% for 1 year?

- Comparison with NO INTERVENTION or other methods or incremental implementation

- Length of effect – male circumcision lasts lifetime

- Country specific costs of salaries and implementation
Societal Costs of HIV

- Health Care Costs – treatment, surveillance & public health efforts
- Lost Productivity for HIV infected person
- Lost Productivity for Caretaker
- Family impoverishment with lost education and future earnings for children
- Indirect costs of pain and suffering
- Statistical Value of Lives Saved

Conclusion: Cost-effectiveness Analyses underestimate societal costs of AIDS
Likelihood of employment before and after antiretroviral therapy in Kwazulu-Natal, South Africa

Source: Bärnighausen T et al. The economic benefits of ART: evidence from a complete population cohort in rural South Africa. 2nd International HIV
Estimated Costs of Combined Investment

Source: Schwartlander et al., Lancet 2011
Deaths Averted from Full Investment

7.4 million AIDS deaths averted between 2011 and 2020

AIDS deaths

Year

Baseline
Investment framework

Journées de la prévention
Paris - Centre universitaire des Saints-Pères
5, 6 & 7 JUIN 2013
Bilateral Global HIV Funding and U.S. Contributions to the Global Fund, FY 2004-FY 2013*

*FY 2013 is President’s Budget Request to Congress.

NOTE: Totals include funding for HIV and the Global Fund.


Figure 3: Bilateral Global HIV Funding and U.S. Contributions to the Global Fund, FY 2004-2013
50% of HIV Resources from Domestic Public and Private Resources in Low & Middle Income Countries

Domestic public and private resources available for HIV in low- and middle-income countries in current billions of US dollars, 2005–2011

Source: UNAIDS estimates.
Estimated New HIV Infections Result Focused vs General Population Prevention Kwazulu Natal & Pakistan

Conclusions (1)

• Focus on High Risk Target Groups
• Two different HIV epidemics
  ✓ Hyperendemic countries of Southern & Eastern Africa >90% of new cases in the world
  • Male Circumcision most cost-effective – 97% lack
  • Family planning for HIV+ women in reproductive ages
  • Expand Condom Use and Decrease Risk Behavior
  • Expand treatment of patients with low CD4 and promote adherence (+/-)
Conclusions (2)

High-income countries where infections concentrated especially MSM

Focus on High Risk Target Groups

• Promote Condom Use and Decrease Risk Behavior? How?

• ART Treatment

• Intravenous Drug Users
  ✓ Needle exchange
  ✓ Oral Opioid Substitution
Conclusions (3)

Highest Priority for Global Reduction in Deaths most cost-effectively remains Child Communicable Disease Control:

• Vaccination
• Malaria Control
• Diarrhea oral rehydration therapy
• Antibiotics for pneumonia