HIV infection: our Current Understanding of the Transmission of HIV and Global Situation
Outline

- HIV transmission factors
- HIBV global epidemiological overview
- Some data in the national response
- What are the current issues
Outline

- HIV transmission factors
- HIV global epidemiological overview
- Some data in the national response
- What are the current issues
The natural course of incidence and prevalence of a local HIV epidemic over time

\[ R_t = R_0 > 1 \]

\[ R_t < 1 \]

\[ R_t = 1 \]

Interested in current incidence – but even if a validated test available would require an order of magnitude increase in sample sizes.
Dynamics of epidemic dissemination:
Basic rate of reproduction of and STI ($R_o$)
Incidence Curves

- Tanzania Incidence
- Uganda Incidence
- Lagged Zimbabwe Incidence
- Lagged Cambodia Incidence
- Lagged Honduras Incidence
Thailand: changes of modes of transmission

- Extramarital
- Mother to Child
- Male from wife
- Female from Husband
- Sex worker
- Male from sex worker
- Injection Drug User
Number of infections per year and mode of, Cambodia, 1988-2004

Source: Peerapatananapokin and Brown, using Asia Epidemic Model
Modes of transmission in sub-Saharan African countries

Distribution of new infections by sources of risk

Modes of transmission in South, East and West Africa, 2008–2009
Sexual and drug taking networks are frequently complex and intertwined. A “one size fits all” approach to addressing behavioral risk rarely addresses local realities.

- Female partners (non FSW)
- Male clients (non IDU or MSM)
- Female sex workers
- Male sex workers
- MSM (non MSW)
- Transgender
- IDU

More common behaviors

Less common behaviors
"Everything" Depends upon the Viral Load
The Plasma Viral Load is Reflected in Semen and Cervico-vaginal Secretions

- Each 1-unit increase in plasma RNA led to 5.6 increase in odds of cervical and 3.9 of vaginal shedding

- If you follow women with serial cervical and vaginal sampling for HIV, 4-100% of cervical samples, and 0-71% of vaginal samples, will be positive.

Mostad et al.
Top—estradiol in dark and progesterone in light. Middle is CX (DNA—infected cells) and lower vaginal. (same)

207/450 samples (46%)

74/449 (16% of samples)

Mostad SB et al. J Infect Dis 1998;178:983
Likelihood of Transmission, by Viral Load

Probability of HIV Transmission, by Titer of HIV in Ejaculate and Quantity of CCR5 Receptors

Chakraborty et al. AIDS 2001
Risk of HIV Transmission by Seminal Fluid Titer and Disease Stage

After adjustment for CD4, women with an STI have 2.5-fold increase in HIV load.

Figure 1. Increases in HIV viral load with syphilis infection and decreases with syphilis treatment.

Effect on Titer in Seminal Fluid of 86 Men with Gonorrhea Receiving a Single Dose of Ceftriaxone

HIV-1 RNA copies/mL (in thousands)

Week 1 | Week 2 | Week 3

120 | 100 | 80

100 | 80 | 60

80 | 60 | 40

60 | 40 | 20

40 | 20 | 0

0 | 20 | 40 | 60 | 80 | 100 | 120

Week 1 | Week 2 | Week 3
Effect on Titer in Genital Tract Secretions Following Treatment for Trichomoniasis, vs. Controls

Price et al. Sex Transm Dis 2003
Transmission of HIV and How STIs Can Increase It

A

Risk of HIV transmission per coital act

1/50-1/250
1/1000 - 1/10,000
1/500 - 1/2000
1/100-

HIV RNA in semen (log_{10} copies/mL)

5
4
3
2

Acute infection 3 weeks Asymptomatic infection HIV progression AIDS

B

HIV RNA in semen (log_{10} copies/mL)

5
4
3
2

Acute Infection 3 weeks STI episode STI episode AIDS

Cohen MS and Pilcher CD. J Infect Dis 2005;191:1391
Meta-analysis of the Association of Genital Herpes with HIV Infection

Risk of HIV Acquisition, by HSV-2 Infection Status

Percentage is incidence per 100 person-years

Modelled Attributable Risk of HIV Infection to Genital Herpes

Transmission of HIV and How STIs Can Increase It

A

Risk of HIV transmission per coital act

1/50 - 1/500
1/1000 - 1/2000
1/250 - 1/10,000
1/1000

HIV RNA in semen (log_{10} copies/mL)

Acute infection 3 weeks Asymptomatic infection HIV progression AIDS

B

HIV RNA in semen (log_{10} copies/mL)

Acute Infection 3 weeks STI episode STI episode AIDS

World Health Organization
Do People with HIV Infection Commonly Become Infected with New Strains of HIV?

"Superinfection"
Coinfection vs. Superinfection

Coinfection

Strain 1 + Strain 2

Superinfection

Strain 1

Strain 2

Smith D et al. J Infect Dis 2005;192:438
The Number of Published Cases of Superinfection is Small

Data are conflicting on how common superinfection is:

- Technically difficult to identify new strains
- If one determines an individual has >2 strains, how do we know if there was coinfection or superinfection?
- Some data indicate it may occur almost as frequently as primary infection (remarkable, and bad for vaccine development) while other data indicate it is rare
So What if I Become Superinfected?

- It seems superinfection, at least temporarily, creates a new "set point" that is higher than the previous set point, coincident with a drop in CD4 cell count.

- Some reports indicate a more rapid clinical progression following superinfection.

What Do Data on Superinfection Mean for Counseling?

90% of HIV-infected MSM in San Francisco have heard of superinfection, and 74% indicate they have used safer sex practices because of it\(^1\)

It may be an effective counselling message for us to give to HIV-positive patients, but we must be honest.

\(^1\)Colfax GN et al. J AIDS 2004;36:990
Does STI Control Reduce HIV Incidence?

3 community-randomized trials

- Mwanza, Tanzania
  *Grosskurth et al. Lancet 1995;346:530*

- Rakai, Uganda

- Masaka, Uganda
  - *Kamali et al. Lancet 2003;361;645*
Outline

- HIV transmission factors
- HIV global epidemiological overview
- Some data in the national response
- What are the current issues
Surveillance: progress and gaps

Quality of HIV surveillance systems, 2009, WHO/UNAIDS
Thirty years into the epidemic

UNAIDS/WHO Epi update, 2009
Global prevalence of HIV, 2010

Source: UNAIDS
Global HIV trends, 1990 to 2009

Number of people living with HIV

Number of children living with HIV

Adult and child deaths due to AIDS

Number of orphans due to AIDS

Dotted lines represent ranges, solid lines represent the best estimate.

Source: UNAIDS.
Figure 2.6

Trends in women living with HIV

Proportion of people 15 years and older living with HIV who are women, 1990–2009.

Source: UNAIDS.

More than 50% Women
- Sub-Saharan Africa
- Caribbean
- GLOBAL
- Eastern Europe and Central Asia
- Central and South America
- Asia
- Western and Central Europe and North America
Figure 2.3

AIDS-related deaths by region, 1990-2009

Sub-Saharan Africa

Asia

Eastern Europe and Central Asia

Caribbean

Central and South America

North America and WC Europe

Dotted lines represent ranges, solid lines represent the best estimate.

Source: UNAIDS.
Figure 2.1

Number of people newly infected with HIV

Dotted lines represent ranges, solid lines represent the best estimate.
To assess changes in incidence, the estimated national incidence rate was compared between 2009 and 2001. Countries with a change (decrease or increase) in the incidence rate of 25% or more during this period were identified. In most cases, the assessment was based on EPP/Spectrum modelling results (1,2). For selected countries, published analyses of country-level incidence were also used. The EPP/Spectrum criteria for including countries in this analysis were as follows. EPP files were available and trends in EPP were not derived from workbook prevalence estimates; prevalence data were available up to at least 2007; there were at least four time points between 2001 and 2009 for which prevalence data were available for concentrated epidemics and at least three data points in the same period for generalized epidemics; for the majority of epidemic curves for a given country, EPP did not produce an artificial increase in HIV prevalence in recent years due to scarcity of prevalence data points; data were representative of the country; the EPP/Spectrum–derived incidence trend was not in conflict with the trend in case reports of new HIV diagnoses; and the EPP/Spectrum–derived incidence trend was not in conflict with modelled incidence trends derived from age-specific prevalence in national survey results.
Score card: Incidence trends in selected countries

**Big increase but small numbers**

<table>
<thead>
<tr>
<th>Increasing &gt;25%</th>
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<tbody>
<tr>
<td>Armenia</td>
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<tr>
<td>Bangladesh</td>
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<td>Georgia</td>
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<td>Kazakhstan</td>
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<td>Kyrgyzstan</td>
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<tr>
<td>Philippines</td>
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<tr>
<td>Tajikistan</td>
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**Stable**

<table>
<thead>
<tr>
<th>Stable</th>
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<tbody>
<tr>
<td>Angola</td>
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<td>Argentina</td>
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<td>Belarus</td>
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<td>Benin</td>
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<td>Cameroon</td>
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<td>Democratic Republic of the Congo</td>
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<td>Djibouti</td>
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<td>France</td>
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<td>Germany</td>
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<td>Ghana</td>
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<td>Haiti</td>
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<td>Kenya</td>
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<td>Lesotho</td>
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<td>Lithuania</td>
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<td>Malaysia</td>
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<td>Nigeria</td>
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<td>Panama</td>
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<td>Republic of Moldova</td>
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<td>Senegal</td>
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<td>Sri Lanka</td>
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<tr>
<td>Uganda</td>
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<tr>
<td>United States of America</td>
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**Decreasing >25%**

<table>
<thead>
<tr>
<th>Decreasing &gt;25%</th>
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<tbody>
<tr>
<td>Belize</td>
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<tr>
<td>Botswana</td>
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<tr>
<td>Burkina Faso</td>
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<tr>
<td>Cambodia</td>
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<tr>
<td>Central African Republic</td>
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<tr>
<td>Congo</td>
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<tr>
<td>Côte d’Ivoire</td>
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<td>Dominican Republic</td>
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<td>Eritrea</td>
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<td>Ethiopia</td>
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<tr>
<td>Gabon</td>
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<tr>
<td>Guinea</td>
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<tr>
<td>Guinea-Bissau</td>
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<tr>
<td>India</td>
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<td>Jamaica</td>
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<td>Latvia</td>
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<td>Malawi</td>
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<td>Mali</td>
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<td>Mozambique</td>
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<td>Myanmar</td>
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<td>Namibia</td>
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<td>Nepal</td>
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<td>Papua New Guinea</td>
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<td>Rwanda</td>
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<td>Sierra Leone</td>
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<td>South Africa</td>
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<td>Suriname</td>
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<td>Swaziland</td>
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<td>Thailand</td>
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<td>Togo</td>
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<tr>
<td>United Republic of Tanzania</td>
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<td>Zambia</td>
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<tr>
<td>Zimbabwe</td>
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</tbody>
</table>
HIV trends in sub-Saharan Africa

Figure 2.8

Dotted lines represent ranges, solid lines represent the best estimate.

Source: UNAIDS.
Figure 2.13
HIV trends in Eastern Europe and Central Asia

- Number of people living with HIV
- Number of people newly infected with HIV
- Number of children living with HIV
- Adult and child deaths due to AIDS

Dotted lines represent ranges, solid lines represent the best estimate.

Source: UNAIDS.
HIV prevalence (%) among male adults 15–49 years old who have sex with men in seven countries in sub-Saharan Africa, 2009 or latest available year.

Source: Baral et al. (28); Nigeria Federal Ministry of Health (29); Lane et al. (30); Parry et al. (31); Sander et al. (32); Sander et al. (33); and Wade et al. (34).
### Global summary of the AIDS epidemic | 2010

#### Number of people living with HIV

<table>
<thead>
<tr>
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<tbody>
<tr>
<td>Adults</td>
<td>34.0 million [31.6 million–35.2 million]</td>
<td>30.1 million [28.4 million–31.5 million]</td>
<td></td>
</tr>
<tr>
<td>Women</td>
<td>16.8 million [15.8 million–17.6 million]</td>
<td>15.8 million [14.8 million–16.8 million]</td>
<td></td>
</tr>
<tr>
<td>Children (&lt;15 years)</td>
<td>3.4 million [3.0 million–3.8 million]</td>
<td>3.0 million [2.8 million–3.4 million]</td>
<td></td>
</tr>
</tbody>
</table>

#### People newly infected with HIV in 2010

<table>
<thead>
<tr>
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</thead>
<tbody>
<tr>
<td>Adults</td>
<td>2.7 million [2.4 million–2.9 million]</td>
<td>2.3 million [2.1 million–2.5 million]</td>
<td></td>
</tr>
<tr>
<td>Children (&lt;15 years)</td>
<td>390 000 [340 000–450 000]</td>
<td>250 000 [220 000–290 000]</td>
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</table>

#### AIDS deaths in 2010

<table>
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<tr>
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</thead>
<tbody>
<tr>
<td>Adults</td>
<td>1.8 million [1.6 million–1.9 million]</td>
<td>1.5 million [1.4 million–1.6 million]</td>
<td></td>
</tr>
<tr>
<td>Children (&lt;15 years)</td>
<td>250 000 [220 000–290 000]</td>
<td>220 000 [200 000–250 000]</td>
<td></td>
</tr>
</tbody>
</table>
Over 7000 new HIV infections a day in 2010

- About 97% are in low and middle income countries
- About 1000 are in children under 15 years of age
- About 6000 are in adults aged 15 years and older, of whom:
  - almost 48% are among women
  - about 42% are among young people (15-24)
Outline

- HIV transmission factors
- HIV global epidemiological overview
- Some data in the national response
- What are the current issues
GLOBAL HIV/AIDS RESPONSE

Epidemic update and health sector progress towards Universal Access

Progress Report 2011
Percentage of women and men who received an HIV test and test results in the 12 months preceding the survey in countries with repeat population surveys, 2003–2010
Number of people receiving antiretroviral therapy in low- and middle-income countries, by region, 2002–2010

- North Africa and the Middle East
- Europe and Central Asia
- East, South and South-East Asia
- Latin America and the Caribbean
- Sub-Saharan Africa
Number of people (all age groups) receiving and needing antiretroviral therapy, and percentage coverage in low- and middle-income countries by region, 2009 to 2010

<table>
<thead>
<tr>
<th>Geographical region</th>
<th>December 2010</th>
<th>December 2009</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Number of people receiving antiretroviral therapy</td>
<td>Estimated number of people eligible for antiretroviral therapy</td>
</tr>
<tr>
<td>Sub-Saharan Africa</td>
<td>5 064 000</td>
<td>10 400 000 [9700 000-11 000 000]</td>
</tr>
<tr>
<td>Eastern and southern Africa</td>
<td>4 221 000</td>
<td>7 600 000 [7100 000-8 000 000]</td>
</tr>
<tr>
<td>Western and central Africa</td>
<td>842 000</td>
<td>2 800 000 [2 600 000-3 100 000]</td>
</tr>
<tr>
<td>Latin America and the Caribbean</td>
<td>521 000</td>
<td>820 000 [710 000-920 000]</td>
</tr>
<tr>
<td>Latin America</td>
<td>461 000</td>
<td>720 000 [620 000-810 000]</td>
</tr>
<tr>
<td>Caribbean</td>
<td>60 300</td>
<td>100 000 [91 000-110 000]</td>
</tr>
<tr>
<td>East, South and South-East Asia</td>
<td>922 000</td>
<td>2 300 000 [2 100 000-2 500 000]</td>
</tr>
<tr>
<td>Europe and Central Asia</td>
<td>129 000</td>
<td>570 000 [500 000-650 000]</td>
</tr>
<tr>
<td>North Africa and the Middle East</td>
<td>14 900</td>
<td>150 000 [120 000-190 000]</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>6 650 000</strong></td>
<td><strong>14 200 000 [13 400 000-15 000 000]</strong></td>
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</tbody>
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Note: some numbers do not add up because of rounding

- See Box 5.9 for further information on the methods for estimating the need for and coverage of antiretroviral therapy in 2010.
- The 2009 figures may differ from those previously published because countries have submitted newly available data.
- All estimated needs have been developed according to 2010 WHO guidelines and criteria for initiating treatment.
- The coverage estimate is based on the unrounded estimated numbers of people receiving and needing antiretroviral therapy.
Low- and middle-income countries with estimated antiretroviral therapy coverage levels of 50–69%, 70–79% and 80% or higher as of December 2010

<table>
<thead>
<tr>
<th>Antiretroviral therapy coverage</th>
<th>50–69% (31 countries)</th>
<th>70-79% (7 countries)</th>
<th>80% or higher (10 countries)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Belarus</td>
<td>Lesotho</td>
<td>Argentina</td>
<td>Botswana</td>
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<td>Malawi</td>
<td>Brazil</td>
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<td>Costa Rica</td>
<td>Paraguay</td>
<td>Mexico</td>
<td>Croatia</td>
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<td>Peru</td>
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<td>Guyana</td>
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<td>Ethiopia</td>
<td>Romania</td>
<td>Zambia</td>
<td>Namibia</td>
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<td>Gabon</td>
<td>Senegal</td>
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<td>Nicaragua</td>
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<td>Georgia</td>
<td>South Africa</td>
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<td>Rwanda</td>
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<td>Guatemala</td>
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<td>Slovakia</td>
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<td>Guinea</td>
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<tr>
<td>Haiti</td>
<td>Turkey</td>
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<tr>
<td>Honduras</td>
<td>Venezuela (Bolivarian Republic of)</td>
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<tr>
<td>Jamaica</td>
<td>Viet Nam</td>
<td></td>
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<td>Kenya</td>
<td>Zimbabwe</td>
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<tr>
<td>Lao People’s Democratic Republic</td>
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</table>
Comparison of number of men and women receiving and estimated to need antiretroviral therapy and percentage coverage, by region, December 2010

<table>
<thead>
<tr>
<th>Geographical region (number of countries reporting/total countries in region)</th>
<th>Coverage</th>
<th>Number receiving antiretroviral therapy</th>
<th>Estimated number who need it</th>
<th>Coverage</th>
<th>Number receiving antiretroviral therapy</th>
<th>Estimated number who need it</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sub-Saharan Africa (44/46)</td>
<td>41%</td>
<td>1751 900</td>
<td>4 300 000</td>
<td>55%</td>
<td>3 060 100</td>
<td>5 600 000</td>
</tr>
<tr>
<td>Eastern and southern Africa (20/22)</td>
<td>48%</td>
<td>1467 400</td>
<td>3 100 000</td>
<td>62%</td>
<td>2 503 300</td>
<td>4 000 000</td>
</tr>
<tr>
<td>Western and central Africa (24/24)</td>
<td>23%</td>
<td>284 500</td>
<td>1 200 000</td>
<td>35%</td>
<td>556 800</td>
<td>1 600 000</td>
</tr>
<tr>
<td>Latin America and the Caribbean (20/29)</td>
<td>64%</td>
<td>322 900</td>
<td>500 000</td>
<td>62%</td>
<td>177 600</td>
<td>280 000</td>
</tr>
<tr>
<td>Latin America (16/20) Caribbean (4/9)</td>
<td>64%</td>
<td>292 800</td>
<td>455 000</td>
<td>64%</td>
<td>147 800</td>
<td>230 000</td>
</tr>
<tr>
<td>East, South and South-East Asia (20/34)</td>
<td>34%</td>
<td>521 800</td>
<td>1 600 000</td>
<td>48%</td>
<td>399 700</td>
<td>830 000</td>
</tr>
<tr>
<td>Europe and Central Asia (18/26)</td>
<td>20%</td>
<td>27 100</td>
<td>140 000</td>
<td>20%</td>
<td>20 600</td>
<td>100 000</td>
</tr>
<tr>
<td>North Africa and the Middle East (7/14)</td>
<td>9%</td>
<td>7 600</td>
<td>86 000</td>
<td>9%</td>
<td>5 600</td>
<td>61 000</td>
</tr>
<tr>
<td><strong>Total (109/149)</strong></td>
<td><strong>40%</strong></td>
<td><strong>2 631 300</strong></td>
<td><strong>6 600 000</strong></td>
<td><strong>53%</strong></td>
<td><strong>3 663 500</strong></td>
<td><strong>6 900 000</strong></td>
</tr>
</tbody>
</table>

a The coverage estimate is based on the unrounded numbers of people receiving and needing antiretroviral therapy.
## Number of children 0–14 years old and adults on antiretroviral therapy in low- and middle-income countries, by region, December 2010

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<tr>
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</thead>
<tbody>
<tr>
<td>Sub-Saharan Africa</td>
<td>387 500</td>
<td>1 840 000 [1 600 000–2 100 000]</td>
<td>21% [19–24%]</td>
<td>55% [52–58%]</td>
</tr>
<tr>
<td>Eastern and southern Africa</td>
<td>337 200</td>
<td>1 290 000 [1 100 000–1 400 000]</td>
<td>26% [23–29%]</td>
<td>62% [59–65%]</td>
</tr>
<tr>
<td>Western and central Africa</td>
<td>50 200</td>
<td>550 000 [480 000–630 000]</td>
<td>9% [8–11%]</td>
<td>35% [33–38%]</td>
</tr>
<tr>
<td>Latin America and the Caribbean</td>
<td>16 300</td>
<td>41 400 [34 000–50 000]</td>
<td>39% [32–48%]</td>
<td>64% [58–74%]</td>
</tr>
<tr>
<td>Latin America</td>
<td>13 600</td>
<td>30 600 [25 000–38 000]</td>
<td>44% [36–55%]</td>
<td>65% [58–75%]</td>
</tr>
<tr>
<td>Caribbean</td>
<td>2 700</td>
<td>10 800 [8 700–13 000]</td>
<td>25% [21–3%]</td>
<td>64% [57–70%]</td>
</tr>
<tr>
<td>East, South and South-East Asia</td>
<td>43 800</td>
<td>113 000 [84 000–140 000]</td>
<td>39% [30–52%]</td>
<td>39% [37–43%]</td>
</tr>
<tr>
<td>Europe and Central Asia</td>
<td>7 500</td>
<td>11 400 [10 000–13 000]</td>
<td>65% [55–71%]</td>
<td>22% [19–25%]</td>
</tr>
<tr>
<td>North Africa and the Middle East</td>
<td>840</td>
<td>18 500 [12 000–25 000]</td>
<td>5% [3–7%]</td>
<td>10% [8–14%]</td>
</tr>
<tr>
<td><strong>All low- and middle-income countries</strong></td>
<td><strong>456 000</strong></td>
<td><strong>2 020 000 [1 800 000–2 300 000]</strong></td>
<td><strong>23% [20–25%]</strong></td>
<td><strong>51% [48–54%]</strong></td>
</tr>
</tbody>
</table>

Note: some numbers do not add up because of rounding.

---

a For an explanation of the methods used, see the explanatory notes for Annex 4 and 5, and Box 5.9.

b The coverage estimate is based on the unrounded numbers of people receiving and needing antiretroviral therapy.
Retention rates for antiretroviral therapy at 12, 24 and 60 months for selected countries
## Estimated number of women living with HIV needing and receiving antiretroviral medicine for PMTCT in low- and middle-income countries, 2010

<table>
<thead>
<tr>
<th>Geographical region</th>
<th>Estimated number of pregnant women living with HIV receiving the most effective antiretroviral regimens (excluding single-dose nevirapine) for preventing mother-to-child transmission</th>
<th>Estimated number of pregnant women living with HIV who need antiretroviral medicine for preventing mother-to-child transmission</th>
<th>Estimated coverage with the most effective regimens, as recommended by WHO</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sub-Saharan Africa</td>
<td>1360 000 [1 200 000–1 500 000]</td>
<td>50% [45–56%]</td>
<td>10%</td>
</tr>
<tr>
<td>Eastern and southern Africa</td>
<td>940 000 [840 000–1 000 000]</td>
<td>64% [57–71%]</td>
<td>13%</td>
</tr>
<tr>
<td>Western and central Africa</td>
<td>410 000 [360 000–470 000]</td>
<td>18% [15–20%]</td>
<td>3%</td>
</tr>
<tr>
<td>Latin America and the Caribbean</td>
<td>25 600 [17 000–33 000]</td>
<td>59% [46–90%]</td>
<td>2%</td>
</tr>
<tr>
<td>Latin America</td>
<td>18 300 [11 000–25 000]</td>
<td>64% [47–95%]</td>
<td>2%</td>
</tr>
<tr>
<td>Caribbean</td>
<td>7 300 [5 900–9 000]</td>
<td>46% [37–57%]</td>
<td>3%</td>
</tr>
<tr>
<td>East, South and South-East Asia</td>
<td>73 800 [53 000–95 000]</td>
<td>16% [13–23%]</td>
<td>16%</td>
</tr>
<tr>
<td>Europe and Central Asia</td>
<td>18 600 [15 000–22 000]</td>
<td>79% [65–94%]</td>
<td>9%</td>
</tr>
<tr>
<td>North Africa and the Middle East</td>
<td>14 200 [9 900–19 000]</td>
<td>4% [3–6%]</td>
<td>3%</td>
</tr>
<tr>
<td><strong>All low- and middle-income countries</strong></td>
<td><strong>1 490 000 [1 300 000–1 600 000]</strong></td>
<td><strong>48% [44–54%]</strong></td>
<td><strong>11%</strong></td>
</tr>
</tbody>
</table>
Coverage of antiretroviral medicine for preventing mother-to-child transmission: most effective regimens and single-dose nevirapine, low- and middle-income countries, by region, 2010a

- **Most effective regimens**
- **Single-dose nevirapine**

<table>
<thead>
<tr>
<th>Region</th>
<th>Most effective regimens</th>
<th>Single-dose nevirapine</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sub-Saharan Africa</td>
<td>50%</td>
<td>10%</td>
</tr>
<tr>
<td>Eastern and Southern Africa</td>
<td>64%</td>
<td>13%</td>
</tr>
<tr>
<td>Western and Central Africa</td>
<td>59%</td>
<td>3%</td>
</tr>
<tr>
<td>Latin America and the Caribbean</td>
<td>64%</td>
<td>2%</td>
</tr>
<tr>
<td>Latin America</td>
<td>46%</td>
<td>3%</td>
</tr>
<tr>
<td>Caribbean</td>
<td>16%</td>
<td>15%</td>
</tr>
<tr>
<td>East, South and South-East Asia</td>
<td>79%</td>
<td>9%</td>
</tr>
<tr>
<td>Eastern Europe and Central Asia</td>
<td>48%</td>
<td>3%</td>
</tr>
<tr>
<td>North Africa and the Middle East</td>
<td>48%</td>
<td>4%</td>
</tr>
<tr>
<td>All low- and middle-income countries</td>
<td>48%</td>
<td>11%</td>
</tr>
</tbody>
</table>

a Single-dose nevirapine is no longer recommended by WHO
Percentage of pregnant women who received an HIV test in the past 12 months in low- and middle-income countries by region, 2005 and 2008–2010
Estimated number of children newly infected with HIV in low- and middle-income countries, 2000–2015
Low- and middle-income countries achieving ≥80% coverage with effective regimens of antiretroviral medicine for preventing mother-to-child transmission, 2010

<table>
<thead>
<tr>
<th>Region</th>
<th>Number of countries²</th>
<th>Countries</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sub-Saharan Africa</td>
<td>5</td>
<td>Botswana, Lesotho, Namibia, South Africa and Swaziland</td>
</tr>
<tr>
<td>Latin America and the Caribbean</td>
<td>4</td>
<td>Argentina, Brazil, Ecuador and Honduras</td>
</tr>
<tr>
<td>Eastern Europe and Central Asia</td>
<td>3</td>
<td>Belarus, Romania and Ukraine</td>
</tr>
</tbody>
</table>

² Countries with at least 100 pregnant women estimated to need antiretroviral medicine for preventing mother-to-child transmission.
Countries with the largest contribution to the global gap in reaching 90% of pregnant women living with HIV in need with antiretroviral medicine for preventing mother-to-child transmission, 2010

- Nigeria (29%)
- Democratic Republic of the Congo (7%)
- Uganda (7%)
- Kenya (6%)
- Malawi (6%)
- Mozambique (6%)
- United Republic of Tanzania (5%)
- India (6%)
- Zimbabwe (3%)
- Ethiopia (2%)
- Countries among the 25 highest-burden countries estimated to contribute less than 2% to the global gap* (13%)
- Other low- and middle-income countries (10%)

* These countries include Angola, Botswana, Burkina Faso, Cameroon, Central African Republic, Chad, Côte d'Ivoire, Ghana, Lesotho, Russian Federation, Rwanda, South Africa, Sudan, Swaziland, United Republic of Tanzania, Zambia, Zimbabwe.
% of pregnant women living with HIV and their infants who received antiretroviral medicine for preventing mother-to-child transmission, low- and middle-income countries, 2005–2010

- Pregnant women living with HIV receiving antiretroviral medicine for preventing mother-to-child transmission
- Infants born to women living with HIV receiving antiretroviral medicine for preventing mother-to-child transmission
- Pregnant women living with HIV receiving the most effective antiretroviral regimens for preventing mother-to-child transmission

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a Coverage in 2010 cannot be compared with previous years as it does not include single-dose nevirapine which is no longer recommended by WHO.

b This includes only the initial (4-6 weeks) prophylaxis for infants.
Percentage of children living with HIV receiving antiretroviral therapy in low- and middle-income countries, 2005, 2009 and 2010
Impact of interventions

From modelling to empirical data
Outline

- HIV transmission factors
- HIV global epidemiological overview
- Some data in the national response
- What are the current issues
Number of people receiving antiretroviral therapy in low- and middle-income countries 2002–2010
Progress of estimated ART coverage in low- and middle-income countries (2003-2010)

- Estimated gap: CD4 cell count ≤ 350/mm^3 but not on ART
- Patients receiving ART: 53% in 2010
- Treatment gap: 97% in 2010
Evidence supports ART for prevention of HIV transmission

- Transmission only occurs from persons with HIV
- Viral load is single greatest risk factor for HIV transmission
- ART can lower viral load to undetectable levels
- PMTCT proof of concept of ART reducing transmission
- Observational evidence in heterosexual couples
- Knowing one's HIV status is key to ART for prevention
- When to start ART is not known with certainty but science increasingly supports earlier start
ART reduces sexual transmission of HIV: meta-analysis shows no transmission <400 copies/ml

IDUs epidemic and response in Ukraine: a success story?

Decrease in HIV prevalence among recent Injecting Drug Users

(median sentinel surveillance in 8 cities, Ukraine - International HIV/AIDS Alliance, 2009)
Estimated Numbers of Perinatally Acquired AIDS Cases by Year of Diagnosis, 1985–2007—United States and Dependent Areas

Note. Data have been adjusted for reporting delays and missing risk-factor information.
Community studies suggest population-level impact of ART

British Columbia, Canada

Taiwan

San Francisco, USA

Wood et al. BMJ 2009;338b:1649
Fang et al. JAIDS 2004;190:879-85
Das et al. PLoS ONE 2010 5(6)
Growing evidence demonstrating TasP impact: ART coverage and mortality decline

Data source: Ministry of Health, South Africa

Impact of ART on mortality in Northwest Province, South Africa
Impact of ART on TB incidence in Botswana

Sources: NASA data reported to WHO and UNAIDS by Ministry of Health, Botswana; TB Program, Ministry of Health, Botswana
Time from HIV seroconversion to CD4 below: 500, 350, 200

Median year (95% CI):
< 500: 1.19 (1.12-1.26)
<350: 4.19 (4.09-4.28)
<200: 7.93 (7.76-8.09)
Risk of AIDS or death was around 6.3% per year
Three Is for HIV/TB and earlier initiation of ART

Providing ART for PLHIV prevents TB by 65%
HPTN 052 clinical results

- 105 morbidity and mortality results ($p<0.01$)
  - 65 in delayed arm
  - 40 in immediate arm

- 20 cases of extrapulmonary TB ($p=0.0013$)
  - 17 in delayed
  - 3 in immediate arm

- 23 deaths (NS)
  - 13 in delayed arm
  - 10 in immediate arm
Likelihood of Achieving Normal CD4+ Cell Count on ART Depends on BL Level

Johns Hopkins HIV Clinical Cohort[1]

ATHENA National Cohort[2]


Yrs on HAART

Wks From Starting HAART
Widespread testing, care, and early ART could have an effect on HIV incidence and survival.

For discordant couples ART is critical long term prevention intervention.
Acute phase

- Estimates range from 3-40% of transmissions in acute phase

- Data is largely drawn from 10 serodiscordant couples in Rakai cohort

- Little direct evidence using virological data given difficulty in determining infection and seroconversion

- Epidemiology matters—generalized epidemic surveillance data suggests that acute phase is not major driver of epidemic

- Opinion varies on impact on treatment as prevention programs
Community Viral Load and New HIV Cases in San Francisco County


n=12,512 unduplicated HIV-positive individuals
CD4 level is associated with TB incidence: earlier start may decrease TB risk

"TB death zone"

Havlir, Getahun et al. 2008 JAMA 300(4):423-430

Slide adapted by Dr. Abhishek Sharma
Risk of non-AIDS morbidity and mortality

HIV may be associated with serious non-AIDS defining events
- Cardiovascular
- Renal
- Liver
- Non-AIDS malignancies

At higher CD4 counts non-AIDS events are much more common than AIDS events

Does ART use reduce risk of some serious non-AIDS events?

SMART Trial

Slide courtesy of A Phillips
Late initiation of ART and mortality

Median CD4 counts at start of ART
Trends over time

Mortality over four years

Source: Egger M, CROI 2007
Treatment works: *Lazarus effect*

Concilia after 90 days of ARV treatment.
Acknowledgements

All HIV Department staff that have contributed to production of slides and technical reports.
Standard and Norms for HIV surveillance, care and treatment and global reporting
Towards Universal Access…
- "I want my leadership to be judged by the impact of our work on the health of two populations: women and the people of Africa."

- "Our greatest concern must always rest with disadvantaged and vulnerable groups. These groups are often hidden, live in remote rural areas or shantytowns and have little political voice."

Dr Margaret Chan

Director-General, WHO
For further information

Dr Jesus M Garcia Calleja (callejaj@who.int)

World Health Organization
HIV/AIDS Department
20, Avenue Appia
CH-1211 Geneva 27
Switzerland
Email: hiv-aids@who.int