The Beginning of the End of AIDS

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AIDS: The Beginning

Friedman-Kien, Color Atlas of AIDS
AIDS: The Middle

**Number of people living with HIV**

**Number of people newly infected with HIV**

**Number of deaths due to AIDS**

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**Human Patient** before and after receiving free treatment for HIV infection and tuberculosis.

This photograph on the left was taken in March 2003, and the one on the right in September 2001. Many impoverished patients in rural Haiti and Rwanda now receive comprehensive medical care through public-private partnerships.
Defining the End of AIDS

- **Elimination of AIDS deaths**
- **Elimination of HIV**
  - Zero disease in a defined geographic area as a result of deliberated efforts
  - Controls needed to prevent reestablishment of infection

The starting point

- 2.5 million new infections
- 300,000 in children
- 1.7 million deaths
- 34 million living with HIV

1. Hopkins, NEJM, 2013
The Scientific Foundation

Key scientific advances

• Treatment as prevention
• Adult male circumcision
• Preexposure prophylaxis (PrEP)
• Evidence for HIV cure
• Vaccine immunology
39 HIV-1 transmission events (IR: 1.2/100 PY)

Linked transmissions: 28 (IR: 0.9/100 PY)

96% reduction in HIV transmission with immediate ART

Unlinked transmissions: 11

Immediate Arm: 1

Delayed Arm: 27

18/28 (61%) transmissions from infected participants with CD4 > 350 cells/mm³

p < 0.001

Cohen, NEJM, 2011
HIV Treatment Prevents AIDS/TB in High (350-550) CD4+ Adults

30% reduction in AIDS/death

Grinsztejn, IAC, 2012
Male Circumcision for HIV Prevention Works

- Proven efficacy: 53-60% protection against HIV infection for males from heterosexual transmission
- Durable protection
- Cost analysis: avert 1 HIV infection by 5-20 circumcisions for $150-900 over a 10-year horizon
PrEP Works for Prevention . . . and, Like ART, Requires Adherence

- 44-67% reduction in HIV acquisition (IPrEX, Partners, TDF2)
- 90% reduction with high adherence
- Demonstration projects in US cities: high uptake
- Injectable with long half-life (GSK744) and vaginal ring (TDF) offer solutions to poor adherence

Grant, NEJ M, 2010

CROI 2011, #24LB, #25LB
The “Path” and Some Evidence of Progress

The Path

- Prevent new HIV infections
- Identify new HIV infections early in disease
- Treat persons with HIV with success

- 13 million persons were tested for HIV in South Africa in 2010
- Globally, 8 million people had access to ART, an increase of 20% from 2010
- Global decline in number of new HIV infections and in AIDS deaths
- 31-55% reduction in new HIV infections among children between 2009 and 2011 in 8 African countries

Source: UNAIDS
HIV Self-Testing and Linkage

- HIV self-testing offered to >16,000 adults in urban Malawi
- Half of adults offered option to initiate ART within home setting
- Key results
  - 3-fold increase in ART start with home intervention
  - 2-fold increase in HIV disclosure with home intervention
  - ART overall coverage increased from 12% to 46%

MacPherson, CROI 2013, #95LB
Increasing CD4+ Cell Count at Presentation

- Evaluation of “late enrollment into care” between 2006 and 2011
- Tanzania, Kenya, Mozambique, Rwanda
- CD4+ count at presentation increased from 200 to 250 during this time period
- Late presenters decreased from 68% to 55%
- Predictors of earlier presentation
  - Greater access to HIV testing
  - Knowledge that early presentation is beneficial
  - Pregnant women

Hoffman, CROI 2013, #94
The Malawi “B+” Scale-Up

- Malawi government early adopter of MTCT B+ approach (treat all HIV+ pregnant women and do not stop ART postpartum) in July 2011
- Increased number of ART sites from 350 to >650
- 763% increase in number of HIV+ pregnant women on ART
- 41% of women started ART during breastfeeding
- 12-month retention of women starting ART is 78%

<table>
<thead>
<tr>
<th>Pregnancy</th>
<th>Labor and Delivery</th>
<th>Breastfeeding</th>
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<tbody>
<tr>
<td>10-25%</td>
<td>35-40%</td>
<td>35-40%</td>
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Barr, CROI 2013, #82
Low- and Middle-Income Countries: On track to eliminate new HIV among children

Source: UNAIDS, 2012
Increased ART Uptake in South Africa

- Hlabisa subdistrict
- Increased ART uptake
- Increased HIV prevalence
- HIV uninfected living in community with high-ART (>30%) vs. low-ART (<10%) coverage 38% less likely to acquire HIV

Tanser, Science, 2013
Increase in Life Expectancy in South Africa
We will not succeed . . .
unless we create a functional “cascade of care”

In the United States

In Africa

Tested HIV+ 100%
CD4 measurement 72% (95% CI 60 - 84)
Eligible for ART 40% (95% CI 26 - 55)
Start of ART 25% (95% CI 13 - 37)

Mugglin, Trop Med Intl Health 2012

From the CDC, IAC, 2012
We will not succeed . . . unless we address highly affected groups (e.g., MSM)
We will not succeed . . .
unless we finance the global response

“Pay now - or pay forever”

2015 gap: US$ 7 billion

HIV investment (US$ billions)

New HIV infections (millions)

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SEARCH, an Alternate Approach: Keeping Patients in the Green Zone

- **CD4 > 500**: Minimal symptoms, Streamlined outpatient co-trimoxazole

- **CD4 350-500**: Bacterial pneumonia, Skin infections, Outpatient antibiotics

- **CD4 200-350**: TB Pneumonia, Intense outpatient antibiotics

- **CD4 < 200**: AIDS-defining opportunistic infections and early mortality, In-patient complex therapy

Adapted from Geng, 2012
Approach: Multidisease “Community Health Campaign”: HIV + Other Diseases

Principles:
- Community led
- High throughput
- Health services for children/adults

Findings:
- Adults with HIV 8%
- Hypertension 12%
- Diabetes 3.5%

Chamie, PLOS Med, 2012
ART Initiation at High CD4+ Cell Counts: High Interest Level

- 186/188 (99%) of patients with CD4 > 350 offered ART chose to initiate.

- Reasons for consenting to ART (n=186):
  - 90% ARVs will keep me healthy
  - 52% ARVs will allow me to continue working
  - 52% ARVs will let me care for family
  - 21% Minimize transmission to children
  - 15% Avoid transmitting to others
  - 12% Am nervous about the future
  - 5% Currently feeling unwell
  - 4% My spouse/partner is on ARVs

- In healthy patients linked to care with high CD4 counts → 99% were interested in ART.
- Top reasons centered on maintaining health and productivity and avoiding transmission.

Jain, IAC, 2012
Significantly Higher Employment at CD4 ≥ 500 among Adults

- Compared with CD4 < 200, CD4 ≥ 500 associated with:
  - 5.8 more days/month
  - 2.2 more hrs/day (40% more than reference mean of 5.5)

Those with CD4 ≥ 500 worked nearly one week/month more than those with CD4 < 200, and as much as HIV-uninfected adults.

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<thead>
<tr>
<th>Regression model coefficients</th>
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<tr>
<td>Outcome:</td>
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<tr>
<td>CD4&lt;200</td>
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<tr>
<td>CD4 200-349</td>
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<tr>
<td>CD4 350-499</td>
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<tr>
<td>CD4 ≥500</td>
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<tr>
<td>Observations</td>
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Linear regression model with age, age-squared, and sex included as controls.
Reference group has CD4 < 200.

** p<0.05, * p<0.10.

Thurminathy, AIDS, 2012
What If We Apply the Evidence?
Modeling

Basic Program Activities
- PMTCT
- Condom
- Key populations
- HIV testing and ART
- Male circumcision
- Harm reduction

Outcomes by 2020
- Infections averted: 12.2 million
- Life-years gained: 29.4 million
- Deaths averted: 7.4 million

Schwartlander, Lancet, 2011
And What If We Do Not?

- AIDS Deaths averted between 2011 and 2020: 7.4 million
- New infections averted between 2011 and 2020: 12.2 million

Cost (billions US$)

- Baseline
- Investment Framework

New HIV infections

- Baseline
- Investment Framework

AIDS Deaths

- Baseline
- Investment Framework
Conclusion

- We have the scientific tools to end AIDS.
- Strategic investments and action will determine whether we succeed.
- Momentum is mounting, but huge obstacles remain that require innovation and research.
- Eliminating HIV is a much longer-term endeavor calling for broader investments in cure and vaccines.
- However, the first great milestone that is within our reach is the global elimination of mother-to-child transmission of HIV.