HIV TESTING STRATEGIES

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Background on Testing Issues

The human immunodeficiency virus (HIV) continues to devastate populations throughout the world, and poses as one of the most vexing public health problems of the twentieth and twenty-first centuries. As of December 2003, UNAIDS estimates that between 34 and 40 million people are currently living with HIV infection. Furthermore, the organization estimates that during 2003 between 4.2 and 5.8 million were newly infected with HIV, while between 2.5 and 3.5 million persons died of AIDS. The World Health Organization estimates that up to 95 percent of the 34-46 million infected persons do not know they are harbouring the virus.

Are there alternatives?

www.ph.ucla.edu/epi/controversies_hiv.html
Estimated No. of Adults Infected with HIV By WHO Region, 1980-2003

Source: WHO. World Health Report, 2004

Life Expectancy in Africa With and Without HIV/AIDS, 2002

Source: WHO. World Health Report, 2004
HIV Treatment with Anti-retroviral Drugs

Who to treat and at what cost?

Estimated Global Coverage with Antiretroviral Therapy
End of 2003

Need HIV testing before being able to find and treat asymptomatic HIV/AIDS

Source: WHO. World Health Report, 2004
2 HIV Cases Put a Scare Into Porn

By Caitlin Liu, Kristina Sauerwein and Monte Morin
Times Staff Writers

TESTED: Adult film star Carmen Luvana has an HIV blood test Thursday at the Adult Industry Medical Health Care Foundation in Sherman Oaks. The clinic was packed with actors seeking tests.
To limit HIV transmission, need testing, contact tracing and partner notification.


Increased public pressure for mandated HIV testing.
HIV Infection in the United States in Years Gone By

Following 10-12 years of infection, the person with HIV dies.

400,000 prevalent carriers created 40,000 new infections each year

Current HIV Infection in the United States

Following infection, persons remain alive due to effective therapy but still harbor the virus, serving as potential transmitters.

1,000,000 prevalent carriers create 40,000 new infections each year
Testing and Avoidance

Probability of becoming infected

1.0

Infected blood

Universal testing

0

Test and avoid contaminated blood

0.2

Blood Transfusion

0.4

0.6

0.8

1.0

Occasional testing

Test and avoid or always use condom

Probability of becoming infected

Infected partner

Monogamous anal sex for one year

Test and avoid contaminated blood

Test and avoid or always use condom
Testing and Avoidance

Probability of becoming infected

If infected and unaware mother

Offspring

Tested, treated and no breastfeeding

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Testing and Avoidance

Probability of becoming infected

Infected partner

Monogamous vaginal sex for one year

Test and avoid or always use condom
**HIV Testing**

**Truth**

$$\begin{array}{c|c|c|c}
\text{HIV+} & \text{HIV-} \\
\hline
\text{HIV+} & A & B \\
\text{HIV-} & C & D \\
\end{array}$$

- **True positives**: A
- **False positives**: B
- **False negatives**: C
- **True negatives**: D

High sensitivity implies few false negatives  
High specificity implies few false positives

Sensitivity = \[ \frac{A}{A + C} \]  
Specificity = \[ \frac{D}{B + D} \]

**Usual HIV Testing Strategy in the United States**

- **Assay One**: ELISA  
  - Results in 1-2 weeks

- **Assay Two**: Western Blot  
  - Results in 1-2 weeks

**Results**

- Test + (Assay One and Assay Two): Positive*  
- Test + (Assay One and Indeterminate): Positive*  
- Test + (Assay One and Negative): Positive*  
- Test + (Indeterminate and Assay Two): Indeterminate**  
- Test + (Indeterminate and Negative): Positive*  
- Test + (Negative and Assay Two): Positive*  
- Test + (Negative and Indeterminate): Indeterminate**  
- Test + (Negative and Negative): Positive*  
- Test - (Assay One): Negative  
- Test - (Assay Two): Negative

*If newly positive, confirm with another sample  
**Retest in two weeks

High Specificity (few false positives)
Planned HIV Testing Strategy in the United States

Assay One
- Rapid Test
  - Test +
  - Test -

Assay Two
- Western Blot
  - Test + Positive*
  - Test ? Indeterminate**
  - Test - Negative

*If newly positive, confirm with another sample
**Retest in two weeks

High Specificity (few false positives)

Personal Screening for HIV (now available in USA)
Home Collection (with telephone counseling)

1. Pharmacy
2. Home Collection
3. Laboratory
4. Telephone counseling and referral
Personal Screening for HIV (not yet available in USA)
Home Collection (with no telephone counseling)

Initial screening for HIV infection is done in the privacy of the home

No counseling, but informed with brochures, posters and the general media
Because of the low infectivity (i.e., ability to lodge and multiply) of HIV, transmission of the virus should be easy to prevent, if infection status is known.

Universal and continued condom use with at risk partners is good in principal but appears to be too much to expect of many people.

HIV testing has been highly effective in preventing transfusion-based transmission and passage from mother to offspring.

An individualize prevention strategy that relies on personal screening holds promise, but only if inexpensive rapid tests are made widely available.
Conclusion

Treatment

- HIV detection is a necessary first step before administering antiretroviral therapy
- Fear of testing and therapy cost are two major deterrents of increased HIV/AIDS treatments in the developing world
- An individualize detection and treatment strategy that relies on personal screening to identify and lead to treatment holds promise, but only if inexpensive rapid tests are made widely available.