Learning Objectives

At the conclusion of this presentation, participants will be able to:

1. Discuss the epidemiology of HIV

2. Describe the economic impact of HIV

3. Recommend HIV screening and testing recommendations of currently available HIV tests
## Risk Factors for HIV and Rates of Transmission

<table>
<thead>
<tr>
<th>Type of Exposure</th>
<th>Risk /10,000 Exposures</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Parenteral</strong></td>
<td></td>
</tr>
<tr>
<td>Blood transfusion</td>
<td>9,250</td>
</tr>
<tr>
<td>Needle-sharing during IDU</td>
<td>63</td>
</tr>
<tr>
<td>Percutaneous needle-stick</td>
<td>23</td>
</tr>
<tr>
<td><strong>Sexual</strong></td>
<td></td>
</tr>
<tr>
<td>Anal receptive intercourse</td>
<td>138</td>
</tr>
<tr>
<td>Receptive penile-vaginal intercourse</td>
<td>8</td>
</tr>
<tr>
<td>Insertive anal intercourse</td>
<td>11</td>
</tr>
<tr>
<td>Insertive penile-vaginal intercourse</td>
<td>4</td>
</tr>
<tr>
<td>Receptive/insertive oral intercourse</td>
<td>Low</td>
</tr>
<tr>
<td><strong>Other</strong></td>
<td></td>
</tr>
<tr>
<td>Mother-Child vertical transmission</td>
<td>Low</td>
</tr>
<tr>
<td>Biting/Spitting/Sharing sex toys</td>
<td>Negligible</td>
</tr>
</tbody>
</table>


IDU= Injection Drug Use
Worldwide Incidence of Adults and Children Living with HIV (2014)

http://www.who.int/gho/hiv/epidemic_status/cases_all/en/

Rates of Diagnoses of HIV Infection Among Adults and Adolescents, by Area of Residence, 2014 — United States and 6 Dependent Areas
N = 44,608

Source: CDC, 2016
http://www.cdc.gov/hiv/library/slideSets/index.html#panel0
Diagnoses of HIV in Adults and Adolescents in the US, By Transmission Category (2014)

Source: CDC 2016 http://www.cdc.gov/hiv/library/slideSets/index.html#panel0

Diagnoses of HIV in Adults and Adolescents in the US, By Race/Ethnicity (2010-2014)

Source: CDC 2016 http://www.cdc.gov/hiv/library/slideSets/index.html#panel0
Worldwide Incidence of HIV-Related Death in Adults and Children (2014)


Age-Adjusted* Rate† of Death Due to HIV Infection in the General Population, by U.S. State, 2013

Rate‡

- <1.0
- 1.0 - 1.9
- 2.0 - 3.9
- 4.0 - 4.9
- ≥ 5.0

*Standard: age distribution of 2000 US population
†Per 100,000 population
‡Per 250,000 population

Source: CDC 2016 [http://www.cdc.gov/hiv/library/slideSets/index.html#panel0]
Trends in Annual Age-Adjusted* Rate of Death Due to HIV Infection, United States, 1987–2013

*Full-sized version of infographic available at end of handout

Note: For comparison with data for 1999 and later years, data for 1987–1998 were modified to account for ICD-10 rules instead of ICD-9 rules.

*Standard: age distribution of 2000 US population


Impact of HIV on US Mortality

- 635,000 lives lost in the US since the beginning of the epidemic
  - 27% of women
  - 54% of blacks/African Americans
  - 52% Southern state residents
  - 67% of persons ≥ 45 years of age

- One of the leading causes of death for those 25 to 44 years of age

Economic Impact of HIV

- Estimated lifetime cost of treatment for one person with HIV is $379,668
- Estimated average annual cost for HIV treatment is $24,000
- Florida, California, New York, and Texas associated with the highest number of new diagnoses
- Total lifetime treatment cost for HIV based on new diagnoses in 2009 was estimated to be $16.6 billion

Savings from Prevention Efforts

• Comparison of the difference between number of infections that have occurred with the number that might have occurred in the absence of prevention programs

• From 1991-2006:
  – Estimated that $129.9 billion saved from the prevention of 361,878 HIV infections


Cost Considerations

• Cost-effectiveness of ART initiation well-established
• Increased patient cost sharing:
  – Decreased medical adherence
  – Frequent drug discontinuation
• Excessive CD4 lab monitoring in those with suppressed virus
  – Costs $10 million per year
• Approximately $900 million may be saved in the US when efavirenz becomes generic

Those Who Should Be Tested

- One in eight are unaware of their HIV infection
- **Everyone** between 13 and 64 years of age should be tested at least once in their lifetimes
- Universal screening for pregnant women
- Annual HIV screening is indicated for patients who are considered “high risk”
  - Engage in unprotected sex
  - Engage in unprotected sex with men who have sex with men or multiple partners since last HIV test
  - Have an HIV positive partner
  - Exchange sex for money or drugs
  - Have injected drugs (including steroids, hormones, or silicone) and shared equipment with others
  - Diagnosed with a sexually transmitted infection (STI), hepatitis, or tuberculosis

Source: CDC 2016. [http://www.cdc.gov/actagainstaids/basics/testing.html](http://www.cdc.gov/actagainstaids/basics/testing.html)
Importance of Receiving Results

• 2.1 million tests conducted annually
  – 39% of those who tested (-) never returned for results
  – 30% of those who tested (+) never returned for results

• Rapid HIV testing provides immediate results
  – Almost all patients receive results

Source: CDC 2013 [http://www.cdc.gov/hiv/testing/lab/clia/rtcounseling.html](http://www.cdc.gov/hiv/testing/lab/clia/rtcounseling.html)

Rapid Testing vs. Standard Testing

• Sensitivity and specificity comparable
• Negative predictive value high in both tests
  – Negative rapid test → patient not infected
• Antibodies take time to form → re-test in 3 months
• Positive predictive value of a rapid test may be low in populations with low prevalence
• False-positive may occur with rapid testing
  – All rapid tests must be confirmed with Western blot or immunofluorescence assay

Source: CDC 2013 [http://www.cdc.gov/hiv/testing/lab/clia/rtcounseling.html](http://www.cdc.gov/hiv/testing/lab/clia/rtcounseling.html)
Rapid Testing

- Most commonly aides in diagnosis
- Rapid enzyme immunoassay (EIA) test that picks up HIV antibodies produced by the body against HIV during early seroconversion
  - ~3 weeks
- Requires blood or oral fluid (not saliva)
- Results in 20-30 minutes
- Allows testing, counseling, and referrals to be completed in one visit
- Most tests do not distinguish between HIV-1 and HIV-2
- All positive antibody tests require confirmative testing with a Western blot
  - False-positive ELISA tests can occur secondary to pregnancy, syphilis, lupus, recent vaccination against influenza, autoimmune hepatitis, or hypergammaglobulinemia.

Source: CDC, 2016: http://www.cdc.gov/hiv/basics/testing.html

Rapid testing for HIV Antibody

<table>
<thead>
<tr>
<th>OraQuick®</th>
<th>Home Access HIV-1 Test System®</th>
</tr>
</thead>
<tbody>
<tr>
<td>FDA approved ≥ 17 years of age</td>
<td>FDA approved ≥ 18 years of age</td>
</tr>
<tr>
<td>HIV-1 and -2</td>
<td>HIV 1 only</td>
</tr>
<tr>
<td>Low level of antibody in oral fluid</td>
<td>High level of antibody in blood</td>
</tr>
<tr>
<td>Oral fluid tests find infection later</td>
<td>Blood tests find infection sooner</td>
</tr>
</tbody>
</table>
| Results: 20 minutes | Results (after specimen is sent to a licensed lab):
  - HIV-1 Test System: “1 week (phone/online)
  - Express HIV-1 Test System: next day |
| Oral fluid swabbed from area between cheek and gum and placed on absorbent pad
  - One line: Negative
  - Two lines: Positive | Requires dried blood from prick on finger with sterile lancet |
| Accuracy
  - HIV Positive: 91.7%
  - HIV Negative: 99.9%
  - 1 in 12 false-negative | Accuracy 99.9% |
| Immunoassay used for screening | Counseling for those who test positive |
| $40 | $44-$55.95 |

Source: CDC, 2013 http://www.cdc.gov/hiv/testing/lab/clia/rtcounseling.html
Confirmation of Rapid Test: Western Blot

- For a confirmative diagnosis, at least 2 of the following bands must be present in order to confirm an HIV diagnosis via Western blot: p24, gp 41, and gp120/160
- Confirmatory antibody detection
- Western blot results → indeterminate
- Diagnosis based off of HIV RNA testing (viral load) that presents in the blood around 10 days after infection
HIV RNA Test

- Detects the virus directly (instead of the antibodies)
- Can detect HIV ~ 10 days after infection
- More costly than antibody tests
- Not used as a screening test

CDC 2013 http://www.cdc.gov/hiv/testing/lab/clia/rtcounseling.html

Summary

- All individuals 13-64 years of age should be tested at least once
- For those at high risk for acquiring the infection, annual testing should be conducted (sooner if necessary)