INTERVENTION TO PREVENT HIV/AIDS

Roger Detels
NEED TO RETURN TO PUBLIC HEALTH PRINCIPLES

- Discard concept of exceptionalism
- Primary responsibility to protect the uninfected
- Promote testing
- Prevent transmission
MODES OF TRANSMISSION

- Blood
- Sexual activities
- Mother to child
DETERMINANTS OF TRANSMISSION FROM AN INFECTED PERSON (1)

- Duration of infection/stage of disease
- Risk of transmission per sexual act
  - Viral RNA level
  - Presence/absence of concurrent STD and other infections
  - Condom use
  - Treatment
DETERMINANTS OF TRANSMISSION FROM AN INFECTED PERSON (2)

- Circumcision status (reservoir of HIV)
- Partner exchange rate
  - Mixing pattern
  - Patterns of sexual behavior (anal, vaginal, etc.)
  - Injection equipment sharing
  - Networks, core transmitters
TARGET GROUPS FOR INTERVENTION STRATEGIES

- Youth 13-25 years
- Men who have sex with men
- Injection drug users
- Promiscuous heterosexuals
- Health care workers
- Biomedical laboratory workers
- Blood/plasma donors
- Pregnant women in high-risk populations
- Persons living with HIV/AIDS
- Spouses of high-risk persons
BARRIERS TO HIV/AIDS CONTROL (1)

- Status of women
- Low condom acceptance (esp. for non-commercial sex)
- Emphasis (& $s$) on treatment, not prevention
- Dependence on external support
- Long-term sustainability of external support
- Low awareness/acceptance of vulnerability (women/youth)
- Low acceptance of testing (emphasis on “opt-in” and individual rights)
BARRIERS TO HIV/AIDS CONTROL (2)

- Stigma (risk groups, HIV-infected, those seeking testing)
- High proportion of uncircumcised men
- Reluctance to be circumcised
- Low literacy rates
- Effectiveness of female-controlled prevention strategies (e.g. microbicides)
- Vaccine unlikely in the near future
- High proportion of asymptomatic STIs
FIGURE 1: Continuum of prevention
TABLE 4: Core HIV prevention interventions

<table>
<thead>
<tr>
<th>Intervention</th>
<th>Evidence</th>
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<tbody>
<tr>
<td>Abstinence from sex and from injecting drugs</td>
<td>Effective in preventing transmission. Programmes promoting sexual abstinence are effective when abstinence is presented along with condoms and safer-sex strategies as other options. Raising the age of sexual debut and avoiding drug use are important goals for such programmes.</td>
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<tr>
<td>Condom use</td>
<td>Reduces transmission by 90 per cent when used correctly and consistently.</td>
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<tr>
<td>Medical male circumcision</td>
<td>Reduces the risk of HIV infection in men by approximately 60 per cent when conducted by well-trained professionals.</td>
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<tr>
<td>Harm reduction</td>
<td>Needle and syringe exchange programmes reduce the risk of HIV transmission by 33–42 per cent. Integration of opiate substitution therapy in harm reduction programmes reduces drug injecting behaviour, improves adherence to antiretroviral therapy (ART) and reduces mortality.</td>
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<tr>
<td>Antiretroviral treatment</td>
<td>Greatly reduces the risk of HIV transmission per exposure. Reduces transmission 50–90 per cent in sero-discordant couples.</td>
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<tr>
<td>Social and behavioural change communication</td>
<td>Is widely used to prevent vertical transmission to newborns and as post-exposure prophylaxis for victims of rape and needlestick injuries. The evidence includes a limited number of successful trials (microbicides and pre-exposure prophylaxis).</td>
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<td></td>
<td>School-based programmes improve knowledge and self-efficacy, which are important foundations for prevention. Social marketing and the use of mass media influence attitudes and increase uptake of HIV-related services. Many behaviour change efforts, however, show little or no impact if not targeted to those most at risk and if not implemented alongside measures to address norms and structural influences on behaviour and access to prevention commodities and services.</td>
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Key Elements for Successful Intervention (1)

- Mobilization of political will and commitment
- Good surveillance
- Learn and adapt from past experiences
- Unified national planning
- Multisectoral response; e.g., police
- Rapid implementation
Key Elements for Successful Intervention (2)

• Focused intervention; e.g., involve marginalized and high-risk groups
• Assure access to intervention tools; e.g. condoms, testing, drugs
• Early education before exposure
• Community involvement
• Access to treatment
• Compliance/adherence/sustainability
• Intensified testing efforts
Key Elements for Successful Intervention (3)

- Reduce barriers to intervention
  - Address restrictive cultural norms (e.g. refusal to acknowledge sexuality)
  - Stigmatization
  - Promote testing (opt out)

- Treatment as prevention
  - Adults
  - Pregnant women

- Development of effective vaccine
Key Elements for Successful Intervention (4)

• Development of an effective microbicide
  – Issues of testing i.e. mandatory condom use
  – Recognition of risk by participants
  – Inducing essential level of adherence
  – Drug resistance for anti-HIV microbicides
Key Elements for Successful Intervention (5)

**PreP**
- Efficacy at individual level
- Achieving essential adherence levels
- Low effectiveness \(\rightarrow\) increased resistance and increased community viral load
- Cost – who pays?
- Target groups

**PEP**
- Speed/interval post-exposure essential
- Cost-effective if it prevents HIV
- Who pays?
- Identifying exposure
# Using Anxiety as a Public Health Tool

<table>
<thead>
<tr>
<th>Level of Anxiety</th>
<th>Consequences</th>
</tr>
</thead>
<tbody>
<tr>
<td>Too little</td>
<td>No action</td>
</tr>
<tr>
<td>Sufficient</td>
<td>Appropriate action</td>
</tr>
<tr>
<td>Too much</td>
<td>Fatalism and no action</td>
</tr>
</tbody>
</table>
Strategies to Prevent HIV Infection – Developing Countries (1)

- Political commitment
- Reduce stigma
- Community mobilization
- Implement routine testing with pretest encouragement and post-test counseling
- Promotion and provision of condoms
- Early education
Strategies to Prevent HIV Infection – Developing Countries (2)

- Drug replacement therapy (methadone, etc.)
- Needle/syringe exchange (size matters)
- Provide ARV treatment
- Promote monogamy and premarital celibacy
- Promote circumcision
- Educate and empower women
- Regulate commercial sex; e.g., Thailand, Cambodia
Strategies to Prevent HIV Infection – Developing Countries (3)

- Increase literacy
- Attention to migrant populations
- STD control – syndromic treatment, testing of those with multiple partners and core transmitters, treatment of partners
- Reduce barriers to HIV and STD testing
- Antenatal screening and treatment
- Exclusive breastfeeding or formula feeding (if feasible)
Strategies to Prevent HIV Infection – Developed Countries (1)

- Harm reduction:
  - condoms
  - needle exchange
  - drug replacement therapy
- Pre- and post-exposure prophylaxis (+ or - ?)
- Protection of health workers – universal precautions, etc.
- Delay sexual debut
- Promote monogamy and premarital celibacy
Strategies to Prevent HIV Infection – Developed Countries (2)

- Antenatal screening and treatment
- Mobilize affected communities:
  - Minorities
  - Men who have sex with men (MSM)
  - Injection drug users (IDUs)
- Early education
- Promote circumcision (especially in newborns)
- Implement routine testing with pretest encouragement and post-test counseling
STRATEGIES TO PREVENT HIV INFECTION

Rapid Testing

1. Immediate results
2. Requires confirmation, if informing patient
STRATEGIES TO PREVENT HIV INFECTION - BLOOD

1. Reduced use of whole blood
2. Screening of blood donors
3. Screening of blood donations
4. Processing of blood products
5. Institutionalization of routine safety procedures for health workers and biomedical laboratory technicians
STRATEGIES TO PREVENT HIV INFECTION – INJECTION DRUG USERS

1. Prevent drug use
2. Reduce needle sharing
3. Use of bleach or boiling
4. Needle exchange programs
5. Drug replacement programs
6. Health education/behavioral intervention for intravenous drug users
7. Improve access to and acceptability of testing
8. Condom promotion
9. Education about prevention strategies
STRATEGIES TO PREVENT HIV INFECTION - SEXUAL ACTIVITIES (MALE-FEMALE, MALE-MALE) (1)

Health education/behavioral intervention

- Increase knowledge of HIV/AIDS at an early age
- Eliminate/reduce high-risk practices (e.g., methamphetamine)
- Promote use of condoms with every intercourse
- Promote monogamy/celibacy
- Improve early sex education in schools
STRATEGIES TO PREVENT HIV INFECTION - SEXUAL ACTIVITIES (MALE-FEMALE, MALE-MALE) (2)

- Reduce opportunities for promiscuity (e.g., close bath houses, reduce number of partners, avoid anonymous partners) and internet dating
- Use of syndromic approach and counseling to treat STDs
- More acceptable STD treatment facilities
- Premarital testing
STRATEGIES TO PREVENT HIV INFECTION - SEXUAL ACTIVITIES (MALE-FEMALE, MALE-MALE) (3)

- Routine testing of sex workers and persons at risk for STDs and HIV, with treatment for those infected
- Regulation of commercial sex
- Improve access to and acceptability of testing
- Voluntary partner notification
- Promote circumcision
- Combat internet sex (use internet effectively)
STRATEGIES TO PREVENT HIV INFECTION – HIGH-RISK HIGH-FERTILITY WOMEN

1. Selection of marital partners
2. Testing before marriage
3. Monogamy
4. Education of spouses
5. Routine testing and effective treatment of STDs
6. Improve access to and acceptability of HIV testing (e.g., routine testing)
7. Promote condom use
8. Empowerment
STRATEGIES TO PREVENT HIV INFECTION - MOTHER TO INFANT (1)

Routine testing
• Women in high-risk groups
• Pre-pregnancy testing
• Antenatal
• Counseling

Antiretroviral treatment
• Prenatal
• Postnatal
STRATEGIES TO PREVENT HIV INFECTION - MOTHER TO INFANT (2)

Developing countries:

• Education
• Exclusive breast-feeding for six months
• Prophylaxis of infant and treatment of mother during breast-feeding
• Effective screening and treatment of STDs
STRATEGIES TO PREVENT AIDS (1)

- Developed countries
  - Initiate HAART at diagnosis of HIV/AIDS
    - Monitor HAART response and development of resistance
STRATEGIES TO PREVENT AIDS (2)

- Developing countries
  - Political commitment
  - Testing and post-test counseling
  - Provision of drugs
  - Development of treatment infrastructure
  - Expansion and training of treatment personnel
  - Education on need for adherence to drug regimen
  - Development of inexpensive, low-tech surrogate tests for monitoring disease course
Overview of STTR Intervention to improve patients outcomes along continuum of HIV care

**SEEK & TEST**
- Identify HIV/AIDS case
- Diagnose HIV/AIDS

**TREAT & RETAIN**
- Clinical assessment
- Clinical monitoring
- Initiation of ART
- Optimal ART adherence

**Intervention:**
- POC rapid tests for HIV + CD4 + VL
- Provider & Patient incentive programs

**Measures:** Process-level evaluations

**OUTCOMES**
- Reduced mortality
- Sustained viral suppression

**HIV Screening**
- Screened HIV-Positive
- Confirmed HIV-Positive
- Notified HIV-Positive

**HIV Testing & Treatment**
- Received CD4 Test
- Received ART
- Received VL Test

**Outcome Measures**
- Number of individuals
COMMUNITY INTERVENTION

• Have community accept responsibility and initiate appropriate intervention activities

• Recruit community leaders, teachers, health workers, peer leaders, media

• Develop appropriate intervention strategies collaboratively with community
EDUCATION IS ESSENTIAL

BUT INSUFFICIENT
CDC, “New Strategies for a Changing Epidemic”

- HIV testing as a part of routine medical care
- New models for testing outside medical settings (e.g., community setting)
- Work with HIV-positive individuals to prevent secondary spread
- Promote routine testing of pregnant women and infants of untested mothers
EVALUATION OF INTERVENTION STRATEGIES

- Are the appropriate risk groups and areas targeted?
- Is the intervention strategy culturally/ economically appropriate for the specific risk group/area?
- How is effectiveness of intervention strategies measured?
- Is the sentinel surveillance system a part of the evaluation scheme?
- Has there been an impact?
- Is the strategy cost-effective?
- Can the intervention be scaled up?
The “comprehensive package” for the prevention, treatment and care of HIV among people who inject drugs

- Needle and syringe programmes
- Opioid substitution therapy and other drug dependence treatment
- HIV testing and counselling
- Antiretroviral therapy
- Prevention and treatment of sexually transmitted infections
- Condom programmes for people who use drugs and their sexual partners
- Information, education and communication for people who use drugs efforts targeting and their sexual partners
- Vaccination, diagnosis and treatment of viral hepatitis
- Prevention, diagnosis and treatment of tuberculosis
OBJECTIVES OF VACCINATION

• Prevent infection
• Prevent disease
• Prevent transmission
REQUIREMENTS FOR A PROPHYLACTIC VACCINE

- Must be safe
- Must elicit a **protective** immune response
- Must stimulate both humoral and cellular immunity
- Must protect against different clades of HIV
- Must provide long-lasting immunity
- Must be practical to produce, transport and administer
- Should stimulate mucosal immunity in genital tract, rectum and oral cavity/GI tract
PRIMARY ISSUES FOR CONSIDERATION IN VACCINE DEVELOPMENT

- No long-lasting natural immunity yet demonstrated in humans
- Disease progresses despite presence of neutralizing antibody
- Variability of viral genome
- Frequent mutations
- Can a group antigen be found to induce immunity? Clades?
- Need to induce humoral and especially **cytotoxic cellular immunity**
- Potential of some vaccine candidates to induce enhancing antibodies