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Epidemiologic Basis of STD Control II — Interventions

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Section A

Groups and Mixing Patterns
Core Neighborhoods and Core Transmitters

- **Core neighborhoods**—geographic units with high prevalence of STDs
- **Core transmitters**—individuals in core neighborhoods who engage in “risky” social behaviors and experience a large proportion of diagnosed STDs
Core groups are critical to maintaining high rates of gonorrhea in community-based models of STD transmission

- Cores are characterized by high transmission density
Neighborhood Characteristics and STD Link

- Studies have consistently found higher rates of STDs in neighborhoods with the following characteristics:
  - Poverty
  - Social disadvantage
  - Segregation (Thomas, 1995)
  - Drug abuse
- Few studies have linked community level characteristics to individuals
The Unique Aspect of STD-Partner Effects

- Without partners, there is no STD
- STD prevalences are different in different populations
- Therefore, “types” of partners may have an enormous impact on STD risk
Sexual Mixing

- The extent of sexual contact within and among definable segments of the population
- Segments of the population can be defined by factors such as
  - Age, race/ethnicity, sex
  - Geography
  - Drug-use patterns
Partner Mixing Patterns

- **“Assortative” mixing** (or “like with like”)
  - In other words, partners are recruited from a population whose STD risk is demographically similar to one’s own
  - For example, the next-door neighbor is a good approximation of assortative mixing!

- **“Dissortative” mixing**—recruitment of partners from different groups
  - For example, contact with commercial sex workers, or with persons from different ethnic groups
  - “Mixed”—many people have assortative and dissortative mixing patterns
Mixing Pattern

Assortative  Random  Disassortative

Source: Boily STD, 2000:27(10);560-71
Laumann, 1998

- Higher STDs in African Americans is partly due to patterns of sexual networks
- STDs remain endemic because partner selections are more assortative by race/ethnicity
- Partner selection is more disassortative by demographic characteristics among African-Americans than other groups
Aral, 1996

- STD morbidity concentrations create potential partner pools of high risk and high sexually transmitted disease
- These geographic and social contexts create a higher probability of exposure to infection for each sex act
Public Health Strategies: Core Transmitters

CORE GROUP

People who have sex with both groups

General Population
Serial vs. Parallel Transmission

Infected

Uninfected

Infected

Best Friend

Uninfected

Infected
Chain Design: Urban Network Study

- Chain-link study design for Atlanta Urban Networks Project, 1995-1999.
- Recruited six `chains' of persons,
  - random selection of the next interviewee
  - nomination by the previous interviewee
- These six chains provided information on personal behavior and network association.
Phases of STD Epidemics

Source: Adapted from Wasserheit and Aral. JID 1996.
Network Approach

- Find, evaluate, and treat both sex and social partners
  - Inquire about index’s social network
  - Rely on other sources of information besides interviews (e.g., community residents)
  - Include places of social significance
Networks are the construct which integrate “core” transmitters into STD epidemiology.

Dense networks are required to maintain STD endemicity, since the random infection transmission efficiency is <100%.

“Core” network members—individuals with high “centrality” are key to population-based control—but this has never been widely actualized.
Questions

- What are the challenges to implementing a network disease intervention approach?
  - Stigma
  - Outcome evaluation
  - Process indicators?
Section B

Theoretical Aspects of STD Control
Behavioral risk reduction ("c" term)
- Abstention
- Reducing number of partners
- Reducing number of exposures
- Increasing age of sexual debut

Partner selection—multifactorial term
- e.g., high-risk vs. low-risk partners!
Impacts “d”

- Studies in HIV and STD settings demonstrate that provider referral usually increases yield
- PN is an expensive intervention and requires intensive supervision and personnel resources
- Cost-effectiveness data is inconclusive
Partner Notification—Methods

- Patient referral (usually with referral card)
- Provider referral (interview patient for sex partners with field follow-up)
- Conditional referral
### Field Record

**Last Name** | **First (Nicknames)** | **Address (Street)** | **(Apt. #)** | **Home Phone**
---|---|---|---|---

**City** | **State** | **Zip** | **Age/D.O.B.** | **Race** | **Ethnicity** | **Sex** | **Marital Status**
---|---|---|---|---|---|---|---

**Height** | **Size/Build** | **Hair** | **Complexion** | **Pregnancy Status** | **Place of Employment/Hours/Phone**
---|---|---|---|---|---

**Exposure** | **Original Patient ID. Number** | **Other Identifying, Locating, or Medical Information**
---|---|---

**REFFERAL BASIS:**
- Partner
- Cluster
- Positive Lab Test
- OOI/ICCR

**Exam Date** | **Test** | **Result** | **Provider**
---|---|---|---

**Treatment Date** | **Drug** | **Dosage** | **Provider**
---|---|---|---

**Interviewer Number:**
- **Disease 1**
  - **Disposition:**
    - Dispo.
      - Date:
  - **New Case #:**
    - Diagnosis:
    - Worker Number:
  - **Type Referral:**
    - Post-test
      - Yes
      - No

**Interviewer #2:**
- **Disease 2**
  - **Disposition:**
    - Dispo.
      - Date:
  - **New Case #**
    - Diagnosis:
    - Worker Number:
  - **Type Referral:**
    - Post-test
      - Yes
      - No

**FR Number** | **OOJ No.** | **OOJ Area** | **Due Date**
---|---|---|---
R = Bcd Duration of Infection—Interventions

- Reduction of d = reduction of asymptomatic pool
- Disease screening programs
- Partner notification and presumptive treatment
- Increased health care access
- Treatment guidelines
STD Screening Programs

- Syphilis $
- Gonorrhea $$
- Chlamydia $$$
- HIV$$
Setting up STD Screening

- Identifying appropriate populations
- Laboratory quality assurance
- Transport, logistical, and supply issues
- Costs and cost allocation
- Development of new technology
- Notification of results
The Screening Process

Clinic

Results

Specimens

Lab
Major Issues in Screening Programs

- Poor logistics
- Follow-up issues
- Inappropriate populations
- Insurance/legislative problems
Partner Notification

- No controlled studies performed
- Probably useful for diseases with long incubation period (syphilis, chlamydia)
- Used for HIV
- Not useful in most settings for diseases with short incubation periods
- Sexual network vs. social network issues
Parran’s Model

- Interview the infected person
- Identify their sex partners
- Find, evaluate, and treat sex partners
Prevention Therapy

- Presumptive treatment of sexual contacts
- Syndromic management
- Intentional over-treatment in most settings
- Impact on resistance-minimal—especially when single dose regimens are used

- Major Issue: identification of contacts
Partner Therapy and Viral STDs

- Not generally indicated
- PEP for HIV - used in practice, efficacy unknown
Challenge to Partner management is access

- New Approaches
  - Pharmacy delivered
  - Partner Delivered

- What do you think would be the challenges to these methods of partner management?
- (See New Engl J med Feb 17 2005)
Section C

Transmission Efficiency
Transmission Efficiency of STDs

- STD B not 100%
- 30-70% per GC/CT exposure
- ~20-30% syphilis
- HIV: 1/100- 1/10,000 depending on type of exposure
Impact of B Reduction

- Reducing transmission efficiency should have a direct effect on individual risk
- Example: Consistent condom use reduces HIV transmission by >98% in dichotomous couples

- Population Impact on STD transmission-modeling studies suggest that modest reductions in B have greater impact
Transmission Efficiency—Interventions

- Condom use and barrier methods
- Microbicides
- Hormonal contraceptives (?)
- Circumcision (?)
- Antiviral therapy (?)
  - “Doc, now that my viral load is zero, do I still have to use a condom … Can I get a prescription for Viagra? …”
Microbicides

- Female controlled methods
- Nonoxynol-9 studies demonstrate ineffectiveness for CT, GC
- For HIV, most data now suggests that mucosal disruption by N-9 may facilitate HIV transmission
- New compounds being developed, especially non-ionic, antibody approaches
Microbicides: Mechanisms of Action

Microbicides: Desirable Characteristics

- Efficacy
- Texture
- Chemical interactions—pH
- Taste and smell
- “Stealth”
- Non-toxic to sperm
- Hepatitis B vaccine is the only STD vaccine
- SKGlaxo herpes vaccine—effective for women, not men
  - Continued clinical trials
- HPV vaccine-preventive and therapeutic, in Phase 1, 2 and Phase 3
- GC and chlamydia—little activity
- HIV vaccines
Condom Use

- Condom efficacy demonstrated for HIV, GC, herpes.
- Biologically plausible
- Population Impact-Thailand, Uganda
Condom use patterns often include use with higher-risk partners—potential for paradoxical effects. Appropriate use requires training (technical efficacy) and negotiation skills.
Suppressive treatment of persons with herpes reduces transmission for individuals in dichotomous relationships

Supposition that HIV treatment would do the same

Impact of STD and HIV interaction
- HIV pattern is that viral load is highest during seroconversion
- Early seroconverters are HIV-negative
- Is sexual transmission during HIV seroconversion the greatest public health risk??