



Sexually Transmitted Infections Are Preventable and Treatable, But the Full Benefit Depends on the Local Context

November 2007

Patterns and Trends in STIs

Sexually transmitted infections (STIs) are responsible for a large burden of disease and death in developing countries because of their impact on reproductive and child health,¹ and their role in making HIV transmission more efficient.² Globally, almost 57 million Disability-Adjusted Life Years (DALYs) are lost to STIs.³

Prevention and management of STIs have improved over the past two decades, but large differences in the epidemiology of STIs between the developed and developing countries persist.

Incidence and prevalence rates are higher in both urban and rural populations in developing countries than in developed settings. Because diagnosis and treatment of STIs are often delayed or inadequate in developing countries, rates of complications can also be high. These complications can include:⁴

- Pelvic inflammatory disease, ectopic pregnancy, and chronic abdominal pain;
- Adverse pregnancy outcomes, including miscarriage, intrauterine death, and premature delivery;
- Infertility;
- Neonatal and infant infections and blindness in infants;
- Urethral strictures in men;
- Genital malignancies, such as cancer of the cervix, vulva, vagina, penis, and anus;
- Arthritis related to gonorrhea and chlamydia;
- Liver failure and liver cancer related to hepatitis B or human T cell lymphotropic virus type I; and
- Central nervous system disease related to syphilis.

In developing countries, high levels of STIs and related complications come from inadequacies in health service

provision—care is usually provided by health workers poorly trained in STIs—and delays in health care seeking.⁵ Levels of awareness about STIs are generally low because of the stigma associated with sexual issues and the asymptomatic nature of many STIs. Variables that affect the duration of infection include adequacy of health workers' training, attitudes of health workers toward marginalized groups, patient loads at health centers, drug and supply availability, and costs of care.⁶

The HIV pandemic, coupled with poor economic conditions in many countries, has negatively affected STI prevention and care services, particularly when health workers have died or migrated.

Sexual behavior is a major determinant of the STI burden in developing countries. These behaviors are heavily influenced by the sociocultural, economic, and political context. In many countries income inequality and population movement have increased with globalization and violent conflict.⁷ One effect of these changes is an increase in multipartner sexual activity, when increases the rate of infection and spread of STIs.

Improvements in Prevention and Management

In the past decade, technological advances in prevention, diagnosis, screening and treatment, evaluation, widespread implementation of case management algorithms, and changes in risk behaviors in response to AIDS have all influenced the dynamics of STIs.⁸

A major recent advance is the early success of a human papillomavirus (HPV) vaccine.⁹ Where available, HPV vaccines will likely prevent genital cancers in developing countries in the near future. Already evidence exists of the effect of the HPV vaccine on these cancers: In a recent study the vaccine reduced the rate of cervical, vaginal, vulvar, and perianal lesions in women by 20 to 34 percent.¹⁰

In some developing countries such as Cambodia, the Dominican Republic, and Thailand, sexual risk behaviors have been declining over the past decade. In Uganda, for example, the age of sexual debut has increased, the frequency of sex with casual partners has decreased, and the use of condoms has increased.¹¹ Demographic and Health Surveys in 29 countries throughout the 1990s found that almost 80 percent of men and 50 percent of women reported that they had done something to avoid AIDS: become monogamous, reduced number of partners, avoided sex workers, or increased condom use.¹²

However, in developed countries some behavior changes in recent years have gone in the opposite direction: Risk behavior among men who have sex with men in many European countries and the United States has increased significantly,¹³ and condom use has declined among heterosexual adults in Europe.¹⁴ Experts believe these changes may be the result of better access to antiretroviral therapy for HIV infection and *prevention fatigue*, or the difficulties of sustaining preventive behaviors in the longer term.

STI Control Depends on the Local Context

STIs are a major public health burden in the developing world. Although the overall prevalence and incidence of *bacterial* STIs have declined because of expanded syndromic management as well as changes in sexual behavior and death of high-risk populations, the prevalence and incidence of many *viral* STIs has increased over the past decade. Although resources are lacking in the developing world, the epidemiology of STIs, the local prevention and care infrastructure, and the cultural and sociopolitical context vary considerably within and across developing countries.

SYNDROMIC MANAGEMENT

Health systems use three different approaches to manage patients with STI symptoms:

- Etiology-based management relies on identifying the causative micro-organism or detecting the specific antibodies and requires costly and often complex laboratory diagnosis, trained personnel, quality assurance, and infrastructure;
- Clinical diagnosis-based management is rapid, inexpensive, and requires less infrastructure, but often may be inaccurate, may miss multiple

infections, and may result in undertreatment or overtreatment; and

- Syndromic management, which is based on the recognition of a constellation of clinical signs and symptoms, is inexpensive, can be standardized, and can be used by both physicians and paramedical personnel, though it often results in overtreatment.

Widespread implementation of the syndromic approach to STI case management has had a considerable effect on the epidemiology of STIs, especially in resource-poor settings¹⁵ and syndromic management has been recommended by experts as a realistic approach for managing symptomatic patients in developing countries.¹⁶

ROLE OF CORE AND BRIDGE GROUPS

Core groups (groups of individuals who have large numbers of sex partners who themselves have large numbers of sex partners) play an important role in the spread and persistence of STIs and are characterized by high STI prevalence. Examples of core groups are: sex workers, injecting drug users, truck drivers, and bar girls. Interventions that target core groups tend to be more cost-effective because one case treated or prevented in a core group member can prevent that person from infecting several others.¹⁷

Bridge populations (individuals who have sexual links with members of both high- and low-prevalence subpopulations) play an important role in disseminating infection from core groups to the general population in situations where high prevalence is concentrated in core groups.¹⁸

In general, people who are infected with an STI are at an increased risk of HIV infection and vice versa. STIs and HIV often facilitate each other's transmission. Treatment of STIs may be particularly important in the fight against HIV because the diseases are worth treating in their own right and because the absence of STIs greatly reduces transmission of HIV.

Bacterial and Viral STIs

Recently, the incidence of bacterial STIs has declined while that of viral STI infections has increased. The table below shows worldwide prevalence estimates and available information on trends.

TABLE 1: PREVALENCE AND TRENDS IN COMMON BACTERIAL AND VIRAL STIS, 1997-2005.

TYPE OF SEXUALLY TRANSMITTED INFECTION	PREVALENCE ESTIMATE	TREND
BACTERIAL		
Chancroid	7 million; mainly Sub-Saharan Africa, Asia, and the Caribbean	Declining
Syphilis	12 million; high in South & Southeast Asia & Sub-Saharan Africa	Re-emerging, especially among men who have sex with men (MSM)
Gonorrhea	62.4 million; high in South & Southeast Asia & Sub-Saharan Africa	Declining after emergence of AIDS
Chlamydia	92 million	On the rise, especially among young people
VIRAL		
HSV-2	10 to 30 percent of adults	On the rise, especially among women and high-risk groups
HPV	10 percent among women of reproductive age globally	-
Hepatitis B	High-endemic areas, 70 to 90 percent of population Low-endemic areas, less than 20 percent of population	On the rise

Note: High-endemic areas include South-East Asia and the Pacific Basin (excluding Japan, Australia, and New Zealand), Sub-Saharan Africa, the Amazon Basin, parts of the Middle East, the Central Asian Republics, and some countries in Eastern Europe. Low-endemic areas include North America, Western and Northern Europe, Australia, and parts of South America.

Sources: Steen 2001¹⁹; WHO 2001a²⁰; CDC 2004²¹; L. Doherty and others 2002²²; Donovan 2004²³; Brughna and others 1997²⁴; WHO HPV Information Centre²⁵; WHO Epidemic and Pandemic Alert and Response 2002²⁶.

Risk Factors for STIs

Unprotected sex with an infected partner is the most important risk factor for acquiring an STI. The prevalence and incidence of STIs vary across societies and subpopulations defined by age, gender, race and ethnicity, and socioeconomic status.²⁷ In all societies, young people are at greater risk for acquiring most STIs. Women tend to have a higher prevalence and incidence of all STIs (except for men who have sex with men) and suffer more of the serious complications. Social and behavioral patterns also increase women’s vulnerability to STIs: For instance many men have concurrent sex partnerships, which increase their risk of transmitting infection to their female sex partners. In addition, many young women have sex with older male partners who expose them to higher STI prevalence rates in older age groups. In most countries, minority ethnic groups have higher STI rates than other groups.

RISK FACTORS FOR EXPOSURE

The factors that increase the potential for exposure to infected sex partners, and thus infection, include: number of sex partners over the individual’s lifetime, over the past year, and over a short term;²⁸ frequency or number of sexual encounters;²⁹ having sex with members of groups with high STI prevalence, such as core groups and sex workers or older age groups;³⁰ and position in a sexual network.³¹

Some behaviors that increase the transmission of STIs include: having concurrent partnerships³² and having short gaps between sex partners in serial monogamous partnerships.³³

RISK FACTORS FOR ACQUISITION OF STI GIVEN EXPOSURE TO INFECTED PARTNERS

Several factors affect the likelihood that an infected person will transmit the infection to a susceptible partner: Condom use decreases that likelihood, while sexual practices such as anal intercourse, vaginal douching, and use of drying agents in the vagina increase the likelihood of STI transmission.³⁴ The likelihood of transmission is higher for bacterial STIs, such as gonorrhea, syphilis, and chlamydia, than HIV. Acquisition and transmission are also affected by other factors such as circumcision status, where the risk of getting HIV and some STIs is higher among men who have not been circumcised.

The length of time a person is infected is another important factor in transmission. The speed with which infected

individuals seek treatment and the speed and effectiveness with which health care providers supply effective treatment together determine the duration of infectiousness.³⁵ Behaviors that can reduce the duration of infectiousness are: timely and appropriate health care seeking; effective participation in risk assessment; and compliance with therapy and prevention recommendations on the part of those infected and at risk.³⁶

SOCIAL DETERMINANTS OF STIS

Sexual networks and patterns of sexual partnership formation and dissolution constitute a major mechanism through which the political economy and the sociolegal system influence the rate of spread of STIs in a population. Sexual networks that are highly critical to the rate of spread of STIs include those involving sex work; exchange of sex for drugs, gifts, or material needs; and anonymous sex. The frequency of sex in exchange for money or other goods appears to be highly sensitive to change in the political economy and the sociolegal system. Internal conflicts, war, economic crises, and social collapse are accompanied by the establishment of major sex markets or the expansion of existing ones. The availability and use of condoms also influences the rate STIs spread.

Political conflict, war, economic deterioration, mass migration, and income and gender inequality, as well as the effects of globalization, can affect sexual relations. Gender power relationships often are marked by great inequity in developing countries. Sexual partnerships often are not stable, and in the long-term absence of a spouse, both men and women (but especially men) have other partners. In addition, as economic needs rise, the number of women who exchange sex for material goods increases. Economic need also affects sexual mixing patterns. In many developing countries, young girls commonly have “sugar daddies” – older, usually married men who provide them with material goods in return for sex while also exposing them to chronic STIs typical of relatively older cohorts. Such gender inequity puts women in a highly vulnerable position.

Interventions

STI interventions benefit from a large body of rigorous evaluation. Interventions to prevent acquisition of STIs have

been evaluated at the individual, group and community level. Most of the evidence available is on individual-level interventions aimed at reducing acquisition, even though these may be costly and difficult to sustain.

Individual-level interventions that have shown success include: behavior change to reduce risky behaviors, antimicrobial prophylaxis, vaccines, and male circumcision.

In group settings, behavior change approaches resulted in significant reduction in incidence of STIs. Interestingly, behavioral interventions in small group settings were more often effective than those delivered to individuals.³⁷

At the community level, interventions have sought to reduce the prevalence and transmission of STIs primarily by shortening the duration of infectiousness within the general population.³⁸ In more recent community level interventions, risk reduction activities which aim to reduce the likelihood of exposure have also been incorporated.

Cost-Effectiveness of Interventions

The cost-effectiveness of interventions to prevent or treat STIs depends on a variety of factors. Location is one: in poor countries, patients can usually get treatment for an STI in a public sector health care facility. Many countries have publicly funded, stand-alone STI clinics, but the typical pattern is for health care personnel to provide care for STIs as part of their regular practice in general outpatient clinics. However, because of concerns about anonymity, many STI patients in poor countries avoid public facilities in favor of traditional healers and private pharmacies.

There are many variables that determine the cost (and therefore the cost-effectiveness) of STI treatment, including:

- Delivery by the public or private sector;
- Economies of scale;
- Economies of scope;
- Prevalence and incidence;
- Epidemic phase;
- Transmission efficiency;
- Health system characteristics;
- Population composition and concentration;

- Resource combinations and input prices;
- Incentives to providers for high quality and quantity of service delivery;
- Willingness to pay for treatment as a function of price, income, and distance;
- Stigmatization; and
- Ineffective condom use.

These factors must be considered in assessing the cost-effectiveness of interventions to prevent or treat STIs. In addition, there is a tension between those who support prioritizing resources for the small proportion of people with the most sexual contacts and those who advocate spreading prevention, screening, and treatment resources more thinly over the whole population. One group of researchers has developed an approach to STI interventions that has demonstrated in several countries that finding the people who practice the riskiest sexual behavior without targeting them as individuals is possible.

All these factors present challenges to determining the most cost-effective interventions for STIs. Experts writing in *Disease Control Priorities in Developing Countries*, 2nd edition, about the cost-effectiveness of interventions for STIs take the position that “it depends.” The health benefit in terms of numbers of DALYs saved by preventing or curing a case of syphilis varies from 3 years in a person who has ceased all sexual activity to as many as 161 years in a sex worker with two partners a day. The cost of treating a sex worker for syphilis varies from US\$5 to US\$100. Thus, the cost per DALY of syphilis treatment can range from less than US\$0.05 per DALY to US\$33 per DALY.

Nonetheless, especially in the context of the HIV pandemic, treatment of STIs is critical. Treatment of STIs lowers the risk of HIV transmission, and appears to be highly cost-effective at US\$16 to US\$105 per DALY averted. In Sub-Saharan Africa, STI screening and treatment promotion to prevent future infection and to identify and treat high-risk populations cost US\$57 per DALY averted.

A review of intervention costs from 35 studies identified estimates for treatment and cure of selected STIs, and showed that even the cost of treatment vs. cure can vary by a factor of 100 or more (see Table 2).

TABLE 2: AVERAGE ESTIMATED COSTS FOR TREATMENT OR CURE, BY DISEASE OR SYNDROME, 2001 US\$

DISEASE OR SYNDROME	TREATMENT	CURE	AVERAGE
Syphilis	36.04	—	36.04
Urethral discharge	14.29	89.07	29.25
Genital ulcer	23.16	100.60	29.25
Venereal disease	25.47	82.65	31.83
Pelvic inflammatory disease	7.12	—	7.12
Vaginal discharge	48.23	102.92	81.04
Total	24.05	96.10	39.49

Source: Authors' calculations based on a literature review done as a background study for the chapter in *Disease Control Priorities in Developing Countries*, 2nd edition by Kumaranayake and others 2004.³⁹

As we learn more about the complexities of delivering STI treatment services and take into account the diversity of risky behaviors, it has become harder to devise a simple cost-effectiveness ratio for STI interventions. The way forward will require a better understanding of why STI treatment and other health services vary so much in terms of their efficiency and effectiveness from one setting to another.

Further research is therefore needed on:

- Development and evaluation of therapeutic, behavioral, and structural interventions to prevent or reduce STIs and their consequences;
- Development and evaluation of mechanisms to accurately quantify the disease burden in order to prioritize activities;
- Development and evaluation of inexpensive and practical rapid diagnostic tests to permit early detection and treatment of STIs;
- Evaluation of effective prevention modalities for persons at highest risk for STIs;
- Identification of practical and cost-effective STI prevention strategies or systems that ideally can be integrated into existing public health infrastructure;
- Implementation of studies in support of global STI elimination programs;
- Randomized controlled trials in different settings to test the hypothesis that treating or preventing STIs in

high-risk individuals has beneficial spillover effects by preventing infections among low-risk individuals;

- Development of single-dose therapy;
- New approaches for treating chronic STIs; and
- Determinants of the variation in unit costs of STI prevention and treatment services

Much is known, but much must still be learned to deliver care in the most cost-effective ways and build systems that pass cost savings on to governments and patients. However, STI control can avert much sickness and death, both directly from the

diseases or syndromes themselves, as well as indirectly, as an HIV prevention strategy.

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