Sexually transmitted diseases (STDs), or sexually transmitted infections (STIs), have been recognised as a major public-health problem for a number of years. In 1912, Prince Morrow, chair of the US committee looking into the problem of venereal diseases, was quoted as saying “It is a conservative estimate that fully one-eighth of all human suffering comes from this source”. Despite medical advances, STDs continue to pose a threat to the health and welfare of individuals.

In the last decade there have been considerable advances in the field of STDs. These have been fuelled to a large extent by the HIV/AIDS epidemic, but also by increased recognition of the range and severity of complications and sequelae that can be linked to these infections and the development of new case-management approaches. More than 30 bacterial, viral, and parasitic diseases have now been identified that can be transmitted by the sexual route; only a minority have sexual transmission as their dominant route of spread, however. For example, in areas with low hygiene standards or poor living conditions, hepatitis B and cytomegalovirus are often acquired through non-sexual routes in childhood.

STDs infect the reproductive tract as their primary site, with transmission occurring during sexual intercourse or from mother to child during pregnancy and childbirth. As a result, the greatest risk of infection is found among sexually active individuals and in infants born to infected mothers. Multiple infections within the same individual are also frequent, as is reinfection if partners have not been adequately treated.

Incidence and prevalence of STDs

The two main sources of information on the prevalence and incidence of a particular disease are case-notification reports and epidemiological studies. In countries with good reporting systems, the number of reported cases is a good proxy for the total number of infections if the disease has very definite symptoms. STDs, however, are often symptomless and when there are symptoms they are often not specific. For example, estimates indicate that 70–75% of women infected with Chlamydia trachomatis are symptom-free. In addition, the social stigma associated with an STD may result in people seeking care from alternative providers or not seeking any care. As a result, report-based STD surveillance systems tend to underestimate substantially the total number of new cases.

In 1996, WHO generated a new set of global estimates for four major STDs drawing on an extensive review of the published and unpublished prevalence data. These estimates suggest that there were more than 333 million new cases of syphilis, gonorrhoea, chlamydia, and trichomoniasis in adults aged 15–49 years in 1995: 12.2 million cases of syphilis, 62.2 million cases of gonorrhoea, 89.1 million cases of chlamydia, and 167.2 million of trichomoniasis.

Figure 1: 1995 estimates of new adult cases of curable STDs (gonorrhoea, chlamydia, syphilis, trichomoniasis)

The WHO estimates, although based on a comprehensive survey of the available information, are limited by the quantity and quality of prevalence data available from the different regions and our knowledge of the duration of infection. Interpreting the data from prevalence studies and comparing results is further complicated by: the nature of the populations studied (the majority of data originate from studies carried out in “convenient” populations, such as STD or antenatal clinic attendees), small sample sizes, and the different diagnostic approaches used.

Data from epidemiological surveys show that within countries and between countries in the same region, the prevalence and incidence of STDs may vary widely even in similar population groups. These differences reflect a
variety of social, cultural, and economic factors, as illustrated by the HIV epidemic, and also access to appropriate treatment (figure 2). In general, the prevalence of STDs tends to be higher in urban residents, in unmarried individuals, and in young adults. STDs tend to occur at a younger age in females than in males, related to patterns of sexual activity and to the relative rates of transmission from one sex to the other.

At the population level, the spread of an STD depends upon the average number of new cases of infection generated by an infected person. This can be described in terms of the basic or case-reproduction ratio (Ro) which, for an STD, depends upon the efficiency of transmission (β), the mean rate of sexual partner change (c), and the average duration of infectiousness (D). The higher the value of Ro the greater the potential for the spread of the infection:

$$Ro = \beta c D$$

Furthermore, the ways in which infected persons seek care, and the consequent delays in diagnosis and treatment, influence STD incidence and the probability of complications. Data on this issue are scarce, and better understanding of health-seeking behaviour is necessary to design STD interventions.

### Disease burden

In the 1993 World Development Report, 1990 estimates suggested that, in demographically developing countries, STDs excluding HIV accounted for 8–9% of the disease burden in women aged 15–45 years and 1.5% in men in the same age class. This ranked STDs, excluding HIV, as the second major cause of lost disability-adjusted life years in women of reproductive age.

The vast majority of the disease burden from STDs is a result of the complications and sequelae that may follow infection. For example, primary infection with gonorrhoea and chlamydia in women is usually asymptomatic. When left untreated, however, infections may migrate upwards from the lower reproductive tract and lead to pelvic inflammatory disease (inflammation of the uterus, fallopian tubes, ovarian, or other pelvic structures), chronic pelvic pain, tubo-ovarian abscesses, ectopic pregnancies, and infertility. In addition, untreated infections in pregnant women may result in fetal loss, stillbirths, low birth weight, and eye and lung damage in the newborn. Unraveling the relations between infection and the frequency and severity of its consequences is a complex exercise and few data are available; most studies have focused on assessing the aetiology of particular complications rather than the probability of developing a particular complication following infection.

### Factors affecting prevalence

- Inadequate sex education and health information
- Female circumcision and other practices
- Urbanisation and other migration
- Divorce of infertile women
- Local customs and traditions—eg, postpartum/permenstrual abstinence—high bride prices that delay marriage
- Inadequate sex education and health information

### Factors affecting morbidity

- Stigmas associated with seeking care
- Lack of available and appropriate care and information
- Antibiotic resistance
- Poorly performed transcervical procedures (abortion, intrauterine device insertion)

$$\text{Factors affecting morbidity:}$$

$$\text{Factors affecting prevalence:}$$

* Decreased social/financial productivity
* Decreased acceptance of contraception

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**Figure 2: Selected factors associated with female reproductive-tract infections (RTIs) in developing countries**

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**Table:** Estimated incidence of STDs (millions) in people aged 15–49 years for 1995

<table>
<thead>
<tr>
<th></th>
<th>Syphilis</th>
<th>Gonorrhoea</th>
<th>Chlamydia</th>
<th>Trichomoniasis</th>
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<tr>
<td></td>
<td>Men</td>
<td>Women</td>
<td>Men</td>
<td>Women</td>
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<td>0.072</td>
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<td>0.005</td>
<td>0.0009</td>
<td>0.009</td>
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<tr>
<td>Sub-Saharan Africa</td>
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<td>1.97</td>
<td>7.30</td>
<td>8.38</td>
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<tr>
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<td>14.56</td>
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<td>5.55</td>
<td>6.66</td>
<td>30.64</td>
<td>31.62</td>
</tr>
</tbody>
</table>

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**Figure 2:** Selected factors associated with female reproductive-tract infections (RTIs) in developing countries

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STD prevention and care

The control of STDs is a public-health priority and one that has become of even higher priority with the HIV epidemic. Since STDs and HIV share many behavioural risk factors, efforts to encourage individuals to modify sexual behaviours and adopt safer sexual practices will have a beneficial impact on both. In addition, data from a number of studies strongly suggest that both ulcerative and non-ulcerative STDs facilitate HIV transmission. As a result, a community-based, randomised trial has been proposed to examine whether strengthening STD control and, in particular, the treatment of STDs, could be an important way to reduce the transmission of HIV. Results from such a study in the Mwanza Region, Tanzania, have shown that this is indeed the case. A 12% reduction in the incidence of HIV was documented in the intervention communities that received improved STD treatment at a cost of US$10.15 per STD case treated.14

Ensuring prompt and effective treatment for all individuals with symptomatic infections is a challenge for health-care providers, especially with the development of antimicrobial resistance. Already, resistance in Neisseria gonorrhoeae is problematic and is emerging in Haemophilus ducreyi (see p 58). Ensuring prompt and effective treatment for symptom-free individuals, however, is an even bigger challenge and will require the development of new diagnostic tools that not only can detect symptomless infections but are rapid, non-invasive, easy to use, and inexpensive.

Even with improved STD treatment and prevention activities, individuals will remain whose initial infections were not diagnosed or treated appropriately. As a result, improving the diagnosis and clinical care of their complications and sequelae should be part of any comprehensive STD programme.

Evidence based on trends in reported cases suggests that public-health programmes have been effective in reducing the incidence of STDs. However, such trends need to be interpreted with caution, because differences in reported cases may reflect changes in how data were collected and access to care rather than a change in incidence. Despite this caveat, the data suggest grounds for optimism. For example, in Norway, the number of reported cases of gonorrhoea fell from more than 10,000 in 1981 to less than 300 in 1993. In Costa Rica, Chile, Zimbabwe, and Thailand, steady and sustained declines following active prevention programmes are occurring. Reduction of the prevalence and burden of disease associated with STDs requires a concerted effort by national public-health services, international and bilateral agencies, nongovernmental organisations, the private sector, and research institutions. A comprehensive, multifaceted strategy is required, which can address a problem that originates in the complex web of social and biological systems.

Primary and secondary prevention programmes need to be strengthened and integrated into health systems, and must be accessible to all. Key elements of these programmes include: first, health-promotion approaches aimed at empowering individuals and communities to avoid situations of risk in their specific social context; second, improved access to and quality of STD services including screening for curable STDs; third, improved access to technologies that people can use to prevent infection (eg, condoms); fourth, reduction of the stigma associated with STDs; and, finally, improved surveillance.

More research will also be required to improve this process, mainly directed at increasing our knowledge of the distribution of these infections, the link between infection and the development of different complications, and the role played by different factors (eg, genetic, environmental, and cultural) in the development of complications.

References