

ESTIMATION OF THE INCIDENCE AND PREVALENCE OF SEXUALLY TRANSMITTED INFECTIONS



Report of a WHO consultation
Treviso, Italy, 27 February-1 March 2002

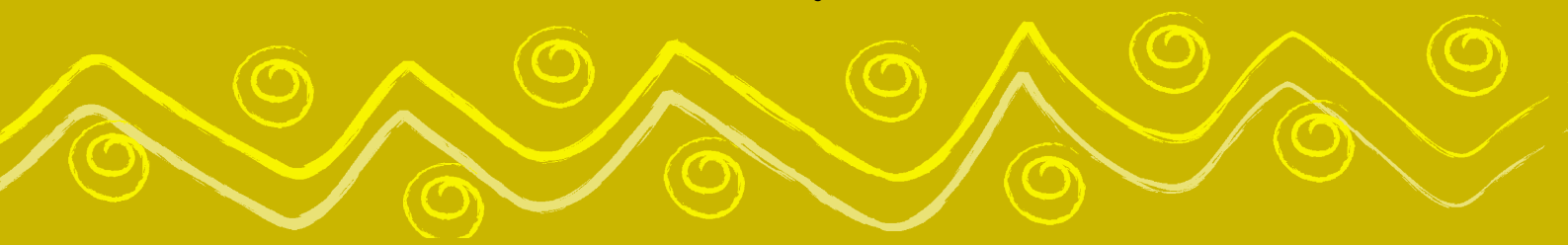


World Health Organization

with support of:



Veneto Region



WHO/HIV/2002.14
WHO/GDS/CSR/NGS/2002.7

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ACKNOWLEDGEMENTS

The World Health Organization (WHO) wishes to acknowledge the support from the Department for Health and Social Services, Veneto Region, and the Treviso and Mogliano Municipalities, Local Health Unit No 9, Italy for the local organization of the meeting. WHO also wishes to thank all those who participated and contributed their expertise in the consultations (see Annex 5) and those individuals that provided valuable comments on drafts of this report.

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ABBREVIATIONS

AIDS Acquired Immune Deficiency Syndrome

ANC Antenatal Care

BSS Behavioural Sentinel Surveillance

DHS Demographic and Health Survey

DNA Deoxyribonucleic Acid

FP Family Planning

GASP Gonococcal Antimicrobial
Susceptibility Programme

GIS Geographical Information System

HIS Health Information System

HIV Human Immunodeficiency Virus

HPV Human Papillomavirus

HSV Herpes Simplex Virus

ICD International Classification of Diseases

LCR Ligase Chain Reaction

MSM Men Sex with Men

NAAT Nucleic Acid Amplification Test

PCR Polymerase Chain Reaction

PID Pelvic Inflammatory Disease

RPR Rapid Plasma Reagin

STIs Sexually Transmitted Infections

STD Sexually Transmitted Diseases

UNAIDS United Nations Joint Programmes on AIDS

WHO World Health Organization

1. BACKGROUND

Sexually transmitted infections (STIs) are among the most common causes of illness in the world and have far-reaching health, social and economic consequences. STIs are not evenly dispersed, with the greatest burden falling on the developing countries and, within countries, on underprivileged people and women in particular. STIs are a major public health problem not only because of the morbidity of acute illness but also because they have serious sequelae and facilitate the transmission of human immunodeficiency virus (HIV).

Data on the prevalence and incidence of STIs and their complications are limited and substantially underestimate the burden of these diseases. Not only are STIs often asymptomatic but appropriate diagnostic tools are often not available. STIs are therefore often undetected and untreated, especially in resource-poor settings. The two main sources of information on STIs are national reporting systems and epidemiological surveys. However, even in countries with good reporting systems, many cases are not reported, either because they are asymptomatic or have nonspecific symptoms or because infected individuals do not seek care because of the social stigma attached to STIs. Consequently, the numbers of STI cases reported underestimate substantially the total number of cases. Epidemiological surveys can provide more accurate information on the prevalence of STIs. However, very few countries regularly conduct epidemiological surveys and these are often limited to specific population groups, limiting the usefulness of this information for national estimates of the burden of disease.

The lack of accurate and timely information on the burden of STIs hampers efforts to prevent and control them. Without data for advocacy, obtaining political commitment and getting resources allocated to improve diagnostics, treatment and preventive services are extremely difficult. Planning appropriate service delivery and monitoring the impact of interventions are also difficult in the absence of good epidemiological data. The end result is a lack of attention to and interest in the problem of STIs.

WHO attempted to address this problem in 1990 by generating global estimates of incidence and prevalence of selected curable STIs using a Delphi approach ^(1,2). Later, a standard method based on available STI prevalence data was developed and used to generate updated global and regional estimates in 1995 and 1999 ⁽³⁻⁵⁾. Although these data have been published in a peer-reviewed journal ⁽⁶⁾, international experts on STI epidemiology and modelling have not formally reviewed the current method. Recent guidelines for second-generation surveillance for HIV ⁽⁷⁾ highlight the utility of STI incidence and prevalence data as a means of monitoring trends in high-risk sexual behaviour. Thus, STI data could be used as biological markers for measuring the impact of intervention activities

promoting safer sex. Because STI control is a preventive intervention in the fight against HIV/AIDS, knowing the magnitude and distribution of STI cases is important. Fulfilling these goals and needs requires strengthening STI surveillance activities, reviewing the estimation methods for accuracy and identifying means of improvement.

WHO in collaboration with the Office of International and Social Health at the Department of Health, Veneto Region, Italy organized a consultation on the estimation of STI prevalence and incidence on 27 February–1 March 2002 in Treviso, Italy with the following objectives:

- to determine the strengths, weaknesses and appropriateness of the current WHO approach to estimating the prevalence and incidence of STIs;
- to identify the STIs or syndromes that are most appropriate for surveillance and the most appropriate methods for deriving estimates of their incidence and prevalence;
- to identify structural surveillance needs within countries;
- to determine the utility and feasibility of using specific STI data as indicators of HIV risk behaviour within the concept of second-generation HIV surveillance; and
- to make recommendations for how the data collected can best be used to prevent STIs and to improve the care of individuals with STIs or their outcomes.

To meet these objectives, the participants discussed:

- the available information on the incidence and prevalence of selected STIs in different countries and regions;
- the methods used by WHO for the 1995 and 1999 rounds of STI estimates; and
- the use of STI surveillance data as an indicator of HIV risk behaviour and for advocacy purposes.

2. DISCUSSION

The incidence and prevalence of STI are frequently used as important measures of HIV risk behaviour in many countries⁽⁸⁻¹¹⁾. WHO and UNAIDS have also recommended strengthening STI surveillance as an essential component of second-generation surveillance for HIV. To assist countries in improving STI surveillance activities, WHO and UNAIDS issued *Guidelines for sexually transmitted infection surveillance in 1999*⁽¹²⁾. This document explains the key concepts and the essential components of an STI surveillance system. The primary objectives of STI surveillance include supporting programme planning, measuring the disease burden for monitoring and evaluation and improving the care of people with STIs. Fulfilling these objectives requires a reliable set of indicators for STI incidence and prevalence. These indicators should be simple, inexpensive, representative, sensitive and specific.

Interpreting STI surveillance data is often difficult because of the presence of the following:

- a complex mix of case-reporting approaches, such as etiological, syndromic and laboratory-based;
- a mixture of incident and prevalent infections;
- a large number of asymptomatic infections; and
- the quality of the reported data, including the completeness of reporting, coverage of health care facilities and seeking of alternative treatments.

Generally, STI incidence and prevalence data are not readily available, especially in many developing countries.

2.1 Measuring the incidence of STIs

The incidence of cases of STIs is the best indicator for monitoring infection and thereby disease trends. STI incidence can be measured by the following methods:

- case reporting using a communicable disease surveillance system;
- prevalence studies among teenagers as a proxy indicator of the incidence of STIs of long duration because of a short period of sexual activity; and
- cohort or follow-up studies.

2.1.1. – Case reporting (communicable disease surveillance system)

Generally, reported cases represent the incidence of disease rather than infection. The proportions of infections reaching the attention of health care providers depend on the association between infection and disease, the recognition of disease and patterns of seeking and delivery of health care. Structurally, case reporting of sexually transmitted diseases (STDs) has been included as an integral part of the communicable disease surveillance system in both developing and industrialized countries for many years. It is a cost-effective way of obtaining minimum data on STD incidence that can be used as an indicator for monitoring and evaluating HIV and STI intervention activities if the data are collected consistently (Figure 1). When STD cases reported in a passive surveillance system are used to monitor STI incidence, patterns should be interpreted with caution owing to the many known biases such as: poor representation, underreporting, changes in patterns of health services utilization and misclassification of diseases. In addition, the quality of data obtained from the system may vary significantly between different geographical areas among countries, and using these reported cases to make meaningful comparisons at the regional or global levels is difficult. However, countries should continue making efforts to improve the case-reporting system to collect better quality data for monitoring disease trends at the country level.

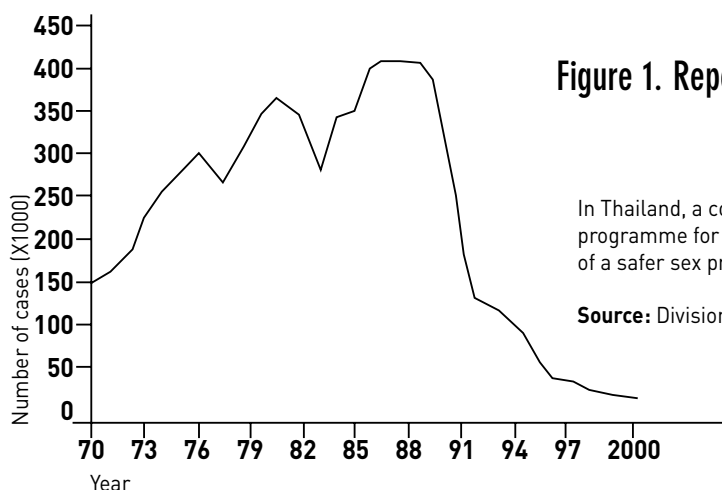


Figure 1. Reported number of cases of sexually transmitted disease in Thailand, 1970-2000

In Thailand, a consistently conducted surveillance programme for STIs enabled the government to monitor the effect of a safer sex prevention programme begun in the early 1990s.

Source: Division of Epidemiology, Ministry of Public Health, Thailand

Types of case reporting

Cases of STI episodes can be reported either etiologically or syndromically. Syndromic STI case reporting has been implemented as the standard STI case-reporting system in developing countries. In some regions, the ICD-10 codes are used to collect and collate the epidemiological data, which has created a problem as STI syndromes are not included in the current ICD definitions. Etiological case reporting is used in many industrialized countries where laboratory confirmation is used (Figure 2).

The case reporting is implemented as either a universal or a sentinel system. In some countries, a complementary sentinel surveillance system, which aims to collect better quality data, is implemented together with the universal reporting system⁽¹³⁾. The epidemiological information obtained from the representative sentinel surveillance clinics could be used to validate the quality of data collected from the universal reporting system.

Selection of diseases or syndromes to indicate incidence

Diseases or syndromes that have an acute onset, are symptomatic and are specific for recent infection with an STI pathogen(s) are the best indicators of STI incidence. Laboratory-confirmed gonorrhoea in men and primary and secondary syphilis are often used as incidence indicators in industrialized countries. In many developing countries, the collection of data on selected

STI syndromes such as urethral discharge in men, genital ulcerations and vaginal discharge is proposed to provide proxy measures for STI incidence. At present, urethral discharge in men has been accepted as the most appropriate proxy indicator to measure the incidence trends where case reporting is consistent.

The quality of STI syndromes in measuring STI incidence varies significantly (Table 1). The predictive value of each syndrome depends on the relative prevalence of the agents causing the STI syndromes. For example, bacterial vaginosis, which is not an STI, is a common cause of vaginal discharge in some regions, and recurrent genital herpes reported as genital ulceration may indicate a recurrence of a persistent infection. Information on the relative prevalence of causative agents for an STI syndrome is therefore essential for meaningful interpretation of reported STI syndromes as a proxy measure for STI incidence. This information could be used to translate the reported STI syndromes into causes.

Figure 2.
Incidence of gonorrhoea and syphilis in Italy based on mandatory notification, 1955-1999

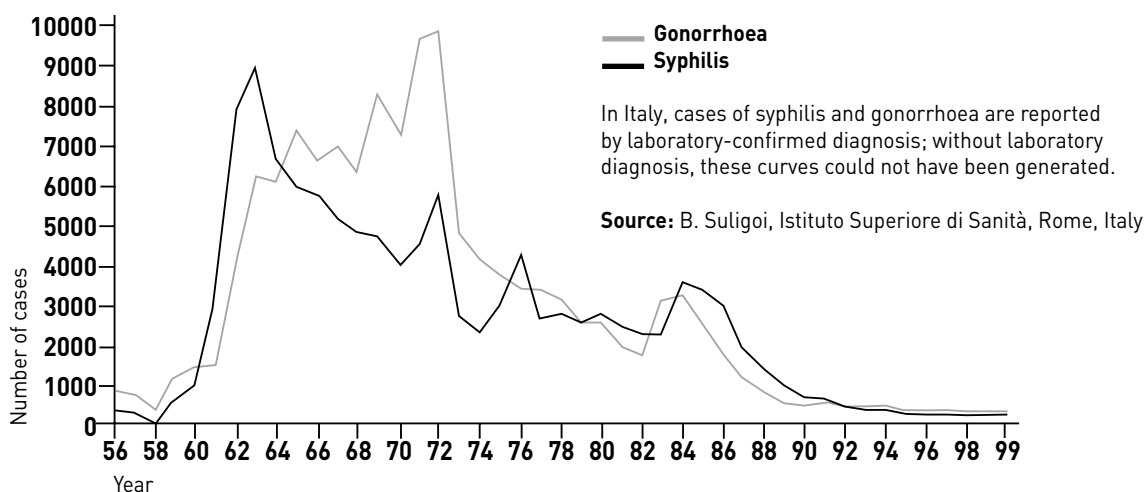


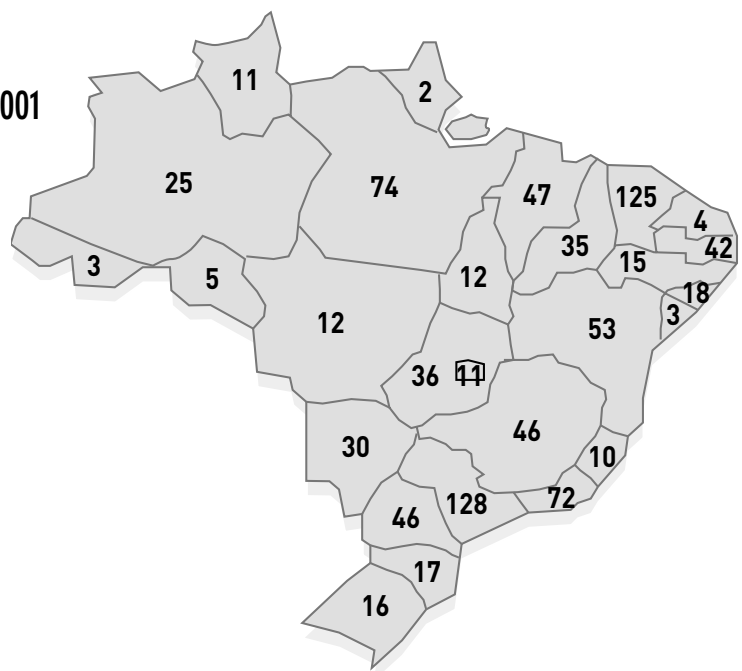
Table 1. Estimated quality of STD syndromes and infections as measures of STI incidence

Good	Fair	Poor	Unknown
Urethral discharge (men)	Genital ulcers (nonvesicular)	Vaginal discharge	Pelvic inflammatory disease
Gonorrhoea (men)	Primary and secondary syphilis	Latent syphilis	
Chlamydia (men)		Genital warts	
		Vesicular ulcers	

Evaluation of surveillance systems

In general, the quality of data collected through case-reporting systems depends on the overall performance of the communicable disease surveillance system of a country. In 2001, WHO published a protocol for the assessment of national communicable disease surveillance and response systems⁽¹⁴⁾. This protocol could be adapted and used to evaluate the performance of the STI surveillance system in countries. In addition, in-depth understanding of the health care-seeking behaviour of people with STI symptoms is essential in determining the level of underreporting. This information is also required for effective programme planning. Ongoing evaluation of the STI surveillance system should be integrated into the overall assessment of the STI programme. Experience from Brazil has highlighted that improving the STI surveillance system could best be integrated into an overall upgrading of STI care services (Figure 3).

Figure 3. Enhanced STI surveillance system in Brazil, 2001



Health units improved for STI care, Brazil - 2001
Total= 1.054

Reporting sites:

- The health units upgraded for STI/HIV/AIDS care
- Antenatal and delivery clinics

Widespread enhancement of STI care services in 2001 enabled Brazil to simultaneously improve its STI surveillance system.

Source: F. Moherdau, STD and AIDS Program, Brazil

2.1.2 – Prevalence studies among teenagers

Another proposed method for measuring STI incidence is conducting a series of STI seroprevalence studies, such as syphilis and herpes simplex virus 2 (HSV-2) serology among youth (such as those 15–24 years old). These studies could be conveniently integrated into the existing HIV sentinel seroprevalence surveys. Other information such as «self-reported history of urethral discharge in men during the last 12 months» has been collected as an incidence indicator in some population-based studies (such as demographic and health surveys and behavioural sentinel surveillance studies). However, more research is required to explore the quality and validity of these indicators as a measure of STI incidence.

2.1.3 – Cohort studies

Conducting large-scale cohort studies at regular intervals to measure STI incidence is not logistically, technically or financially feasible. However, cohort studies might be used to measure the impact of specific intervention activities on STI incidence in a specific region^(15,16). A secondary outcome from such studies is STI incidence among control individuals or communities, which should provide a measure of STI incidence in the absence of the study interventions.

2.2 Measuring the prevalence of STIs

The prevalence of STIs can best be measured by detecting infections that are asymptomatic and persistent (Table 2). These data can be collected from routine screening services (such as rapid plasma reagin screening for antenatal care attendees, blood donors and occupational health units) or from prevalence studies. Asymptomatic infections caused by certain STIs (such as gonorrhoea and *Chlamydia*) are common, especially among women. Studies detecting these STIs among sexually active women are a measure of prevalence in the community. Standard survey methods must be followed to obtain unbiased prevalence estimates for study populations. Laboratory investigations are usually required, and the variation in the performance of laboratory tests should be taken into account when comparing the prevalence data from different studies.

2.2.1 – Selection of the study population

The population groups should be selected at the country level. WHO can assist in developing a framework or standard survey methods to ensure the comparability of prevalence data within countries over time as well as between countries. Population-based prevalence studies are preferable, as they provide representative estimates of STI prevalence for the whole population.

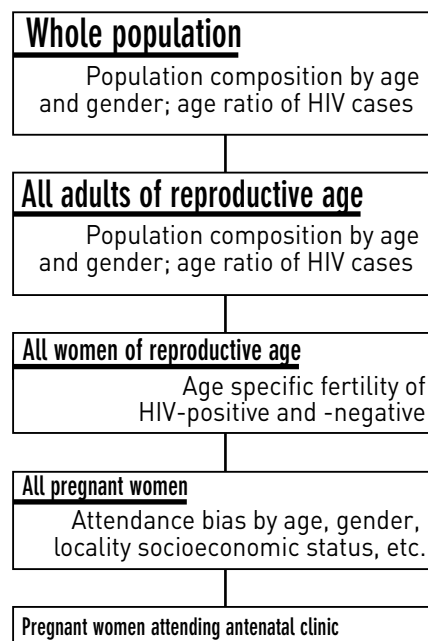
Table 2. Estimated quality of STD syndromes and infections as measures of STI prevalence

Good	Fair	Poor	Unknown
Gonorrhoea <i>Chlamydia</i>	Syphilis serology <i>Trichomonas</i>	Vaginal discharge Urethral discharge ^a Genital ulcers ^a	Chlamydial serology

^aMay be useful for monitoring prevalence when people are examined for reasons other than having symptoms

As in the case of HIV sentinel seroprevalence studies, women attending antenatal care clinics might be used as a proxy for the rest of the population. Based on the experience of existing HIV sentinel surveillance systems, women attending antenatal care clinics have many competing biases, and these biases change over time (Figure 4). For example, increases in subnormal fertility and spontaneous abortion associated with syphilis, HIV and other STIs might influence the prevalence of STIs and HIV observed among childbearing women. This effect has been documented in some studies conducted in Africa⁽¹⁷⁾.

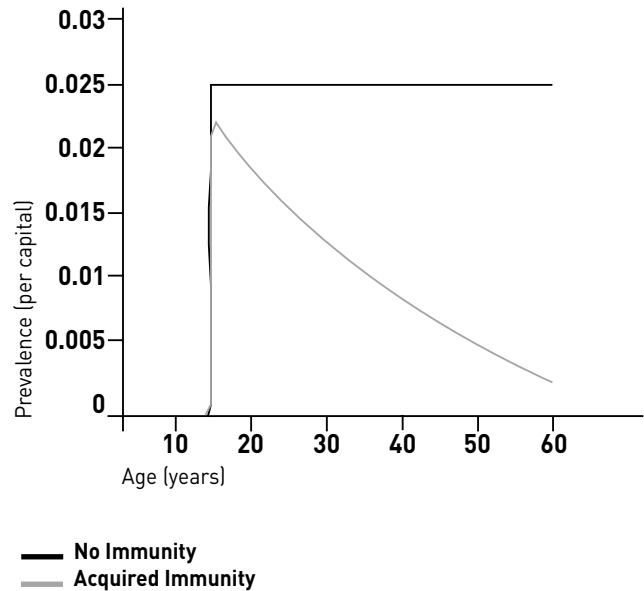
Figure 4. Biases in HIV sentinel surveillance



Source: G. Garnett, Department of Infectious Disease Epidemiology, Imperial College, London, United Kingdom

Figure 5. Impact of acquired immunity on STI disease dynamics

Other important issues to be considered when interpreting the STI prevalence data from these studies include the changes in host susceptibility related to age and/or immunity, such as higher prevalence rates of trichomoniasis in older women and higher *Chlamydia* prevalence rates in younger women (Figure 5).



Hypothetical model of prevalence of an STI with a short duration of infection with or without acquired immunity at a young age.
Source: G. Garnett, Department of Infectious Disease Epidemiology, Imperial College, London, United Kingdom

Local information on other possible sources of bias, such as rural-urban and gender differences in STI prevalence, should be sought and appropriate adjustments should be made if systematic biases can be estimated. If possible, the prevalence obtained from a sentinel population should be validated with those obtained from population-based studies (Box 1). If resources permit, these prevalence studies should be conducted in other vulnerable population groups (such as sex workers, youth and men who have sex with men) for the purpose of planning programmes.

Box 1. Population-based studies of STI prevalence

Population-based and community-based microbiological surveillance

- More accurate than sentinel groups
- Requires appropriate sampling techniques
- Allows the total burden of disease to be estimated
- Allows the relative prevalence of symptomatic versus asymptomatic disease to be estimated
- Facilitates the targeting of groups in the community that do not seem to be at risk of infection

2.2.2 – Selection of the diagnostic methods

Laboratory tests and specimen collection

Laboratory methods must be selected consistently to ensure the comparability of prevalence data, especially for monitoring and evaluation purposes. However, establishing a global standard for the laboratory methods to be used in STI prevalence studies is difficult. The decision should be made locally based on the feasibility (technical and logistics) and affordability of specific tests to be used within a country. Generally, the most sensitive and specific laboratory methods a country can readily afford should be used. However, ensuring that the performance of the chosen tests has been well evaluated internationally as well as locally is important.

Selection of the type of specimens and collection methods depends on the study population. For population-based studies (such as household surveys) where genital specimens cannot be easily obtained, nucleic acid amplification tests are required to detect STIs from the alternative specimens such as urine (for example, ligase chain reaction to detect gonococcal and chlamydial infections). A wide range of laboratory methods such as microscopy, culture and antigen detection methods can be used for institution-based studies (such as antenatal care and family planning clinics), where genital specimens can be collected. The DNA detection methods (with or without amplification) are more appropriate for the studies conducted in remote areas with long delays in transporting specimens. Newly developed point-of-care tests might also be used for this type of study. Other innovative approaches for specimen collection and testing, such as self-collected vaginal swabs, tampons and pooling of specimens, must be evaluated under local conditions to assess their performance as well as acceptability to the people being tested.

Overall, the standard clinical, laboratory and ethical guidelines must be followed in collecting, storing, transporting and testing the clinical specimens in these studies.

Quality assurance

Appropriate on-site training in performing these tests and interpreting the results must be conducted. WHO and its partner organizations can help to establish regional STI reference laboratories to assist with conducting quality assurance and accreditation programmes for STI diagnosis procedures.

2.2.3 – Implementation of prevalence studies

If resources permit, prevalence studies should be conducted at least once every 3 years to provide essential information for estimating the burden of STD at the country level. These studies should at least detect priority STIs: syphilis, *Chlamydia*, gonorrhoea, trichomoniasis and HSV-2. The list should be reviewed regularly, as the priorities may change.

The participants recommended that the prevalence studies be included in the national STI surveillance framework. The departments responsible for HIV/AIDS and STIs and the health information system should clearly define the plan of work and responsibilities for planning and implementing these studies. WHO can assist in preparing policy and operational guidelines for measuring STI prevalence at the country and regional levels. In addition, WHO and its partner organizations can provide technical and financial assistance for collecting STI prevalence data, especially in resource-poor countries.

2.3 – Estimating the prevalence and incidence of STIs

Globally, STI surveillance systems are based mainly on the reporting of symptomatic STI cases. Underreporting is a major problem in assessing the total burden of STIs in both developing and industrialized countries⁽¹⁸⁾ (Table 3). In addition, these reported cases only reflect the minimum incidence of STIs, as significant proportions of individuals with STIs are asymptomatic. The global and regional STI incidence is currently substantially underestimated because of significant underreporting that is partly associated with a high level of asymptomatic infections. Estimates of the global and regional STI incidence are therefore generated periodically, using a standard method.

Table 3. Underestimation of gonorrhoea and syphilis cases reported by mandatory notification and by 85 STD clinics in Italy, 1986-1988

	Gonorrhoea	Syphilis
Cases reported by STD clinics	991	2 350
Cases reported by mandatory notification	509	995

Source: Greco et al. ⁽¹⁸⁾

WHO generated estimates of STI prevalence and incidence in 1995 and 1999 to highlight the global burden of STIs. The key parameters used in estimating prevalence include the (median) prevalence of specific curable STIs in low-risk population groups and the size of the sexually active population. Adjustments were made to correct potential variation in prevalence by age, gender, geographical location (rural versus urban) and the performance of the laboratory tests applied (Box 2).

A major weakness of the STI estimates in 1995 and 1999 is the lack of unbiased prevalence estimates in many countries. Prevalence data collected for different purposes were used for the estimation, and the survey methods used in obtaining these data varied substantially. In many countries where STI prevalence data were not available, the prevalence rates of neighbouring countries or similar countries were applied.

In 1995 and 1999, the incidence estimates were generated using a formula based on the relationship between prevalence and incidence (Boxes 3 and 4). The duration of infection for each STI (asymptomatic, adequately treated and untreated symptomatic) was estimated based on the information available in the literature (Annex 3). Unfortunately, limited information was available because of the ethical and logistical difficulties in conducting these types of studies. The quality and coverage of STI care services in individual countries were not available, and a best guess was used for the proportion of people with STIs who were adequately treated (Annex 4).

Box 2. Method used to estimate STI prevalence and incidence, 1995 and 1999

Steps in estimating prevalence

- Search published and unpublished data
- Create a prevalence database recording the following information:
 - the population sampled: age, gender, location and population group
 - the date the samples were collected
 - study design: sampling procedure, sample size, diagnostic methods and time period
- Generate prevalence estimates by region and country for men and women based on a subset of studies after 1985 in low-risk populations with:
 - scaling to the whole population 15–49 years old
 - adjusting for the sensitivity of the test used
- For regions and countries with limited or no data from low-risk populations, estimates based on all available data, data from surrounding countries and discussions with experts
- For trichomoniasis, for which data are seriously lacking, assume for all regions:
 - the prevalence in adult females is twice the prevalence of *Chlamydia* in adult females
 - the prevalence in adult males is 10% of the prevalence of *Chlamydia* in adult females

Box 3. Method used to estimate STI incidence in 1995 and 1999

$$\text{Incidence} = \text{prevalence} / [(1 - \text{prevalence}) * \text{duration}]$$

Assumptions:

- * Steady-state prevalence of infection
- * Constant population size

Box 4. Method used to estimate the duration of infection for gonorrhoea, Chlamydia and trichomoniasis in 1995 and 1999

- Estimated proportion of individuals who are symptomatic
- Estimated proportion of individuals treated if:
 - symptomatic
 - asymptomatic (contact tracing and inadvertent correct treatment)
- Estimated duration of infection if:
 - untreated
 - symptomatic and treated
 - asymptomatic and treated
- Generate estimates of duration of infection

Separate calculations were made for men and women for each region.

A theoretical review of the options for improving estimates of STI incidence and prevalence was presented and discussed during the Consultation. Unlike the HIV sentinel surveillance system, no mechanism has been established to collect regular and consistent STI prevalence data in many countries. Collecting unbiased STI prevalence data at the country level is important for generating high-quality estimates in the future. Attention must be paid to important methodological issues such as: selection of the study population, sample size, interpretation of laboratory results and differences in prevalence by gender and by urban versus rural location. Caution should be exercised when interpreting these prevalence data, as observed and actual prevalence rates might differ substantially in poorly conducted studies. In fact, the quality of available STI prevalence data often varies significantly. The quality of estimates should therefore be graded based on the quality of prevalence data used in the process. The level of population coverage, validity of study design and performance of laboratory methods should be considered in determining the quality of these data.

In addition, the users and functions of STI estimates must be clearly defined to determine the methods and assumptions required (Box 5). The complexity of the estimation method and subsequent utility of the estimates depend on the quality of the data.

Box 5. Functions of estimates of STI prevalence and incidence

- Advocacy
- Mobilizing and allocating resources
- Planning
- Identifying problems
- Monitoring time trends
- Focusing intervention

2.3.1 – Syphilis

Many developing countries have established programmes of antenatal screening for syphilis to prevent congenital syphilis. In addition, syphilis serology has been conducted as an integral part of HIV sentinel seroprevalence surveys in some countries. The information collected from these existing activities could be used in estimating the prevalence of syphilis. As in HIV seroprevalence studies, attempts should be made to identify and overcome the biases associated with antenatal care

prevalence data by validating them against data obtained from the population-based surveys, if available. This process will also provide standard ratios or compensating factors for age, gender and rural-urban differences, which could be used in similar populations. Directly comparing syphilis seroprevalence rates between different regions or countries could be difficult because the testing protocols vary considerably. The prevalence estimates should therefore be generated separately according to the testing protocols used: for example, a non-treponemal test alone, a non-treponemal test confirmed by a treponemal specific test or a specific treponemal test alone.

The method for estimating the incidence of syphilis should depend on the seroprevalence rates of a country. In low-prevalence settings (based on prevalence rates among women attending antenatal care clinics) with good reporting networks, routine case reporting could be used to provide the minimum incidence of syphilis in the populations. In high-prevalence settings, the prevalence among young women attending antenatal clinics could be used as a marker of incidence for trends and comparisons. Although the age group 15–24 years has been proposed, the definition of young women should be based on the local knowledge of the age of sexual debut. An exploration of reported data on neonatal syphilis to validate these incidence estimates has been suggested.

2.3.2 – Chlamydia

In recent years, more prevalence data has become available from population-based studies and screening services, especially in industrialized countries. These observed prevalence data could be used to generate better estimates of *Chlamydia* prevalence and incidence. Unfortunately, similar population-based data are not widely available in developing countries, where the available prevalence data were mainly collected from studies evaluating syndromic management algorithms. However, the working group reported that the prevalence of *Chlamydia* infection among women presenting with vaginal discharges was similar to that of the asymptomatic women from the same population groups. The prevalence data obtained from the studies evaluating syndromic STI management algorithms might therefore be used as a proxy measure for *Chlamydia* prevalence in all sexually active women. These prevalence rates should be validated using the prevalence data obtained from population-based studies, where available. The working group also reported that, in studies conducted in Africa, the *Chlamydia* prevalence in men is approximately half that of women from the same population⁽²⁰⁾. Similar studies should be conducted in other regions to quantify the gender differences in prevalence.

Numerous laboratory methods are available for detecting chlamydial infection, and their performance varies substantially. The performance of the laboratory tests should be adjusted for to make a valid comparison between different studies. Similar to syphilis estimates, estimates should be graded according to the quality of the prevalence data used.

2.3.3 – Gonorrhoea

In developing countries, gonococcal prevalence studies are conducted in diverse population groups for different purposes. An approach similar to that discussed for *Chlamydia* estimation should be used for selecting sentinel population groups, validating prevalence data and updating the assumptions. Unlike *Chlamydia*, limited prevalence data are available from population-based studies and routine screening services in industrialized countries. In these settings, case reporting from the clinics and laboratory networks should be used for estimating both prevalence and incidence.

2.3.4 – Trichomoniasis

Limited information on the prevalence of trichomoniasis was available during the 1990s. The incidence and prevalence of trichomoniasis were therefore estimated in 1995 and 1999 based on *Chlamydia* prevalence. Since then, the quality of prevalence data has improved because of newly developed laboratory methods such as polymerase chain reaction. Current research studies exploring the potential use of trichomoniasis prevalence in measuring the impact of STI and HIV intervention activities might generate better prevalence data. As with other STIs, all assumptions should be reviewed and updated.

2.3.5 – HSV-2

The working group recommended that attempts be made to include HSV-2 in the future estimates, as evidence is growing of its association with the transmission of HIV (21,22). Studies have shown that teenagers with positive HSV-2 antibody had a higher HIV prevalence rate, and the presence of recurrent HSV-2 episodes may increase the chance of acquiring HIV infection. In addition to this potential biological role, the types of risk behaviour leading to HSV-2 and HIV infection are likely to overlap. HSV-2 seroprevalence might therefore be suitable as a proxy indicator for HIV risk behaviour, especially among teenagers. The estimation of HSV-2 prevalence should be based on available seroprevalence studies. Seroprevalence studies on HSV-2 could be integrated into sentinel HIV surveillance along with syphilis serology in the future. Meanwhile, the estimation process should be limited to the countries with available seroprevalence data.

2.3.6 – Human papillomaviruses (HPV)

More prevalence data would be useful, especially for oncogenic types. The natural history of HPV, including the role of natural immunity and the rate of progression to cancer of the cervix, should be reviewed regularly. It was suggested that, at present, HPV should not be included in the estimation process because available data on its prevalence are limited in many developing countries.

2.3.7 – Chancroid

The increased use of the multiplex polymerase chain reaction method to determine the causes of genital ulceration will generate better prevalence data for chancroid. The growing interest in interactions between HSV-2 and HIV might stimulate more studies on the causation of genital ulcer. The relative prevalence of chancroid obtained from these studies could be used for future estimation purposes. An enhanced surveillance system required to support the elimination of chancroid might also generate better quality data, especially in hyperendemic regions.

2.3.8 – STI syndromes

It was agreed that the reported number of cases of STI syndromes is more useful for programme planning at the country level than for international comparison. However, this might be useful to highlight the global burden of STIs and especially their influence on the health systems of different countries. Future documents should highlight the relationships between the infections included in the estimates and STI syndromes. In addition, estimating STI syndromes will assist in calculating the cost of care and economic burden caused by STIs. The estimation of STI syndromes should be included in global estimates when syndromic reporting systems improve in most countries. The methods for estimation should be developed with the assistance of a small reference group.

2.4 Dissemination of STI surveillance information

Regularly disseminating STI surveillance information at the global, regional and country levels is important. This process will stimulate the countries with limited STI epidemiological data to collect more information.

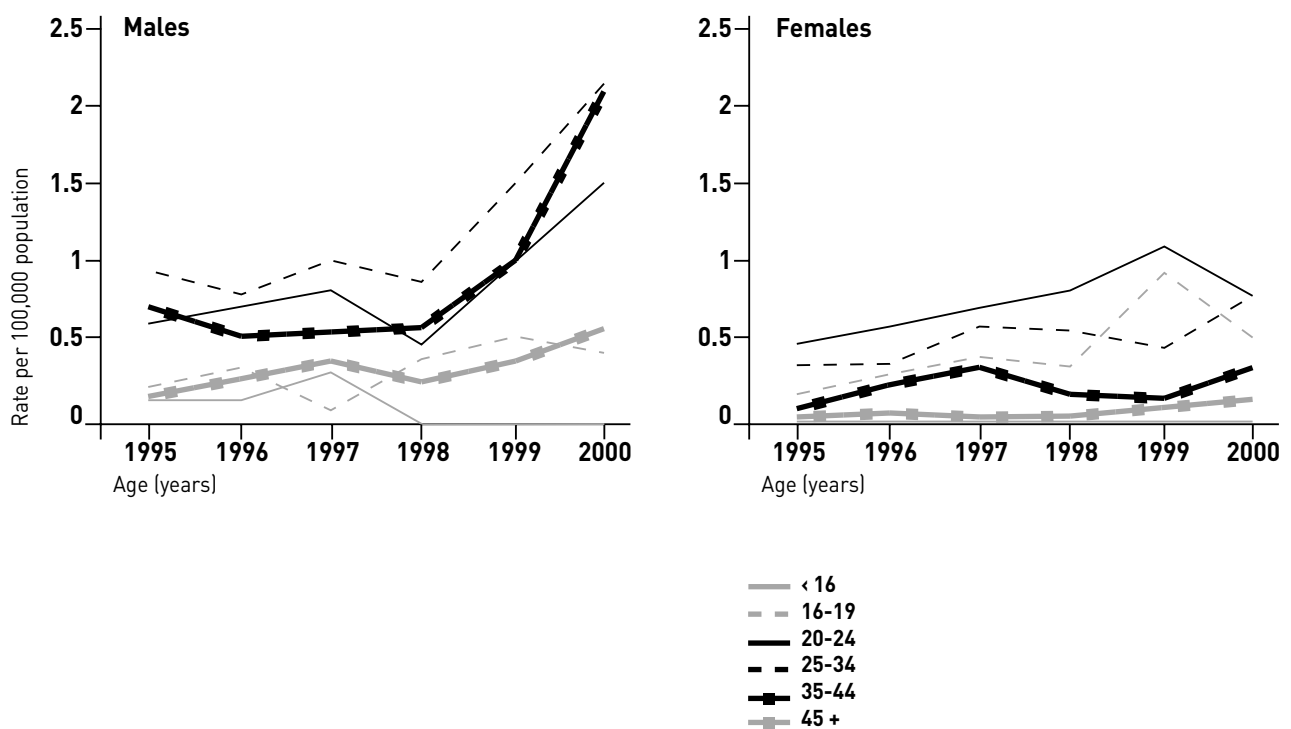
WHO should improve the completeness of STI prevalence data in the global STI database in collaboration with its partner organizations and individual countries. The accessibility of these databases should be improved using available information technology, including Web-based databases and e-mail discussion groups.

2.5 Incidence and prevalence of STIs as an indicator of recent changes in sexual behaviour related to HIV

Measuring the incidence of HIV infection is technically difficult because of the long period of the asymptomatic infection and life-long positivity to currently available diagnostic tests (that is, HIV antibody tests). In contrast, some bacterial STIs are highly infectious with a short incubation period, and most infected people are symptomatic and curable. In industrialized countries, the increases in laboratory-confirmed cases of gonorrhoea and infectious syphilis have been associated with the increase in unprotected sex among men who have sex with men. The incidence of some STIs could therefore be used as an indicator of recent changes in the types of sexual behaviour that create a high risk for the transmission of HIV infection (Figure 7). A significant decline in STI incidence in a region might indicate the success of intervention activities before a significant change in the prevalence of HIV infection becomes evident⁽²³⁻²⁵⁾. STI incidence data could therefore be used as an outcome measure for HIV intervention activities (Figure 8). Monitoring and evaluation of HIV and STI intervention activities should be improved by triangulating data on STIs, HIV infection and behavioural surveillance.

The working group suggested that the incidence of male urethral discharge and HSV-2 antibody and syphilis seroprevalence among young women attending antenatal care could be used as potential indicators of sexual behaviour that creates a high risk for the transmission of HIV infection. A small working group should be established to explore the validity and sensitivity of STI prevalence and incidence indicators in measuring HIV risk behaviour.

Figure 7. Diagnoses of infectious syphilis at genitourinary medicine clinics in the United Kingdom according to gender and age group, 1995-2000



Data are currently unavailable from Scotland for 2000 and from N. Ireland for 1996 & 1997

Source: Source: HIV/STI Division, Communicable Disease Surveillance Centre, PHLS, London, United Kingdom

2.6 Future research needs

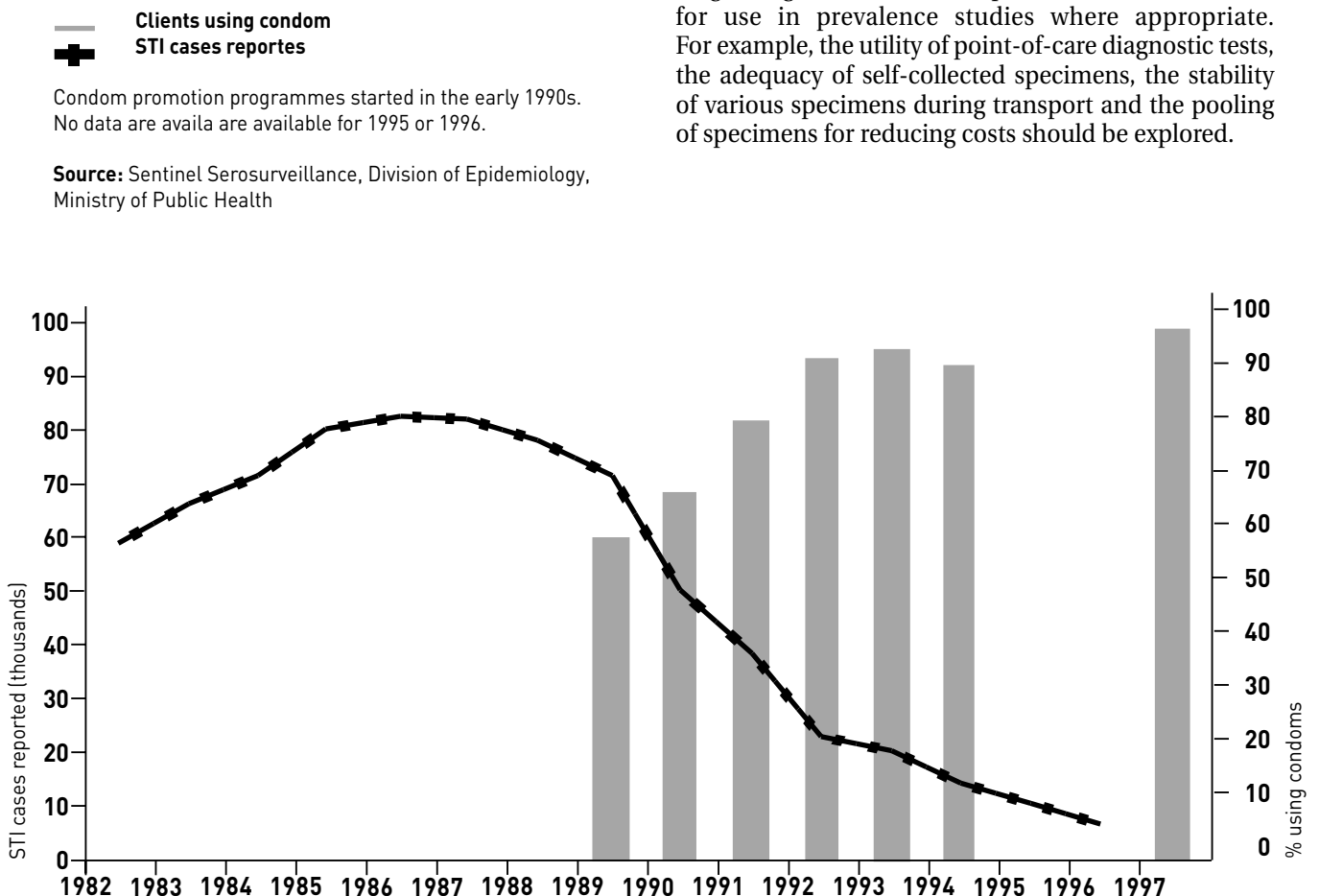
Research studies such as studies on the causation of important STI syndromes (that is, urethral discharge, genital ulcer and vaginal discharge syndromes) and the antimicrobial susceptibility of STI agents (especially *Neisseria gonorrhoeae*) should be conducted at regular intervals. These studies will contribute to improving the effectiveness of STI management. In addition, the relative prevalence of causative agents that cause a specific STI syndrome could provide better understanding of the local epidemiology of STIs.

Innovative research studies should be done to improve the assumptions used in estimating STI prevalence and incidence. These studies include the natural history of people with treated and untreated STIs, such as the proportion of people who become symptomatic, the duration of untreated and treated infections, the proportion that progresses to complications and the proportion adequately treated.

The validity of self-reported STIs recorded in population-based studies such as demographic and health surveys and behavioural surveillance studies should be evaluated.

The potential use of newly developed methods for diagnosing STIs should be explored and recommended for use in prevalence studies where appropriate. For example, the utility of point-of-care diagnostic tests, the adequacy of self-collected specimens, the stability of various specimens during transport and the pooling of specimens for reducing costs should be explored.

Figure 8. Percentage of clients of female sex workers using condoms and number of STI cases reported by public clinics in Thailand, 1982-1997



3. CONCLUSIONS

STI surveillance has existed for several decades, but the approach used has changed substantially over that time. Historically, venereal diseases were notifiable conditions in many countries. The diagnosis and management of STIs advanced rapidly during the 1990s. However, the complexity of natural history and clinical presentation of STIs imposed a major barrier to implementing comprehensive STI surveillance systems, especially in developing countries. Lack of confidence in the quality of data generated from STI surveillance systems leads to poor utilization of the available data. This leads to a sequence of negative events in many developing countries: poor advocacy, poor political commitment and poor resource allocation for STI care and surveillance.

WHO generated estimates of STI prevalence and incidence to use as advocacy tools in 1990. Over the past decade, attempts have been made to improve the quality of these estimates by introducing various evidence-based approaches. During this Consultation, WHO and its partner organizations have committed not only to further improving the existing methods of estimation but also to upgrading overall global STI surveillance activities. This process will assist in the efficient provision of essential STI prevention and care services, including the monitoring and evaluation of intervention activities.

4. RECOMMENDATIONS

Estimation of STI incidence and prevalence

1. The methods WHO currently uses for estimating the global and regional prevalence and incidence of STIs for advocacy purposes are acceptable, given the quality and quantity of the epidemiological data on STIs currently obtainable on a global and regional basis. The methods are recommended for continued use until a periodic review by a duly constituted scientific working group determines that additional data on the biology and epidemiology of STIs warrants changes.
2. The estimation exercise should not be carried out more frequently than every 3 to 5 years.
3. Future STI estimates should continue to include syphilis, gonorrhoea, *Chlamydia* and trichomoniasis. HSV-2 should also be included in the estimates for the countries in which seroprevalence studies have been carried out.
4. When the quality and quantity of obtainable epidemiological data on STIs have improved sufficiently on a country-by-country basis, estimates of STI prevalence and incidence by country should be included in future estimation exercises. These estimates should be developed in collaboration with countries.
5. WHO should establish a small scientific working group to review and recommend the methods and assumptions used for estimating STI prevalence and incidence at the country, regional, and global levels. This group is also envisaged as one that could assist WHO in deciding when country-specific STI estimates would be appropriate.
6. WHO should redesign and update a global data bank on STI prevalence and incidence data and actively promote the collection of information from both official and unofficial sources. A protocol with a standardized method and database format should be developed for collecting, collating and validating these data.
7. WHO should facilitate, by a scientific working group or by other means, a review of the methods used to estimate the morbidity and mortality associated with the sequelae and complications of STIs.
8. Estimating the incidence of STI syndromes is useful in estimating STI-related morbidity and projecting the cost of STI care. A small scientific working group should be convened to design estimation methods and to explore further the quality of data available from STI syndromic case reporting.

STI surveillance

1. The working group agreed that the WHO *Guidelines for sexually transmitted infection surveillance* ⁽¹²⁾ from 1999 is a comprehensive and useful document. WHO should extend its usefulness by developing instructional manuals to facilitate the implementation of these guidelines at the country level.
2. It was agreed that syndromic reporting should be recommended as the standard STI case-reporting system in developing countries.
3. WHO should encourage countries to collect and compile the annual incidence of reported STI syndromes and should assist in regular dissemination. Appropriate adjustments should be made to account for the limitations of these data, especially for making comparisons between countries. The main function of such data is to identify programme needs.
4. It was recommended that countries be encouraged to conduct prevalence (population-based) studies on selected STI priority diseases (syphilis, gonorrhoea, *Chlamydia*, trichomoniasis and HSV-2) every 3–5 years.
5. These prevalence studies should be conducted in the general population or in selected population subgroups using standardized or cross-comparable methods. These subgroups might be selected as a proxy for the general population, such as pregnant women at selected antenatal clinics, or selected as a proxy for a higher-risk group as a whole.
6. The selection of populations and laboratory tests to be used in these studies should be determined at the regional or country level. The working group acknowledged that the choice of population groups and the laboratory tests might vary from country to country. WHO should provide technical assistance to laboratory testing protocols for STIs specific to developing countries and to each disease.
7. Antimicrobial susceptibility testing should be promoted through existing networks, such as the Gonococcal Antimicrobial Susceptibility Programme (GASP), with greater emphasis on standardized sample collection methods, preferably population-based.
8. Algorithms on the selection and use of STI laboratory methods for different purposes (such as screening, diagnosis, case management and surveillance) should be developed to provide standard and cost-effective approaches.
9. WHO should promote the development of national

quality assurance systems for STI laboratory procedures, including regular proficiency testing, with accreditation of laboratories, as well as promoting routine internal monitoring of laboratory quality assurance. To facilitate this, WHO should assist in the establishment of regional STI reference laboratories.

10. Graphical display tools such as the WHO HealthMapper should be used to disseminate data on STI prevalence and incidence at the global, regional or country level.

Research needs

1. A small scientific working group should be established to review and recommend STI indicators for assessing population-level changes in behaviour and practices associated with the risk of HIV or STIs as well as future research needs.

Examples of possible indicators include positive syphilis serology rates among women attending antenatal clinics who are 15–19 or 15–24 years old, rates of self-reported urethral discharge among men in sentinel surveillance studies of behaviour and HSV-2 seroprevalence among teenagers.

2. Improved information on the natural history of STIs is needed. Research studies on the duration of infection, the proportion of infections that become symptomatic and the rate of development of complications should be encouraged.
3. Operational research studies such as assessment of STI surveillance systems, examining the quality of reported data and assessing health care-seeking behaviour for STIs, should be conducted to evaluate the level of underreporting, reporting delay and incomplete diagnosis in STI surveillance data.

References

1. *Sexually transmitted infections increasing: 250 million new infections annually*. Geneva, World Health Organization, 1990 (WHO Features, No. 152).
2. De Schryver A, Meheus A. Epidemiology of sexually transmitted diseases – the global picture. *Bulletin of the World Health Organization*, 1990, 68: 639–654.
3. *Global prevalence and incidence of selected curable sexually transmitted diseases: overview and estimates* (whqlibdoc.who.int/hq/1995/WHO_GPA_STD_95.1_RE V.1.pdf). Geneva, World Health Organization, 1995 (accessed 20 August 2002).
4. Gerbase AC, Rowley JT, Mertens TE. Global epidemiology of sexually transmitted diseases. *The lancet*, 1998, 351(suppl 3): 2–4.
5. *Global prevalence and incidence of selected curable sexually transmitted infections: overview and estimates*. Geneva, World Health Organization, 2001 (document WHO/HIV_AIDS/2001.02, WHO/CDS/CSR/EDC/2001.10).
6. Gerbase AC, Rowley JT, Heymann DH et al. Global prevalence and incidence estimates of selected curable STDs. *Sexually transmitted infections*, 1998, 74(suppl 1): s12–s16.
7. World Health Organization and Joint United Nations Programme on HIV/AIDS. *Guidelines for second generation HIV surveillance*. Geneva, World Health Organization, 2000 (document WHO/CDS/CSR/EDC/2000.5).
8. Renton AM, Whitaker L. Using the classical STDs to monitor HIV prevention programmes. In: Paccaud F et al., eds. *Assessing AIDS prevention*. Basle, Birkhauser Verlag, 1992: 32–51.
9. Renton AM, Whitaker L. Using STD occurrence to monitor AIDS prevention. *Social science and medicine*, 1994, 38: 1153–1165.
10. Wolitski RJ, Valdiserri RO, Denning PH et al. Are we headed for a resurgence of the HIV epidemic among men who have sex with men? *American journal of public health*, 2001, 91: 883–888.
11. Stolte IG, Dukers NH, de Wit JB et al. Increase in sexually transmitted infections among homosexual men in Amsterdam in relation to HAART. *Sexually transmitted infections*, 2001, 77: 184–186.
12. World Health Organization and Joint United Nations Programme on HIV/AIDS. *Guidelines for sexually transmitted infection surveillance*. Geneva, World Health Organization, 1999 (document WHO/CHS/HSI/99.2).
13. Ye H, Leong MG, Wright J et al. Implementation of syndromic STI surveillance in Gauteng Province, South Africa. Presented at the Joint Conference of the STD & Infectious Diseases Societies of Southern Africa, Cape Town, 2001.
14. *Protocol for the evaluation of epidemiological surveillance systems*. Geneva, World Health Organization, 1997 (document WHO/EMC/DIS/97.2).
15. Wawer MJ, Sewankambo NK, Serwadda D et al. Control of sexually transmitted diseases for AIDS prevention in Uganda: a randomised community trial. Rakai Project Study Group. *The lancet*, 1999, 353: 525–535.
16. Grosskurth H, Mosha F, Todd J et al. Impact of improved treatment of sexually transmitted diseases on HIV infection in rural Tanzania: randomised controlled trial. *The lancet*, 1995, 346: 530–536.
17. Gray RH, Wawer MJ, Serwadda D et al. Population-based study of fertility in women with HIV – 1 infection in Uganda. *The lancet*, 1998, 351: 98–103.
18. Greco D, Giuliani M, Suligoi B et al. Sexually transmitted diseases in Italy: clinical returns versus statutory notifications. *Genitourinary medicine*, 1990, 66: 383–386.
19. Gregson S, Terceira N, Kakowa M et al. Study of bias in antenatal clinic HIV-1 surveillance data in a high contraceptive prevalence population in sub-Saharan Africa. *AIDS*, 2002, 16: 643–652.
20. Korenromp E. Treatment of sexually transmitted diseases as an HIV prevention strategy? Cofactor magnitudes, syndromic management and a reappraisal of the Mwanza and Rakai trials. Rotterdam, University of Rotterdam, 2001.
21. Mar Pujades RM, Obasi A, Mosha F et al. Herpes simplex virus type 2 infection increases HIV incidence: a prospective study in rural Tanzania. *AIDS*, 2002, 16: 451–462.
22. Dallabetta G, Feinberg M. Efforts to control sexually transmitted diseases as a means to limit HIV transmission: pros and cons. *Current infectious disease reports*, 2001, 3: 162–168.
23. Celentano DD, Nelson KE, Lyles CM et al. Decreasing incidence of HIV and sexually transmitted diseases in young Thai men: evidence for success of the HIV/AIDS control and prevention program. *AIDS*, 1998, 12: F29–F36.
24. Hanenberg RS, Rojanapithayakorn W, Kunasol P et al. Impact of Thailand's HIV-control programme as indicated by the decline of sexually transmitted diseases. *The lancet*, 1994, 344: 243–245.
25. Renton AM, Whitaker L, Riddlesdell M. Heterosexual HIV transmission and STD prevalence: predictions of a theoretical model. *Sexually transmitted infections*, 1998, 74: 339–344.

Annex 1 – Agenda of the Consultation

WHO Consultation on Estimation of Incidence and Prevalence of Sexually Transmitted Infections Treviso, Italy, 27 February–1 March 2002

27 February 2002

- 09:00–09:30 Registration
- 09:30–10:00 Official opening
Luigi Bertinato, Stefano Lazzari
- 10:00–10:30 Objectives, programme
and method of work
- 10:30–11:00 Coffee break
- 11:00–11:45 «Overview of the Current Status of
Global STI Surveillance: Achievements
and Problems» (*Bill Levine*)
- 11:45–12:45 Experiences in STI surveillance
- in Africa (*Emil Asamoah-Odei*)
 - in South-East Asia (focus on Thailand)
(*Anupong Chitwarakorn*)
 - in Latin America (focus on Brazil)
(*Fabio Moherdau*)
 - in industrialized countries
(*Christine McGarrigle*)
- 12:45–13:00 Discussion
- 13:00–14:30 Lunch break
- 14:30–15:30 Review of the methods used for
the 1995 and 2000 round of global STI
estimates, followed by discussion
(*Antonio Gerbase, Jane Rowley and
Ivonne Cameroni*)
- 15:30–16:00 Coffee break
- 16:00–16:30 Laboratory testing for STI surveillance
in developing countries: current standards
and new approaches (*Ron Ballard*)
- 16:30–17:30 Options and methodologies for
developing STI incidence and prevalence
estimates and projections in developed
and developing countries (*Geoff Garnett*)

28 February 2002

- 09:00–09:45 STI and second-generation HIV
surveillance. Presentation and
discussion on potential use of selected
STI data as an indicator of risk
behaviour for HIV transmission
(*Stefano Lazzari*)
- 09:45–10:00 Introduction to group work
- 10:00–10:30 Tea break
- 10:30–13:00 Working groups on
- a) recommendations for improving
STI surveillance
 - b) recommendations on improvement
of STI estimation methods
 - c) identification of areas where
additional research is required
(such as methods, assumptions
and STI surveillance)
- 13:00–14:30 Lunch break
- 14:30–15:00 Working groups (continued)
- 15:00–16:00 Plenary presentation
from the working groups
- 16:00–16:30 Coffee break
- 16:30–17:30 Discussion

1 March 2002

- 09:00–09:15 Summary of day two and introduction
to group work
- 09:15–10:00 Working groups to develop
workshop recommendations
- 10:00–10:30 Coffee break
- 10:30–11:30 Working groups to develop workshop
recommendations (continued)
- 11:30–13:00 Presentation, discussion and adoption
of recommendations
- 13:00–13:30 Closure of meeting

Annex 2 – Questions (group discussions)

Group A – Recommendations for improving STI surveillance

1. What essential components of STI surveillance should be implemented in resource-poor countries?
2. List the most important structural and functional weaknesses of the existing STI surveillance systems in these countries.
3. Discuss and recommend the minimal STI data to be collected for deriving estimates of STI prevalence and incidence.
4. Discuss problems related to the interpretation of STI surveillance data for monitoring and evaluation and ways to overcome these problems.
5. Discuss the use of STI data as indicators of HIV risk behaviour.
6. What roles should WHO and partner organizations play in improving STI surveillance activities?

Group B – Recommendations on improvement of STI estimation methods

1. Discuss the uses of estimates of STI incidence and prevalence in improving STI prevention and control programmes.
2. Review the strengths and weaknesses of current WHO estimation methods.
3. Review the assumptions used in the 1995 and 1999 estimations and make recommendations for improvements.
4. Discuss and recommend how to improve the methods used to estimate the burden of STI at the country level.

Group C – Identification of areas where additional research is required

1. Discuss and recommend the laboratory tests to be used in STI prevalence studies.
2. Review the assumptions used in the 1995 and 1999 estimates and make recommendations for improvement.
3. Which STIs should be included in the future estimates?
4. What other research studies need to be conducted to improve the future estimation of the prevalence and incidence of STI?

Annex 3 – Estimation of the global prevalence and incidence of STI in 1995 and 1999: assumptions on the duration of infection according to treatment and gender

	Untreated		Treated - symptomatic ^a	
	Male	Female	Male	Female
Gonorrhoea	0.5 years	0.5 years	3 weeks	3 weeks
Chlamydia	1.25 years	1.25 years	4 weeks	4 weeks
Trichomoniasis	0.125 years	1.5 years	2 weeks	6 months

^aDuration of infection if asymptomatic and treated = half the duration of infection if untreated

Annex 4 – Estimation of the global prevalence and incidence of STI in 1995 and 1999: assumptions on the proportion of symptomatic individuals adequately treated according to gender

	Male	Female
North America Western Europe Australasia	0.9	0.85
Latin America and the Caribbean Europe and central Asia East Asia and the Pacific North Africa and the Middle East	0.65	0.55
Sub-Saharan Africa South and South-East Asia	0.35	0.25

The proportion of asymptomatic people treated = 10% of symptomatic people

Annex 5 – List of participants

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