Introduction to HIV, AIDS and STI Surveillance

Sexually Transmitted Infection Surveillance

Participant Manual

September 2009

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Introduction

How to Study This Module

What you should know before the course

This course is meant primarily for district-level surveillance officers. As a participant, you should have a basic understanding of HIV/AIDS and public health surveillance before taking the course.

Module structure

The module is divided into units. The units are convenient blocks of material for a single study session.

This module can also be used for self-study.

Because you already know quite a bit about HIV/AIDS, we begin each unit with some warm up questions. Some of the answers you may know. For other questions, your answer may just be a guess. Answer the questions as best you can.

You will keep the warm up questions in this manual. No one will see your answers but you. We will study and discuss the unit, and then you will have time to go back and change your warm up answers. At the end of the unit, the class will discuss the warm up questions. You can then check your work.

As you study this module, you may come across italicised terms and acronyms that are unfamiliar. In Appendix B you will find a glossary that defines these words.

Module summary

This module is intended to train public health officers how to develop and operate systems for sexually transmitted infection surveillance in the context of Integrated Disease Surveillance.

Appendices

At the end of this module, more information is provided in appendices:

Appendix A, References and Further Reading Material
Appendix B, Glossary and Acronyms
Appendix C, Useful Links
Appendix D, Answers to Warm Up Questions and Case Studies

Additions, Corrections, Suggestions

Do you have changes to suggest for this module? Is there other information you'd like to see? Please email us. We will collect your emails and consider your comments in the next update to this module.

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Unit 1

Introduction to STI Surveillance and the Relationship between STIs and HIV

Overview

What this unit is about

This unit describes the general state of sexually transmitted infections (STIs) and STI surveillance in resource-constrained countries around the world. It also discusses the behavioural, epidemiological and immunological links between STIs and HIV infection.

Warm up questions

1. What are the three main areas of inter-relationship between STIs and HIV?

2. True or false? STIs increase susceptibility to HIV and also increase the risk of transmitting HIV.

   True False

3. True or false? An STI surveillance system can serve as an evaluation tool for HIV prevention programmes.

   True False

4. List two ways the Integrated Disease Surveillance strategy is expected to improve STI surveillance.

   a.

   b.

Warm up questions, continued

5. Which of the following increases the risk of HIV transmission in sexual exposure?

    a. Greater mucous membrane exposure
    b. The presence of white blood cells and inflammation
    c. Increasing the duration of exposure
    d. All of the above

6. Which of the following determines infectivity of HIV?

    a. The amount of virus (viral load) to which an uninfected person is exposed
    b. The type of exposure (blood, mucous membrane)
    c. Host factors that protect against infection
    d. All of the above

Introduction

What you will learn

By the end of this unit, you should be able to:

- Describe the three main areas of inter-relationship between STIs and HIV
- Describe the basic principles of the Integrated Disease Surveillance system
- Explain how an STI increases susceptibility to HIV
- Explain how an STI increases the risk of transmitting HIV
- Describe how STI surveillance data can be used in understanding HIV epidemics.

STIs around the world

Sexually transmitted infections (STIs) are diseases that are spread from person to person during sexual contact. They constitute a major public health problem worldwide and are the primary causes of reproductive tract infections and infertility. They are also the leading cause of adverse pregnancy outcomes, including low birth weight, stillbirth, and maternal mortality. Furthermore, STIs may cause cervical cancer and primary liver cancer, the most common forms of cancer worldwide. Most STIs can be prevented through safe sexual practices, such as monogamy or consistent and correct use of condoms. Bacterial STIs can be cured completely with antibiotics. The impact of STIs is made worse because they increase susceptibility to HIV transmission.

There are gaps in the available data on the status and trends of STIs. The *World Health Organization* (WHO) estimates that there were 340 million new, curable STI cases worldwide in 1999. Table 1.1 on the next page summarises this situation.

Definitions

The following definitions will help you understand Table 1.1, as well as other parts of this module.

- *Incidence*: a measure of the frequency with which an event, such as a new case of illness, occurs in a population over a period of time. The denominator is the population at risk. The numerator is the number of new cases occurring during a given time period.
- *Prevalence*: the proportion of persons in a given population with a disease or condition at a given point in time.

Definitions, continued

Table 1.1. Estimated prevalence and annual incidence of curable STIs by region, 1999.

Region	Population 15-49 yrs (in millions)	Prevalence (in millions)	Prevalence per 1000	Annual incidence (in millions)
Sub-Saharan Africa	269	32	119	69
North Africa and Middle East	165	3.5	21	10
North America	156	3	19	14
Western Europe	203	4	20	17
Eastern Europe and Central Asia	205	6	29	22
South and Southeast Asia	955	48	50	151
East Asia and Pacific	815	6	7	18
Australia and New Zealand	11	0.3	27	1
Latin America and Caribbean	260	18.5	71	38
Total	3 040	116.5	363	340

Source: WHO Global prevalence and incidence of selected curable sexually transmitted infections (www.who.int/docstore/hiv/GRSTI/002.htm)

Discussing the table

Look at Table 1.1 and answer the following questions:

a. Which region has the highest estimated prevalence of curable STIs per 1 000 persons?

b. In your own words, explain the difference between the terms "prevalence" and "incidence."

STI Surveillance

Overview

Surveillance is the ongoing collection, interpretation and dissemination of public health data for disease management purposes. The role that STI *surveillance* can play in HIV surveillance differs depending on the state of the HIV epidemic. Epidemics of HIV differ by geographic region. It is important to recognise that the type of HIV epidemic in a given area may change over time. WHO describes three types of HIV epidemic, detailed below in Table 1.2 along with the benefits of STI surveillance for each.

Table 1.2. State of HIV epidemic and benefit of STI surveillance.

For this state of HIV epidemic…	STI surveillance serves as:
Low-level: HIV prevalence has not consistently exceeded 5% in any group.	▪ An early warning system for HIV infection and emergence of HIV in new groups or new geographical areas ▪ An evaluation tool for HIV prevention programmes
Concentrated: HIV prevalence consistently exceeds 5% in one or more groups with high-risk behaviour. HIV prevalence is less than 1% in pregnant women.	▪ A marker for the emergence of HIV in new groups ▪ A marker of how successful prevention programmes have been in high-risk populations
Generalised: HIV prevalence is consistently greater than 1% in pregnant women.	▪ A marker of how successful prevention programmes have been in the general population

Discussing Table 1.2

a. For what epidemic state(s) can STI surveillance be used to determine the effectiveness of HIV prevention programmes?

b. If HIV prevalence in Country X is 6% in one population sub-group and 0.5% in pregnant women, what epidemic state is Country X experiencing?

STI Surveillance, continued

Types of case reporting

Cases of STIs can be reported either by *aetiologic case reporting* or *syndromic case reporting*.

- In aetiologic case reporting, cases are diagnosed and reported using laboratory results that identify the specific microbial organism that caused the STI.
- In syndromic case reporting, cases are diagnosed and reported according to a set of clinical signs and symptoms that correspond to two clinical *syndromes* (i.e., genital ulcer disease and male urethral discharge). Diagnostic laboratory tests are not used to make a diagnosis of a STI syndrome.

Some countries lack the resources and laboratory support to conduct aetiologic case reporting. In these countries, syndromic case reporting is easier, cheaper and generally more practical.

Additional activities

In addition to case reporting, several other activities are part of STI surveillance and serve as examples of *second-generation HIV surveillance*. Second-generation surveillance uses a variety of methods and tools that change based on a country's needs, in order to gain a more thorough understanding of the country's HIV epidemic. Some of these activities are:

- Monitoring aetiologies for STI syndromes (i.e., conducting laboratory tests to find out which STI organisms are present in the two STI syndromes)
- Assessing the prevalence of certain STIs both in the general population and in specific population groups
- Combining *behavioural surveys* with STI and HIV testing (i.e., finding out what behaviours are associated with STI and HIV prevalence in various groups)
- Measuring *anti-microbial resistance* patterns (i.e., finding out if the organisms causing certain STIs have become resistant to anti-microbial therapies).

Incidence data on STIs also can be used as an indicator for biological HIV transmission. If STI surveillance data show that STI transmission is occurring, then HIV transmission may be occurring as well. You can make this inference because STIs and sexually transmitted HIV are spread in the same way.

STI Surveillance, continued

Problems with STI surveillance

Because STI surveillance systems do not function adequately in resource-constrained settings, there is not enough information available for planning, implementing and evaluating STI and HIV prevention and care programmes.

In many parts of the world, STI reporting is incomplete. When STI surveillance does occur, it may consist of either aetiologic or syndromic STI case reports or a combination of the two. These factors complicate the interpretation of STI surveillance data.

In some countries, STI case reporting is integrated into the general disease surveillance system (see Integrated Disease Surveillance below). An integrated system is one in which multiple diseases are reported using a single, standard data collection form. In this way, STI surveillance can be done at a much lower cost and reporting is more complete because an elaborate infrastructure is in place.

A *vertical system* reports only one disease. Data collection is more tightly controlled. Although data collection occurs at fewer sites, the data are more detailed and of higher quality.

Other problems with STI surveillance in resource-constrained settings include:

- Lack of clear national guidelines
- Lack of commitment and feedback from ministries of health
- Use of an excessively long list of *notifiable diseases* (diseases that are required by law to be reported to the health authority)
- Confidentiality concerns
- Treatment of STIs in the private and informal sectors, which do not report cases
- Absence of screening programmes leading to the under-diagnosis of *asymptomatic* STIs (STIs which do not result in symptoms in the patient)
- The asymptomatic nature of many STIs.

Also, most countries generally do not monitor:

- STI prevalence
- Aetiologies of STI syndromes (what organisms are causing the main STI syndromes in the country)
- Anti-microbial resistance patterns.

STI Surveillance, continued

The use of syphilis data

Prevalence data for STIs can be especially useful for determining patterns of spread and where the risk of HIV infection is greatest. Prevalence data for STIs, especially syphilis data, are often available but not used. In many countries, for example, *antenatal clinics* (ANCs) conduct syphilis screening of women attending the clinic. This is done either routinely or as part of HIV *sero-surveillance* (the process in which blood samples are collected for the purpose of surveillance).

Few countries, however, compile, analyse and report syphilis sero-prevalence. High syphilis sero-prevalence in pregnancy is an important cause of spontaneous abortion, stillbirth and congenital syphilis. It also is an indicator of HIV risk in the community.

Passive and active surveillance systems

Data on STIs can be reported using a passive or an active surveillance system.

- In a *passive surveillance system*, health facilities provide case reports directly. When the facilities are understaffed or not trained, the reports may be late, incomplete or not delivered at all.
- In an *active surveillance system*, public health officers contact health facilities and identify and report cases.

Using a passive system for STI case reporting is a major cause of underreporting STI cases. Active surveillance systems, however, are costly and use a considerable amount of human resources. For this reason, active surveillance is impractical for resource-constrained countries.

How IDS improves STI surveillance

The *Integrated Disease Surveillance* (IDS) strategy integrates priority communicable disease surveillance activities at the district level with support for training, supervision and resources from all programmes. The strategy includes the surveillance of two STI syndromes:

1. Urethral discharge syndrome in men
2. Genital ulcer disease in men and women.

How IDS improves STI surveillance, continued

The IDS strategy is expected to improve STI surveillance by:

- Simplifying disease reporting for communicable diseases of highest priority
- Combining data management and analysis at the district and national levels for communicable diseases of highest priority
- Providing training, supervision and resources for surveillance for all disease control programmes.

STI and HIV Inter-relationship

Three related areas

Over the course of the HIV epidemic, we have begun to understand the complex inter-relationships between STIs and sexually transmitted HIV.

Behavioural factors: Both STIs and HIV can be sexually transmitted by vaginal, anal and oral intercourse. The risk of HIV transmission is generally greatest for anal intercourse and least for oral intercourse.

Epidemiological factors: Populations with high rates of STIs have high rates of sexually transmitted HIV.

Host factors: The presence of STIs causes local immunologic changes in the mucous membranes of the genital track, and, in the case of genital ulcers, cause tears in the protective layer of skin. These changes make it easier to acquire and transmit HIV.

Use this information to encourage clinicians to change STI/HIV clinical practices and provide their patients with better prevention strategies.

How HIV is transmitted

Transmission of HIV depends on a variety of biological, behavioural and epidemiological factors. Together these factors are usually referred to as *infectivity*. Infectivity is the probability of an organism being transmitted from an infected person to an uninfected person. We will consider these two essential questions:

- What *risk factors* determine whether HIV or an STI will be transmitted through a sexual exposure?
- How does the presence of an STI affect the risk factors, both for HIV-infected and HIV-uninfected persons?

How HIV is transmitted, continued

We also will consider the three primary biological factors that influence the transmission and acquisition of HIV infection:

- The amount of virus to which an uninfected person is exposed
- How they are exposed
- Host factors that protect uninfected persons against infection.

Amount of virus

The concentration of virus (called the *viral load*) is higher in some bodily fluids than in others. When a person is exposed to fluids with a high viral load, he or she has a greater risk of being infected than if exposed to fluids with a lower viral load. In general, HIV viral load is much higher in blood and genital fluids than in oral fluids.

- Viral load in blood can be measured with an HIV viral load blood test.
- Higher viral loads in the blood in general, correspond to higher viral loads in genital fluids (i.e., semen and vaginal secretions).
- The viral load varies during the clinical course. It is highest in the early and late stages of the disease.
- Effective treatment with *antiretroviral therapy* (i.e., drugs used to fight HIV infection) lowers the viral load in blood and may lower it in genital fluids.

Type of exposure

The type and duration of exposure affects the risk of HIV transmission. Consider these factors:

- Exposure of an HIV-uninfected person's blood to an HIV-infected person's blood carries a greater chance of transmission than exposure of an uninfected person's mucous membrane to an infected person's blood, semen or vaginal secretions. As an example, blood exposure could occur through the transfusion of HIV-infected blood into an uninfected patient.

- Sexual exposure risk is increased with:
  - The presence of white blood cells and inflammation
  - The duration of exposure
  - Small tears or breaks in the skin or mucous membranes.

The risk of acquiring HIV is greater among uncircumcised than circumcised men because the foreskin area often contains large numbers of white blood cells that HIV can infect and because removal of the foreskin results in thickening of the underlying skin.

Type of exposure, continued

The risk of transmission from an infected man to an uninfected woman during intercourse may be slightly higher than the risk of transmission from an infected woman to an uninfected man. Factors that may contribute to a higher risk of transmission from a man to a woman include:

- STIs and HIV in semen can remain viable for up to 72 hours following ejaculation, increasing the time of female exposure to HIV
- The male is exposed to HIV only during the act of intercourse because significant amounts of cervico-vaginal fluids are not introduced into the male partner's urethra during sex
- The cervix and the opening of the cervical canal have greater surface area than the tip of the male urethra.

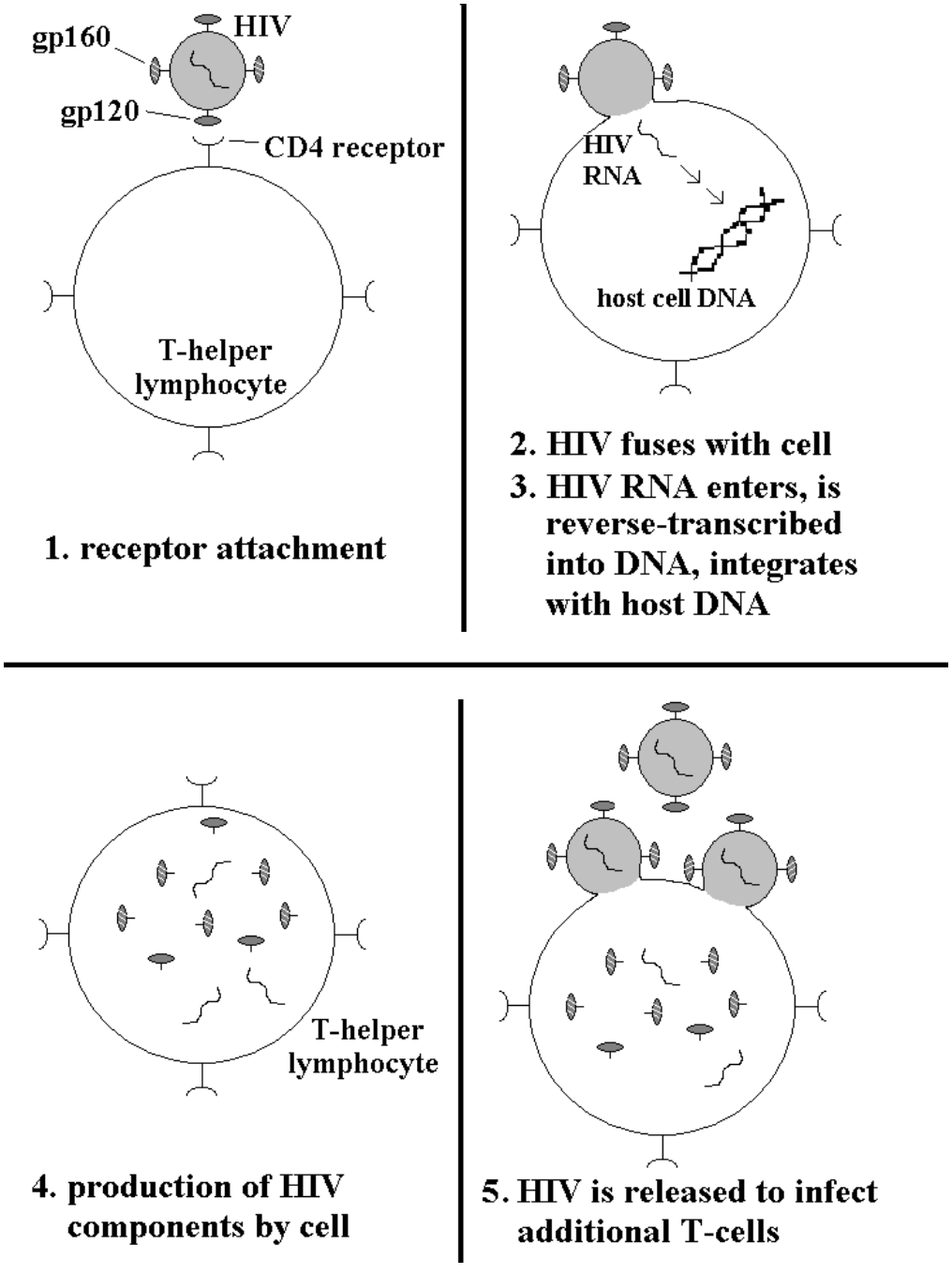
Host factors

Host factors also affect the risk of infection. Figure 1.1 on the next page shows the HIV infection process.

- Sexual transmission of HIV begins when HIV infects immune cells in the genital tract or rectum.
- Much of the research on early events of sexual transmission focuses on the mucosal immune defenses, which include CD4+ T cells, *dendritic cells* (DCs) and macrophages. The surface of these cells is covered with molecules called "receptors" which allow the cells to interact with each other and with pathogens.
- The virus uses different receptors to enter these cells, including CD4 and CCR5 for T cells and DC-SIGN and mannose receptor for DCs. The DCs in the genital tract can pick up HIV and carry it to the lymph nodes, which are hubs of immune activity in the body.
- Once HIV reaches the lymph nodes, it rapidly infects CD4+ T cells and establishes "systemic" infection, meaning that the virus can be found in the blood and throughout the body.

Host factors, continued

Figure 1.1. HIV infection process of a T-helper lymphocyte, on a cellular level.



STI and HIV Inter-relationship, continued

Discussing the figure

Look at Figure 1.1 and answer the following questions:

a. What process enables the HIV virus to enter T lymphocytes?

b. Where are new HIV components produced?

How host factors increase HIV risk

STIs may increase the risk of transmitting and acquiring HIV infection. Although this association has been measured only in observational studies, there is biological plausibility for such a relationship. The following is a description of how this process might work and is shown in Figure 1.2 on the next page:

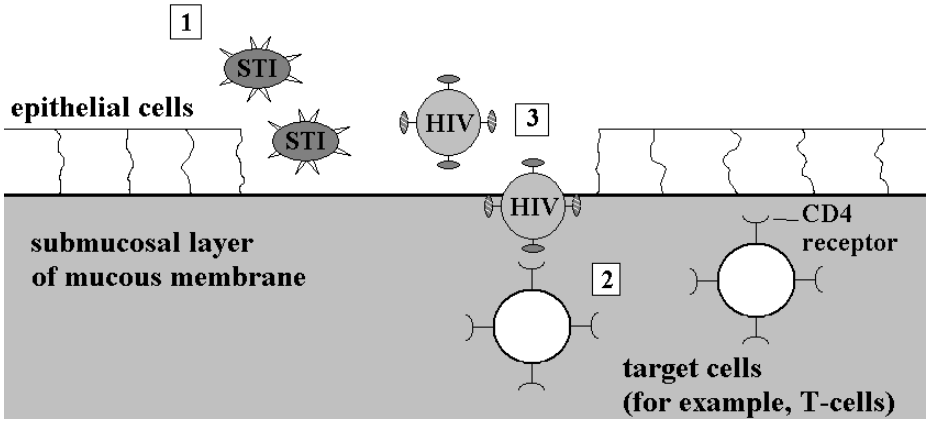
- STIs destroy cells in the epithelium at the site of infection in the genital tract (e.g., the urethra in men or the cervix in women).
- This cell destruction partially or completely exposes the sub-mucosal layer of the mucous membrane and forms ulcerations. The ulcerations can be seen on examination of the patient or can be detected microscopically.
- The ulceration results in an inflammatory immune response. The cells of the immune system that arrive in response to the infection include, among others, cells that HIV can target. These cells are:
  - T-helper lymphocytes
  - Macrophages.

  These cells contain CD4 receptors and are present in the sub-mucosa and on the surface of the mucous membranes.

How STIs increase HIV risk, continued

Figure 1.2. How STIs increase the risk of HIV transmission.

1. STIs destroy epithelial cells of genital tract
2. immune response brings target cells to mucous membrane
3. HIV cells attack target cells (see Figure 1.1)



Discussing the figure

Look at Figure 1.2 and answer the following questions:

a. How do STIs increase the risk of HIV transmission?

b. What does HIV do once it has entered the sub-mucosal membrane?

Although this process can occur with infection from many STIs, *Herpes simplex* virus type 2 (HSV-2) is thought to be the most important STI in HIV transmission. The virus causes symptomatic and asymptomatic genital ulcers, cannot be cured and has high prevalence levels in men and women worldwide. Contrary to what has been thought, however, studies of treatments to suppress HSV-2 in patients have not demonstrated reductions in HIV transmission.

STIs increase risk of acquiring and transmitting HIV

As shown in Table 1.3, STIs affect both HIV-infected and HIV-uninfected patients.

Table 1.3. The effect of STIs on HIV-infected and -uninfected patients.

HIV Status	Effect of STIs
Infected	▪ Increases the recruitment of HIV-infected cells, such as T-helper lymphocytes and macrophages, to the surface of the mucous membranes
Uninfected	▪ Increases the recruitment of cells that can be infected by HIV, such as T-helper lymphocytes and macrophages, to the surface of the mucous membranes, thereby increasing susceptibility to HIV transmission ▪ Destroys epithelial layer through ulceration and exposes sub-mucosal tissues that contain *target cells* (i.e., cells that can be infected by HIV)

Discussing the table

Look at Table 1.3 and discuss the following questions:

a. How would ulceration increase the risk of acquiring HIV?

b. What causes the recruitment of HIV target cells to the surface of mucous membranes?

Number of exposures influences risk of acquiring HIV

The risk of acquiring HIV infection increases with the number of exposures to an infected person:

- An uninfected person repeatedly exposed to an infected person is at greater risk of being infected over time than someone exposed only once. As an example, an infected wife's uninfected husband is at greater risk if he has sex with her 100 times over a year than if he has sex with an infected sex worker one time during that year.
- A person who reduces his or her number of sexual exposures to infected partners decreases the risk of infection.
- The likelihood that one's sexual partner is infected affects the risk of infection. In areas with higher prevalence of HIV and STIs, the probability that a person will be infected is greater than in an area with lower prevalence.

Can controlling STIs decrease HIV transmission?

Several community trials have examined the impact of treatment of STIs on HIV transmission. All but one of these has failed to show that better treatment of STIs or regular treatment for STIs can reduce HIV transmission.

- In the Mwanza district of Tanzania, improved STI syndromic management and public health programmes led to a decrease in HIV transmission compared to usual care.[1] This study was conducted when the STI prevalence was high and the HIV prevalence was low but increasing rapidly in Tanzania. Overall HIV incidence was 42% lower in communities that received improved STI services compared to those that continued with the usual levels of STI services.
- Four other STI control trials were conducted in Uganda and Zimbabwe, in areas of high but stable or declining HIV incidence and moderate or lower STI prevalence. These trials found different results from the trial in Tanzania.
  - In the Rakai, Uganda studies[2,3], azithromycin, ciprofloxacin and metronidazole were used to control STIs among pregnant women and other adults, but these did not lead to a decrease in HIV transmission.
  - In the Masaka, Uganda trial[4], improved syndromic case management and public health STI management, similar to the strategy used in Mwanza, also failed to decrease HIV transmission.
  - In the Zimbabwe trial[5], integrated peer education, condom distribution and syndromic STI management failed to reduce population-level HIV incidence.

[1] 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. Lancet 1995; 346:530-36.
[2] Wawer MJ, Sewankambo NK, Serwadda D, et al, and the Rakai Project Study Group. Control of sexually transmitted diseases for AIDS prevention in Uganda: a randomised community trial. Lancet 1999; 353:525-35.
[3] Gray RW, Wabwire-Mangen F, Kigozi G, et al. Randomized trial of presumptive sexually transmitted disease therapy during pregnancy in Rakai, Uganda. Am J Obstet Gynecol 2001; 185: 1209-17.
[4] Kamali A, Quigley M, Nakiyingi J, et al. Syndromic Management of sexually transmitted infections and behavioural change interventions on transmisión of HIV-1 in rural Uganda: a community randomised trial. Lancet 2003; 361:645-52.
[5] Gregson S, Adamson S, Papaya S, et al. Impact and process evaluation of integrated community and clinic-based HIV-1 control: a cluster randomized trial in Eastern Zimbabwe. PLoS Med 2007;4:e102.

Can controlling STIs decrease HIV transmission?, continued

- Two recent trials of suppressive therapy for HSV-2 were unable to demonstrate a reduction in HIV transmission[6,7].
- Two other trials from Burkina Faso examined the effect of HSV-2 suppressive therapy on HIV-1 levels in co-infected women taking HAART and those not eligible for HAART, using vaginal shedding of HIV as a proxy for infectivity in women.
    - In the trial conducted in co-infected women taking HAART[8], HSV-2 suppressive therapy did not have a significant impact on genital HIV-1 RNA levels, but did significantly reduce frequency and quantity of genital HIV-1 RNA shedding among the subset of women who shed HIV-1 at least once in the baseline phase.
    - In the trial conducted in co-infected women not taking HAART[9], HSV suppressive therapy significantly reduced genital and plasma HIV-1 RNA.

[6] Watson-Jones D, Weiss HA, Rusizoka M, et al. Effect of herpes simplex suppression on incidence of HIV among women in Tanzania. N Engl J Med 2008; 358: 1560-71.
[7] Celum C, Wald A, Hughes J, et al. Effect of acyclovir on HIV-1 acquisition in herpes simplex virus 2 seropositive women and men who have sex with men: a randomised double-blind, placebo-controlled trial. Lancet 2008; 371: 2109-19.
[8] Ouedraogo A, Nagot N, Vergne L, et al. Impact of suppressive herpes therapy on genital HIV-1 RNA among women taking antiretroviral therapy: a randomized controlled trial. AIDS 2006; 20:2305-13.
[9] Nagot N, Ouedraogo A, Foulongne V, et al. Reduction of HIV-1 RNA levels with therapy to suppress herpes simplex virus. N Engl J Med 2007; 356:790-9.

Possible explanations

Why did the Mwanza study demonstrate a reduction in HIV transmission while all the other trials found no effect of STI treatment on HIV transmission? One hypothesis is that community-wide STI treatment is only effective during the early stages of an HIV epidemic, but not once an epidemic has stabilized.

At one point, it was hypothesized that the Uganda studies were not effective because genital ulcer disease, such as HSV-2 infections, accounted for increased HIV transmission. Suppressive herpes therapy, however, did not reduce HIV transmission. The reason the HSV-2 suppression trials were ineffective may be that the dose used in the two trials was too low to suppress HSV-2 lesions completely, coupled with the very low rate of adherence. Another possible explanation is that the association between STIs and HIV originally came from observational studies, which are subject to confounding.

The clinical trials that provided treatment for curable STIs were effective, although optimal control was not achieved, possibly because the intervention was insufficient. If this is the case, it is unlikely that community-wide control of STIs is achievable because control is easier in a clinical trial than in routine circumstances.

STI screening implications

Patients who present with an STI or who may have been exposed to STIs offer an opportunity for clinicians to help reduce their patients' risk of transmitting and acquiring HIV infection. In addition to diagnosing and treating any STI and providing screening and treatment for partners, clinicians can:

- Provide HIV behavioural risk-reduction counselling
- Provide HIV testing and referral of infected persons for care and treatment
- Provide HIV counselling and testing of partners.

Uses of STI surveillance for HIV prevention

A goal of second-generation HIV surveillance is to enhance the use of surveillance data for public health action. The impact of data can be enhanced when several sources of information are used. Data from STI surveillance is therefore an important source that can be used for public health action.

Summary

The inter-relation of STIs and HIV is because of behavioural, epidemiological and host factors. Infection with STIs increases susceptibility to HIV and also increases the risk of transmitting HIV. Surveillance data on STIs can provide early warning of the emergence of HIV and an evaluation tool for HIV prevention programmes.

Unit 1 Exercises

Warm up review

Take a few minutes now to look back at your answers for the warm up questions at the beginning of the unit. Make any changes you want to make.

Small group discussion

Get into small groups by country, region or province to discuss these questions.

1. What type of STI surveillance takes place in your province, district or country?

2. What types of analysis and reports of these data are produced in your province, district or country?

3. What sort of laboratory support is available in your province, district or country for aetiologic STI testing?

Apply what you've learned/ case study

Try this case study individually.

You are a national-level public health officer in the Republic of Melabia, a country with a generalised HIV epidemic, and have reviewed the surveillance data on male urethral discharge for your country. Currently, male urethral discharge is reported using a vertical reporting system. You have concluded that the reporting of this STI is incomplete in most provinces.

a. List the appropriate actions to take to improve the quality and completeness of gonorrhoea reporting for your country.

b. List two ways that surveillance for male urethral discharge can be used in understanding the HIV epidemic in the Republic of Melabia.

Notes

Unit 2

STI Surveillance Methods, Concepts and Terms

Overview

What this unit is about

Together, the components of sexually transmitted infection (STI) surveillance work provide a more complete picture of the STI situation. This unit describes these components and how the data from surveillance can be used. Also explained are the terms and concepts of STI surveillance:

- Aetiologic and syndromic case reporting
- Passive and active surveillance
- Basic and advanced surveillance
- Integrated Disease Surveillance (IDS) reporting for STIs.

Warm up questions

1. True or false? Some elements of an STI surveillance system are more important for HIV surveillance activities. Others are more important for STI control programme activities.

   True False

2. True or false? STI surveillance data can serve as an indicator of trends in HIV risk behaviours.

   True False

3. True or false? Aetiologic reporting of syphilis (by stage), gonorrhoea, chlamydia, and congenital syphilis is considered a basic surveillance activity in resource-constrained countries.

   True False

4. Which of the following is not a component of an STI surveillance system?

   a. STI universal case reporting
   b. STI sentinel surveillance systems
   c. STI testing and treatment
   d. STI prevalence assessment and monitoring

Warm up questions, continued

5. True or false? In generalised HIV epidemics, prevalence assessments should include monitoring gonorrhoea and chlamydia.

   True False

6. True or false? An STI surveillance system includes conditions that are newly acquired, as well as those that represent past infections.

   True False

7. In aetiologic case reporting, STI cases are reported by the specific microbial organism that caused the STI, while in syndromic case reporting, STI cases are reported by the clinical syndrome with which the patient presents.

Introduction

What you will learn

By the end of this unit you should be able to

- Discuss the components of an STI surveillance system
- Discuss the uses of STI surveillance data
- Describe the difference between aetiologic and syndromic STI diagnosis and surveillance
- Determine the difference between basic and advanced STI surveillance activities and how these activities should be used, depending on the type of HIV epidemic
- Describe IDS case reporting.

Components and Uses of STI Surveillance Systems

Components of STI surveillance

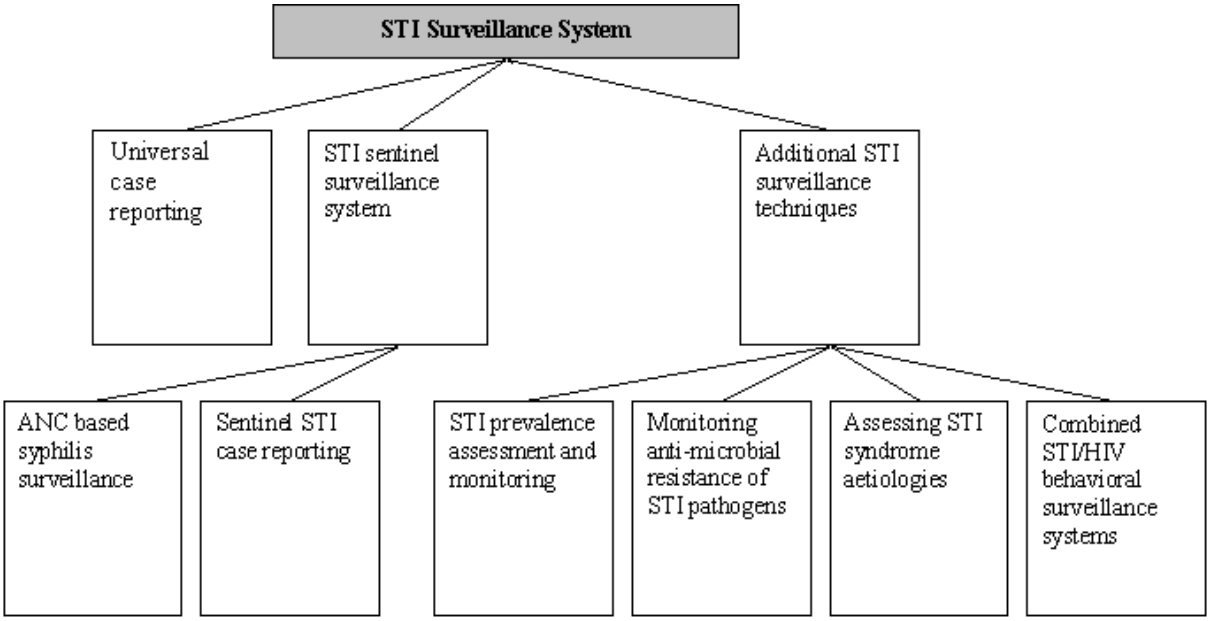
The components of an effective *sexually transmitted infection* (STI) *surveillance* system include routine data collection and special studies. These include the following:

- *Universal case reporting* of STIs, in which all cases of a particular disease are reported to health authorities. Universal case reporting can be either *aetiologic* or *syndromic*.
- *Sentinel surveillance* systems (sentinel surveillance takes place at selected sites)
  - clinic-based syphilis surveillance, usually done at *antenatal clinics* (ANCs) but also at STI clinics
  - *sentinel STI case reporting* (aetiologic and syndromic).
- Additional STI surveillance techniques
  - STI *prevalence* assessment and monitoring
  - Combined STI/HIV and behavioural surveillance surveys
  - Monitoring *anti-microbial resistance* of STI pathogens
  - Assessing *aetiologies* of STI syndromes.

Figure 2.1 on the next page depicts the components of an STI surveillance system.

Components of STI surveillance, continued

Figure 2.1. Components of an STI surveillance system.



Discussing the figure

Look at the figure and the text above it and answer the following questions:

a. What are the two components of an STI sentinel surveillance system?

b. What are the three components of an STI surveillance system?

Which components should be used?

The components of STI surveillance should be used together to generate a complete picture of the STI burden in a country or region. Different STI surveillance components are more important for STI control programme activities, and others are more important for *second-generation HIV surveillance*. These relationships are summarised below and on the next page:

- Some components of an STI surveillance system are more important for second-generation HIV surveillance activities, such as combined STI/HIV behavioural surveillance surveys.

Which components should be used?, continued

- Some STI surveillance components are more important for STI control programme activities, for example:
  - Assessing syndrome aetiologies
  - Anti-microbial resistance monitoring.
- Some components are equally important for second-generation HIV surveillance and STI control, for example:
  - STI case reporting
  - STI prevalence assessment and monitoring.

Also, different STI surveillance components are more important in different situations. How do you determine which components to use in your surveillance? Consider existing programmes in your country and think about what you want to investigate. Your goal might be to investigate:

- The needs of STI control programmes established by the Ministry of Health in your country;
- The existing surveillance systems for other communicable diseases used by the Ministry of Health;
- The health management information system used by the Ministry of Health for the STI control programme;
- Existing health services infrastructure, especially laboratory services, because, for example, if a clinic has a well functioning laboratory on site, it can do surveys of STI aetiologies;
- The state of the HIV epidemic in your country (i.e., is the HIV epidemic *low-level*, *concentrated* or *generalised*). The state of the epidemic guides where surveillance activities should focus. In a generalised epidemic, for example, there is a greater need and opportunity for STI prevalence assessments. There is more information about this later in this unit.

An example

As an example, think about the STI surveillance components that would be needed in the following situation.

The Republic of Melabia has a nearly perfect reporting system for STIs diagnosed by syndrome (by symptoms) in public health facilities. Although the existing surveillance infrastructure provides good data on the annual burden of STI syndromes in public health facilities, additional information is necessary to understand the population burden of particular STIs. (Example continues on next page)

An example, continued

- To estimate the true population burden of STIs and how the STIs relate to HIV, the country would need special studies to establish:
  - How many STI patients seek care from government or private health facilities;
  - How many patients seek STI care from other providers (e.g., private clinics, traditional medicine or pharmacies) or medicate themselves.
- To determine which organisms are causing specific STI syndromes, syndrome aetiologies would need to be studied.

Symptomatic and asymptomatic STIs

To accurately calculate *incidence* and prevalence, the STI surveillance system needs to identify:

- Which STIs are newly acquired
- Which STIs may have been present for a long time.

To identify these conditions, it is important to understand the role of *symptomatic* and *asymptomatic* infections. Some STIs produce symptoms rapidly after infection, and other produce no symptoms.

Symptomatic infections are recently acquired and represent true incident cases. *Herpes simplex* virus is an exception to this rule. Because its symptoms can recur without new infection, it is not possible to determine if the infection is newly acquired or longstanding. Symptomatic STIs include:

- Chancroid
- Gonorrhoea
- Early syphilis
- Chlamydia.

Asymptomatic infections do not produce clinical symptoms. They can be present for a long time, often months or even years, without the patient knowing he or she is infected. For this reason, asymptomatic infections cannot be used to measure incidence. They can, however, be used to measure prevalence. Some STIs can be both asymptomatic and symptomatic depending on the person infected and the location (anatomical site) of the infection. Asymptomatic STIs include:

- Latent syphilis (although there can be symptoms associated with tertiary syphilis)

Symptomatic and asymptomatic STIs, continued

- Chronic *H. simplex virus type 2* (HSV-2) (intermittent asymptomatic flare-up may occur)
- Chlamydia
- Gonorrhoea.

Women have symptoms less often than men, especially for gonorrhoea and chlamydia. Their asymptomatic infections can be detected only by laboratory tests.

In general, STI case reporting of male *urethritis* (inflammation of the urethra) and male and female *non-vesicular genital ulcer disease* can be considered to represent recently acquired infections. Based on the above information, consider the following information when interpreting STI surveillance data:

- Diagnoses of urethral discharge in men and non-vesicular ulcers in men and women reflect recently acquired infections. Non-vesicular ulcers are caused by syphilis and chancroid.
- Vesicular ulcers are usually caused by *H. simplex* virus and may represent an infection that occurred in the past. The vesicles may easily be scraped off, however, leaving an ulcer, which makes it difficult to make a clinical diagnosis of herpes.

How STI surveillance data are used

Surveillance data on STIs can be used for a variety of purposes related to the monitoring, prevention, control and allocation of resources for STIs and HIV. The data can be used to:

- Assess the overall burden of STIs;
- Monitor trends in recently acquired STIs;
- Provide information necessary for physicians to treat STI patients and their sex partners;
- Provide information to assist in planning and managing efforts in STI and HIV prevention and control programmes;
- Provide data for the purposes of advocacy and resource mobilisation and for programme planning, targeting, monitoring and evaluation;
- Serve as a marker of HIV risk behaviours;
- Monitor the number of people infected with HIV who develop an STI, which is a marker of risky behaviours.

Aetiologic versus Syndromic Case Reporting

STI cases can be reported by one of the following strategies:

- *Aetiologic case reporting*, in which the specific STI pathogen is identified by laboratory methods to make a diagnosis
- *Syndromic case reporting*, in which the symptom complex is used for diagnosis in the absence of laboratory confirmation of an STI pathogen.

Aetiologic case reporting

In aetiological case reporting, the specific STI is reported (e.g., gonorrhoea). Aetiologic case reporting requires laboratory confirmation of diagnoses.

- Aetiologic case reporting is only possible where well-developed systems of laboratory diagnosis are incorporated into routine STI clinical case management.
- There are wide variations in diagnostic and reporting practices. For this reason, do not base aetiologic case reporting on clinical impressions. You must have laboratory confirmation.
- In resource-constrained countries, the use of laboratory services for diagnosis is frequently not available for routine care.

Syndromic case reporting

Syndromic case reporting relies on examining a patient and identifying a *syndrome* (a group of symptoms reported by a patient and detected in an examination that are characteristic of a specific condition). For surveillance purposes, the most useful STI syndromes are male urethral discharge and male or female genital ulcers. Recognise the following limitations of syndromic case reporting:

- The syndromes are not specific to a particular pathogen. Laboratory studies are required to determine which organisms are causing the symptoms.
- Only urethral discharge in men and non-vesicular genital ulcers in men and women are likely to reflect recent infection. So they are important for detecting trends in STI incidence.
- Syndromic case reports are a poor tool for assessing disease burden among women. Clinical infection is not always readily apparent in women compared with men, so syndromic case reporting may under-estimate disease burden in women.
- When possible, STI prevalence assessment and monitoring should be undertaken as a supplement to case reporting.

Aetiologic versus Syndromic Case Reporting, continued

Recommendation for case reporting

Because many areas do not have adequate support, STI case management and case reporting in these types of settings should be based on the syndromic approach.

Case definitions

Diagnosis of STI syndromes should be based on standard *case definitions*. A case definition is standard terminology for deciding whether a person has a particular disease using clinical or laboratory criteria, or both.

- Uniform case definitions should be used throughout the country to allow data gathered from the reporting systems to be compared.
- When a clinician makes and records a diagnosis, he or she must do so according to the standard case definition. This helps record officers or other designated staff to make correct counts. If a clinician counts cases that do not meet the standard case definitions, he or she might over-estimate STI incidence.
- Record clerks should know how to record the cases according to standard case definitions. They will determine whether or not the diagnosis meets the case definition. Cases should be recorded only if they meet the standard case definition, not based simply on the assigned diagnosis.

Syndromic STI case reporting

Where syndromic case reporting is used, clinicians should use uniform case definitions in recording their diagnoses and reporting cases. *The Joint United Nations Programme on HIV/AIDS* (UNAIDS)- and the *World Health Organization* (WHO)-recommended syndromic case definitions for surveillance are shown in Table 2.1 on the next page. These are the syndromes useful for surveillance purposes, but are only a sub-set of syndromes that would be identified in clinical care.

Syndromic STI case reporting, continued

Table 2.1. Recommended surveillance case definitions for selected STI syndromes.

STI syndrome	Case definition	Additional information
Urethral discharge	▪ Urethral discharge in men, with or without *dysuria*	▪ Caused by *Neisseria gonorrhoeae* and *Chlamydia trachomatis* ▪ Other possible infectious agents include *Trichomonas vaginalis, Ureaplasma urealyticum* and *Mycoplasma* spp.
Genital ulcer (non-vesicular)	▪ Ulcers on the penis, scrotum or rectum in men ▪ Ulcers on the labia, vagina or rectum in women, with or without inguinal lymphadenopathy	▪ Caused by syphilis, chancroid, lymphogranuloma venereum, granuloma inguinale or atypical types of genital herpes ▪ Reporting only non-vesicular genital ulcers excludes most herpes infections, which are most often the result of prior infection

Source: UNAIDS/WHO Working Group on Global HIV/AIDS/STI Surveillance. Guidelines for Sexually Transmitted Infections Surveillance. Geneva: World Health Organization, Communicable Disease Surveillance and Response, 1999. Available at www.who.int/hiv/pub/me/en/GuidelinesforSTISurveillance1999_English.pdf

Discussing the table

Looking at Table 2.1, answer the following questions:

a. Which STI syndrome can be caused by *N. gonorrhoeae* and *C. trachomatis*?

b. Why are vaginal or female urethral discharge not recommended in STI syndromic surveillance?

Using the IDS strategy to report

Under the IDS strategy, STI cases are reported from the district level using similar structures and reporting forms used for other high priority communicable diseases. The data are collected, analysed and disseminated in an integrated way.

Using the IDS strategy to report, continued

The STI surveillance portion of IDS includes reports for these syndromes:

- Cases of urethral discharge in men
- Cases of non-vesicular genital ulcers in men
- Cases of non-vesicular genital ulcers in women.

Aetiologic STI case reporting

Where aetiological case reporting is followed, clinicians use uniform case definitions in recording their diagnoses and reporting cases. The UNAIDS/WHO-recommended aetiological case definitions for surveillance are shown in Table 2.2:

Table 2.2. Recommended aetiological case definitions for selected STI syndromes. (continues on next page)

Gonorrhoea ***Confirmed Case definition:*** ▪ Isolation of typical Gram negative, oxidase-positive diplococci (presumptive *N. gonorrhoeae*) from a clinical specimen ▪ Demonstration of *N. gonorrhoeae* in a clinical specimen by a nucleic acid-based test ▪ Observation of Gram negative intracellular diplococci in a urethral smear obtained from a man.
Chlamydia ***Confirmed Case definition:*** ▪ Positive culture ▪ Direct fluorescent antibody test ▪ Antigen detection test or nucleic acid-based test for *C. trachomatis* taken from a genital site (some nucleic acid-based tests can be done on urine).
Syphilis (primary or secondary) ***Probable Case definition:*** ▪ Illness with ulcers (primary) or muco-cutaneous lesions (secondary) AND ▪ Reactive serological test (non-treponemal or treponemal). ***Confirmed Case definition:*** ▪ Demonstration of *T. pallidum* in a clinical specimen by dark field microscopy, direct fluorescent antibody test for *T. pallidum*, nucleic acid-based test or equivalent methods.

Syphilis (re-activation)

Probable Case definition:

- No clinical signs or symptoms of syphilis AND
- either a reactive non-treponemal and treponemal test in a patient with no prior syphilis diagnosis OR
- A non-treponemal test titre demonstrating a four-fold or greater increase from the last non-treponemal test titre.

Syphilis (latent)

Probable Case definition:

- No clinical signs or symptoms of syphilis, with evidence that the infection was acquired more than 24 months ago OR of unknown duration syphilis AND
- A non-treponemal test which is reactive or non-reactive AND a treponemal test which is reactive in a patient with no prior syphilis diagnosis.

Congenital Syphilis

Probable Case definition:

- An infant whose mother had untreated of inadequately treated syphilis during pregnancy (regardless of signs in the infant)
- An infant or child with a reactive treponemal test and any one of the following: evidence of congenital syphilis on physical examination, long bone x-rays compatible with congenital syphilis, a reactive VDRL-CSF, an elevated CSF cell count or protein (without other cause), a reactive FTA-ABS 19S-IgM antibody test, a reactive IgM ELISA, or a reactive IgM treponemal Western blot.

Confirmed Case definition:

- Demonstration of *T. pallidum* by darkfield microscopy, fluorescent antibody, or other specific stains in specimens from lesions, placenta, umbilical cord or autopsy material.

Stillbirth Case definition:

- A foetal death that occurs after a 20 week gestation or in which the foetus weighs >500g and the mother had untreated or inadequately treated syphilis at delivery.

Chancroid

Probable Case definition:

- Illness with genital or anal ulcers with the combination of no evidence of *T. pallidum* infection by dark field examination of ulcer exudates, or by a serological test for syphilis performed ≥7 days from ulcer onset
- Negative test for herpes simplex virus on ulcer exudates.

Confirmed Case definition:

- Identification of *H. ducreyi* by culture or nucleic acid-based test in ulcer exudates.

Discussing the table

Look at Table 2.2 and answer the following questions:

a. What are the differences between the case definitions for probable and confirmed primary or secondary syphilis?

b. Can gonorrhoea be diagnosed by symptoms and Gram stain alone in a man?

Basic and Advanced STI Surveillance

Two levels of STI surveillance activities can be planned:

- Basic STI surveillance activities should be undertaken in areas with limited resources.
- Advanced STI surveillance activities can be conducted in countries with more extensive resources and well-developed laboratories.

The types of activities to consider for each level are listed in Table 2.3.

Table 2.3. Comparing the approach for basic and advanced STI surveillance (continues on next page).

Basic Surveillance	Advanced Surveillance
Case reporting	
Sentinel or universal syndromic reporting (with minimal data elements collected) of: ▪ Male urethral discharge ▪ Non-vesicular genital ulcer disease in men and women.	Aetiologic reporting of: ▪ Syphilis (by stage) ▪ Gonorrhoea ▪ Chlamydia.
STI prevalence assessment and monitoring	
▪ Conduct periodically in high-risk populations (sex workers, STI patients) ▪ Test all pregnant women for syphilis ▪ Focus only on serologic testing for syphilis	▪ Conduct periodically in the general and high-risk populations: o Women attending family planning clinics o Military recruits o High-risk populations (sex workers, STI patients). ▪ Include urine testing for gonorrhoea and chlamydia as well as serologic testing for syphilis ▪ Can be combined with behavioural surveys

Table 2.3, continued

Assessment of syndrome aetiologies	
▪ Assess genital ulcer disease and urethral and vaginal discharge every three years	▪ Assess causes of genital ulcer disease at least every three years ▪ Assessment of genital discharge is not needed because laboratory-based diagnoses and aetiologic case reporting is used
Special studies	
▪ Monitor anti-microbial resistance for *N. gonorrhoeae* annually ▪ Conduct evaluation of STI treatment guidelines every three years	▪ Investigate outbreaks of diseases with low incidence ▪ Conduct special studies of: o Anti-microbial resistance monitoring for *N. gonorrhoeae* annually o Serologic surveys of HSV-2 especially among adolescents and young adults o Prevalence surveys of *human papilloma virus* (HPV) infections o Prevalence studies of bacterial vaginosis. Bacterial vaginosis is the most common cause of vaginal discharge in women of reproductive age. The presence of this infection is often a marker for multiple sex partners.

Discussing the table

Look at Table 2.3 and answer the following questions:

a. Which surveillance system requires an assessment of syndrome aetiologies for urethral discharge in men?

b. Which system is more reliant on syndromic case reporting?

Fit STI surveillance activities to HIV epidemic state

While all countries should conduct some form of case reporting, STI assessment and monitoring activities will depend on the state of the HIV epidemic. The table on the next page provides ideas for how to do this.

Fit STI surveillance activities to HIV epidemic state, continued

Table 2.4. Planning for advanced STI surveillance.

For this state of HIV epidemic…	Advanced STI surveillance plan
Low-level: HIV prevalence has not consistently exceeded 5% in any sub-population, even among high-risk groups, such as sex workers and injection drug users.	▪ Conduct prevalence assessments in urban areas because that is where risk is initially greatest.
Concentrated: HIV prevalence consistently exceeds 5% in one or more groups with high-risk behaviour. HIV prevalence is less than 1% in pregnant women.	▪ Conduct prevalence assessments in both rural and urban areas to monitor the spread from urban to rural areas.
Generalised: HIV prevalence is consistently greater than 1% in pregnant women. Although high-risk groups continue to contribute very greatly to the spread of HIV, sexual networking in the general population is sufficient to sustain the epidemic, independent of the high-risk groups.	▪ Conduct prevalence assessments in both rural and urban areas to monitor the spread from urban to rural areas. ▪ Include monitoring gonorrhoea and chlamydia. These infections suggest recent high-risk behaviours.

Discussing the table

Look at the table and answer the following questions:

a. In which states of the epidemic should you conduct prevalence assessments in urban areas? In rural areas?

b. What are the characteristics of a concentrated epidemic?

Summary

An STI surveillance system includes routine data collection and special studies. This surveillance can rely on either aetiologic or syndromic case reporting, but syndromic case reporting is recommended for countries with limited resources. Basic STI surveillance activities should be undertaken in areas with limited resources. Advanced STI surveillance activities can be conducted in countries with more extensive resources and well-developed laboratories.

Unit 2 Exercises

Warm up review

Take a few minutes now to look back at your answers for the warm up questions at the beginning of the unit. Make any changes you want to make.

Small group discussion

Get into small groups by country, region or province to discuss these questions.

1. What are the most common STIs in your district, province or country?

2. Is there currently ongoing surveillance for STIs in your district, province or country?

3. If you answered yes to question 2, is it a part of the IDS system? How does it relate to the HIV and AIDS surveillance systems?

Apply what you've learned/ case study

Try this case study. We will discuss the answers in class.

Table 2.5. Reports of STI case reporting from IDS in Yamo Province.

STI condition	2004	2005	2006	2007
Male urethral discharge	25,292	28,959	29,784	29,859
Male non-vesicular genital ulcer	6,429	7,983	7,497	7,698
Female non-vesicular genital ulcer	5,834	6,497	6,306	6,905

a. Look at the STI data provided in Table 2.5. Assume that the population size has not changed between 2004 and 2007. What do the data suggest about the trends in the incidence and prevalence of these conditions in Yamo Province?

b. What do these data suggest about trends in HIV risk behaviours?

c. What additional data would you be interested in reviewing to assess burden of STI infection and incidence of STI infection in the province, and why would you be interested?

Annex 2.1. Health Facility Outpatient and Inpatient IDS Case Reporting Form

Health Facility _____ **District** _____ **Province** _____

Year _____ *Month* _____ *Record below the total number of cases and total number of deaths for each disease/condition. Report these totals to the next level. Complete the column for the current month for all diseases/conditions.*

		Outpatient	Inpatient	
			Cases	Deaths
Malaria <5 years	Uncomplicated			
	Severe or complicated			
Malaria ≥5 years	Uncomplicated			
	Severe or complicated			
Inpatient malaria (severe and complicated, all ages)				
Uncomplicated malaria (≥5 years, pregnant)				
Complicated malaria (≥5 years, pregnant)				
Severe malaria (≥5 years)				
Severe pneumonia (≥5 years)				
Diarrhoea with some dehydration (<5 years)				
Diarrhoea with severe dehydration (<5 years)				
AFP				
Malaria in pregnancy				
Maternal discharge				
Male non-vesicular genital ulcer				
Female non-vesicular genital ulcer				
Diarrhoea with blood				

Number of sites that reported on time _____

Number of outpatient sites that are supposed to report _____ Number of sites that reported late _____

Zero reporting for immediately reported, case-based disease/conditions:
Total cases previously reported this month on case forms or line lists

AFP		Measles		Plague	
Cholera		Meningitis		Yellow fever	
Dracunculiasis		Neonatal tetanus		Viral haemorrhagic fever	

NOTE: Official counts of immediately notified cases come only from case forms or line lists. The counts from the zero-reporting boxes are not official counts.

Analysis, interpretations, comments and recommendations on both outpatient and inpatient data

Other information:

Look at the trends in the District Analysis Book. Comments on observed trends? Abnormal increase in cases, deaths or case fatality ratios? Lack of decrease of previous increasing trends? Improving trends?

Conclusions, actions taken and recommendations:

Sent Report Date: _____ Person: _____ Received Report Date: _____ Person: _____

- Some dehydration, severe dehydration, pneumonia and severe pneumonia are defined according to WHO Integrated Management of Childhood Infections (IMCI) definitions. TB and leprosy data reported quarterly on separate forms.

Notes

Unit 3

Universal Case Reporting and Sentinel Surveillance for STIs

Overview

What this unit is about

This unit compares and contrasts universal sexually transmitted infection (STI) case reporting and STI sentinel surveillance.

Warm up questions

1. Which of the following is an advantage of universal STI case reporting?

   a. It is the most readily available source of surveillance data and easy to collect from health facilities.
   b. It provides data on the burden of STIs at the health facility level, which is important for planning health services provisions.
   c. Under stable conditions and consistent reporting, data from universal STI case reporting reflect the true incidence of STIs in a population.
   d. All of the above.

2. True or false? Data collected from sentinel sites can be easily generalised to a broader population.

   True False

3. In countries where information about STIs is obtained through a universal reporting system, sentinel STI surveillance:

   a. Is unnecessary
   b. Should replace universal reporting as the primary method to study STIs
   c. Should supplement information obtained from the universal reporting system.

4. True or false? Supervision and feedback are easier to provide for a sentinel surveillance system than for a universal system.

   True False

Warm up questions, continued

5. True or false? Universal case reporting provides a poor assessment of the true disease burden among women.

   True False

6. What system of surveillance is recommended for reporting all priority communicable diseases?

Introduction

What you will learn

By the end of this unit you should be able to:

- Discuss the purpose of each of these systems of surveillance
- Discuss the advantages and disadvantages of each system
- Define when each system should be implemented
- Define the population studied for each system
- Discuss reporting under Integrated Disease Surveillance (IDS).

Two case reporting approaches

This unit discusses, compares, and contrasts two different approaches to STI case reporting:

- Universal STI case reporting, in which all healthcare facilities report all STI cases to public health authorities
- Sentinel STI surveillance, in which selected sites collect more detailed data on STI cases.

Universal STI Case Reporting

Types of reports used

In *universal case reporting*, minimal data elements about *sexually transmitted infections* (STIs) are collected from all health facilities in the country. These minimum data include information such as age group and sex. Health facilities may provide either:

- *Syndromic case reports*, which provide data on each patient's set of symptoms (*syndromes*)
- *Aetiologic case reports*, which provide data on what micro-organism is causing each patient's symptoms. These determinations can be made only in a laboratory.

Often in resource-constrained settings, lack of laboratory support means that syndromic reports will be the only reports received.

Case reporting for STIs is limited to reporting from public health facilities. The STIs tend to be under-reported because some STIs do not cause symptoms and because patients who are *symptomatic* tend to self-medicate or to seek care from a wide range of sources, such as private clinics, traditional practitioners and pharmacies.

Advantages and disadvantages

The advantages and disadvantages of universal case reporting for STIs are outlined in Table 3.1.

Table 3.1. Advantages and disadvantages of universal STI case reporting.

Advantages	Disadvantages
▪ It is the most readily available source of STI surveillance data. ▪ It provides data that are easy to collect from health facilities. ▪ It provides data on the burden of STIs at the health facility level, important for planning health services. ▪ When consistent, it can be used to track population-level STIs trends.	▪ It is based on recognition of symptoms and thus provides a poor assessment of the true disease burden among women (compared with men, STIs are more often *asymptomatic* in women). ▪ It does not provide a direct estimate of the population burden of STIs because people with asymptomatic infection do not realise they are infected so they do not seek care. ▪ It is affected by fluctuations in *health-seeking behaviours* of the population not related to the burden of disease (for example, availability of drugs or introduction of user fees at clinics).

Universal STI Case Reporting, continued

Discussing the table

Look at Table 3.1 on the previous page, and answer the following questions:

a. Why does universal case reporting provide poor assessment of disease burden among women?

b. Does universal case reporting provide a direct estimate of the population burden of STIs? Why or why not?

Reporting

The World Health Organization (WHO) recommends the *Integrated Disease Surveillance* (IDS) form for universal STI case reporting in resource-constrained countries. This form is used for reporting all *priority communicable diseases*. It collects the same basic data for all diseases. Three STI syndromes are reported in IDS:

- Male urethral discharge
- Male genital ulcer disease
- Female genital ulcer disease.

IDS is used primarily for universal case reporting.

STI Sentinel Surveillance

A *sentinel surveillance* system is a system in which a pre-arranged sample of reporting sources, usually health care facilities, agrees to report all cases of one or more notifiable conditions. These sources are known as *sentinel surveillance* sites, where:

- More data on STI cases are recorded and reported
- Site trends are used to infer trends of STI case reports in other health facilities.

Health facilities that are known to be diligent in reporting STI cases are selected and supported as sentinel surveillance sites. Quality data are obtained from a few sites. You can collect more detailed data and use it along with the data obtained from the universal case reporting system to help understand the populations affected by STIs.

STI Sentinel Surveillance, continued

STI sentinel surveillance is most effective when:

- Staff at the sentinel reporting sites receive special training
- A data system can be established so that the data are examined and used effectively.

Sentinel site case reporting

In sentinel site case reporting, STI cases are reported from a small number of sentinel sites and can be based on the syndromic or aetiologic approach.

- In most resource-constrained countries, STI case reporting in most sentinel sites is based on the syndromic approach.
- Cases are diagnosed by doctors and nurses at the sentinel sites and specific syndromes are recorded onto patients' charts.
- It is important that the same *case definition* be used at all surveillance sites to enable comparison of data across sites.

Aetiologic case reporting may be possible in sentinel sites where laboratory support is adequate.

- Cases may be classified as confirmed or probable, depending on the strength of the laboratory evidence of the probable causative organism.

In this unit, we will discuss only STI sentinel surveillance based on STI syndromes.

Advantages and disadvantages

The major advantage of STI sentinel case reporting is that a few sites actively cooperate in systematic data collection. The result is higher quality and more consistent information. The cost of the system is kept at a minimum.

Another advantage is that additional data elements can be collected and reported to provide more detail on patients' *demographic information*, risk profile and treatment. The choice of which additional data to report largely depends on how the data will be used. Table 3.2 on the following page describes additional advantages and disadvantages of sentinel STI case reporting.

Advantages and disadvantages, continued

Table 3.2. Advantages and disadvantages of sentinel STI case reporting.

Advantages	Disadvantages
▪ Regular supervision, feedback, and logistical support can be relatively easily provided because sentinel sites are located in fewer facilities. ▪ Higher quality data can be obtained from a few sites with intensive support of training, supervision and logistics. ▪ A sentinel STI case reporting system is less expensive to run and maintain than a universal reporting system. ▪ Sentinel STI case reporting is generally more flexible than universal case reporting. Additional studies that collect STI and/or behavioural data can be added without changing the basic structure.	▪ Sentinel STI surveillance cannot provide minimum population-based estimates of disease burden. Sentinel sites are located in only a few health facilities. Therefore, data from sentinel sites only represent the sites and their catchment populations and not the whole district, province or nation. ▪ Sentinel sites cannot be considered representative of other clinics owing to the special attention that they receive. It is good to remember that information from these sites is representative only of the population they serve.

Discussing Table 3.2

1. True or false? Sentinel sites can be considered representative of other clinics.

   True False

2. True or false? Additional studies can be added to existing sentinel surveillance activities.

   True False

Selection of sentinel sites

Generally, the selection of sentinel sites is based on *convenience sampling,* which is the selection of sites from the population of all health facilities based on their accessibility and availability.

Another way to sample sites is by *probability sampling*, in which the sampling ensures that each site has an equal chance of being selected. *Probability sampling* is more difficult and inconvenient, so it is usually not done. But using *convenience sampling* may affect how representative the data are that arise from the system.

Selection of sentinel sites, continued

The selection, number and geographical distribution of STI sentinel sites are influenced by:

- The objectives of the system
- The structure of the country's health system
- The extent to which STI care is incorporated into primary health care.

The system should include all sectors that provide STI care; for example, public and private sectors, general outpatient departments and special clinics.

Consider these factors when you select STI sentinel surveillance sites. The site should:

- Already be seeing a large number of STI cases and providing care;
- Be varied and represent different geographic areas of the country and different population groups, including urban and rural populations;
- Have qualified staff who are willing and motivated to take on the extra responsibilities of case reporting;
- Include high-risk groups;
- Integrate STI surveillance activities with other ongoing surveillance activities, such as HIV/AIDS sentinel surveillance, to benefit from integrated action.

The national disease surveillance unit of the AIDS/STI control programme should be able to supervise the sites effectively and provide logistic backup and support, providing training, supervisory visits and supplies.

Another less common way to select sites is to use administrative or geographic areas as sentinel areas and include all sites within the area in the sample. Surveillance in such administrative or geographic areas is enhanced to provide higher quality and more detailed data than the rest of the country. This type of system, however, is not included in IDS because it discourages reporting from geographical areas outside the sentinel areas.

Developing reporting forms

The national surveillance unit and the national AIDS/STI control programme should develop the reporting forms, taking into account the data required. Consider the following information (next page):

Developing reporting forms, continued

- The same form should be used at all the sentinel sites.
- Simplified reporting forms, using information that is normally collected as part of routine patient care, should be used whenever possible. Using an overly complex reporting form may result in incomplete reporting. It also may add heavy additional demands for data entry and analysis.
- To protect patients' privacy, reporting forms should not have personal identifiers. Even where individual case reporting forms are transferred, they should be designed so that personal identifying information is removed before the data are reported.

Data elements

The following table outlines the *core data elements* and additional data elements that may be collected. Core data elements are those that must be collected.

Table 3.3. Core and additional data elements.

Core data elements	Potential additional data elements
▪ Reporting site ▪ Date of visit ▪ Sex ▪ Age group, age or date of birth ▪ Syndrome	▪ Residence ▪ Education or socio-economic status ▪ Marital status ▪ Occupation ▪ Anatomic site of infection ▪ Date of symptom onset ▪ Risk behaviour ▪ Pregnancy ▪ Previous episodes of STI ▪ Treatment ▪ Other information deemed necessary that pertains to region or district

Discussing the table

Look at Table 3.3 and answer the following questions:

a. Is socio-economic status a required core data element, or an optional additional data element?

b. Are age group, age and date of birth all required data elements?

STI Sentinel Surveillance, continued

Implementing surveillance

The following details are important in the implementation of sentinel surveillance at the selected sites:

- Staff members at the sites need to be trained in data collection and transfer using the standard reporting forms.
- There should be an adequate supply of forms at the sites.
- There should be supervision from the national surveillance/epidemiology unit and the AIDS/STI control programme.
- A system should be put in place of regular transfer of data from the sites to the central office for analysis.
- Once a sentinel site has been chosen and is operating, it should be monitored to ensure the overall quality of data coming from the site. A site may need ongoing training of staff if there is turnover or if there is a pattern of missing and incomplete data.

Interpreting results from sentinel sites

Data from sentinel surveillance systems must be interpreted with care because they are not necessarily representative of all clinics in the country, unless they were chosen through probability sampling. As a result, data from sentinel sites cannot be generalised to the country as whole.

Combined Universal and Sentinel Surveillance Case Reporting

Ideally, all health facilities in a country should report through the universal system using IDS. For best results, however, you can combine STI sentinel surveillance and universal case reporting:

- Universal case reporting through IDS provides minimum estimates of the incidence and prevalence of STIs;
- Sentinel surveillance, both sentinel site case reporting and sentinel site syphilis screening, provides epidemiological and clinical detail on a sub-set of cases;
- In combined systems, sentinel sites should report cases both through the universal case reporting system and through the sentinel site case reporting system.

Combined Universal and Sentinel Surveillance Case Reporting, continued

In countries where universal STI reporting is not conducted or where universal STI case reporting cannot be incorporated into the national health information system, STI sentinel surveillance alone can be conducted. The priority should be given to universal case reporting through IDS, however.

Syphilis screening at sentinel sites

Though distinct from sentinel STI reporting described above, many countries routinely screen patients without symptoms at *antenatal clinics* (ANCs) and STI clinics for syphilis using blood tests such as *VDRL* or *RPR*. At times, this type of syphilis screening is done as part of sentinel HIV *sero-surveillance*. The syphilis screening conducted in this activity is used for clinical purposes (i.e., to diagnose and treat pregnant women or STI patients for syphilis and to prevent transmission). Data obtained in this way can, however, also be used for estimating the prevalence of syphilis. Because the syphilis data are obtained from sentinel sites, they can be considered to be a type of sentinel STI surveillance.

Types of clinics that can be included as sentinel sites are:

- ANCs
- STI clinics.

Data on characteristics of persons without symptoms who are screened for syphilis can be collected from sentinel sites. To calculate prevalence from these data, divide the number of persons with positive syphilis tests (the numerator) by the number of persons tested (both positive and negative, the denominator). This can be done for all patients screened at the sentinel site or for specific demographic or risk groups, such as:

- Pregnant women under 24 years of age screened at an ANC
- Commercial sex workers screened at an STI clinic.

Summary

STI surveillance can occur through universal STI case reporting, sentinel STI surveillance or a combination of the two. Sentinel surveillance produces higher quality and more consistent surveillance data than universal case reporting, and at a lower cost. Although you cannot assume that sentinel surveillance data are representative of the general population, you can make that assumption with universal case reporting data. Through IDS, priority should be given to universal case reporting.

Unit 3 Exercises

Warm up review

Take a few minutes now to look back at your answers for the warm up questions at the beginning of the unit. Make any changes you want to make.

Small group discussion

Get into small groups by country, region or province to discuss these questions.

1. If you were to set up a sentinel site for STI surveillance in your district or province

    a. What would be the objectives of the system?

    b. What factors would influence your location of the sentinel site?

    c. What data elements would you collect from the site?

Apply what you've learned/ case study

Try this case study individually. We will discuss the answers in class.

Yamo Province set up an STI control programme in 2002. The management of STIs in Yamo Province, primarily carried out by doctors, nurses, or midwives, is based on a syndromic approach. Cases of STIs diagnosed by the syndromic approach were reported irregularly on a monthly basis to the Ministry of Health, National Health Information System (NHIS).

In addition to STI reporting, local healthcare providers also reported cases of 40 other diseases or health conditions.

In 2005, in collaboration with the STI control programme, NHIS conducted a two-year pilot test of STI universal case reporting from 850 public community-based clinics and 65 public hospitals covering the 29 districts of the country. The population size of men and women was stable during this time period.

Apply what you've learned/case study, continued

During this two-year pilot test, the NHIS received regular monthly case reporting of genital discharge, genital ulcers and genital warts from the peripheral health care providers.

The following table shows the results of this 2-year case reporting for 2005-2006 for men and women.

Table. Number of STI cases and proportion of patients with STI as a percentage of all patients seen at reporting health facilities for each STI syndrome, by sex and year, Yamo Province, 2005-2006.

	2005				2006			
	Men		Women		Men		Women	
STI syndrome	N	%	N	%	N	%	N	%
Urethral discharge	24,200	3.6	0	0	23,283	2.6	0	0
Vaginal discharge	0	0	54,000	6.0	0	0	77,321	5.9
Genital ulcer	5,834	0.8	5,800	0.6	5,800	0.6	7,042	0.6
Genital warts	1,134	0.2	2,700	0.3	986	0.1	3,060	0.2

a. Based on the scenario:

- Do STIs represent a significant burden of disease in Yamo Province?

- To better understand the situation in Yamo Province, what data elements would you suggest collecting on a reporting form?

- What would be the STI case definitions that would yield the best information to:

  1. Understand the STI situation?

  2. Assist in designing intervention programmes and evaluating them?

- Based on the rates of health facility utilisation, what syndrome is the most prevalent in Yamo Province?

Apply what you've learned/case study, continued

b. How useful are the data on:

- Vaginal discharge syndrome in women in determining STI burden and trends?

- Genital warts?

c. Complete the table below by calculating the incidence rates in cases per 100,000 of genital ulcer disease for 2005 and 2006 in both men and women.

Table. Estimated population and incidence of genital ulcer disease by sex and year, Yamo Province, 2005-2006.

	Men		Women	
	Estimated population	**Incidence***	**Estimated population**	**Incidence***
2005	926,000	630	927,000	
2006	950,000		980,000	

*Incidence: cases per 100,000 per year

Notes

Unit 4

Case Reporting, Data Management and Analysis

Overview

What this unit is about

This unit discusses sexually transmitted infection (STI) case reporting and the information flow from health facilities to the district and to the national level. It also reviews how to handle and analyse data.

Warm up questions

1. Match the STI data analysis parameter with its description by putting a letter in each blank:

___ Analysis by place	a. Annual analysis of data could show an annual trend of disease stratified by age group and sex.
___ Analysis by time	b. Analysis to detect if there are any trends in case reports over time and any inferences that can be made.
___ Analysis by person	c. Analysis to provide information about where clustering of disease might be occurring and any inferences that can be made.

2. True or false? Interpretation of STI trends should be made independently from STI control programmes and the health care system.

   True False

3. The district office should send case reports to the national level

   a. Weekly
   b. Monthly
   c. Quarterly
   d. Annually

Warm up questions, continued

4. District surveillance officers are responsible for:

    a. Checking data for inconsistencies (for example, STIs in very old or very young patients)
    b. Forward the results to the national level
    c. Following up with any health facility site that has missing or inconsistent data
    d. All of the above

5. True or false? Health facilities should report their data directly to the national level.

    True False

6. List three ways to handle surveillance data so that patient confidentiality is protected.

    a.

    b.

    c.

Introduction

What you will learn

By the end of this unit you should be able to:

- Describe how to plan your data collection and ensure confidentiality
- describe the flow of data from health facilities to the district and to the national level
- Discuss the roles and responsibilities of each person involved in data handling at each level
- Discuss the analysis of STI data
- Explain how to use the Integrated Disease Surveillance (IDS) strategy to plan STI data collection and reporting.

Planning Your Data Collection

Initial considerations

National, district and health facility needs and the type of *case reporting* already being done dictate the data elements to be collected. Table 4.1 summarises the two types of case reporting:

Table 4.1. Two types of case reporting.

Type of case reporting	Description
Universal	▪ A minimum set of *data elements* essential for reporting a case are collected. ▪ This set of data elements should be predetermined at the national level and collected by all facilities.

Sentinel site surveillance	▪ The Ministry of Health or National Health Information Centre:
	  ▪ Decides what should be collected
	  ▪ Chooses the sentinel sites
	  ▪ Provides each sentinel site with a standard form.

Discussing the table

Look at Table 4.1 and answer the following questions:

a. Who should be in charge of choosing the sites for sentinel surveillance?

b. Which type of reporting involves the reporting of a minimum set of data elements?

Initial considerations, continued

The national level should develop forms that all sites will use and coordinate training. The World Health Organization (WHO) recommends the *Integrated Disease Surveillance* (IDS) form for universal STI case reporting in resource-constrained countries. This form is used for reporting all *priority communicable diseases*. It collects the same basic data for all diseases.

A data management system should be developed at the national level. Clear lines of reporting must be specified. The roles of different workers, from health facilities or sentinel sites through to the national level, should be clearly defined. The data management system should clearly explain how surveillance officers at both the district and national levels:

- Receive data
- Record data
- Check the data for completeness and consistency.

The national level should also design a method for the submission of the reports by mail, regular direct pick-up from the sites and districts, or hand delivery.

Confidentiality and security

All STI surveillance data must be handled to ensure patient *confidentiality* (the protection of a patient's personally identifying information) and privacy. Specifically:

- Train staff who record, store and report surveillance data in the importance of privacy and confidentiality of each patient's data;
- Develop a written confidentiality policy for your surveillance and STI control programme;
- Protect the integrity of STI data to ensure that they cannot be modified;
- Restrict access to the data; use passwords or restrict access to computers;
- Lock all raw data in filing cabinets;
- Remove all personal identifying information before you report data from one level to another;
- Keep patients' personal identifying information only at the health facility where it was collected and do not allow unauthorised disclosure of the personal identifying information.

Confidentiality and security, continued

Secure the data to protect it from harm or loss. Back up on an external drive or CD-ROM every time data are added or edited.

- All STI data are confidential. The computer hardware should be password protected. Access should be limited to data-entry personnel.
- Provide safe cabinets for storing forms that have been entered.
- Lock the cabinets and restrict access to authorised personnel only.
- When disposing of computers and/or external drives, ensure that all personally identifying information is permanently deleted prior to disposal.

Collecting Data

At the health facilities

Collection of STI data should be an integral part of STI case management. Everyone involved must have clearly defined duties.

- The data collection process should interfere as little as possible with the patient's care and case management.
- The data required should be data usually collected during case management.
- Data should be recorded on outpatient cards then transferred to the patient register and standard reporting forms.
- One individual must be responsible for the actual reporting so that reports are made on time.
- A supervisor must ensure that the data are ready before they are sent to the district.
- Questions from the district should be investigated and answered.

Health facility process

Here is the step-by-step process undertaken at the health facilities:

1. The doctor, midwife, or nurse who diagnoses and provides care for the patient:

    - Is responsible for identifying cases and recording medical and *demographic* data onto patients' charts
    - Must record the diagnoses according to standard *case definitions* to help record officers or other staff to correctly tally at the end of the month.

Health facility process, continued

2. Depending on data requirements for reporting, the information may be transferred directly to standard reporting forms from the patients' charts.

3. STI cases should be hand-tabulated regularly, usually monthly. Data entry clerks should be knowledgeable about the STI case definitions so they can decide whether a patient meets the definition if there is any question. The data entry clerk or other trained staff:

   - Abstracts data from the patients' charts onto the patient register or tally sheets
   - Only includes patients presenting for the first visit with a current episode of STI
   - Makes separate entries for each syndrome. Because some patients will have more than one syndrome, a separate entry will result in a slight overestimation of the total number of people with STIs but will yield a more reliable estimate of the magnitude and trends of the individual syndromes.
   - Transfers monthly totals from tally sheets to standard reporting forms, provided as Annex 4.1 of this unit
   - Makes a zero entry if there were no cases of a specific syndrome during that month (do not leave the space blank) so the district level will know the report is complete.

4. In some cases, the facility will include several clinics or sites. In that case, a supervising doctor or nurse should:

   - Review monthly tallies from the health facility
   - Make their comments and have problems investigated before the reports are submitted to district authorities.

5. The final reporting forms should be completed in triplicate. Submit two copies to the district, and file one at the health facility.

6. *Sentinel site* case reports from health facilities will include more information than universal case reports. The same form should be used at all sites. Sentinel case reports should provide:

   - The source of the data, such as outpatient department, antenatal clinic, specialised STI clinic.
   - Total number of patients and number of new outpatients seen in the reporting department for all conditions during the reporting period.
   - The age in the patient register (age in years, date of birth or both)

Health facility process, continued

- A summary of age in representative age groups (for example: less than 10 years, 10-14, 15-19, 20-24, 25-29, 30-34, 35-39 and 40 and above; or in IDS, as 10-24 and ≥25)

- Uniform categories of age in all reporting sites to allow for comparisons across sites.

At the district level

When the district level carefully reviews facility forms, the quality of data received at the national level is high. Of course, the better the data quality, the better the national level can make decisions that will affect every health facility.

District level data checking and editing should focus on:

- Checking for completeness of data
- Ensuring that all the variables indicated on the data collection forms are appropriately filled.

District surveillance officers should check for:

- Inconsistencies (for example, gonorrhoea in very old patients).

The district surveillance officer should follow up with any health facility site that has missing or inconsistent data. Do this before forwarding the forms to the regional or national level.

The district combines the totals from all the reporting health facilities:

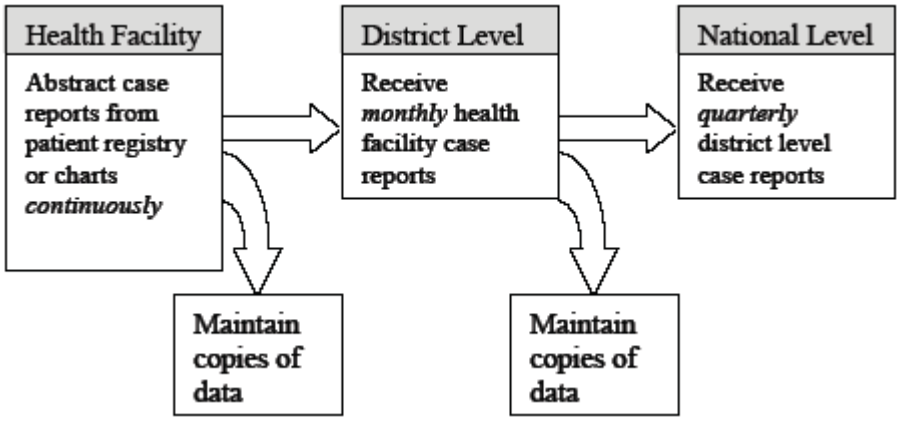
- If the district has computers and software, a data entry clerk will enter data into a computerised database. If these resources are not available, data entry is done at the national level.
- A copy of the health facility case reports should be kept at the district level.
- District reporting forms should state the number of health facilities with complete reports.
- The original district summary totals should be sent to the regional or national level following clear reporting lines. Annex 4.2 provides a sample form.

At the national level

Check inconsistent data with the reporting sites. At the regional and national levels, depending on your country's resources, a trained data entry clerk will enter reports into a computerised *database*, a programme that stores all patient information. The data then are analysed.

Figure 4.1 on the following page summarises the data flow process.

Figure 4.1. Data collection and flow.



Discussing the figure

Looking at Figure 4.1, answer the following questions:

a. In addition to passing the data to a higher level, what else should be done with the information collected at each stage?

b. How often should district-level reports be sent to the national level?

Entering and Analysing Data

Using the IDS strategy

Under the IDS strategy, the district level reports STI cases using the reporting forms used for other high priority communicable diseases. The data are analysed and disseminated in an integrated way.

Data entry

Data should be *double-entered* (that is, entered twice) to avoid errors. Alternatively, use software such as *Epi Info*™, which combines data entry with validation. Consider the following points regarding data entry (next page):

Data entry, continued

- Even if you use a data entry edit program, data still need to be carefully checked before analysis.
- A simple frequency tabulation can be run after data are entered to re-check for implausible values.
- Other ways to ensure correct data entry include:
  - Place a tick or cross on forms once they have been entered
  - Print out data in the form of a table to check whether the data are logical (for example, women should not be reported with urethral discharge).

Data analysis

In *second-generation HIV surveillance,* STI case reporting is used as a proxy for HIV transmission because STIs are transmitted in the same way as sexually transmitted HIV and because programmes that target prevention of sexually transmitted HIV also should prevent transmission of STIs. Several STI syndromes result in symptoms quickly and represent recently acquired infection that may indicate trends in HIV incidence as well. Surveillance of the three main STI syndromes – male urethral discharge syndrome, male non-vesicular genital ulcer disease, and female non-vesicular genital ulcer disease – can, therefore, serve two functions:

- Indicate where HIV transmission could be occurring (for instance, a geographical area or a population group)
- Indicate where HIV prevention programmes are failing (if the rates of STIs are rising) or succeeding (if the rates of STIs are falling).

The analysis of STI data usually takes place at the national level, and there may be an epidemiology unit for analysis of surveillance data on all priority diseases. Collaboration between this unit and the AIDS/STI control programme is essential.

Analyse data by these categories to identify the sites that are not reporting consistently:

- Reporting site
- Type of facility
- District
- Sex
- Age group.

Also, analyse data separately for each syndrome (if syndromic case reporting is conducted) or for each disease (if aetiologic case reporting is conducted).

Data analysis, continued

STI data analysis should generally focus on three parameters: person, place, or time. Table 4.2 explains these parameters.

Table 4.2. Types of STI data analysis.

Type of analysis	Description
By person	▪ Annual analysis of data to show trends in specific syndromes ▪ In the case of aetiologic surveillance, diseases stratified by age group and sex.
By place	▪ Analysis to show where diseases might be clustering and any inferences that can be made ▪ Stratified analysis by region or geographical area to show if there are significant differences between places.
By time	▪ Analysis to detect if there are any trends in case reports over time and if any inferences can be made (for example, incidence increasing or decreasing) ▪ Data for a specific quarter should be compared with the same quarter in the previous year.

Discussing the table

Looking at Table 4.2, answer the following questions:

a. Does analysis by person allow you to track STI trends in specific age groups? How would this aid HIV prevention programmes?

b. Does analysis by place allow you to detect if there are any trends in case reports over time? How would this aid HIV prevention programmes?

Interpreting trends

Be careful when you are interpreting STI trends. Interpretation of trends should not be made outside the context of STI control programmes or the healthcare system. In other words, to interpret STI trends accurately, you must think about the following factors (next page):

Interpreting trends, continued

- Factors related to *health-seeking behaviour*, such as additional healthcare facilities opening, availability or unavailability of medications, or introduction of user fees
- Factors affecting reporting practices, such as changes in staffing or training the staff handling case reporting and data
- Changes in *case definitions* or quality of services.

If there are unexpected fluctuations, officers at the national or regional level should investigate by contacting the sites.

Analysing universal and sentinel site data

Analysis of *sentinel site surveillance* data and universal reporting data is similar, with the following exceptions:

- When doing analysis by place, be cautious in interpreting clustering because sentinel sites cannot be taken as wholly representative of non-sentinel clinics
- Unlike universal reporting, it may not be possible to analyse annual trends in population-based rates of disease in a sentinel system. A rough approximation might be possible, however, if the population of the catchment area of sentinel sites is known. That is, if the population from which the clinic population is drawn is known, it can serve as a denominator to calculate prevalence.

The magnitude of STIs by category and trends should help in drawing preliminary conclusions about the burden of STIs.

At all levels of analysis, the data should be clearly summarised in tables, graphs, or charts, to be easily understood. In this way, trends or patterns are identified.

Annex 4.1 provides a sample IDS reporting form for the district level.

Summary

Surveillance data collection occurs at the health facility level, and data processing takes place at the district and national levels. It is extremely important to ensure patient confidentiality. STI data analysis should generally focus on three parameters: person, place, or time.

Unit 4 Exercises

Warm up review

Take a few minutes now to look back at your answers for the warm up questions at the beginning of the unit. Make any changes you want to make.

Small group discussion

Get into small groups by country, region, or province to discuss these questions.

1. Describe the system for forwarding STI surveillance reports from the health facility level to the national level in your country. Describe what happens to the forms at each level and indicate the responsible officers.

2. What core data elements are required for reporting a case through the STI universal reporting system? What other information would you normally report in addition to STI case reports from a health facility and from a district?

Apply what you've learned/ case study

Try this case study. We will discuss the answers in class.

You are the national STI surveillance officer for the Republic of Melabia. You rely primarily on syndromic surveillance using a universal reporting system and IDS. You have noticed an increase in the number of reported cases of male non-vesicular genital ulcer disease in Tehama District, one of five districts in the country.

Table. Number of reported cases of male non-vesicular genital ulcer disease by district and year, Republic of Melabia.

District	Year					
	2002	2003	2004	2005	2006	2007
Modoc	40	42	38	54	45	38
Mono	60	70	72	84	65	58
Tuolomne	47	50	42	40	41	39
Tehama	53	87	76	95	107	197
Yamo	49	49	36	72	65	48

Apply what you've learned/case study, continued

a. What are some possible causes of this increase?

There is a large camp for displaced persons immediately across the border from Tehama. There are rumours that displaced persons have been coming to Tehama for care since 2006. Reliable figures are unavailable.

b. Could an influx of displaced persons with STI symptoms account for the increase in STI cases in Tehama?

c. How would you investigate this?

You examine all syphilis tests done at the clinic for one month. Because this is a sentinel site for syphilis screening as well, demographic data, including nationality, are available. The table below shows your findings:

Table. Results of sentinel syphilis screening by nationality, Tehama District.

Nationality	Positive syphilis tests	Total tested	Percentage positive
Melabian displaced persons	10	1,000	
Non-Melabian displaced persons	10	100	

d. Calculate the prevalence among Melabians and non-Melabians. How could these data be used for STI control?

Annex 4.1. District IDS Summary of Outpatient and Inpatient Surveillance Reports, District to Regional or National Level

Year ____ Month _____ District _____ Province _____

Record below the total number of cases and total number of deaths for each ... condition. Report these totals to the next level. Complete the column for the current month for all diseases or ...

		Outpatient	Inpatient	
		...ses	Cases	Deaths
Malaria <5 years	...omplicated			
	S...e			
Malaria >5	Unc...licated			
	...ver			
Inpatient ...alari...h se... ana...a (... years)				
U...ompl... mala... 5 years, la... ...ed)				
U... ...ca... I... ...ria (... ...ears lab-con... ...e				
Pneu... ...a (... ...ars				
...re p... mo... (< 5 years)				
Di... ...a w... ...ome dehydration (<5 years)				
...h severe dehydration (<5 ...rs)				
... AIDS cases				
Male urethral discharge	15-24 years old			
	≥25 years old			
Male non-vesicular genital ulcer	15-24 years old			
	≥25 years old			
Female non-vesicular genital ulcer	15-24 years old			
	≥25 years old			
Diarrhoea with blood				

Number of sites that reported on time _____

Number of outpatient sites that should report _____

Number of sites that reported late _____

Zero reporting for immediately reported, case-based disease or conditions:
Total cases previously reported this month on case forms or line lists:

AFP		Measles		Plague	
Cholera		Meningitis		Yellow Fever	
Dracunculiasis		Neonatal Tetanus		Viral Hemorrhagic Fever	

NOTE: Official counts of immediately notified cases come only from case forms or line lists. The counts from the zero-reporting boxes are not official counts.

Analysis, interpretations, comments, and recommendations on both outpatient and inpatient data

Other information:

Look at the trends in the District Analysis Book. Comments on observed trends? Abnormal increase in cases, deaths, or case fatality rates? Lack of reports or previous increasing trends? Improving trends?
Conclusions, actions taken, and recommendations

Sent Date: _____ Receipt Date: _____
Report Person: _____ Report Person: _____

Some dehydrating severe dysentery, severe pneumonia and severe pneumonia are defined according to WHO Integrated Management of Childhood Infections (IMCI) definitions. Tuberculosis and malaria cases reported quarterly on separate forms. Update District Analysis Book if you receive late reports from health facilities. Late reports are received from health facilities from previous months, separate sheet, last level updating numbers.

Notes

Unit 5

Specialised Techniques: STI Prevalence Assessment and Combined STI/HIV Behavioural Surveillance Surveys

Overview

What this unit is about

This unit describes four types of specialised surveys and defines when and how to use each:

- STI prevalence assessment and monitoring
- Combined behavioural and STI/HIV surveys.

Warm up questions

1. Prevalence_____ is the determination of prevalence among persons screened in defined populations, while prevalence monitoring is the determination of trends in prevalence over time.

2. True or false? STI prevalence data that show high rates of STIs are used to identify population sub-groups at high risk for HIV infection.

   True False

3. What is the primary purpose of STI prevalence assessment and monitoring?

   a. To identify population sub-groups with high prevalence of STIs
   b. To monitor trends in STI prevalence among defined populations
   c. a and b
   d. None of the above

4. In an STI prevalence survey of the general population, which STIs would you test for?

5. True or false? Undertaking a combined STI/HIV prevalence assessment and behavioural surveillance survey can identify population sub-groups at high risk for HIV infection.

   True False

Warm up questions, continued

6. True or false? The choice of which STI to include in a behavioural survey is made independently of the type of population to be studied.

   True False

7. True or false? STI prevalence data are useful for monitoring the effectiveness of HIV prevention programmes.

   True False

8. True or false? Combining HIV/STI surveillance and behavioural surveillance surveys is more cost effective than conducting the two surveys separately.

   True False

9. What does X represent in the equation below?
   a. total number of patients who test negative for a specific disease
   b. total number of patients who test positive for all priority diseases
   c. total number of patients tested

$$\text{Prevalence} = \frac{\text{total number of patients who test positive for a specific disease}}{X}$$

Introduction

What you will learn

By the end of this unit you should be able to:

- Discuss the use of prevalence assessment in a comprehensive STI surveillance system
- Discuss how STI sero-prevalence studies can be linked to HIV sero-prevalence studies
- Discuss the assessment of STIs in serological surveys
- Discuss how prevalence assessment studies can be linked to behavioural surveillance surveys
- Identify the STIs most suitable for inclusion in combined STI/HIV behavioural surveillance studies.

Prevalence Assessment and Monitoring

Prevalence assessment is a major component of STI surveillance. This core surveillance function is similar to HIV *sero-prevalence* surveys, and includes collecting blood or urine for identification of STIs as well as basic *demographic* information about the person tested.

Information obtained through *prevalence* assessments can be used to understand which groups are at greater risk for infection or resistance. Assessments determine demographic information about populations at risk. This information is used to describe a population. When prevalence and trends are identified, appropriate treatment can be planned.

Prevalence assessments are usually planned at the national level as one of the following:

- Part of a combined STI/HIV behavioural survey
- Part of a national HIV sero-prevalence survey
- A stand-alone project.

The STIs that can be included in surveys are:

- Syphilis
- Gonorrhoea
- Chlamydia
- *Herpes simplex* virus
- Hepatitis B.

Prevalence Assessment and Monitoring, continued

Objectives of assessment and monitoring

The main purposes of STI prevalence assessment and *monitoring* are to:

- Identify *population sub-groups* with high prevalence of STIs
- Monitor trends in STI *prevalence* among defined populations.

Prevalence assessments are used in various situations:

- In prevalence assessment and monitoring, interventions (such as screening and treatment) are part of the surveillance activity
- Prevalence assessment may also be performed as part of studies. These studies are designed to obtain data for programme planning
- Often, STI prevalence is monitored in routinely screened, defined populations. For example, women are routinely screened for syphilis during antenatal care or delivery. The main purpose of screening at *antenatal clinics* (ANCs) is detection and treatment of STIs. Determination of prevalence is not the main goal.

Definition and terms

Here are some of the terms used in prevalence assessment and monitoring:

- Prevalence of a disease or infection: proportion of people in a population who have the disease or infection at a specified time
- Prevalence monitoring: following prevalence trends over time to see if they are increasing or decreasing
- STI prevalence assessment and monitoring: using surveys to determine what percentage or how many people have STIs compared to the total population.

Programme planning

STI prevalence data are of great use in HIV and STI programme planning, management, and evaluation. They are used to:

- Develop national estimates of STIs
- Identify population sub-groups at *high risk* for HIV infection (as evidenced by high rates of STIs)
- Guide funding and resource allocation for STI and HIV prevention programmes
- Monitor effectiveness of STI and HIV prevention programmes
- Intervene in the transmission of STI through screening and treatment.

Prevalence Assessment and Monitoring, continued

General population surveys

Sero-prevalence surveys for certain STIs are similar to HIV sero-prevalence surveys. But unlike HIV, these surveys are *linked*. In other words, the patients know their blood has been drawn for screening, and they receive the results.

The two most common settings for general population serological screening for STIs are ANCs and blood donation sites. They are especially useful in countries where few other data on STI prevalence have been obtained and reported. The results can be used to guide HIV and STI prevention programmes. These are slightly different from syphilis screening activities at sentinel sites, where more complete data are obtained.

- At ANCs, sero-prevalence of syphilis among antenatal women should be conducted at least once every two years.
- At blood donor sites, syphilis *serologic tests* should be conducted routinely. These data (positives and number screened) should be forwarded without personally identifying information to STI control programmes. In many countries, this is not done so STI programmes do not have the chance to organise or report these data.

Other sites for routine syphilis screening

Routine syphilis screening is also done for:

- Prisoners at entry into detention facilities
- Military recruits
- Routine sex worker examinations.

There is less selection bias when the people being screened are from these sorts of facilities than when people are seeking care because they have symptoms. People with STI symptoms are more likely to be infected with STI organisms than people without symptoms. Thus, data from sites where people seek care for symptomatic STIs will over-estimate the prevalence of infection.

General population surveys, continued

In formal prevalence assessments, several types of tests can be performed, such as:

- Sero-prevalence surveys for syphilis. These are the most readily available data and are routinely done at antenatal and STI clinics and blood banks. Syphilis should be the initial focus of prevalence assessments
- Urine screening for asymptomatic chlamydia and gonorrhoea using nucleic acid-based tests
- *Unlinked anonymous* sero-prevalence surveys for viral STIs such as the *Herpes simplex* virus and the hepatitis viruses.

Laboratory requirements

Prevalence assessments are usually performed when local laboratory infrastructure exists, or when a site with no laboratory collaborates with a site that has the necessary resources.

Assessment of prevalence is primarily based on diagnosis of diseases that are asymptomatic and persistent. This means that prevalence must be reported based on laboratory diagnosis:

- Serologic testing is used for syphilis, *H. simplex* virus, and hepatitis B
- Chlamydia and gonococcal infections can be tested for using urine.

Diagnostic tests are more useful for assessing prevalence when the test results are specific for *active infection*. For example:

- Non-treponemal syphilis serologic tests, such as *VDRL* and *RPR*, are not specific for primary, secondary or early latent syphilis, unless titres are examined in relation to a reliable treatment history. In most developing countries, such historical data are not available.
- Treponemal tests alone do not distinguish adequately treated syphilis from active syphilis infection.
- Use of a non-treponemal test titre cut-off (for example, 1:4 or 1:8) may assist in monitoring trends in prevalence of recent, primary, secondary, and early latent syphilis infection.

Prevalence Assessment and Monitoring, continued

Calculating prevalence

To calculate prevalence, take the number of patients who test positive for a specific disease (the numerator) and divide it by the total number of patients tested (the denominator), all with valid test results, as shown below:

Figure 5.1. Calculating prevalence.

$$\text{Prevalence} = \frac{\text{total number of patients who test positive for a specific disease}}{\text{total number of patients tested}}$$

When testing equipment is not available for prevalence assessments, you can calculate the *syndromic prevalence*, based on whether symptoms are present in a patient. In this case, prevalence is calculated according to the following equation:

Figure 5.2. Calculating syndromic prevalence.

$$\text{Prevalence} = \frac{\text{total number of patients symptomatic for a certain disease}}{\text{total number of patients seen}}$$

In most cases, unless you are assured of including a person only once, positivity is only an estimate of prevalence.

Discussing the figures

Looking at Figures 5.1 and 5.2, answer the following questions:

a. Under what conditions would you use the equation in Figure 5.2 instead of the equation in Figure 5.1?

b. What is the denominator in each of the equations?

Data elements

Data elements for prevalence assessment and monitoring are the same as those used for case reports. Data should be analysed by sex and age group. The prevalence of *Herpes simplex virus-2* (HSV-2) among 15-24-year-old women, for instance, can be calculated by dividing the number of HSV-2 antibody-positive women 15-24 years old by the total number of 15-24-year-old women tested for HSV-2 during the assessment period.

Prevalence Assessment and Monitoring, continued

Sample size

The minimum acceptable *sample size* for assessing the prevalence depends on:

- The expected prevalence of the disease in the population, based on prior estimates or similar situations in neighbouring cities and countries
- Whether the sample will be used to monitor trends in prevalence over time. To be valid, the sample size needs to be large to determine trends in prevalence over time and identify sub-populations at *high risk* for infection. This means that the sample size needs to be large enough to be able to detect the difference between two prevalence estimates. Statistically, this is referred to as the *margin of error* (for example, ± 3%).

The standard statistical approach for determining the sample size requires:

- An estimate of STI prevalence in the population to be surveyed
- The margin of error considered acceptable (for example, ± 3%). This is also called interval width
- The level of confidence desired (a 95% *confidence interval* refers to values that are above and below the prevalence estimate and means that if the survey were done 100 times, the prevalence in 95 surveys out of 100 would fall within the 95% confidence interval. For example: if the estimated prevalence is 10% and the 95% confidence interval is 8%-12%, then 95% of the time the true prevalence will be between 8% and 12%).

The STATCALC feature of *Epi Info*™ software provides a user-friendly sample-size calculator for setting specific target sample sizes. The Epi Info™ software is distributed by the United States Centers for Disease Control and Prevention (CDC). You may learn more about Epi Info™ and download the software for free at this site: http://www.cdc.gov/epiinfo.

Practical considerations

In practice, sample sizes are balanced against the technical and financial resources available for each collection of the survey. Very large sample sizes in a sentinel site can provide useful information on the local epidemic; however, there may not be enough resources to carry out the surveys.

Formula to determine sample size

An exact formula to determine sample size (N) to achieve a certain pre-specified interval (for example, ± 3%, which is the same as a width of 6%) with a specified level of confidence (for example, 95%) is shown in Figure 5.3.

Figure 5.3. Formula to determine sample size needed for pre-specified interval with specified confidence level.

$$N = 4\, z_{\alpha}^{2}\, P\,(1-P) \div W^{2}$$

- z_{α} is a factor that corresponds to the desired confidence interval (for a 95% confidence level, $z_{\alpha} = 1.96$)
- P is the expected proportion of patients with the outcome (such as syphilis sero-prevalence)
- W is the width of the interval (for example the width for a margin of error of ± 3% is 0.06.

Analysis of STI prevalence

Analysis of routinely collected prevalence data (for instance, data obtained from routine screening of women in antenatal care) is similar to the analysis of *universal* and *sentinel case reporting* data. Quarterly and annual trends in prevalence should be analysed overall and stratified by basic categories, such as disease, sex, age group. and geographic location.

Prevalence trends may be altered by changes in the population being screened for several reasons:

- Different types of clinics, for example, an STI clinic versus a clinic serving the general population may get different results
- Change in the population's health-seeking behaviour
- Change in criteria used to select persons for screening
- Change in diagnostic tests, especially for chlamydia, which often vary in *sensitivity* and *specificity*.

Any changes should be recorded and taken into account in the interpretation of trend data.

Combined STI/HIV Prevalence and Behavioural Surveillance Surveys

Behavioural surveys of certain high-risk groups and of the general population are an integral part of *second generation surveillance*. They can be combined with HIV sero-prevalence surveys. An example of this is the Demographic and Health Survey with HIV testing (DHS+). Behavioural surveys also can be combined with STI prevalence surveys done along with HIV testing. These *combined STI/HIV behavioural surveillance surveys* collect data that compare patients' high-risk behaviour with the presence of STIs and HIV.

Combined STI/HIV behavioural surveillance surveys combine:

- STI/HIV prevalence assessments (including blood or urine tests for HIV and STIs)
- Behavioural surveys.

Prevalence assessments

As described earlier in this unit, prevalence assessments measure the proportion of a population that has a particular infection or disease. To calculate prevalence, you divide the numerator (the number of people infected) by the denominator (the number of people tested).

Behavioural surveys

Behavioural surveys use questionnaires to examine the prevalence of behaviours associated with HIV transmission. In these surveys prevalence is the number of people who have a certain behaviour (usually within a specified time period) divided by the total number of people who answered the question. They are an integral part of *second-generation surveillance*. They may be conducted as part of:

- National health and demographic surveys
- HIV behavioural surveillance or HIV sero-surveillance in high-risk populations.

In behavioural surveys, you interview people about their sexual and other high-risk behaviours that are associated with an elevated risk of STI or HIV infection. Examples of high-risk behaviour include:

- Having multiple casual sexual partners
- Not using condoms with casual partners
- Taking or giving gifts or money for sex
- Injecting drugs.

Combined STI/HIV Prevalence and Behavioural Surveillance Surveys, continued

Combined surveys

In contrast to STI case reporting, combined STI/HIV and behavioural surveys allow collecting denominator data, which in this case are the number of persons surveyed. In this way, prevalence of STIs among persons and certain behaviours can be calculated.

Combining STI/HIV prevalence assessment with behavioural surveillance surveys is more cost-effective than conducting separate surveys. The combined surveys reduce personnel costs and time.

Goals of combined surveys

Goals of combined prevalence assessment and behavioural surveys are to:

- Assess the prevalence of asymptomatic STIs in surveyed populations
- Identify *population sub-groups* at high risk for infection.
- Assess *health-seeking behaviour* for STI services. Health-seeking behaviour consists of actions an individual takes to maintain or improve their health. An example of this is getting tested for STIs at a public health clinic
- Measure the effectiveness of HIV/STI prevention programmes
- Determine the need for additional prevention and health services
- Guide funding and resource allocation for STI and HIV programmes.

Use consistent data elements

Use consistent data elements to determine risk behaviour. Use behavioural survey questions, such as:

- The number of sexual partners in the past three or 12 months
- New sexual partners in the past three months
- Condom use at the last sexual intercourse with someone other than a regular sexual partner
- Alcohol or drug use in the past 12 months
- Giving or receiving money for sex in the past 12 months.

When used with behavioural surveys, HIV and STI testing assesses risk behaviours and HIV and STI burden in high-risk and *bridging populations* and in the general population. Bridging populations include people in high-risk groups who have sex with people of lower risk in the general population, such as a female commercial sex worker having sex with her boyfriend who does not have other high-risk behaviours.

Combined STI/HIV Prevalence and Behavioural Surveillance Surveys, continued

Choosing STIs for behavioural surveys

When you are choosing which STI to test for in a combined STI/HIV and behavioural survey, consider two things:

- The laboratory infrastructure development in the country
- The type of populations under study.

These assessments almost always include HIV testing.

Laboratory testing for STIs

A country with strong laboratory support can conduct the following tests for STIs. Some of these infections reflect recent high-risk behaviour:

- Gonorrhoea and chlamydia - Gonorrhoea and chlamydia infections, identified through urine-based testing using nucleic acid amplification tests, are likely to reflect recently acquired infections. Although chlamydia and gonorrhoea can rarely persist for several months, their typical duration of shedding is on the order of a few to several weeks in the absence of treatment. Consequently, the presence of these STIs reflects recent high-risk behaviour or recent exposure from a partner with high-risk behaviour.

- HSV-2 - Serologic testing for HSV-2 may be useful in adolescent populations to indicate recent high-risk behaviour. In adults, HSV-2 testing is not useful because information on the duration of infection is absent.

- *Trichomonas vaginalis* – Trichomoniasis can represent recent high-risk sexual behaviour. For these surveys, sophisticated laboratory methods are usually used. These methods are not readily available and therefore *Trichomonas* is not usually part of these types of surveys.

- *Haemophilus ducreyi* - Serologic testing for *H. ducreyi*, the causative agent for chancroid, requires sophisticated laboratory capabilities. It is not typically a part of these types of surveys.

Most resource constrained countries have limited laboratory capacity and only test for syphilis (*Treponema pallidum*). Serologic testing for syphilis indicates infection but cannot determine the stage of disease or time of infection, although titres of non-treponemal tests are available (for

Laboratory testing for STIs, continued

example, the *VDRL* or *RPR* tests), titres of 1:8 or higher, or a four-fold increase in titers from a previous test can be used as a marker of recent infection.

Populations and STI monitoring

Table 5.1 provides a summary of populations and STIs for monitoring.

Table 5.1. Populations and STI monitoring.

Population	STI	Comments
Low-risk (youth)	HSV-2, *N. gonorrhoeae*, *C. trachomatis*	HSV-2 measures early sexual exposure
Bridging and high-risk: ▪ Sex workers ▪ Truck drivers ▪ Injection drug users.	*N. gonorrhoeae*, *C. trachomatis, H. ducreyi*, *T. vaginalis* (women only)	Measures recent sexual exposure
	T. pallidum	Exposure period cannot be determined unless titres are used
General population	*N. gonorrhoeae*, *C. trachomatis*	Measures recent sexual exposure
	T. pallidum	Exposure period cannot be determined unless titres are used

Discussing the table

a. Which STIs are useful for prevalence monitoring in both low-risk and bridging/high-risk populations?

b. Which STIs would you use for prevalence monitoring among male injection drug users?

Data elements

The data elements for combined STI/HIV surveillance and behavioural surveillance are those collected for routine STI surveillance, including data collected regarding demographics and risk behaviours. The types of behavioural data collected will vary depending on the populations surveyed. For example:

- In high-risk population surveys, greater attention is given to specific high-risk behaviours. For migrant truck drivers, for instance, questions may include having sex in exchange for money or goods and using condoms for sex with primary partner and other partners.
- In general population surveys, questions regarding general risks along with demographic characteristics and health-related behaviours are the priority. Questions may include age, marital status, sex, and occupation.

Data analysis

Data on STIs initially should be analysed separately for each specific disease. Cases of gonorrhoea, for instance, should be counted separately from cases of syphilis.

Calculate separately the prevalence and risk factors for each disease. Further calculate the prevalence by:

- Sex
- Age group
- Geographic area
- Marital status
- Other relevant characteristics for each disease.

Combine the frequency of the various acute STIs and risk behaviours to calculate the number of persons with an acute STI in a certain time period with certain demographic characteristics or risk behaviours.

Reporting Results of Special Studies

Distribute results of special STI surveillance activities to health centres, clinicians, and laboratories that have participated to help increase timely, valid, and complete case reporting.

National STI programmes should develop and implement a plan to effectively communicate the STI surveillance data. People experienced in health communications should design materials that summarise and effectively communicate the data to each of these groups:

- National AIDS programme directors
- National STI programme directors
- District medical officers
- Healthcare providers
- *Non-governmental organisations* (NGOs)
- Donors
- Other public health agencies.

Types of reports

When communicating surveillance data, think about using the following types of reports:

- Annual STI surveillance reports, with case numbers, rates, and trends by geographic area and demographic variables, and prevalence data by population
- Fact sheets, based on the data provided by the system, with tables and graphs that can be posted at health department offices and clinics, and provided in response to ad hoc inquiries, guidelines, and technical manuals
- Regular newsletters for clinicians, laboratory personnel, and others, which may include brief reports of surveillance data along with updated information on patient management
- Press releases that highlight disease burden and trends, and that can be used as part of public information campaigns
- Educational materials, such as charts and posters developed using the data provided by surveillance case reports
- Verbal feedback during meetings and supervisory visits
- Electronic media, such as summary data published on a web site.

Summary

STI prevalence assessments can be used to monitor STI prevalence trends in population sub-groups. Combined STI/HIV and behavioural surveys allow surveillance officers to calculate the prevalence of STIs among persons practicing risky behaviours. Selecting an STI for inclusion in a combined STI/HIV behavioural surveillance study depends on the population surveyed and available laboratory infrastructure.

Unit 5 Exercises

Warm up review

Take a few minutes now to look back at your answers for the warm up questions at the beginning of the unit. Make any changes you want to make.

Small group discussion

Get into small groups by country, region or province to discuss these questions.

1. What are the main objectives of STI prevalence monitoring?

   How can STI prevalence data be used by an HIV control programme?

2. Are data on syphilis sero-prevalence in routinely tested populations collected in your district or province? If so, what populations are being routinely tested?

   Are the data analysed and results disseminated?

Apply what you've learned/ case study

Try these case studies. We will discuss the answers in class.

Exercise 1

You work in an STI clinic in a brothel complex that serves about 1,000 female sex workers. You conducted syphilis screening and treatment for female sex workers at the clinic every quarter as part of the intervention and monitoring activities. The table on the next page shows the results of the STI screening and treatment programme in this high-risk population.

Apply what you've learned/case study, continued

Table. Number of female sex workers participating in the screening and treatment programme for one year and number with positive syphilis serologies (RPR >1:8) by quarter and age groups.

	Quarter							
Age Group (years)	**I**		**II**		**III**		**IV**	
	No. +	**N sampled**	**No. +**	**N sampled**	**No. +**	**N sampled**	**No.+**	**N sampled**
<15	3	54	4	59	3	62	1	61
15-19	4	52	4	60	4	64	3	68
20-24	8	80	9	88	7	90	6	95
25-29	9	78	9	82	8	86	7	90
30-34	7	52	6	50	7	60	6	62
>34	7	41	7	45	7	52	6	54

a. Complete the age-specific prevalence of syphilis sero-reactivity by quarter in the table below.

- Does the trend in age-specific prevalence levels support your belief that you collected good quality data?

- Why is the prevalence of reactive syphilis serologies higher among older women?

- Compute test positivity of syphilis for the one-year period. What is the main use of this information?

Apply what you've learned/case study, continued

Table. Prevalence of syphilis among female sex workers participating in the screening and treatment programme for one year and number with positive syphilis serologies (RPR >1:8) by quarter and age groups.

Age group (years)	Quarter				Total
	I	II	III	IV	
<15	5.6%	6.8%	4.8%	1.6%	4.7%
15-19	7.7%				
20-24	10.0%				
25-29	11.5%				
30-34	13.5%				
>34	17.1%				
Total	12.4%				

b. There is a downward trend of STI prevalence over time that may be attributable to your intervention programme (for example, condom promotion and screening and treatment of STIs).

- List other possible reasons for this downward trend of STI prevalence in this clinic population.

- What other information do you need to collect to support your belief that this downward trend is due to your intervention?

Apply what you've learned/case study, continued

Exercise 2

You are the HIV/STI surveillance coordinator in a health district in an East African country that has a generalised HIV epidemic. Your country also has high rates of other STIs, demonstrated through STI case reporting. Last year, an aid agency announced its interest in conducting a demographic and health survey of rural and urban areas. You were contacted by the provincial HIV/AIDS surveillance officer because he has decided to work with this agency to add STI testing to the HIV and behavioural survey in your province. He is asking you and the other district surveillance coordinators for your input into the survey design.

1. Which populations would you like to include in the survey in your district? Why?

2. Which STIs would you test for in addition to HIV? Why?

3. In addition to the demographic questions that the aid agency will routinely ask in the survey, what additional questions on STI/HIV risk behaviours would you want to include?

Notes

Unit 6

Specialised Techniques: Anti-Microbial Resistance Monitoring and Assessment of STI Syndrome Aetiologies

Overview

What this unit is about

This unit describes two types of specialised surveys and defines when and how to use each:

- Anti-microbial resistance monitoring
- Assessment of sexually transmitted infection (STI) syndrome aetiologies.

Warm up questions

1. For countries where syndromic STI case reporting is used, syndrome aetiologies should be reassessed every _____ years.

   a. One to two
   b. Two to three
   c. Three to four

2. True or false? Monitoring anti-microbial resistance of *Neisseria gonorrhoeae* may help to detect newly emerging resistance.

   True False

3. Choose an item below that is not one of the main purposes of assessing syndrome aetiologies:

   a. Provide data for guiding STI syndromic management
   b. Assess effectiveness of HIV prevention programmes
   c. Assist in the interpretation of syndromic case reports and the assessment of disease burden caused by specific pathogens
   d. Evaluate syndromic management algorithms for urethral discharge and genital ulcers

Warm up questions, continued

4. List two possible uses for data obtained from monitoring anti-microbial resistance of STI pathogens.

   a.

   b.

5. Which of the following sampling strategies is the most difficult to use when conducting anti-microbial resistance monitoring?

   a. Random
   b. Systematic
   c. Consecutive

Introduction

What you will learn

By the end of this unit you should be able to:

- Discuss the objectives of anti-microbial resistance monitoring in *N. gonorrhoeae* and *Haemophilus ducreyi*
- Discuss why assessment of syndrome aetiologies is a core component of a comprehensive STI surveillance system
- Describe the two main STI syndromes and their microbiological causes
- Discuss how data from assessments of syndrome aetiologies are used to revise syndromic treatment guidelines.

Monitoring Anti-microbial Resistance of STI Pathogens

Why monitor for resistance?

Drugs are routinely used to treat STI infections, which has led to increasing rates of *resistance*. Resistance is the alteration of a pathogen that makes it non-responsive to a particular anti-microbial agent. Simply put, the drug being used no longer controls or eliminates the infection.

Why monitor for resistance?, continued

Resistance monitoring entails examining in the laboratory the effectiveness of various anti-microbial agents in inhibiting the growth of *N. gonorrhoeae.* In resistance monitoring, various concentrations of a given anti-microbial agent are used to determine the minimum concentration of that agent that is required to stop the organism from growing. Depending on the concentration of the anti-microbial agent required to inhibit growth, the organism can be classified as sensitive, intermediate, or resistant to a particular anti-microbial agent. Usually the organism is checked for sensitivity against several different antimicrobials, often from different antimicrobial classes.

As an example of how to monitor anti-microbial resistance we will discuss *N. gonorrhoeae*, a core component of STI surveillance. Resistance monitoring is done to:

- Obtain the data necessary for developing and revising treatment guidelines
- Detect newly emerging resistance.

It is also important to monitor *N. gonorrhoeae* to ensure that the medication given to a patient with a gonococcal infection will cure the infection. Effective treatment for gonorrhoea:

- Relieves the signs and symptoms and achieves microbiologic cure in individual patients
- Prevents complications of pelvic inflammatory disease, chronic pelvic pain, and infertility in women
- Reduces the risk of HIV transmission by decreasing the presence of white blood cells at the cervix and urethra
- Interrupts transmission of *N. gonorrhoea.*

Laboratory requirements

Surveillance surveys for anti-microbial resistance of STI pathogens are usually organised and conducted by the national AIDS/STI control programme. Sites are chosen that have health care facilities with well-trained staff and laboratory expertise. Only selected sites will have the capacity to conduct these types of surveillance activities.

In our example of monitoring *N. gonorrhoeae* and selecting anti-microbial drugs for susceptibility testing, give priority to drugs commonly used for treating gonococcal infections. A laboratory performing susceptibility testing for *N. gonorrhoeae* should be able to accomplish the following tasks (next page):

Laboratory requirements, continued

- Culture the organism
- Perform biochemical and serologic confirmatory tests
- Perform minimum inhibitory concentration (MIC) agar dilution testing of anti-microbial agents.

If the national reference laboratory does not have this capacity, it may send *isolates* to a regional laboratory in another country for testing. An isolate is a culture of bacteria or other cells.

- Regional networks supported by *World Health Organization* (WHO) Collaborating Centres have been established in several WHO regions to conduct anti-microbial susceptibility testing for *N. gonorrhoeae*.
- National reference laboratories are encouraged by WHO and UNAIDS to participate in these centres' programmes of quality control and assessment.

Planning the testing

The minimum acceptable *sample size* for assessing the proportion of resistant organisms depends on:

- The expected proportion of the disease in the population, based on prior estimates or similar situations in neighbouring cities and countries
- Whether the sample is intended to be used to monitor trends in the proportion of resistant organisms over time. To be valid, the sample size needs to be substantially larger if you want to monitor trends over time.

Samples for resistance testing can be random, systematic, or consecutive.

- A *random sample* of gonococcal isolates is one in which each patient submitting a specimen from which the isolate is obtained would have an equal chance of selection. This type of sampling yields the most representative sample but is too difficult to conduct in most clinic settings.
- A *systematic sample*, for instance, every tenth patient with discharge and a positive *Gram stain* during the sampling period, is an adequate sample and easier to obtain. Systematic sampling requires attention to procedural details and is subject to manipulation by clinic staff. An example of manipulation is if a staff member excludes eligible cases that come in on busy days because of time constraints. For these reasons, systematic sampling is not feasible in some situations.

Planning the testing, continued

- A *consecutive sample* consists of selecting every patient that meets the inclusion criteria until you get to the required sample size or the survey period is over. Use this type of sampling if you determine that systematic sampling will not work in your setting.

A sample of 100 isolates per sentinel site during a defined time interval, such as a quarter or a year, is usually large enough to identify local patterns of resistance.

A finding of zero cases of resistant isolates among 100 isolates tested provides a probability of 95% that the true proportion of resistant isolates is <5% (if a random sample of isolates was tested).

Frequency of assessment

The assessment of anti-microbial resistance should be performed at least once a year. When feasible, it is best to sample isolates on an ongoing basis rather than during only one month or quarter per year. You can test 20 isolates per month, for example, at each sentinel site throughout the year. Ongoing sampling makes it more likely that newly emerging resistance or large changes in patterns of resistance will be detected early.

If trends in susceptibility are to be monitored reliably over time, variations in the sentinel sites and sampling procedures should be minimised.

Collection recommendations

Sentinel sites for collection of gonococcal isolates should be representative of the major regions in the country. Urban STI clinics that have the capacity to perform cultures usually are used as sentinel sites.

- Obtain isolates from both women and men.
- Obtain samples from men who have urethral discharge or women with vaginal discharge. A sample of the cervical discharge from women is necessary for isolation of the organism.
- Test for *Gram negative* intracellular diplococci.

Using a *Gram stain* on a sample of symptomatic people is an important option where laboratory resources are scarce because the yield of culture from these patients will be high.

Monitoring Anti-microbial Resistance of STI Pathogens, continued

Data analysis and interpretation

Microbiologists who are familiar with the sensitivity and specificity of each of the tests used should interpret the results.

- *Sensitivity* refers to the proportion of persons with a disease who are correctly identified by a screening test or case definition as having the disease.
- *Specificity* refers to the proportion of persons without a disease who a screening test or case definition correctly identifies as not having the disease.

Review the results of resistance testing each quarter, even if the sample size per quarter is small. Make sure the data are complete and patterns are generally consistent from quarter to quarter. If you see a big change in your quarterly review of data, investigate to determine if the change is due to:

- Real shifts in resistance patterns
- Problems in the laboratory.

Further investigation

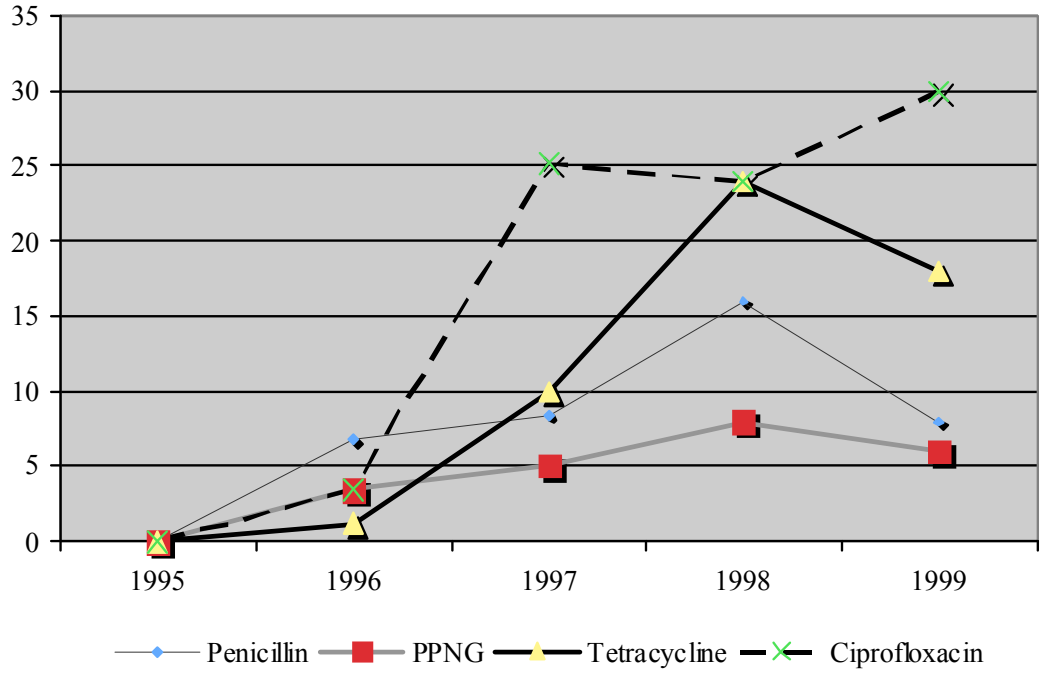
If shifts are noted, it may be useful to:

- Expand the sample beyond the number previously collected each month
- Increase the number of sites where susceptibility testing is performed until the problem is identified.

The appearance of new resistant strains should be reported as soon as possible to a WHO Collaborating Centre. The Centre will assist in confirming the finding and determine if intensive investigation is needed. Data on resistance should be reviewed carefully in preparing updated treatment guidelines and in revising the country's list of essential drugs.

Further investigation, continued

Figure 6.1. Frequency of penicillin-, tetracycline- and ciprofloxacin-resistant *N. gonorrhoeae* and frequency of penicillinase-producing *N. gonorrhoeae* by year, New Delhi, 1988-1993.



Source: Ray K, Bala M, Kumar J, Misra. Trend of antimicrobial resistance in *Neisseria gonorrhoeae* at New Delhi, India. Intl J STD AIDS 2000; 11:115-118.

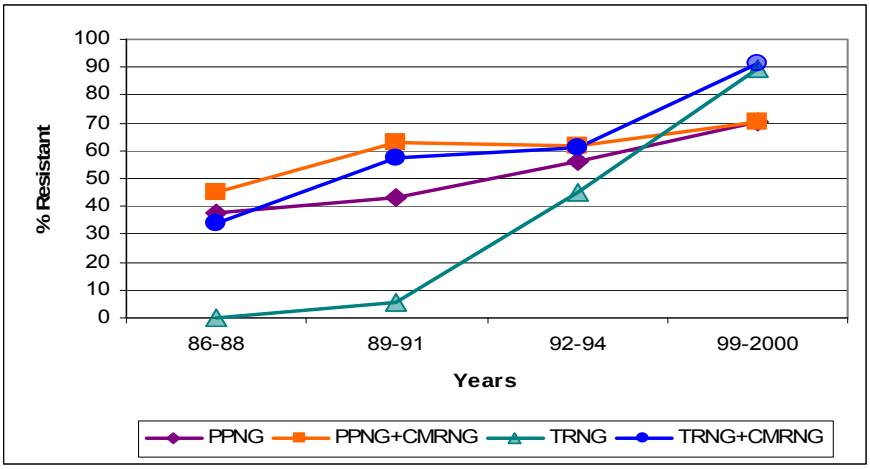
Discussing Figure 6.1

a. What is the overall trend in frequency of tetracycline-resistant *N. gonorrhoeae*?

b. Which antimicrobial agent was least likely to be effective against *N. gonorrhoeae* in 1999?

Further investigation, continued

Figure 6.2. Resistance of N.gonorrhoeae to penicillin and to tetracycline over time, Kigali Rwanda, 1986-2000.



Note: PPNG, penicillinase-producing N.gonorrhoeae; CMRNG, chromosomal-mediated resistant *N.gonorrhoeae*; TRNG, tetracycline resistant *N. gonorrhoeae.*

Source: Van Dyck E, Karita E, Abdellati S, Dirk VH, Ngabonziza M, Lafort Y et al. Antimicrobial Susceptibilities of Neisseria gonorrhoeae in Kigali, Rwanda, and Trends of Resistance Between 1986 and 2000. Sex Transm Dis 2001;28(9): 539-45.

Discussing Figure 6.2

a. Describe the trends in penicillinase-producing *N. gonorrhoeae* (PPNG) from 1989-1994.

b. From 1989-1991, was the total resistance (including chromosomal-mediated resistance) of *N.gonorrhoeae* higher to penicillin (PPNG+CMRNG) or tetracycline (TRNG+CMRNG)?

Disseminating results

Distribute data on gonococcal resistance nationally at least once a year. Use charts and graphs similar to those shown in Figures 6.1 and 6.2.

Reports should summarise the proportion of isolates that were found to be resistant to the anti-microbial agents. Results should be stratified by *sentinel site*. It may also be useful to summarise the proportion of isolates that were of intermediate sensitivity. Reports should include:

- The sex of patients
- The clinic setting where the patients were tested (for example, antenatal clinic, STI clinic or clinic for female sex workers)
- Changes that have occurred in the sentinel sites over time.

Disseminating results, continued

The information can assist in the interpretation of test results, particularly if certain sites are attended by patients whose previous therapies have failed. Such patients are more likely to have resistant strains.

Assessing STI Syndrome Aetiologies

Determining the micro-organisms that cause urethral discharge and genital ulcer disease are a core STI surveillance activity. This assessment of *aetiologies* of STI syndromes is especially important in countries where STI *syndromic* management and case reporting are usually performed. Knowing the organisms that account for the STI *syndromes* allows the STI control programmes to recommend effective treatment.

The national AIDS/STI control programme typically organises and carries out an STI syndrome aetiology assessment. These surveys are conducted to assess the relative contributions of the major STI pathogens such as:

- The syndrome of urethral discharge in men (gonorrhoea, chlamydia and others)
- The syndrome of genital ulcer disease in men and women (syphilis, chancroid and *herpes simplex virus* (*HSV*)-*2*.

Syndrome aetiologies should be reassessed every two to three years, or more frequently if the need arises. If there is a new outbreak of genital ulcer disease, for example, you would reassess which micro-organisms are causing disease earlier.

Objectives

The main purposes of assessing syndrome aetiologies are to:

- Provide data for guiding STI syndromic treatment
- Assist in the interpretation of syndromic case reports and the assessment of disease burden due to specific pathogens
- Design or modify guidelines for treating urethral discharge and genital ulcers.

Laboratory requirements

A microbiologist experienced in STI diagnostic tests should develop laboratory protocols for determining which organisms are causing the symptoms. Laboratories should also have quality assurance and control protocols in place.

Laboratory requirements, continued

The range of diagnostic tests that may be used is broad. Many new tests are being developed. Selection of the test to use will depend upon local availability of resources. Table 6.1 below summarises the general types of laboratory tests that may be used for assessing syndrome aetiologies:

Table 6.1. Laboratory tests for specific STI syndromes.

Syndrome	Corresponding laboratory tests
Urethral discharge in men	▪ Microscopy (Gram stain of urethral discharge to identify Gram negative diplococci bacteria, primarily *N. gonorrhoeae*) ▪ Gonorrhoea and chlamydia testing: o Culture for *N. gonorrhoeae* o Direct fluorescent antigen and *enzyme-linked immunoassay* (EIA) for *C. trachomatis* o Amplified (such as polymerase chain reaction [PCR] or strand displacement amplification) and non-amplified nucleic-acid based tests for both pathogens
Genital ulcer disease in men and women	▪ Syphilis serologic testing (non-treponemal and treponemal) ▪ Dark field, direct fluorescent antibody test for syphilis ▪ Culture for *H. ducreyi* ▪ HSV-2 culture or antigen detection test ▪ PCR for *T. pallidum, H. ducreyi* and HSV-2 available in some settings

Discussing the table

Looking at Table 6.1, answer the following questions:

a. For which syndrome is it appropriate to perform microscopy?

b. How would you test for syphilis in genital ulcer disease?

Assessing STI Syndrome Aetiologies, continued

Testing procedures

Selection of populations for assessing syndrome aetiologies depends on the number of cases available for examination at a single site. Syndrome aetiologies should ideally be assessed in:

- Different types of populations
- Populations with high rates of disease
- Populations with low rates of disease
- Different geographic locations.

If your country has limited resources, begin with an assessment of urethral discharge and genital ulcer disease at a single specialised STI clinic. The clinic should:

- Have well trained personnel that can perform high quality Gram stain and microscopy
- Be able to perform syphilis serologic testing

In many countries, reliable dark field microscopy is unavailable. Collaborate with a well-equipped laboratory to assess the contribution of chlamydia to urethral discharge. Further assess the contribution of chancroid and herpes to genital ulcer disease. Also keep in mind that:

- Syphilis serologic testing alone provides an incomplete assessment of genital ulcer aetiology. This is because many patients with chancroid and HSV-2 ulcers can have reactive syphilis serologic tests from previously treated or untreated (latent) infections.
- A substantial proportion (10%-30%) of patients with primary syphilis will not yet have developed a serologic response to infection.

Sample size

The sample size depends on the specific aetiology and the expected prevalence of pathogens.

A minimum sample size of 50 or 100 specimens from consecutive patients with the specified syndrome (or other type of systematic sample) will provide adequate information for useful analyses.

Assessing STI Syndrome Aetiologies, continued

Analysis

It is important to analyse STI data separately for each specific disease rather than reporting findings together. Ccases of gonorrhoea, for example, should be analysed separately from cases of syphilis. The frequency of the various STI and risk behaviours should then be calculated and analysed by:

- Sex
- Age group
- Geographic area
- Marital status
- Other relevant characteristics.

These tests should be anonymous, so there is no way to give results to individual patients. But if for any reason these tests are conducted in a way that the results could be linked back to the individual, patients need to be given results and treated.

Summary

Anti-microbial resistance monitoring helps detect emerging resistance and develop treatment guidelines. Assessing syndrome aetiologies provides information on the relative contributions of different pathogens to the main STI syndromes. This guides STI syndromic treatment and assists in the interpretation of syndromic case reports.

Unit 6 Exercises

Warm up review

Take a few minutes now to look back at your answers for the warm up questions at the beginning of the unit. Make any changes you want to make.

Small group discussion

Get into small groups by country, region or province to discuss these questions.

1. What is the first-line therapy for male urethral discharge syndrome in your country?

   Is there any evidence to suggest that *N. gonorrhoeae* isolates are resistant to that therapy?

   If there was evidence of widespread resistance, what would you advise your provincial or national STI control programme to do?

2. How could knowing STI syndrome aetiologies be useful in designing HIV prevention programmes?

   What approaches might you consider if , for instance, 80% of genital ulcer disease was due to syphilis or chancroid?

What if 80% of genital ulcer disease were due to HSV-2?

Apply what you've learned/ case study

Try this case study. We will discuss the answers in class.

You are the HIV/STI surveillance coordinator in a health district in an East European country. STIs in your country are routinely managed and reported using the WHO syndromic approach. The national STI control programme will be conducting a national assessment of anti-microbial resistance in *N. gonorrhoeae* and your district has been asked to participate.

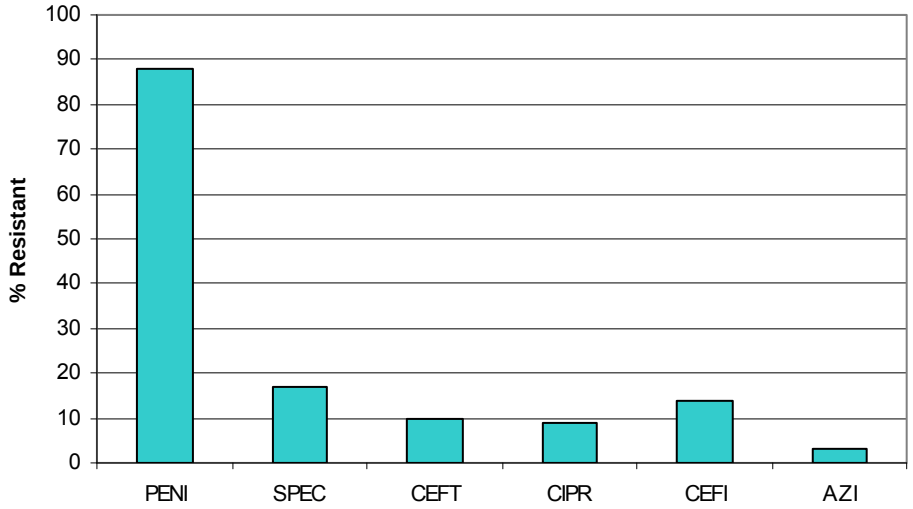
a. What are the reasons for conducting an assessment of anti-microbial resistant *N. gonorrhoeae*?

b. What factors will you need to consider to conduct this assessment in your district?

c. How would you select your sample?

d. Given the results in the figure below, what recommendations would you make regarding the treatment of *N. gonorrhoeae* in your country?

Percentage of gonococcal isolates that were resistant to selected anti-microbial agents.



Note: PENI, penicillin; SPEC, spectinomycin; CEFT, ceftriaxone; CIPR, ciprofloxacin; CEFI, cefixime; AZI, azithromycin

Final Case Study

1. What are the benefits of conducting STI surveillance in:

    a. A country with a low-level HIV epidemic?

    b. A country with a concentrated epidemic?

    c. A country with a generalised epidemic?

2. You are a provincial public health officer for Yamo Province in the Mono Republic. Your province currently conducts syndromic STI surveillance with universal reporting. Your province has recently been given funds to begin aetiologic case reporting to determine the prevalence of the micro-organisms that cause urethral discharge and genital ulcer.

    a. Which micro-organisms would you include to determine the causative agent of genital ulcer disease in men and women?

    b. Which micro-organisms would you monitor to determine the most common causes of urethral discharge in men?

    c. How frequently should STI aetiologies be assessed?

3. Looking at last year's surveillance data for Yamo Province you find that many of the variables indicated on the data collection forms were left blank and that there were many inconsistencies in the way data was collected. How would you improve the completeness and consistency of reporting?

4. Due to sub-optimal prescribing practices and poor adherence to prescribed regimens, resistance to the drugs that treat *N. gonorrhoeae* has recently become a problem in Yamo province.

    a. What are the laboratory requirements of monitoring anti-microbial resistance?

    b. If your country's national reference laboratory does not have the capacity to conduct susceptibility testing, what would you do?

Final case study, continued

c. How often would you review the results of resistance testing?

d. What information would you include when nationally distributing data on anti-microbial resistance? How frequently would you distribute these data?

5. Syndromic STI surveillance in Yamo Province conducted in 2005 found the following data:

	Site 1	Site 2	Site 3	Site 4	Site 5
Total number tested	158	209	196	233	240
Prevalence of:					
Genital ulcer disease	11%	16%	22%	8%	13%
Urethral discharge (among men only)	26%	21%	29%	14%	18%
HIV	7%	5%	12%	2%	3%

Create a figure that shows the prevalence of genital ulcer disease, urethral discharge and HIV in Yamo Province by site. What trends do you see? What are the limitations of these data?

Summary

- If surveillance data shows that STI transmission is occurring, then HIV transmission likely is occurring as well.

- The World Health Organization estimates that 340 million new, curable STI cases occurred globally in 1999.

- The most feasible STI surveillance system resource-constrained countries is STI case reporting. The STI case reporting process involves health care providers reporting cases of STIs to public health authorities at the district, provincial, or national level. In *universal* STI case reporting, minimum data on STI cases are collected from all the health facilities in the country.

- There are two different ways to diagnose and manage STI cases. These are *syndromic* diagnosis and reporting, and *aetiologic* diagnosis and reporting. In syndromic diagnosis, three syndromes are used for STI surveillance. In aetiologic diagnosis, an exact microbiologic diagnosis is given (for example, gonorrhoea).

- Diagnosis of STI syndromes should be based on standard *case definitions*, which use readily identifiable and consistent clinical criteria. Uniform case definitions should be used throughout the country to enable comparability of the data arising from the reporting systems.

- Only curable STIs with acute onset and short duration, such as gonorrhoea, chlamydia, chancroid, trichomoniasis, primary and secondary syphilis, and the syndromes they cause, are important for STI surveillance to be used as a tool for assessing STI *incidence* and *prevalence*.

- At *sentinel surveillance sites*, more data on STI cases are recorded and reported. Trends from these sites are used to infer trends of STI case reports in other health facilities. The major advantage of this system is that higher quality and more consistent information is obtained.

- *Prevalence assessment* is the determination of prevalence of certain STIs by laboratory testing among persons screened in defined populations. *Prevalence monitoring* is the monitoring of trends in prevalence over time.

- Combined STI/HIV and behavioural surveys combine STI and HIV prevalence assessments with behavioural surveys. These can be done in the general population (as in DHS+) or in specific high-risk populations.

- In view of the increasing rates of drug-resistant pathogens worldwide, it is important for each country to monitor anti-microbial resistance in *Neisseria gonorrhoeae* as a core component of STI surveillance.

Summary, continued

- In countries using the syndromic approach to STI treatment, it is important to monitor the actual aetiologies of urethral discharge syndrome in men, and genital ulcer diseases in men and women. These findings are used to refine national STI treatment guidelines.

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Notes

Appendix B, Glossary and Acronyms

ACASI: Acronym for 'audio computerised assisted survey instruments.'

Accuracy: Refers to how well the sample reflects (nearest to the truth) the study population.

Acquired immunodeficiency syndrome (AIDS): See Advanced HIV infection.

Active infection: An infection that is currently producing symptoms (disease) or in which the organism that causes disease is reproducing.

Active surveillance: A system in which the organisation conducting surveillance initiates procedures to obtain reports. Example: making telephone calls or visits to health facilities to obtain information.

Adherence: The extent to which a patient takes his/her medication according to the prescribed schedule (also referred to as 'compliance').

Advanced HIV disease reporting: The systematic and standardized ongoing reporting of persons diagnosed with advanced HIV disease (clinical stage 3 or 4 and/or CD4 counts ≤350.

Advanced HIV infection: (*also* Advanced HIV disease) The late stage of HIV infection that includes development of one or more opportunistic illnesses (illnesses that occur because of low levels of CD4 lymphocytes, or immunodeficiency). Advanced HIV infection (disease) is the term now used for AIDS in updated WHO Guidelines.

Aetiologic case reporting: A surveillance system in which a laboratory test has confirmed the presence of the pathogen.

Aetiological: Refers to the causes of disease. Also known as 'aetiologic.'

Agent: A factor, such as a micro-organism, chemical substance, or form of radiation, whose presence is essential for the occurrence of a disease.

Aggregate case reporting: A single form summarises all of the patients who were diagnosed with the condition at certain sites in a given time period.

AIDS: Acronym for 'Acquired Immunodeficiency Syndrome.'

AIDS case reporting: The identification and reporting of persons meeting the AIDS case definition to permit public health authorities to track the disease over time. Also known as 'AIDS case surveillance.'

AIDS case surveillance: The identification and reporting of persons meeting the AIDS case definition to permit public health authorities to track the disease over time. Also known as 'AIDS case reporting.'

AIDS-defining illness: Any of a series of health conditions that are considered, in isolation, or in combination with others, to be indicative of the development of AIDS. These conditions result from low levels of CD4 lymphocytes which are destroyed by HIV.

AIDS Indicator Survey (AIS): A standardized tool to obtain indicators for effective monitoring of national HIV/AIDS programs. The protocols will help us provide, in a timely fashion and at a reasonable cost, the information required for meeting HIV/AIDS program reporting requirements.

Algorithm: Step-by-step procedure for decision-making; a recipe for achieving a specific goal.

Aliquot: A portion of a sample; for example, an aliquot of a 100 millilitre sample of blood might be a 5 millilitre portion of that sample.

Alliances: Partnerships created to assist with formative assessment. These partnerships differ based on the type of most-at-risk group being sampled, but usually include gatekeepers, governmental or non-governmental organisations, influential members of the target group, advocates, and physicians and others who provide health care to the target group.

Anonymous: Having no known name or identity. Removing all personally identifying information from a sample that will be tested for HIV, for example, in order to protect the patient's identity.

Anti-microbial resistance: The ability of an organism to avoid destruction or deactivation typically caused by drugs or chemicals designed to do so.

Antibiotic medicines: Drugs that kill or inhibit the growth of bacteria.

Antibodies: Molecules in the blood or secretory fluids that tag, destroy, or neutralise bacteria, viruses, or other harmful toxins.

Antimicrobial agents: An agent that kills or inhibits microbial growth. 'See Antibiotic medicines.'

Antiretroviral drugs: Drugs used to fight infections caused by retroviruses, such as Advanced HIV Disease.

Antiretroviral drug resistance: Resistance to one or more antiretroviral drugs. Antiretroviral drug resistance is one of the more common reasons for therapeutic failure in the treatment of HIV.

Antiretroviral therapy (ART): Treatment with drugs that inhibit the ability of HIV to multiply in the body.

Area map: A map used as a graph showing variables by geographic location.

Artefact: An inaccurate observation, effect or result caused by experimental error.

Asymptomatic: Without symptoms.

At-risk groups: Groups of people that are at increased risk for passing HIV on to others or for being infected by others.

B-lymphocytes: Also known as 'B-cells.' Blood cells of the immune system involved in the production of antibodies. In persons living with AIDS, the functional ability of both the B and the T lymphocytes is damaged, with the T lymphocytes being the principal site of infection by HIV.

Bacterial vaginosis: A chronic inflammation of the vagina caused by the bacterium *Gardnerella vaginalis*.

Bangui: The initial WHO AIDS surveillance case definition, developed to provide case definition of AIDS for use in countries where testing for HIV antibodies was not available.

Bar chart: A visual display of the size of the different categories of a variable. Each category or value of the variable is represented by a bar (or column). The Y-axis represents frequency. The X-axis represents different classes.

BED assay: A simple enzyme immunoassay (EIA) that can be used for detecting recent HIV-1 infection (within the last 160 days). It uses a branched peptide that includes sequences from HIV sub-types B, E and D, and allows detection of HIV-specific antibodies among various sub-types.

BED capture-EIA test: This test detects an antibody to a small HIV protein, gp41. It was first tested in HIV types B, E and D, hence its name BED.

Behavioural surveillance: Surveys of HIV-related behaviour that involve asking a sample of people about their risk behaviours, such as their sexual and drug-injecting behaviour.

Beneficence: To promote the interest of the patient or participant. To balance the benefits and risks to people involved in surveys. These risks include physical harm, such as violence and psychological harm, such as social stigmatisation.

Bias: A systematic error in the sample selection and the collection or interpretation of data.

Biological surveillance: Surveillance that involves regular and repeated cross-sectional surveys, but collects biological samples that are tested for HIV and other related illnesses, such as sexually transmitted diseases and tuberculosis.

Bivariate analysis: One of the main types of behavioural surveillance analysis that is performed to determine whether one variable is related to the distribution of another. For example, there might be an association between a respondent's age (the explanatory variable) and their use of condoms (the outcome variable). Variables are associated if the value of one tells you something about the value of another. Statistical tests in bivariate analysis determine whether any observed difference reflects a true difference, or may be due to chance.

Body fluids: Any fluid produced by the human body, such as blood, urine, saliva, sputum, tears, semen, mother's milk, or vaginal secretions. Fluids that commonly transmit HIV are blood, semen, pre-ejaculate, vaginal fluids, and breast milk.

Bridging populations: Persons in high-risk sub-populations who interact with people of lower risk in the general population, making it more likely that the HIV epidemic shifts from concentrated to generalised.

BSS: Acronym for ‘behavioural surveillance survey.’

***Candida albicans*:** The fungal causative agent of vulvovaginitis in women and inflammation of the penis and foreskin in men.

CAPI: Acronym for ‘computer-assisted personal interview.’

Capture-recapture: A technique used to estimate numbers of persons in a target population. Two or more lists containing individuals in common can establish the number of individuals missing from both, thereby estimating the total population of interest.

Carrier: A person or animal without apparent disease who harbours a specific infectious agent and is capable of transmitting the agent to others.

Case: An individual in the population or sample with a particular disease of interest.

Case-based reporting: each person diagnosed with the disease is reported separately, as opposed to aggregate case reporting in which data from patients with the disease are combined.

Case-control study: A type of observational analytic study. Enrolment into the study is based on presence ('case') or absence ('control') of disease. Characteristics such as previous exposure are then compared between cases and controls. The purpose of case control studies is to identify factors that are associated with, or explain the occurrence of the specific disease or condition being studied.

Case definition: A set of standard criteria for deciding whether a person has a particular disease or health-related condition, by specifying clinical criteria and limitations on time, place and person.

Case fatality rate: The proportion of patients who become infected or develop a disease that dies as a result of that infection or disease.

Case reporting: A surveillance system in which persons who are identified as meeting the case definition are reported to public health authorities.

CASI: Acronym for 'computerised assisted survey instruments.'

Catchment population: A geographic area that is to be examined or surveyed. Can refer to the population served by a given clinic.

Categorical surveillance system: System that deals with reporting a single disease.

Categorical variable: Items that can be grouped into categories, such as marital status or occupation.

Cause of disease: A factor (characteristic, behaviour, etc.) that directly influences the occurrence of disease. A reduction of the factor in the population should lead to a reduction in the occurrence of disease.

CD4 count: A measure of the number of CD4 cells in a millilitre (mL) of blood. The CD4 count is one of the most useful indicators of the health of the immune system and a marker for the progression of HIV/AIDS.

CD4 receptors: Markers found on the surface of some body cells, including T-cells. These receptors are targets of HIV, and thus CD4+ cells are attacked by the virus.

Census sampling: Every unit, or case, is measured for the entire population. A de facto census allocates persons according to their location at the time of enumeration. A de jure census assigns persons according to their usual place of residence at the time of enumeration (Last).

Centers for Disease Control and Prevention (CDC): The US Department for Health and Human Services agency with the mission to promote health and quality of life by preventing and controlling disease, injury, and disability.

Chain referral sample: Any sampling method wherein participants refer other potential participants for inclusion in the sample. There are several types of chain referral sampling methods, most of which are non-probability samples. Examples of chain referrals include RDS, network sampling, random walk and snowball sampling.

Chancroid: An acute, sexually transmitted, infectious disease of the genitalia caused by the bacteria *Haemophilus ducreyi*. The infection produces a genital ulcer that may facilitate the transmission of HIV.

Characteristic: A definable or measurable feature of a process, product, or variable.

Chlamydia trachomatis: The most common sexually transmitted bacterial species of the genus Chlamydia that infects the reproductive system. Chlamydia infection causes infection of the cervix of women and the urethra of men and is frequently asymptomatic. If left untreated, it can cause sterility in women.

Clinic-based surveys: Surveys that use samples that have been selected in clinical facilities, such as STI or drug treatment clinics. The most common type of the clinic-based surveys that are done using biological markers, such as HIV infection, is clinic-based sentinel sero-surveillance.

Cluster: Any aggregate of the population of interest (for example, departments, villages, health facilities).

Cluster sampling: The population of interest is broken into groups or clusters and a sample of clusters is randomly selected (Levy & Lemeshow).

Clustered bar chart: A bar chart in which the columns are presented as clusters of sub-groups. Also known as 'stacked bar chart.'

Code: A unique identification for a specimen. It may or may not be linked to any personal identifying information.

Cohort analysis: Analysis that involves following groups of subjects over time.

Cohort studies: Cohort studies follow a group of initially uninfected people over time, and test them repeatedly. Cohort studies follow a well-defined group of people who have had a common experience or exposure, who are then followed up for the incidence of new diseases or events, as in a cohort or prospective study tested repeatedly over a long period of time.

Community advisory board: Members of the community who offer input into study design and local procedures. CAB members include community activists and/or professionals associated with HIV/AIDS prevention and services delivery. Some CAB members are trial participants.

Community-based surveys: Surveys that use samples that have been selected from non-clinical settings. They often include most-at-risk populations, such as sex workers or truck drivers, who are not included in clinic-based surveys. As with clinic-based surveys, the most common type of community-based survey is called 'repeated cross-sectional community-based sentinel sero-surveillance.'

Community sites: Locations in the community, such as households or brothels.

Completeness of data elements: The extent to which the information requested in the case report form is provided.

Completeness of reporting: One of several attributes of a surveillance system. The term refers to the proportion of cases that were reported. Completeness of reporting is also referred to as the sensitivity of the surveillance system and is determined by using an alternative (and thorough) method of identifying cases of the disease and then dividing the number of cases reported by the total number of cases identified. Completeness is often reported as a percentage.

Compulsory testing: Testing that is required of all individuals in a population to be surveyed. For example, requiring HIV tests to be done on all members of a prison population.

Concentrated HIV epidemic: The epidemic state in which HIV has spread to a high level in a defined subpopulation but is not well established in the general population. HIV prevalence is consistently >5% in at least one defined subpopulation and is <1% in pregnant women in urban areas.

Confidence interval: The compound interval with a given probability, for example, 95% that the true value of a variable such as mean, proportion, or rate is contained within the limits. Also known as 'confidence limits.'

Confidence limits: See 'confidence interval.'

Confidentiality: Protecting information that concerns a study participant or patient from release to those who do not need to have the information.

Consecutive sampling: This sampling method consists of sampling every patient who meets the inclusion criteria until the required sample size is obtained or the survey period is over. While this method is not strictly a probability sample, it is easier to use and offers less occasion for sampling bias.

Contact: Exposure to a source of an infection, or a person so exposed.

Contagious: The characteristic of an organism or person that renders it capable of being transmitted from one person to another by contact or close proximity.

Continuous variable: Items that occur in a numerical order, such as height or age.

Convenience sampling: The selection of entities from a population based on accessibility and availability. Available participants may be people on the street, patients in a hospital or employees in an agency. This type of sampling does not generally represent the population of interest and is best used in the exploratory stage of research.

Core data elements: Information about a patient that must be collected during a survey.

Cotrimoxazole preventative therapy (CPT): Administering cotrimoxazole prophylaxis to prevent opportunistic infections among HIV- infected patients.

Cotrimoxazole prophylaxis: A combination of two anti-infection drugs, sulfamethoxazole and trimethoprim, used to prevent opportunistic infections in patients with HIV.

Coupon: Used in RDS studies to provide incentives to participants. Coupons in RDS can be used both to track participation for reimbursements and to link the recruiters to the recruits. Other methods may use coupons to encourage participation, much like the advertisements placed in popular clubs or bars. Some coupons may have two parts that can be easily separated. One part of the coupon serves as the referral coupon, which the recruiter uses to recruit a peer into the study. The other part of the coupon serves as the payment coupon. It is kept by the recruiter and he or she will use it to claim an incentive for having recruited a peer into the study. Both parts of the coupon have the unique identification number of the recruitee printed on them. The dual system eliminates the need to collect names for incentive collection.

Coupon rejecters: People who are offered a coupon by a recruiter, but decline to take it.

Cross-sectional survey: A survey that is conducted over a given period of time, such as during a single year, rather than over an extended period of time.

Cruising area: Cruising areas are public space, such as parks, public restrooms, bath houses, dance clubs and railway stations where MSM meet, congregate and arrange and/or engage in sexual activity.

Cryolabel: Labels designed to adhere during freezer storage.

Cryovial: A vial that is designed to be stored in a freezer.

CSW: Acronym for ‘commercial sex worker.’

DALYs: See ‘disability-adjusted life years.’

Database: A computer programme that stores the variables for each patient in the survey sample or surveillance system.

Data dictionary: Electronic files that describe the basic organisation of a project or database. They contain all of the rules that guide data entry.

Data entry: The process of entering paper records into a computer database

Data entry screens: The forms on the computer screen into which a data entry clerk enters the data.

Data synthesis: See 'triangulation.'

Definitive diagnosis: A diagnosis based on laboratory or other tests specifically designed for diagnosis and considered authoritative.

Demographic Health Survey: National household surveys that provide data for a wide range of monitoring and impact evaluation on topics including HIV prevalence and attitudes and beliefs about HIV/AIDS.

Demographic information: The 'person' characteristics of epidemiology (usually collected with "place" and "time") – age, sex, race and occupation – used to characterise the populations at risk.

Denominator: The population (or population experience, as in person-years, etc.) at risk in the calculation of a proportion or rate. The denominator is the lower portion of a fraction used to calculate a rate or ratio.

Dependent variable: In a statistical analysis, the outcome variable(s) or the variable(s) whose values are a function of other variable(s).

Descriptive statistics: Used to describe the basic features of the data, they provide simple summaries about the sample and the measures.

DHS: Acronym for 'demographic and health surveys.'

Dichotomous variable: A special type of nominal variable that has only two categories, such as male/female.

Differential recruitment: Recruiters successfully bring recruits in at different rates.

Direct transmission: The immediate transfer of an agent from a reservoir to a susceptible host by direct contact or droplet spread.

Disaggregated data: Data which is divided up according to different variables, to provide a more detailed analysis.

Disability-adjusted life years (DALYs): A measure of burden of disease in a population obtained by combining 'years of life lost' and 'years lived with disability.'

Disease burden: The size of a health problem in an area, as measured by cost, mortality, morbidity or other indicators.

Disease registry: The file of data that contains reported diseases.

Disease reporting: The process by which notifiable diseases are reported to the health authority.

Disinhibition: Poor decision-making when considering risk-taking behaviours.

Distribution: The frequency and pattern of health-related characteristics and events in a population. In statistics, the observed or theoretical frequency of values of a variable.

Double-entered: Entered twice, to avoid mistakes by identifying and correcting discrepancies.

Double Y-scale: On a graph, two Y-axes, one on the vertical left for data with large values and one on the vertical right for data with smaller values.

Dysuria: Painful, frequent or difficult urination.

EIA: See 'enzyme-linked immunoassay.'

ELISA: See 'enzyme-linked immunosorbent assay.'

Emic: Refers to accounts, descriptions, and analyses expressed in terms of the concepts and categories regarded as meaningful and appropriate by the members of the population of interest.

Endemic disease: The constant presence of a disease or infectious agent within a given geographic area or population group; may also refer to the usual prevalence of a given disease within such area or group.

Enumeration units: The sampling units from the final stage of a multistage sampling design. See 'Listing units.'

Enzyme immunoassay (EIA): A type of test that identifies antibodies to an organism such as HIV. EIAs rely on a primary antigen-antibody interaction and can use whole viral lysate of HIV or one or more antigens from the virus.

Enzyme-linked immunosorbent assay (ELISA): A type of enzyme immunoassay (EIA) to determine the presence of antibodies to an infectious agent such as HIV in the blood or oral fluids.

Epidemic: The occurrence of a disease (or other health-related event) at a greater than expected level of increase to a baseline. For example, the high prevalence of HIV found in many parts of the world today, including sub-Saharan Africa, Latin America and South and Southeast Asia.

Epidemic state: The prevalence the epidemic has reached in a country or region. Can be low-level, concentrated, or generalized within a sub-population or within the general population.

Epidemiology: The study of the distribution and determinants of the frequency of health-related states or events in specified populations, and the application of this study to the control of health problems.

Epi Info™: Freely distributed epidemiological software available on the CDC website (www.cdc.gov/epiinfo).

Equilibrium: In RDS, the point in the recruitment process where a variable is not expected to change by more than 2% with each successive wave.

Ethnographic assessments: Ethnographic assessments are written analyses of the cultural practices, beliefs and behaviours of a particular culture, network or sub-group.

Ethnographic mapping: Collecting information on the geographic location, temporal movement of and interactions among members of the study population.

Etic: Refers to accounts, descriptions and analyses expressed in terms of the concepts and categories regarded as meaningful and appropriate by the community of scientific observers.

Exclusion criteria: Characteristics of patients who should be excluded from the sample, but who would otherwise be eligible.

Experimental study: A study in which the investigator specifies the exposure category for each individual (clinical trial) or community (community trial), then follows the individuals or community to detect the effects of the exposure.

External validity: The ability to make inferences from the study sample to the population of interest.

Factor: An intrinsic factor (age, race, sex, behaviours, etc.) which influences an individual's exposure, susceptibility, or response to a causative agent

False negatives: Test results that are negative when the patient actually has the disease that is being tested for.

False positives: Test results that are positive when the patient does not actually have the disease that is being tested for.

Female sex workers: Females who engage in sex work, or the exchange of sex for money, which includes many practises and occurs in a variety of settings. These may include 'direct' or 'formal' sex workers, who are sometimes included in registries and often found in brothels, and 'indirect' or 'casual' sex workers, who do not engage in sex work full time and are unlikely to be included in registries.

Filter paper: Porous paper on which samples can be placed.

Focus groups: A group setting in which people are asked by a facilitator about their views about a topic. Participants are free to talk with other group members as well as the facilitator. Focus groups allow interviewers to study people in a more natural setting than they can in a one-to-one interview.

Formative assessment (or research): Research conducted before the study begins. Researchers use qualitative methods, such as focus groups, in-depth interviews, mapping or observations of the target population and the individuals who work with them to ensure that the research team sufficiently understands the community.

GAP: Acronym for the CDC's 'Global AIDS Program.'

Gatekeepers: Persons who can provide access to a high-risk population. Examples are a brothel owner who can provide access to female sex workers, or a prison warden who can provide access to prisoners.

General population surveillance: Surveillance that measures HIV risk behaviours in a sample of people selected to represent the people living in a region or nation. The surveillance can be restricted to certain ages (for example, young people aged 15-24) or genders.

Generalisability: The results from the sample are the same as the results we would have obtained had we tested every person in the study population (that is, the results from the sample are generalisable to the study population).

Generalised HIV epidemic: The epidemic state in which HIV is firmly established in the general population. HIV prevalence is consistently >1% in pregnant women.

Genital discharge syndrome: This syndrome includes infections due to *N. gonorrhoea*, and *C. trachomatis*.

Genital ulcer syndrome: Genital lesions due to *T. pallidum*, *H. ducreyi*, HSV, *C. trachomatis* or *C. granulomatis*.

Geographical Information System (GIS): System of hardware, software.

Gigolo: Male sex workers who identify as straight. They tend to have foreign clients and engage in male-male sexual activity.

Glycoprotein (HIV): Proteins on the surface of the HIV virus that bind to CD4 receptors on target cells.and procedures designed for integrated storing, management, manipulation, analysing, modelling and display of spatially referenced data for solving planningand management problems.

Gonorrhoea: An infection caused by *Neisseria gonorrhoeae* bacteria. Although gonorrhoea is considered primarily a sexually transmitted infection, it can also be transmitted to newborns during the birth process.

Gram-negative: Bacteria that do not absorb the stain during the process of Gram staining.

Gram-positive: Bacteria that do absorb the stain during the process of Gram staining.

Gram stain: A laboratory method of staining microscopic slides of organisms in order to identify and classify the various types of bacteria. Bacteria are classified as either Gram-negative (does not absorb the stain) or Gram-positive (absorbs the stain).

Graph: A diagram that shows a series of one or more points, lines, line segments, curves or areas, representing variations of a variable in comparison with variations of one or more other variables.

Grey literature: Material that is not published in easily accessible journals or databases. Besides programme evaluations, government surveillance reports and programme planning documents mentioned earlier, it includes the abstracts of research presented at conferences, and unpublished theses and dissertations.

***Haemophilus ducreyi*:** The causative agent of chancroid. See ‘chancroid.’

Health indicator: A measure that reflects, or indicates, the state of health of persons in a defined population; for example, the infant mortality rate.

Health information system: A combination of health statistics from various sources, used to derive information about health status, healthcare, provision and use of services, and impact on health.

Health-seeking behaviour: The actions individuals or populations take to care for their health, for example, attending a clinic or district hospital when they feel ill.

Hard-to-reach populations (HTRP): Groups of people linked by behaviours, socioeconomic situations or societal structures, who for various reasons (e.g. law, stigma) refrain from involvement in the legal economy and other aspects of the majority social

institutions. Includes but is not limited to: IDUs, MSM, CSW and undocumented migrants.

Hepatitis B virus (HBV): The causative agent of hepatitis B. The virus is transmitted by sexual contact, the use of contaminated needles and instruments and by contaminated serum in blood transfusion. The infection may be severe and result in prolonged illness, destruction of liver cells, cirrhosis or death.

Hepatitis C virus (HCV): The causative agent of hepatitis C. This virus is transmitted largely by the use of contaminated needles and instruments and by blood transfusions. The disease progresses to chronic hepatitis in up to 50% of the patients acutely infected.

Herpes simplex virus 1 (HSV-1): A virus that causes cold sores or fever blisters on the mouth or around the eyes, and can be transmitted to the genital region.

Herpes simplex virus 2 (HSV-2): A virus causing painful sores of the anus or genitals. While this is a sexually transmitted infection, it may be transmitted to a newborn child during birth from an infected mother.

Herpes viruses: A group of viruses that includes herpes simplex type 1 (HSV-1), herpes simplex type 2 (HSV-2), cytomegalovirus (CMV), Epstein-Barr virus (EBV), varicella zoster virus (VZV), human herpes virus type 6 (HHV-6), and HHV-8, a herpes virus associated with Kaposi's sarcoma.

Highly active antiretroviral therapy (HAART): The use of at least three ARV drugs in combination to suppress viral replication and progression of HIV disease by reducing the viral load to undetectable levels.

High-risk behaviours: Behaviours that increase the risk that a person will contract a disease.

High-risk group: A group in the community with an elevated risk of disease, often because group members engage in some form of risky behaviour.

High-risk group surveillance: Surveillance that measures HIV risk behaviours in groups whose behaviours, occupations or lifestyles could expose them to higher risk of acquiring and transmitting HIV than the rest of the population. These groups are often important in establishing, accelerating or sustaining the HIV epidemic.

High-risk heterosexuals (HRH): Includes but is not limited to: mobile populations, uniformed personnel and sex partners of other MARPs.

Histogram: A graph that represents a frequency distribution by means of rectangles whose widths represent class intervals and whose areas represent corresponding frequencies.

HIV: See 'Human Immunodeficiency Virus.'

HIV-1: A type of HIV with slight genetic variations from HIV-2. More easily transmitted than HIV-2.

HIV-2: A type of HIV with slight genetic variations from HIV-1. Less easily transmitted than HIV-1.

HIV case reporting: the systematic, standardized, ongoing collection of reports of persons diagnosed with HIV infection (clinical stages 1-4) and/or advanced HIV disease (clinical stages 3 and 4).

HIV clinical stages: In these modules, a classification by WHO of HIV disease on the basis of clinical manifestations that can be recognized and treated by clinicians in diverse settings, including resource-constrained settings. In order of severity, starting with the lowest, the stages are:

Stage 1: Often asymptomatic or with swollen glands
Stage 2: Symptoms, including moderate weight loss and respiratory infections
Stage 3: More severe symptoms, including extreme weight loss and severe bacterial infections. Called advanced HIV disease.
Stage 4: End-stage HIV infection (AIDS), with manifestations such as wasting syndrome, tuberculosis, lymphoma. Called advanced HIV disease.

HIV-negative: Showing no evidence of infection with HIV (for example, absence of antibodies against HIV) in a blood or tissue test.

HIV-positive: Showing indications of infection with HIV (for example, presence of antibodies against HIV) based on a test of blood or tissue.

HIV sub-types: Distinct lineages of HIV that contain genetic differences.

HIV viral suppression: Lowering the level of HIV RNA in plasma, below the threshold of detection.

Homophily: In RDS, a measure of the tendency of people to connect to other people like themselves.

HSV-2: see herpes simplex virus 2.

Human immunodeficiency virus (HIV): A retrovirus that causes AIDS by infecting T-cells of the immune system.

Human papilloma virus (HPV): A causative agent of genital warts.

IDSR: See ‘Integrated disease surveillance and response.’

IDU: Acronym for 'injection (injecting or intravenous) drug user.'

Immune response: The activity of the immune system against foreign substances such as infectious agents including bacteria and viruses.

Immune system: The body's complicated natural defence against disruption caused by invading foreign agents (for example, microbes or viruses).

Immunodeficient: A situation in which a patient's health is compromised because his/her immune system is insufficient to ward off infections, thus making the person susceptible to certain diseases that they would not ordinarily develop.

Immunology: The science of the system of the body that fights infections.

Impact evaluation: An evaluation of a programme that determines what the impact of the programme is, as opposed to 'process evaluation.'

Impact indicators: A standardised set of indicators developed by UNAIDS to help monitor HIV prevalence in particular populations.

Incentive: A reward or reimbursement given to participants in a study. In RDS surveys, there are typically two levels of incentive: primary incentive and secondary incentive. A participant receives the primary incentive for enrolling in the study and completing an interview. The same participant receives secondary incentive(s) for recruiting his or her peers into the study. Incentives are not absolutely necessary in every situation and should be determined during formative research.

Incidence: A measure of the frequency with which an event, such as a new case of illness, occurs in a population over a period of time. The denominator is the population at risk; the numerator is the number of new cases occurring during a given time period.

Inclusion criteria: Characteristics required in study participants, in order to be considered for the sample.

Incubation period: A period of sub-clinical or unapparent pathologic changes following exposure, ending with the development of the infection.

Independent variable: An exposure, risk factor, or other characteristic being observed or measured that is hypothesised to influence the outcome (that is, the dependent variable).

Indicators: Specific data that are gathered to measure how well a prevention or treatment programme is doing as well as define an aspect of behaviour that is key to the spread of HIV. Indicators provide a way to track changes in behaviours over time and provide a way to compare levels of risk behaviours between different population groups.

Indicator mutations: Genotypic mutations that best predict resistance to a specific antiretroviral agent.

Indirect transmission: The transmission of an agent carried from a reservoir to a susceptible host by suspended air particles or by animate (vector) or inanimate (vehicle) intermediaries.

Infectiousness: The ability of an organism to cause infection.

Infectivity: The proportion of persons exposed to a causative agent who become infected by an infectious disease.

Information bias: Error that results from people who have a disease being misclassified as not having the disease.

Informed consent: The permission granted by a patient or a participant in a research study after he or she has received comprehensive information about a research study or medical procedure. Informed consent protects the person's freedom of choice and respects his or her autonomy with regard to decisions affecting his or her body and health.

In-group affiliation: In RDS, what homophily measures (group similarity based on ethnicity, age, socio-economic status and so forth).

Injection drug users (IDUs): Also called 'intravenous drug users,' they are persons who use or have used needles or syringes to inject drugs. Injection drug use is considered a high-risk behaviour.

Institutional review board (IRB): The committee designated to approve, monitor, and review biomedical and behavioral research involving humans with the aim of protecting the rights and welfare of research participants. Also known as ethics committee.

Institutional sampling: Individuals in an institution, such as prison, are sampled.

Integrated disease surveillance (IDS): An approach to surveillance in which communicable diseases are prioritised. Surveillance for all of the high-priority diseases is conducted in an integrated manner and is initiated at the district level. These diseases have a high potential for epidemic spread and can be controlled through public health measures.

Internal validity: The absence of substantial differences between groups at baseline; the absence of substantial difference of attrition rates between groups at follow-up.

Internally displaced persons (IDPs): IDPs are persons who have left their homes due to civil unrest or natural disasters, but have stayed in their homeland and have not sought sanctuary in another country.

Interval width: The range of certainty as to the true value of the calculated outcome value. For example, in the case of a 95% confidence interval, there is 95% certainty that the true outcome lies between the upper and lower bound of the interval. Statistically, this interval is equal to two standard deviations on either side of the calculated outcome value.

Interviewer error: Problems stemming from the actions and behaviours of the person doing the interview.

Intradermally: Injected into the layers of the skin.

Intramuscularly: Injected into a muscle.

Intravenously: Injected into a vein.

Involuntary migrants: Involuntary migrants include persons who have migrated away or have been displaced from their home countries due to an established or well-founded fear of persecution, or have been moved as a result of deception or coercion.

Isolates: A population of bacteria or other cells that has been isolated and cultured.

Isoniazid prophylaxis: Giving isoniazid to individuals with latent Mycobacterium tuberculosis infection, in order to prevent the progression to active disease. Prophylaxis with isoniazid significantly reduces the incidence of tuberculosis in adults with HIV and a positive tuberculin skin test result.

Key informants: Members of the target group, who can often become informal assistants.

Kick-off meeting: A meeting you host for community members who may in turn become seeds for the RDS survey. The purpose of the meeting is to educate seeds on study goals and process, inform seeds of their importance to the success of the study and encourage the seeds to be enthusiastic.

***Klebsiella granulomatis*:** The bacterial causative agent of granuloma inguinale or donovanosis.

Laboratory-initiated reporting: A surveillance system in which the reports of cases come from clinical laboratories.

Laryngeal TB: Tuberculosis involving the larynx, producing ulceration of the vocal cords and elsewhere on the mucosa, and commonly attended by hoarseness, cough, pain on swallowing, and hemoptysis.

Latent period: A period of unapparent infection following exposure to a pathogen, ending with the onset of symptoms of chronic disease.

Lessons learned: Information from actual studies that will help you make decisions when planning your study.

Linked anonymous HIV testing: In linked anonymous testing, a person agrees to have an HIV test, but the specimen is labelled with a code without a name or identifiers that could reveal the person's identity. This method is voluntary and requires obtaining informed consent and making the test results available (with appropriate counselling) to the person tested.

Linked confidential HIV testing: In linked confidential testing, a person agrees to have an HIV test with the assurance that the test result will be kept confidential and only selected health-care providers may be informed. This method is voluntary and requires obtaining informed consent and discussing the test results with the person. Linked confidential testing also allows for the collection of more detailed demographic and risk-behaviour information.

Linking: Refers to whether a tested individual's names or identifying information is associated with his or her HIV test results.

Listing units: The sampling units from the final stage of a multistage sampling design. See enumeration units.

Log scale: In a graph, when the data covers a large range of values, they are presented on a logarithmic scale. This type of scale reduces data to a smaller range so that it is easier to work with.

Longitudinal surveillance: Surveillance over time during which patients' status can be updated. *Longitudinal databases* allow the update of patients records over time with, for example, start dates for care, disease progression, new information.

Low-level HIV epidemic: The epidemic state in which HIV has never spread to significant levels in any sub-population, although HIV infection may have existed for many years. HIV prevalence has not consistently exceeded 5% in any defined sub-population. This state suggests that networks of risk are rather diffuse or that the virus has only been recently introduced.

Lymphocytes: A type of white blood cell that is involved with fighting infections in the body. The T lymphocyte is the cell that HIV infects and destroys.

Macrophage cells: Tissue cell derived from monocytes that protect the body against infections.

Male sex workers: Males who engage in sex work, or the exchange of sex for money, which includes many practises and occurs in a variety of settings.

Mandatory testing: Testing that is required of a patient if he or she is to obtain certain services; for example, mandatory HIV testing of individuals who request marriage certificates.

Margin of error: An estimation of the extent to which a survey's reported percentages would vary if the same survey were taken multiple times.

Markov process: A mathematical theory that provides a probabilistic description of the state of a system at any future time. The Markov process is especially relevant to RDS because of the nature of the recruitment process, whereby a chain of peers recruiting peers is monitored through a coupon mechanism.

Marriage pressure: Family pressure on sons to marry to provide stability for parents and the continuation of the family name as well as to avoid the stigma of a person being MSM.

MARP: Acronym for most-at-risk population, a group within the community with an elevated risk of disease, often because group members engage in some form of high-risk behaviour.

Masking: Describes the behaviour of reclusive respondents, people who do not want to be found.

Mean: The measure of central location commonly called the average. It is calculated by adding together all the individual values in a group of measurements and dividing by the number of values in the group.

Men who have sex with men (MSM): Men who have sex with men (MSM) are one of the highest risk groups in the Americas, Asia, Europe and Oceania. For the purposes of this manual, we also consider male sex workers, transvestites and transgendered persons (*hijra*) in the MSM category.

Microbe: A micro-organism, such as a bacteria or virus.

Microbicide: A chemical or other agent that destroys microbes.

MICS: See 'Multiple Indicator Cluster Survey.'

Migrants: see 'mobile populations'

Mobile populations: Refers collectively to groups of people who move from one place to another (migrants). They may move temporarily, seasonally, or permanently and for either voluntary or involuntary reasons.

Monitoring: Evaluating a programme's performance over time.

Monitoring and Evaluation (M&E): Collecting and analysing accurate and reliable information that can be used to improve programme performance and planning.

Monocyte: A type of white blood cell.

Morbidity: Any departure, subjective or objective, from a state of physiological or psychological well-being.

Mortality rate: A measure of the frequency of occurrence of death in a defined population during a specified interval of time.

Mortality rate, infant: A ratio expressing the number of deaths among children under one year of age reported during a given time period divided by the number of births reported during the same time period.

MSC: See 'multi-stage cluster sampling.'

MSM: Acronym for 'men who have sex with men.'

MSW: Acronym for 'male sex worker.'

MTCT: Acronym for 'mother-to-child transmission.' See 'perinatal transmission.'

Multi-stage cluster sampling (MSC): Two- or more- stage sampling. Final units from selected clusters may be randomly selected.

- Simple two-stage cluster sampling
- Probability proportional to size sampling (PPS) is used when all clusters do not have the equal probability of being selected in the sample. PPS is a class of unequal probability sampling in which the probability of a unit being sampled is proportional to the level of some known variable (Levy & Lemeshow).

Multivariate analysis: One of the main types of analysis conducted in behavioural surveillance that is performed to look at the influence of at least two variables on another variable. since relationships between variables are often complex and interwoven. Multivariate techniques can pinpoint the individual effects of several explanatory variables on an outcome variable, which may be related to each other.

Natural history of disease: The temporal course of disease.

Needs assessment: A systematic examination of the type, depth and scope of a problem.

Negative controls: Specimens known to be negative and used to ensure that a laboratory reagent is working properly prior to testing specimens from patients.

Negative predictive value: In HIV testing, the probability that a person with a negative test result is not infected. Also known as 'predictive value negative.'

***Neisseria gonnorrhoeae*:** The causative agent of gonorrhoea.

Network: This sampling method may be used for groups whose members are socially linked. Ego-centred network sampling is based on random, representative or any other form of quota sampling (Schensul). Full relational network sampling begins with identification of individuals (see 'seeds') who act as entry points to the network.

NGO: Acronym for 'non-governmental organisation.'

Nominal variable: Variables that represent discrete categories without a natural order, such as marital status.

Non-probability sampling: The sampling units are selected through a non-randomised process; therefore, the probability of selecting any sampling unit is not known.

Non-random mixing: The tendency of people to associate preferentially with others who are like themselves.

Non-vesicular genital ulcer disease: An STI syndrome characterised by ulcers and the absence of vesicles.

Notifiable disease: A disease for which law or regulation requires reporting to the health authority.

Numerator: The upper portion of a fraction. In a rate, the numerator is usually the number of people infected.

Operational definitions of target populations: Definitions that are operationally useful for sampling and fieldwork purposes. For example, a definition that clearly identifies what constitutes a sex worker, in terms of duration of selling sex, form of payment, type of venue where they work, etc.

Operations manual: A document that describes every step to be taken during the implementation of a survey or study. Ideally, it provides standard operational procedures for every foreseeable occurrence.

Opportunistic infections: Illnesses caused by various organisms infecting immunodepressed persons that usually do not cause disease in persons with healthy immune systems. Persons with advanced HIV infection (that is, AIDS) suffer opportunistic illnesses of the lungs, brain, eyes, and other organs. These illnesses are referred to as AIDS-defining illnesses or conditions.

Opt-in: A patient or participant agrees to be tested.

Opt-out: A patient or participant refuses to be tested.

Optical density: The intensity of colour as measured by a machine in an EIA HIV antibody test, indicating whether the patient's sample is HIV-positive.

Ordinal variable: Variables that have a natural order, such as level of education.

Over-sampling: A sample may obtain more members of a particular sub-group than their representation in the target population warrants. In some cases, over-sampling is carried on purpose to learn more about a small sub-group, such as female injection drug users in communities that are predominantly male.

p24 antigen: A protein that appears in the serum of infected individuals approximately one week before HIV antibodies appear, or about 14 days after actual infection. In very large sero-surveys, persons who tested negative for HIV antibody can be retested for p24 antigen.

Pandemic: An epidemic occurring over a very wide geographic area (several countries or continents) and usually affecting a large proportion of the population. HIV is an example of a pandemic.

Parameter: The summary numerical description of variables about the target population.

Parenteral transmission: Transmission of an infectious agent through blood. Parenteral transmission of HIV can occur from the sharing of injection drug equipment, from transfusions with infected blood or blood products, or from needle stick injuries.

Participant observation: A qualitative research method in which direct observation is carried out over a period of time, and which is understood and accepted by the group being observed.

Participation bias: Error in results from a study that is due to differences in characteristics between those who participate in a survey and those who do not. For example, persons who already know they are HIV-infected may find testing unnecessary; those who suspect they are HIV-infected may decline testing in order to avoid stigma.

Partner concurrency: Having extensive sexual network connections to many persons at the same time, which increases the spread of HIV and STIs.

Passive surveillance: A system in which a health-care provider or worker notifies the health authority of any cases of these diseases, as opposed to 'active surveillance.'

Pathogen: A biological agent that causes disease or illness to its host (for example, bacteria or virus).

Payment coupon: Kept by the recruiter. He/she will use it to claim an incentive for having recruited a peer into the study.

Perinatal transmission: Transmission of an infectious agent, such as HIV, from mother to baby before, during, or after the birth process. Also known as 'vertical transmission' or 'mother-to-child transmission.'

Period prevalence: The amount a particular disease that is present in a population over a specified period of time.

Pie chart: A circular chart in which the size of each 'slice' is proportional to the frequency of each category of a variable. A pie chart compares subclasses or categories to the whole class or category using different coloured slices.

PLACE: See 'Priorities for local AIDS control efforts.'

PLWHA: Acronym for 'Persons living with HIV/AIDS.'

PMTCT: Acronym for 'prevention of mother-to-child transmission.'

Point estimate: The amount of a particular disease present in a population.

Point prevalence: Refers to prevalence at a single point in time. Also known as 'point incidence.'

Population: The total number of inhabitants of a given area or country. In sampling, the population may refer to the unit from which the sample is drawn, not necessarily the total population of people.

Population-based sero-survey: A type of sero-survey that uses a probability sample of a population defined by geographic boundaries, such as villages or provinces, in order to obtain a direct measure of HIV prevalence in a general population.

Population sub-group: A group within a population that share certain characteristics or behaviours.

Positive controls: Specimens known to be positive, as used in proficiency testing.

Positive predictive value: The probability that a person with a positive test result is infected; in surveillance this refers to the proportion of cases reported by a surveillance system or classified by a case definition which are true cases. Also known as 'predictive value positive.'

PPS: See 'Probability proportional to size sampling.'

Precision: Refers to how well the results can be reproduced each time the survey is conducted.

Presumptive clinical diagnosis: Diagnosis made solely on the basis of symptoms, without the use of specific diagnostic tests.

Pre-surveillance assessment: Describes a set of activities that occur prior to beginning formal HIV and behavioural surveillance in *high-risk* groups. These activities include developing detailed plans and reviewing and collecting information that will help in planning and designing surveillance activities.

Prevalence: The proportion of persons in a given population with a disease or condition at a given point in time; a specific group infected. Prevalence is a direct measurement of the burden of disease in a population.

Prevalence assessment: Surveys that determine prevalence of a disease in a population.

Prevalence monitoring: Monitoring prevalence repeatedly over time to track trends.

Primary incentive: The incentive a participant gets for enrolling in the study and completing an interview.

Primary units: A sampling frame of larger unit. When it is difficult or impossible to make a list/sampling frame of each individual in the target population, we can develop a sampling frame of some larger unit; that is, clusters or primary sampling units. We then sample in stages by first sampling clusters and then sampling people within the clusters.

Priorities for Local AIDS Control Efforts (PLACE): A new, rapid assessment tool used to identify high transmission areas, which formalises the collection of information on high transmission areas. PLACE uses key informants to identify sites where people meet new sex partners, then interviews people at the site in order to characterise the site in each area and map sites, and, finally, interviews individuals socialising at the site to describe the characteristics of the people at the site.

Priority communicable disease: These are diseases that have the potential for epidemic spread and can be controlled through public health action. They are the diseases included in the Integrated Disease Surveillance form.

Prisoner: Any person involuntarily confined or detained in a penal institution, including persons detained pending arraignment, trial, or sentencing.

Probability proportional to size sampling: A class of unequal probability sampling in which the probability of a unit being sampled is proportional to the level of some known variable (Levy & Lemeshow).

Probability sampling: A sampling scheme that ensures that each entity in a population has a known, non-zero chance of being selected.

Process evaluation: An evaluation of a programme that determines how well the programme is functioning, as opposed to 'impact evaluation.'

Proficiency panel: A set of samples designed to judge the accuracy and precision of a laboratory. A necessary component of laboratory quality assurance. In the context of HIV testing this may be a group that contains approximately six HIV-negative and HIV-positive (weak to strong) specimens representative of the HIV strains circulating in a country and of the different stages of HIV infection. The panel should be sent to participating laboratories once or twice each year for quality assurance testing.

Proficiency testing: The act of sending a proficiency panel to a laboratory, designed to test the accuracy and precision of that laboratory.

Prophylaxis: Treatment to prevent or suppress infection, often given before a person's exposure to the pathogen. For example, the treatment given to mother's during childbirth in order to prevent infection of the newborn child.

Proportion: The relationship of a part to the whole, in which the numerator is included in the denominator; often depicted as a percent by multiplying by 100.

Prospective case reporting: To watch a group of cases for outcomes, such as the development and progress of HIV disease, over time and to relate this to other factors such as suspected risk or protection factors.

Prostitués homosexuels: Homosexual prostitutes. Male sex workers who identify as homosexual or gay.

Protocol: The detailed plan for conducting a research study or other activities in which specific steps are required, including surveillance activities.

Purposive sampling: A non-random sampling method that involves choosing respondents with certain characteristics.

Qualitative research: Research that focuses on the characteristics or quality of things, rather than the quantity. The sample included qualitative research is usually much less used than that included in quantitative research.

Quality assurance: The dynamic and ongoing process of monitoring a system for reproducibility and reliability of results that permits corrective action when established criteria are not met.

Quality control: A laboratory's internal processes for running specimens to ensure that the test equipment and reagents function properly.

Quantitative research: Research that focuses on quantity of things, rather than the quality. Quantitative research has powerful tools for the analysis of numbers, but researchers know that the things counted are often qualitative categories or definitions.

Questionnaire faults: Problems with the way questions are phrased, set out and ordered, which lead to misunderstandings of the questions.

Random error: Also called non-systematic error. This is the type of error that results from chance and leads to imprecise results.

Random sample: A sample derived by selecting individuals such that each individual has the same probability of selection.

Random walk: A variation of link-tracing sampling procedure in which the respondent is asked to give the names of other members of a hidden population. From that list, one is selected randomly, located and added to the sample. The process is repeated for a desired number of waves. (S.K. Thompson et al.)

Range: The difference between the largest and smallest values in a distribution.

Rapid assessment and response (RAR): A method that is used to assess the nature and extent of a public health problem and to suggest ways to address the problem. RAR is not designed as a surveillance tool, but as a way to assess a situation quickly, and bring in resources to address it.

Rapid HIV test: An HIV antibody test that is simple, does not require any reagents or equipment other than what is contained in the kit and provides results in less than 20 minutes.

Rapid plasma reagin test (RPR): A common serologic test for syphilis. Specifically, a non-treponemal test for anticardiolipin antibodies.

Rate: An expression of the frequency with which an event occurs in a defined population.

Ratio: The quantitative relationship between two or more things; the value obtained by dividing one quantity by another.

RDS: See 'Respondent driven sampling.'

RDSAT: Acronym for respondent driven sampling analysis tool (a freeware software package for analysing RDS data).

Reference laboratory: A laboratory that functions as a recognised centre of expertise and standardisation of diagnostic techniques.

Referral coupon: Used by the recruiter to recruit a peer into the study.

Refugees: By legal definition, refugees are persons who are outside their country of nationality and who are unable or unwilling to return to that country. They cannot return due to a well-founded fear of persecution because of race, religion, political opinion or membership in an ethnic or social group.

Relative risk: A comparison of the risk of some health-related event such as disease or death in two groups. For example, an HIV-uninfected individual who has sexual intercourse with an HIV-infected person once a year may have a 5% chance of infection. But if the uninfected individual uses a condom every time, the relative risk when compared to condom non-use is 15%.

Reliability: Refers to how reproducible a result is from repeated applications of a measure to the same subject.

Representative sample: A sample whose characteristics correspond to those of the original population or reference population.

Representativeness: The degree to which the sample truly reflects the study population (that is, whether it is representative of the study population).

Resistance: The ability of an organism, such as HIV, to overcome the inhibitory effect of a drug.

Resource assessment: A component of RAR, a systematic examination of the response (funds, people, buildings, knowledge) that is either available or required to solve the problem.

Respondent driven sampling (RDS): A sampling technique that does not require a sampling frame. It is an adaptation of a non-probability sampling method (snowball sampling) and is based on the assumption that members of the sub-population themselves can most efficiently identify and encourage the participation in surveillance of other sub-group members. RDS starts with initial contacts or 'seeds' who are surveyed and then become recruiters. Each of these recruiters is given coupons to use to invite up to three eligible people that he/she knows in the high-risk group to be interviewed. The new recruits bring their coupon to a central place where they are interviewed. The recruits then become recruiters. This occurs for five to six waves. Both the recruits and the recruiters are given incentives to encourage participation.

Retrospective case reporting: To look backwards and examine exposures to disease, for example, HIV infection, and suspected risk or protection factors in relation to an outcome (infection) that is established at the start of the reporting.

Retrovirus: A type of RNA virus that produces reverse transcriptase which converts RNA into DNA. HIV is an example of a retrovirus.

Reverse-transcription: The process by which HIV's genetic material (RNA) is transformed into DNA, which allows it to fuse with the host's genetic material (DNA).

RIBA: Acronym for recombinant immunoblot assay, also known as Western blot. Immunoblot assays confirm anti-HCV reactivity. Serum is incubated on nitrocellulose strips on which four recombinant viral proteins are blotted. Color changes indicate that antibodies are adhering to the proteins. A positive result is if two or more proteins react and form bands. An indeterminate result is if only one positive band is detected.

Risk: The probability that an event will occur; for example, that an individual will become ill within a stated period of time.

Risk factor: An aspect of personal behaviour or lifestyle; an environmental exposure; an inborn, inherited, or demographic characteristic. Associated with an increased occurrence of disease or other health-related event or condition. For example, injection drug use is a risk factor for acquiring HIV.

RPR: See 'Rapid Plasma Reagin test.'

Safety protocol: A study document that describes how to deal with field incidents or adverse events.

Sample: A selected subset of a population. There are specific types of samples used in surveillance and epidemiology such as convenience, systematic, population-based and random.

Sample size: The number of subjects to be used in a given study.

Sample frame: A list of units from which a sample may be selected. A sample frame is a fundamental part of probability sampling.

Sampling bias: Also called selection bias. This refers to errors in sampling that decrease accuracy and lead to incorrect estimates. We also use the term 'biased samples' to mean that errors were made in choosing the people in the sample.

Sampling element: Individual member of the population whose characteristics are to be measured. See 'Sampling unit.'

Sampling error: The part of the total estimation error of a parameter caused by the random nature of sampling.

Sampling interval: The standard distance between elements selected in the sample population.

Sampling scheme: Procedure for choosing individuals to be included in a sample.

Sampling units: Refers to individual members of the population whose characteristics are to be measured. See 'Sampling element.'

Sampling variation: Difference between the estimate you measure in a sample and the true value of the variable in the study population.

Scale line graph: A graph that represents frequency distributions over time where the Y-axis represents frequency and the X-axis represents time

Second-generation surveillance*:* Built upon a country's existing data collection system, second-generation HIV surveillance systems are designed to be adapted and modified to meet the specific needs of differing epidemics. This form of surveillance aims to improve the quality and diversity of information sources by developing and implementing standard and rigorous study protocols, using appropriate methods and tools. Second generation surveillance refers to activities outside of those activities generally considered to be a part of routine case surveillance such as case reporting and sentinel sero-surveys and uses additional sources of data to gain additional understanding of the epidemic. It includes biological surveillance of HIV and other STIs, as well as systematic surveillance of the behaviours that spreads them.

Secondary incentive: The incentive a participant gets for recruiting his or her peers into the study.

Seeds: Non-randomly selected (by the investigators) members of the target population who will initiate the RDS recruitment process by recruiting members of his or her peer group. From each seed, a recruitment chain is expected to grow.

Selection bias: A systematic error in the process respondent selection for a study or survey.

Sensitivity: The proportion of persons with disease who are correctly identified by a screening test or case definition as having disease.

Sentinel case reporting: Reporting cases of a disease from sentinel sites.

Sentinel populations: Populations that are subject to sentinel surveillance activities. They may not necessarily be representative of the general population, but rather they might be the first affected by HIV. Examples include sexually transmitted infection patients or truck drivers.

Sentinel sites: Sites at which sentinel surveillance activities take place, including clinics attended by individuals who may or may not be representative of the general population but are likely to represent groups initially infected or at higher risk for infection than the general population.

Sentinel surveillance: A surveillance system in which a pre-arranged sample of reporting sources at 'watch post' or 'sentinel' sites agrees to report all cases of one or more notifiable conditions. Often designed to provide an early indication of changes in the level of disease. Depending on the nature of the population surveyed, these data may be representative of the general population, or they may simply give more detailed information about the populations tested.

Sero-conversion: The development of antibodies to a particular microbe. When people develop antibodies to HIV, they 'sero-convert' from HIV-negative to HIV-positive.

Sero-incidence surveillance: Collecting blood samples for measuring newly acquired HIV infection for the purposes of surveillance.

Serologic test: A blood test that determines the presence of antibodies to particles such as viruses. For example, a blood test that detects the presence of antibodies to HIV.

Sero-prevalence: The proportion of a population that is infected, as determined by testing blood for the appropriate antibody. For example, the proportion of a population that is infected with HIV, as determined by testing for HIV antibodies in blood samples.

Sero-prevalence surveillance: Collecting blood samples for the purpose of surveillance. Latent, sub-clinical infections and carrier states can thus be detected, in addition to clinically overt cases. This is especially important in the case of HIV and other STIs, which often have a long latent period before symptoms are apparent.

Sero-status: Refers to the presence/absence of antibodies in the blood. For example, the presence or absence of HIV.

Sero-surveillance: Collecting blood samples for the purpose of surveillance. Latent, sub-clinical infections and carrier states can thus be detected, in addition to clinically overt cases. This is especially important in the case of HIV and other STIs, which often have a long latent period before symptoms are apparent.

Sexual transmission: Transmission of an infectious agent, such as HIV, that occurs predominately through unprotected vaginal or anal intercourse, and less frequently through oral intercourse.

Sexually transmitted diseases: Symptomatic. Caused by organisms that are spread by sexual contact from person to person.

Sexually transmitted infection (STI): Asymptomatic. Diseases that are spread by the transfer of organisms from person to person during sexual contact.

Sex workers (SWs): Persons who engage in **sex work**, or the exchange of sex for money, which includes many practises and occurs in a variety of settings. These may include '**direct**' or '**formal**' sex workers, who are sometimes included in registries and

often found in brothels, and '**indirect**' or '**casual**' sex workers, who do not engage in sex work full time and are unlikely to be included in registries. The term 'sex worker' can be used to refer to female, male and transgendered sex workers.

Simple random sampling (SRS): Sampling where everyone has an equal chance of being randomly selected (a non-zero probability) and we know what that chance is.

Skewed: A distribution that is asymmetrical and does not follow a normal (bell-shaped) distribution.

Snowball sampling: Relies on informants to identify other relevant study participants in a chain referral pattern. Informants (seeds) who meet inclusion criteria are identified. This sampling design is based on chain referral and relies on the seed(s) to identify other relevant subjects for study inclusion. Those other subjects may identify other relevant subjects for inclusion. Snowball sampling is useful for studying populations that are difficult to identify or access. Representativeness is limited.

Social influence: Mild peer pressure from the recruiter who will receive a secondary incentive for recruiting his/her peers.

Social network: Members of a peer group who know each other.

Socio-metric stars: Seeds who are not only willing to recruit their peers, but are well-regarded by their peers and have a lot of them. Such seeds are more likely to influence others to be recruited into the study.

Specificity: The proportion of persons without disease who are correctly identified by a screening test or case definition as not having disease.

SRS: See simple random sampling.

Stacked bar chart: See 'clustered bar chart.'

Stakeholders (or stakeholder's group): Those with an interest in the results of surveillance activities. Includes public health practitioners, healthcare providers, data providers and users, representatives of affected communities; governments at the district, province and national levels; members of professional and private non-profit and donor organisations.

Standard error: Estimate of precision in probability sampling that can be used to construct a range of values within which the true population measure is likely to fall. We usually want to be 95% sure that the true population measure lies in our range.

Standardised Testing Algorithm for Recent HIV Sero-conversion (STARHS): A calculation for measuring new infection that uses a single blood test. STARHS uses the

results of two EIA tests, one highly sensitive and another modified to be less sensitive. The less sensitive EIA test is called the 'detuned' assay.

Statistics: A branch of applied mathematics concerned with the collection and interpretation of quantitative data and the use of probability theory to estimate population parameters.

Steering method: In RDS, using additional methods to recruit a special sub-population of interest; for example, providing an extra coupon to be used only to recruit female IDUs.

STI: See 'sexually transmitted infection.'

Stigma: A mark of disgrace or shame. For example, in some societies, being infected with HIV causes a person to be stigmatised.

Strata: A sub-group in stratified sampling.

Strategic information (SI): Refers to any data collected by surveillance or monitoring and evaluation of a programme or system. Includes, but is not limited to, process indicators, output indicators and surveillance data.

Stratification: The classification of a survey population into sub-groups or strata on the basis of selected characteristics.

Stratified and constant incentives: In a study of SWs, a constant incentive level was considered too low to attract the more hidden SWs who earned a higher income. The research team considered using a stratified incentive process. The SWs received an incentive based on the type of sex work they did. For instance, a street-based SW received a $5.00 incentive, while a call-girl-type SW received a $10.00 incentive

Stratified sampling: Stratified sampling is generally used to obtain a representative sample when the population is heterogeneous, or dissimilar, where certain homogeneous, or similar, sub-populations can be isolated (strata). A stratified sample is obtained by taking samples from each stratum or sub-group of a population.

Street children: Children who live and/or work on the streets, including orphaned, homeless, runaway, or neglected children who live chiefly in the streets without adequate protection, supervision, or direction from responsible adults.

Subcutaneously: Below the skin, as in an injection.

Sub-population: See 'population sub-group.'

Sufficient cause: A causal factor or collection of factors whose presence is always followed by the occurrence of the effect (of disease).

Surveillance: The systematic collection, analysis, interpretation, and dissemination of health data on an ongoing basis, to gain knowledge of the pattern of disease occurrence and potential in a community, in order to control and prevent disease in the community.

Surveillance sites: The places from which case reports are obtained. This includes sites at which universal reporting and sentinel reporting are done. These may be healthcare facilities or other locations at which sero-surveys are conducted.

Survey population: The target population modified to take into account practical considerations (for example, all commercial sex workers in a city over the age of 15, excluding those who are based at home, as they cannot be accessed).

Survey protocol: A manual that describes all the steps and tasks involved in a sero-survey.

Survival sex: To barter sex for the necessities of living, such as food, shelter, goods, money. Engaged in by vulnerable populations, for example, by displaced women, street children, and transgendered people who are marginalised and discriminated against.

Susceptible: Vulnerable or predisposed to a disease.

Symptomatic: Exhibiting symptoms.

Symptoms: Any perceptible, subjective change in the body or its functions that indicates disease or phases of disease, as reported by the patient.

Syndrome: A group of symptoms as reported by the patient and signs as detected in an examination that together are characteristic of a specific condition.

Syndromic case reporting: A surveillance system in which a diagnosis of the infection is made through the presence of symptoms using a standard case definition. Frequently used for surveillance of sexually transmitted infections in countries in which access to laboratory testing may be limited.

Syndromic prevalence: The prevalence of a particular syndrome, or set of symptoms, in a given population. Usually calculated when testing equipment is not available to verify the presence of particular pathogen in a laboratory.

Syphilis: A sexually transmitted disease resulting from infection with the bacterium *Treponema pallidum*. Syphilis can also be acquired by newborns from their mothers during pregnancy.

Systematic sampling: A sampling method that consists of randomly selecting the initial patient who meets the inclusion criteria and then selecting every ‘nth’ (for example, third or fifth) eligible patient thereafter until the predetermined sample size is reached or the survey period is over.

Systemic: Concerning or affecting the body as a whole.

Table: A set of data arranged in rows and columns.

Target population: The group that meets a survey's measurement objective (for example, all commercial sex workers in a city).

Targeted sampling: Targeted sampling uses pre-existing indicator data (qualitative and quantitative) to construct a sampling frame from which recruitment sites are then randomly selected. Qualitative indicator data includes ethnographic data and key informant interviews. Types of quantitative indicator data include cases of HIV/AIDS and STIs, admissions to drug treatment and population characteristics from census data. There are several limitations: 1) indicator data may not be useful in characterising the target population; 2) sampling may be biased and difficult to replicate; 3) geographic areas may not be sampled in proportion to the number of members in the population of interest; 4) the population of interest may not be sampled in proportion to the intensity of risk behaviour and 5) the probability of selecting a member of the population of interest may not be known.

TB: Acronym for tuberculosis.

Testing (HIV) strategy: The use of an appropriate HIV test or combination of HIV tests. The choice of testing strategy used is based on the objective of the test, the sensitivity and specificity of the test, and HIV prevalence in the population being tested.

T-helper lymphocyte: Also known as 'T-cell.' Immune cells that seek and attack invading organisms. HIV enters T-cells through their CD4 receptor proteins, making T-cells virtual HIV-factories.

Time-location sampling (TLS): Similar to conventional cluster sampling, but gets around the problem of clusters that are not stable (that is, clusters where the number and type of people vary by, for example, time of day). Time-location sampling allows the same site to be included in the sample frame more than once (for example, at different times of the day or different days of the week).

Timeliness of reporting: One of several attributes of a surveillance system. Timeliness may be defined as the time period between the diagnosis of the disease and the receipt of a case report form at the health district.

Transactional sex: Distinct from other forms of commercial sex. Includes the receipt of gifts or services in exchange for sex.

Transgendered persons: Persons who identify with or express a gender and/or sex different from their biologic sex.

Transition probability: The likelihood that a person will change from one state to another, for example becoming HIV positive.

Transmission: Any mode or mechanism by which an infectious agent is spread through the environment or to another person.

Trend: A long-term movement or change in frequency, usually upwards or downwards.

Treponema pallidum: The bacterial causative agent of syphilis.

Triangulation: The process of examining several different sets of data, which are measuring different things to come up with a better understanding of how and where an epidemic is spreading. For example, the use of antenatal clinic data, census data, and registered deaths in order to create a more complete picture of the AIDS burden in a country.

***Trichomonas vaginalis*:** A sexually transmitted protozoan parasite that causes the vaginal infection, **trichomoniasis**, characterised by itching, burning and vaginal discharge. Reinfection is common if sexual partners are not treated simultaneously.

True negatives: Test results that are negative when the patient actually does not have the disease that is being tested for.

True positives: Test results that are positive when the patient actually has the disease that is being tested for.

Tuberculosis: An airborne, often fatal bacterial infection caused by *Mycobacterium tuberculosis.* It causes damage to the lungs and other parts of the body. Infection is more likely in people with weak immune systems.

UAT: See 'unlinked anonymous testing.'

UNAIDS: Acronym for The Joint United Nations Programme on HIV/AIDS.

UNGASS: Acronym for United Nations General Assembly Special Session on HIV/AIDS.

Univariate analysis: The most basic, yet often the most important, type of behavioural surveillance analysis, because it shows the distribution of each variable. Most of the indicators defined for behavioural surveillance purposes are calculated through univariate analysis. They would include variables like the proportion of young men who have had sex with more than one partner during a given time period. When trends are analysed, statistical techniques are used to calculate how likely it is that changes in the proportions could have occurred by chance, or whether observed changes are likely to reflect real changes.

Universal case reporting: A surveillance system in which all persons who are identified as meeting the case definition for a particular disease are reported. For example, all persons with AIDS who receive care at any healthcare facility are reported. This is in contrast to sentinel reporting in which only selected sentinel sites report all persons who meet the case definition.

Universal conscription: Military conscription in which all physically able men between certain ages (for example 17-28) must perform military service.

Universal precautions: Recommendations issued by CDC to minimise the risk of transmission of bloodborne pathogens, particularly HIV and HBV, by healthcare and public safety workers. Barrier precautions are to be used to prevent exposure to blood and certain body fluids of all patients.

Unlinked anonymous testing (UAT): Testing that occurs when a sample of blood originally collected for other purposes is tested for HIV after being anonymised. The person whose blood is taken does not know that his/her blood will be tested for HIV. All information that could identify the person is removed from the sample so that the results of the test cannot be linked back to them.

Unprotected sex: Having sex without using a condom as protection against HIV and other sexually transmitted infections.

Urethritis: Inflammation of the urethra.

Vaccine: When injected into an individual, a vaccine protects against subsequent infection by a particular organism or results in a less severe illness should infection occur. Currently there is no vaccine for HIV.

Validity: The validity of a measure is the extent to which it actually measures what it is suppose to measure: the truth.

Values: Magnitude of measurements (statistics).

Variable: Any characteristic or attribute that can be measured.

VCT: See ‘voluntary counselling and testing.’

VDRL: See ‘Venereal Disease Research Laboratory test.’

Venue-based: Locations in the community, such as bars, tea houses, and street corners.

Venue-based sampling: Recruit respondents in places and at times where they would reasonably be expected to gather. The venues act as screeners in identifying potential respondents. Venue-based sampling requires comprehensive formative research.

Venereal Disease Research Laboratory test (VDRL): A common serologic test for syphilis. Specifically, a non-treponemal test for anticardiolipin antibodies.

Vertical surveillance system: See 'categorical surveillance system.'

Vertical transmission: See 'perinatal transmission.'

Vesicular: Pertaining to vesicles or blisters.

Viral load: The amount of HIV in the circulating blood. Also known as 'viral burden' or 'viral dose.'

Viral load test: Test that measures the quantity of HIV in the blood.

Virulence: The relative capacity of an organism to overcome the body's immune defences.

Virus: Micro-organisms that typically contain a protein coat surrounding nucleic acid (RNA or DNA) that are capable of growth only within living cells.

Vital records: Certificates of birth, death, marriage and divorce that are required by law.

Voluntary counselling and testing (VCT): A programme that provides both counselling and testing services to communities, allowing persons who are tested to obtain emotional and medical support before and after their HIV tests.

Voluntary migrants: People who temporarily work or travel away from their homes.

Volunteerism: A term used to describe overly cooperative subjects, leading to a potential bias if such cooperative people differ from the rest of the population of interest.

Vulnerable population: A group whose members are discriminated against and who face stigma, making them vulnerable to negative consequences of surveillance, including social and physical harm.

Western blot: A type of HIV test, Western blot uses an electroblotting method in which proteins are transferred from a gel to a thin, rigid support and detected by binding of labeled antibody to HIV.

WHO: Acronym for the 'World Health Organization.'

Width: See 'interval width.'

X-axis: The horizontal line of a graph, usually found at the bottom.

Y-axis: The vertical line of a graph, usually found at the left but sometimes also at the right.

Years of potential life lost: A measure of the impact of premature mortality on a population, calculated as the sum of the differences between some predetermined minimum or desired life span and the age of death for individuals who died earlier than that predetermined age.

YLL: See 'years of potential life lost.'

Notes

Appendix C, Links

Resources on Sexually Transmitted Infections

Sexually Transmitted Diseases information from the NLM and NIH

NLM provides a wide variety of resources related to the biomedical and health sciences. This web site provides a collection of information on STIs, including articles about prevention, diagnosis, research, and statistics.
www.nlm.nih.gov/medlineplus/sexuallytransmitteddiseases.html

Sexually Transmitted Diseases: Journal of the American Sexually Transmitted Disease Association

Sexually Transmitted Diseases publishes original, peer-reviewed articles on clinical, laboratory, immunologic, epidemiologic, sociologic, and historical topics pertaining to sexually transmitted diseases and related fields. Reports from the CDC and NIH provide up-to-the-minute information. Included in each issue are studies and developments from around the world.
www.stdjournal.com

American Social Health Association

The American Social Health Association is dedicated to improving the health of individuals, families, and communities, with a focus on preventing sexually transmitted diseases and their harmful consequences. This web site provides resources on a variety of STIs, as well as a sexual health glossary and statistics about STIs.
www.ashastd.org/index.cfm

Sexually Transmitted Infections information from Planned Parenthood

This web site, maintained by the United States branch of the International Planned Parenthood Federation, provides basic information about common STIs. The materials presented are suitable for younger audiences, and include fact sheets and guidelines to safer sex.
http://www.plannedparenthood.org/pp2/portal/medicalinfo/sti/

International Union against Sexually Transmitted Infections (IUSTI)

IUSTI is the oldest international organisation in the field whose object is the achievement of international cooperation in the control of sexually transmitted diseases, including HIV infection. IUSTI is especially concerned not only with the medical aspects but the social and epidemiological aspects of the control of sexually transmitted diseases and increasingly HIV/AIDS.
www.iusti.org/

Sexually Transmitted Infections information from the WHO

This page, maintained by the World Health Organization, provides links to descriptions of activities, reports, news and events, as well as contacts and cooperating partners in the various WHO programmes and offices working on this topic. Also shown are links to related web sites and topics.
www.who.int/topics/sexually_transmitted_infections/en/

California STD Initiatives

California STD Initiatives was established in 1998 by the California HealthCare Foundation from a statewide collaboration between the University of California, San Francisco, the California Department of Health Services STD Control Branch, public health agencies, medical professionals, and community based agencies. The project's overriding goal is to improve prevention and control of STIs, and the following website provides a variety of resources.
www.ucsf.edu/castd/

Division of STD Prevention (CDC)

The Division of STD Prevention provides national leadership through research, policy development and support of effective services to prevent sexually transmitted diseases (including HIV infection) and their complications such as enhanced HIV transmission, infertility, adverse outcomes of pregnancy and reproductive tract cancer.
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Appendix D, Answers to Warm Up Questions and Case Studies

Answers are provided in italics for each unit's warm up questions and case study.

Answers to the questions within the unit are not included. Unit questions are designed to stimulate small group discussion among participants in the workshop or class.

Unit 1 Answers

Warm up questions

1. What are the three main areas of inter-relationship between STIs and HIV? *Behavioural (both STIs and HIV are transmitted sexually), epidemiological (populations with high rates of STIs also have high rates of sexually transmitted HIV), and immunological (the presence of STIs makes it easier to acquire and spread HIV).*

2. True or false? STIs increase susceptibility to HIV and also increase the risk of transmitting HIV. *True. Because of the relation between STIs and HIV (see previous question), STIs increase the risk of transmitting and acquiring HIV infection.*

3. True or false? An STI surveillance system can serve as an evaluation tool for HIV prevention programmes. *True. HIV prevention programmes attempt to reduce sexually risky behaviours, including those that lead to STI transmission. Therefore, monitoring STIs through STI surveillance can help to evaluate the effectiveness of these prevention programmes.*

4. List two ways the Integrated Disease Surveillance (IDS) strategy is expected to improve STI surveillance. *IDS strives to improve STI surveillance by combining at the district level communicable disease priority surveillance activities; and by supporting training, supervision and resources for all disease control programmes.*

5. Which of the following increases the risk of HIV transmission in sexual exposure?
   a. Greater mucous membrane exposure
   b. The presence of white blood cells and inflammation
   c. Increasing the duration of exposure
   d. All of the above

   Mucous membranes often contain white blood cells, which are targets of HIV. Similarly, the presence of white blood cells and inflammation provides more targets for HIV to infect. Finally, increasing the duration of exposure allows HIV more time to infect the body.

6. Which of the following determines infectivity of HIV?
   a. The amount of virus (viral load) to which an uninfected person is exposed
   b. The type of exposure (blood, mucous membrane)
   c. Host factors that protect against infection
   d. All of the above

   All of the above factors make it more likely that HIV is transmitted from an infected person to an uninfected person.

Case study

You are a national level public health officer in the Republic of Melabia (a country with a generalised HIV epidemic) and have reviewed the surveillance data on male urethral discharge for your country. Currently, male urethral discharge is reported using a vertical reporting system. You have concluded that the reporting of this STI is incomplete in most provinces.

a. List the appropriate actions to take to improve the quality and completeness of gonorrhoea reporting for your country.

   1. Move from a vertical system to an integrated system using the IDS forms.
   2. Establish an active reporting system in which health department staff contact health facilities to gather the surveillance data.

b. List two ways that surveillance for male urethral discharge can be used in understanding the HIV epidemic in the Republic of Melabia.

   Surveillance for STIs (such as male urethral discharge syndrome) can be used as a marker:
   1. For the emergence of HIV in new groups
   2. Of how successful prevention programmes have been in high-risk populations

Unit 2 Answers

Warm up questions

1. True or false? Some elements of an STI surveillance system are more important for HIV surveillance activities. Others are more important for STI control programme activities. *True. Combined STI/HIV behavioural surveillance surveys, for example, are important for HIV surveillance, while anti-microbial resistance monitoring is more important for STI control programmes.*

2. True or false? STI surveillance data can serve as an indicator of trends in HIV risk behaviours. *True. Because STIs and sexually transmitted HIV are transmitted the same way, trends in STI data may reflect similar trends in HIV transmission.*

3. True or false? Aetiologic reporting of syphilis (by stage), gonorrhoea, chlamydia, and congenital syphilis is considered a basic surveillance activity in resource-constrained countries. *False. Aetiologic reporting is only possible where well-developed systems of laboratory diagnosis exist.*

4. Which of the following is not a component of an STI surveillance system?
   a. STI universal case reporting
   b. STI sentinel surveillance systems
   c. STI testing and treatment
   d. STI prevalence assessment and monitoring

   Treatment of STIs is not a component of STI surveillance activities.

5. True or false? In generalised HIV epidemics, prevalence assessments should include monitoring gonorrhoea and chlamydia. *True. These conditions suggest recent high-risk behaviours.*

6. True or false? An STI surveillance system includes conditions that are newly acquired, as well as those that represent past infections. *True. This will help to accurately calculate prevalence and incidence.*

7. In *aetiologic* case reporting, STI cases are reported by the specific microbial organism that caused the STI, while in syndromic case reporting, STI cases are reported by the clinical syndrome with which the patient presents. *Aetiologic testing involves a well-developed laboratory system. Therefore, it is less common in resource-constrained settings.*

Case study

Table. Reports of STI case reporting from IDS in Yamo Province.

STI condition	2004	2005	2006	2007
Male urethral discharge	25,292	28,959	29,784	29,859
Male non-vesicular genital ulcer	6,429	7,983	7,497	7,698
Female non-vesicular genital ulcer	5,834	6,497	6,306	6,905

a. Look at the STI data provided in the table. Assume that the population size has not changed between 2004 and 2007. What do the data suggest about the trends in the incidence and prevalence of these conditions in Yamo Province?

There appears to be an increase in the number of cases of each of these STI syndromes. Because they are likely to represent new infections, it is likely that this means an increase in incidence and prevalence of these syndromes. This view, however, is based on an assumption of stable populations and surveillance practices.

b. What do these data suggest about trends in HIV risk behaviours?

Increases in STIs suggest increases in HIV sexual risk behaviour, such as increases in unprotected sex and/or increases in the number of sexual partners. Increases in these behaviours often correspond to increases in HIV rates.

c. What additional data would you be interested in reviewing to assess burden of STI infection and incidence of STI infection in the province and why would you be interested?

It would be worthwhile to examine HIV sero-prevalence data obtained from the general population (such as from women attending antenatal clinics) as well as from high-risk populations (such as sex workers or truck drivers). If data are available from behavioural surveys of high-risk groups or the general population (as occurs with demographic health surveys), they should be examined. Also, it is always important to understand the extent to which increases in case reports may be due to changes in the population. For this reason census or other population data should be examined. Changes in surveillance practices can affect case reporting. As such, information on surveillance practices should be obtained and interpreted. Similarly, changes in the healthcare system need to be understood. These would include changes in the number of health clinics or in the services provided.

Unit 3 Answers

Warm up questions

1. Which of the following is an advantage of universal STI case reporting?

   a. It is the most readily available source of surveillance data and easy to collect from health facilities.
   b. It provides data on the burden of STIs at the health facility level, which is important for planning health services provisions.
   c. Under stable conditions and consistent reporting, data from universal STI case reporting reflect the true incidence of STIs in a population.
   d. All of the above

   In addition to the above advantages, universal case reporting also provides data that is easy to collect from health facilities.

2. True or false? Data collected from sentinel sites can be easily generalised to a broader population. *False. Because sentinel sites are located in only a few health facilities, they are only representative of the populations served by those facilities, and not the broader population.*

3. In countries where information about STIs is obtained through a universal reporting system, sentinel STI surveillance:

   a. Is unnecessary
   b. Should replace universal reporting as the primary method to study STIs
   c. Should supplement information obtained from the universal reporting system

   The universal reporting system provides data that are applicable to the entire population, so it should be the priority. For more detailed information on a sub-set of cases, sentinel surveillance also can be used.

4. True or false? Supervision and feedback are easier to provide for a sentinel surveillance system than for a universal system. *True. Sentinel surveillance involves activities at a smaller number of sites than in a universal system, so supervision and feedback are easier to provide.*

5. True or false? Universal case reporting provides a poor assessment of the true disease burden among women. *True. In universal case reporting, health data are collected from all health facilities in the country. Most patients who seek care for STIs do so because they have symptoms. STIs are often asymptomatic in women, thus universal reporting is representative of women with symptomatic STIs but often misses those without symptoms.*

6. What system of surveillance is recommended for reporting all priority communicable diseases? *Integrated Disease Surveillance. Through this system, health facilities report the same basic data for all diseases, helping to streamline the surveillance process.*

Case study

Yamo Province set up an STI control programme in 2002. The management of STIs in Yamo Province, primarily carried out by doctors, nurses, or midwives, is based on a syndromic approach. Cases of STIs diagnosed by the syndromic approach were reported irregularly on a monthly basis to the Ministry of Health, National Health Information System (NHIS).

In addition to STI reporting, local healthcare providers also reported cases of 40 other diseases or health conditions.

In 2005, in collaboration with the STI control programme, NHIS conducted a two-year pilot test of STI universal case reporting from 850 public community-based clinics and 65 public hospitals covering the 29

districts of the country. The population size of men and women was stable during this time period.

During this two-year pilot test, the NHIS received regular monthly case reporting of genital discharge, genital ulcer and genital warts from the peripheral healthcare providers.

The following table shows the results of this 2-year case reporting for 2005-2006 for men and women.

Table. Number of STI cases and proportion of patients with STI as a percentage of all patients seen at reporting health facilities for each STI syndrome, by sex and year, Yamo Province, 1995-1996.

	2005				2006			
	Men		Women		Men		Women	
STI syndrome	**N**	**%**	**N**	**%**	**N**	**%**	**N**	**%**
Urethral discharge	24,200	3.6	0	0	23,283	2.6	0	0
Vaginal discharge	0	0	54,000	6.0	0	0	77,321	5.9
Genital ulcer	5,834	0.8	5,800	0.6	5,800	0.6	7,042	0.6
Genital warts	1,134	0.2	2,700	0.3	986	0.1	3,060	0.2

a. Based on the scenario above:

- Do STIs represent a significant burden of disease in Yamo Province? To better understand the situation in Yamo Province?
- To better understand the situation in Yumo Province, what data elements would you suggest collecting on a reporting form?
- What would be the STI case definitions that would yield the most beneficial information to:
  1. understand the STI situation?
  2. assist in designing intervention programmes and evaluating them?
- Based on the rates of health facility utilisation, what syndrome is the most prevalent in Yamo Province?

To evaluate whether STI is a significant burden of disease in Yamo Province information on other disease burdens should be obtained. Thus, we could evaluate the relative disease burdens of all 40 reported diseases in this pilot project. Of the 40 reported diseases, vaginal discharge, especially among women, may be a significant burden.

Information on age (age groups would be sufficient), date, and location (health facility, district, and province) should be collected.

The most beneficial STI syndromes to collect would be male urethral discharge and non-vesicular genital ulcer disease in men and women. If

the structure of healthcare services, health-seeking behaviour and reporting are consistent, trends in urethral discharge syndrome in men and non-vesicular genital ulcer disease in men and women will reflect trends in incidence in the population. These syndromes may provide a minimum estimate of national STI incidence.

The most prevalent STI syndrome is vaginal discharge.

b. How useful are the data on vaginal discharge syndrome in women in determining STI burden and trends? How useful are the data on genital warts?

Because vaginal discharge syndrome in women is much more non-specific than urethral discharge syndrome in men and can be due to a wide range of non-sexually transmitted pathogens, it is essentially useless in determining STI burden and trends. Genital warts are a chronic condition and, for this reason, are useless for understanding trends in STI incidence.

c. Complete the table below by calculating the incidence rates in cases per 100,000 of genital ulcer disease for 2005 and 2006 in both men and women.

Table. Estimated population and incidence of genital ulcer disease by sex and year, Yamo Province, 2005-2006.

	Men		Women	
	Estimated population	**Incidence***	**Estimated population**	**Incidence***
2005	926,000	630	927,000	*626*
2006	950,000	*611*	980,000	*719*

*Incidence: cases per 100,000 per year

Unit 4 Answers

Warm up questions

1. Match the STI data analysis parameter with its description by putting a letter in each blank:

C Analysis by place	*a. Annual analysis of data could show an annual trend of disease stratified by age group and sex.*
B Analysis by time	*b. Analysis to detect if there are any trends in case reports over time and any inferences that can be made.*

A. Analysis by person

c. Analysis to provide information about where clustering of disease might be occurring and any inferences that can be made.

2. 2. True or false? Interpretation of STI trends should be made independently from STI control programmes and the healthcare system. *False. Analysis should consider the context of control programmes and the healthcare system. For example, you should think about possible changes in case definitions or quality of services, changes in staff training or handling of data, etc.*

3. The district office should send case reports to the national level
   a. Weekly
   b. Monthly
   c. Quarterly
   d. Annually
   This is frequent enough to give the national level an accurate representation of trends in STIs, and yet it gives the district office enough time to collect the monthly reports from the health facilities.

4. District surveillance officers are responsible for:
   a. Checking data for inconsistencies (for example, STIs in very old or very young patients)
   b. Forward the results to the national level
   c. Following up with any health facility site that has missing or inconsistent data
   d. All of the above
   This should be done before data are sent to the national level, in order to ensure the accuracy of the information.

5. True or false? Health facilities should report their data directly to the national level. *False. They should send their reports to the district level, which will then check and compile all reports in the district before sending them to the national level.*

6. List three ways to handle surveillance data so that patient confidentiality is protected. *Way to protect patient confidentiality include the following measures: the computer hardware should be password protected; access should be limited to data entry personnel; provide safe cabinets for storing forms that have been entered; lock the cabinets and restrict access to authorised personnel only.*

Case study

You are the national STI surveillance officer for the Republic of Melabia. You rely primarily on syndromic surveillance using a universal reporting system and IDS. You have noticed an increase in the number of reported cases of male non-vesicular genital ulcer disease in Tehama District, one of five districts in the country.

Table. Number of reported cases of genital ulcer disease by district and year, Republic of Melabia.

District	Year					
	2002	2003	2004	2005	2006	2007
Mudoc	40	42	38	54	45	38
Mono	60	70	72	84	65	58
Tuolomne	47	50	42	40	41	39
Tehama	53	87	76	95	107	197
Yamo	49	49	36	72	65	48

a. What are some possible causes of this increase?
   - *Improved surveillance*
   - *Artefact*
   - *Increase in health-seeking behaviour by local population*
   - *Increase in high-risk behaviour*
   - *Immigration*

There is a large camp for displaced persons immediately across the border from Tehama. There are rumours that displaced persons have been coming to Tehama for care since 2006. Reliable figures are unavailable.

b. Could an influx of displaced persons with STI symptoms account for the increase in STI cases in Tehama? *Yes.*

c. How would you investigate this?
   Do a special study to find out numerators and denominators of non-Melabian displaced persons visiting clinics.

You examine all syphilis tests done at the clinic for one month. Because this is a sentinel site for syphilis screening as well, demographic data, including nationality, are available. The table below shows your findings:

Table. Results of sentinel syphilis screening by nationality, Tehama District.

Nationality	Positive syphilis tests	Total tested	Percentage positive
Melabian displaced persons	10	1,000	*1*
Non-Melabian displaced persons	10	100	*10*

d. Calculate the prevalence among Melabians and non-Melabians. How could these data be used for STI control?
Potential uses of these STI data include:
- *Estimating the quantity and types of drugs that are required for treatment of current and future STI cases*
- *Developing focused interventions*
- *Advocating for resources for STI care*

Unit 5 Answers

Warm up questions

1. Prevalence *assessment* is the determination of prevalence among persons screened in defined populations, while prevalence monitoring is the determination of trends in prevalence over time. *Prevalence assessment is similar to HIV sero-prevalence surveys, and includes collecting blood or urine for identification of STIs as well as demographic information about the person tested.*

2. True or false? STI prevalence data that show high rates of STIs are used to identify population sub-groups at high risk for HIV infection.
True. Because STIs and sexually transmitted HIV are similarly transmitted, and because STIs make the spread of HIV more likely, sub-groups with a high prevalence of STIs will also be at high risk for HIV infection.

3. What is the primary purpose of STI prevalence assessment and monitoring?
   a. To identify population sub-groups with high prevalence of STIs
   b. To monitor trends in STI prevalence among defined populations
   c. a and b
   d. None of the above
   In addition to these purposes, prevalence assessments can also be used as components of studies, and often include interventions as part of the surveillance activities.

4. In an STI prevalence survey of the general population, which STIs would you test for? *You should test for asymptomatic STIs, such as gonorrhoea, chlamydia, syphilis, etc. These assessments almost always include HIV testing also.*

5. True or false? Undertaking a combined STI/HIV prevalence assessment and behavioural surveillance survey can identify population sub-groups at high risk for HIV infection. *True. The combination of behavioural surveys and prevalence assessment helps to identify those groups that are undertaking risky behaviours and that have higher prevalence levels of STIs and HIV.*

6. True or false? The choice of which STI to include in a behavioural survey is made independently of the type of population to be studied. *False. Depending on which population you plan to study, the STIs that you would include varies. For example, in the general population you might want to test for* T. pallidum*, while in low-risk groups you might want to test for HSV-2.*

7. True or false? STI prevalence data are useful for monitoring the effectiveness of HIV prevention programmes. *True. Especially when combined with behavioural surveys, STI prevalence data can help monitor the effectiveness of HIV prevention programmes. This is because STIs and HIV are transmitted through similar routes. Therefore, those who have STIs are also at high risk of acquiring sexually transmitted HIV.*

8. True or false? Combining HIV/STI surveillance and behavioural surveillance surveys is more cost effective than conducting the two surveys separately. *True. The combined surveys reduce personnel costs and time.*

9. What does X represent in the equation below?
   a. Total number of patients who test negative for a specific disease
   b. Total number of patients who test positive for all priority diseases
   c. Total number of patients tested

$$\text{Prevalence} = \frac{\text{total number of patients who test positive for a specific disease}}{X}$$

This equation estimates the prevalence (that is, the proportion of people in a particular population who have a specific disease).

Case study

Exercise 1

You work in an STI clinic in a brothel complex that serves about 1,000 female sex workers. You conducted syphilis screening and treatment for female sex workers at the clinic every quarter as part of the intervention and monitoring activities. The table below shows the results of the STI screening and treatment programme in this high-risk population.

Table. Number of female sex workers participating in the screening and treatment programme for one years and number with positive syphilis serologies (RPR >1:8) by quarter and age groups.

Age Group (years)	Quarter							
	I		II		III		IV	
	No. +	N sampled	No. +	N sampled	No. +	N sampled	No.+	N sampled
<15	3	54	4	59	3	62	1	61
15-19	4	52	4	60	4	64	3	68
20-24	8	80	9	88	7	90	6	95
25-29	9	78	9	82	8	86	7	90
30-34	7	52	6	50	7	60	6	62
>34	7	41	7	45	7	52	6	54

a. Complete the age-specific prevalence of syphilis sero-reactivity by quarter in the table below. Does the trend in age-specific prevalence levels support your belief that you collected good quality data? Why is the prevalence of reactive syphilis serologies higher among older women? Compute test positivity of syphilis for the one-year period. What is the main use of this information?

Table. Prevalence of syphilis among female sex workers participating in the screening and treatment programme for one year and number with positive syphilis serologies (RPR >1:8) by quarter and age groups.

Age group (years)	Quarter				Total
	I	II	III	IV	
<15	*5.6%*	*6.8%*	*4.8%*	*1.6%*	*4.7%*
15-19	*7.7%*	*6.7%*	*6.3%*	*4.4%*	*6.0%*
20-24	*10.0%*	*10.2%*	*7.8%*	*6.3%*	*9.6%*
25-29	*11.5%*	*11.0%*	*9.3%*	*7.8%*	*9.8%*
30-34	*13.5%*	*12.0%*	*11.7%*	*9.7%*	*11.6%*
>34	*17.1%*	*15.6%*	*13.5%*	*11.1%*	*14.0%*
Total	*12.4%*	*10.2%*	*8.7%*	*6.7%*	*9.0%*

The increasing trend of syphilis sero-positivity by age group supports the belief that the quality of laboratory (RPR test) data may be good.

The prevalence of syphilis sero-positivity in older groups is higher than in younger groups due to several factors:

-
- *Longer exposure to syphilis infections for older groups. Syphilis sero-positivity (RPR) remains positive unless adequate treatment is given. Even with adequate treatment about 10-30% remain positive (sero-fast reaction).*
- *Lower condom use in older female sex workers than in younger sex workers. Older sex workers have less room for condom use negotiation with their clients because they are less desirable.*
- *Higher use of douching and dry sex agents among older sex workers. Douching and dry sex agents have been shown to increase the acquisition of STI by increasing the mucosal irritation.*

Test positivity in one year = total number of positive tests divided by total number of valid tests during one year period = 142/1585x100%= 9.0%. These numbers are useful for programme planning and management.

b. There is a downward trend of STI prevalence over time that you can say is attributable to your intervention programme (condom promotion and screening and treatment of STIs).

List other possible reasons for this downward trend of STI prevalence in this clinic population.

Possible reasons for this down trend of STI prevalence include:

- *Changing health-seeking behaviour of the clinic population. Those at high-risk for STIs would seek screening and treatment somewhere else*
- *Changing of case definition of STI or laboratory test used in the diagnosis*
- *Changes in the mobility of the clinic populations (for example, more sex workers with low risk for STI move into the site where the clinic is located)*

    - What other information do you need to collect to support your belief that this downward trend is due to your intervention?

- *Verify that health-seeking behaviour of the clinic population has not changed over time*
- *Ensure that case definition of STI or laboratory test used in the diagnosis has not been changed*

- *Verify that the clinic population has not changed over time (for example, more sex workers with low risk for STI move into the site where the clinic is located)*
- *Check for other existing interventions in the area that may be influencing STI prevalence*

Exercise 2

You are the HIV/STI surveillance coordinator in a health district in an East African country that has a generalised HIV epidemic. Your country also has high rates of other STIs, demonstrated through STI case reporting. Last year, an aid agency announced its interest in conducting a demographic and health survey of rural and urban areas. You were contacted by the provincial HIV/AIDS surveillance officer because he has decided to work with this agency to add STI testing to the HIV and behavioural survey in your province. He is asking you and the other district surveillance coordinators for your input into the survey design.

1. Which populations would you like to include in your survey in your district and why?

This country has a generalised HIV epidemic. As such, it is useful to include sexually active adults in the general population for a combined STI/HIV and behavioural surveillance survey. Urban areas often have higher rates of HIV and STI than rural areas and as such, should be prioritised. In addition to the general population, surveys of high-risk populations can be useful. These might include sex workers and truck drivers. Efforts should be made to sample persons from all groups that may be substantially affected by HIV and STI.

2. What STIs would you test for in addition to HIV? Why?

The choice of test depends to some extent on what laboratory assistance is available and the setting in which the survey is being conducted. For a household survey, tests that do not require an examination should be used. These would include urine-based testing for gonorrhoea and chlamydia as well as serologic testing for HIV and syphilis.

3. In addition to the demographic questions that the aid agency will routinely ask in the survey, what additional questions on STI/HIV risk behaviours would you want to include?

This country has a generalised HIV epidemic. As such, the types of behavioural questions to include would focus on sexual risk. These would include the number of sexual partners, use of condoms or other forms of barrier protections, extramarital affairs of the participant and his/her spouse, history of STI (either aetiologic or syndromic diagnoses). The type of work one engages in also increases risk of sexual exposure. This would include current or past commercial sex work, as well as work that takes one away from ones spouse for a significant period of time such as occurs among truck drivers, or those whose work is in urban areas but who reside in rural areas.

Unit 6 Answers

Warm up questions

1. For countries where syndromic STI case reporting is used, syndrome aetiologies should be reassessed every _____ years.
   a. One to two
   b. Two to three
   c. Three to four
   This is the average amount of time. If, however, there is a new outbreak of a particular syndrome (such as genital ulcer disease), you should reassess earlier.

2. True or false? Monitoring anti-microbial resistance of *Neisseria gonorrhoeae* may help to detect newly emerging resistance. *True.*

3. Choose an item below that is not one of the main purposes of assessing syndrome aetiologies:
   a. Provide data for guiding STI syndromic management
   b. Assess effectiveness of HIV prevention programmes
   c. Assist in the interpretation of syndromic case reports and the assessment of disease burden caused by specific pathogens
   d. Evaluate syndromic management algorithms for urethral discharge and genital ulcers
   Assessing syndrome aetiologies helps to identify the particular microbes that are causing urethral discharge and genital ulcer disease. This information is not helpful in evaluating HIV prevention programmes.

4. List two possible uses for data obtained from monitoring anti-microbial resistance of STI pathogens. *Two of the main uses for data obtained through monitoring anti-microbial resistance include acquiring the data necessary for developing and revising treatment guidelines; and detecting newly emerging resistance.*

5. Which of the following sampling strategies is the most difficult to use when conducting anti-microbial resistance monitoring?
   a. Random
   b. Systematic
   c. Consecutive
   A random sample involves a complicated sampling scheme that, while providing the most representative sample (because each patient has an equal chance of being selected), is too difficult and expensive to conduct for resistance monitoring.

Case study

You are the HIV/STI surveillance coordinator in a health district in an East European country. STIs in your country are routinely managed and reported using the WHO syndromic approach. The national STI control programme will be conducting a national assessment of anti-microbial resistance in *N. gonorrhoeae* and your district has been asked to participate.

a. What are the reasons for conducting an assessment of anti-microbial resistant *N. gonorrhoeae*?

You should understand that in those regions in which STI treatment is done using the syndromic approach, verification that N. gonorrhoeae is sensitive to the anti-microbial agent recommended in syndromic treatment is necessary, for treatment to be effective. Events that prompt assessment include reports on clinical failure of the treatment for gonococcal infection and increased resistance in the neighbouring countries or regions.

b. What factors will you need to consider to conduct this assessment in your district?

Factors that should be mentioned include: 1) what site/populations to collect specimens from and identify the commonly used anti-microbial for the treatment of gonorrhoea in this population, 2) prevalence of syndromes related to N. gonorrhoeae infection (that is, urethral discharge) and sample size of N. gonorrhoeae isolates , 3) laboratory tests to be used (that is, laboratory methods to culture N. gonorrhoeae and measure the anti-microbial resistance for N. gonorrhoeae such as agar dilution and E-test, 4) data management, 5) interpretation of the data (it would be useful to obtain information on the clinical failure of gonorrhoea treatment to supplement the information collected from this in-vitro study)

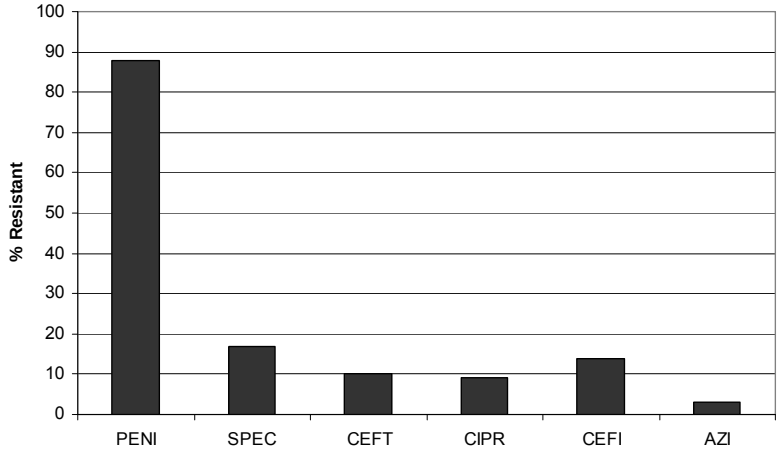
c. How would you select your sample?

Systematic sampling is preferable to consecutive sampling because it is probabilistic sampling scheme that produces a random sample. However, it requires a large number of high-risk populations to collect a sufficient number of N. gonorrhoeae isolates. If a large number of high-risk populations could not be easily obtained, consecutive sampling is sufficient.

To increase yield in detecting N. gonorrhoeae by culture in urethral and cervical specimens, only consecutive men and women with symptoms will be recruited. For selecting urethral samples from men, it is more efficient to perform a Gram stain of urethral discharge prior to culture. Only those men whose Gram stain indicates the presence of Gram-negative intracellular diplococci should be cultured.

d. Given the results in the figure below, what recommendations would you make regarding the treatment of *N. gonorrhoeae* in your country?

Percentage of gonococcal isolates that were resistant to selected anti-microbial agents.



Note: PENI, penicillin; SPEC, spectinomycin; CEFT, ceftriaxone; CIPR, ciprofloxacin; CEFI, cefixime; AZI, azithromycin

The treatment recommendations should be changed to one of the following anti-microbial agents: ceftriaxone, ciprofloxacin, cefixime, or azithromycin. Because ciprofloxacin is the most inexpensive drug of the 3 above and is given in a single oral dose, the national recommendation for the treatment of uncomplicated gonococcal infection should be ciprofloxacin. Because about 18% of the isolates are resistant to Spectinomycin, this anti-microbial should not be used as the alternative treatment for gonococcal infection. Continue to conduct surveillance for anti-microbial resistance.

Final Case Study

1. What are the benefits of conducting STI surveillance in:

    a. A country with a low-level HIV epidemic?

    In countries with a low-level HIV epidemic, STI surveillance can act as an early warning system for HIV infection and emergence of HIV in new groups or new geographical areas. STI surveillance can also be used as an evaluation tool for HIV prevention programmes

    b. A country with a concentrated epidemic?

    In a concentrated HIV epidemic, the presence of STIs can serve as a marker for the emergence of HIV in new groups. STI surveillance can also measure how successful prevention programmes have been in high-risk populations.

    c. A country with a generalised epidemic?

    In generalized HIV epidemics, STI surveillance can help to measure how successful prevention programmes have been in the general population.

2. You are a provincial public health officer for Yamo Province in the Republic of Melabia. Your province currently conducts syndromic STI surveillance with universal reporting. Your province has recently been given funds to begin aetiologic case reporting to determine the prevalence of the micro-organisms that cause urethral discharge and genital ulcer.

    a. Which micro-organisms would you include to determine the causative agent of genital ulcer disease in men and women?

    Syphilis, chancroid, and HSV-2

    b. Which micro-organisms would you monitor to determine the most common causes of urethral discharge in men?

Gonorrhoea and chlamydia

c. How frequently should STI aetiologies be assessed?

Syndrome aetiologies should be assessed every two to three years or more frequently if the need arises.

3. Looking at last years surveillance data for Yamo Province you find that many of the variables indicated on the data collection forms were left blank and that there were many inconsistencies in the way data was collected. How would you improve the completeness and consistency of reporting?

As surveillance data collection occurs at the health facility level, and data processing takes place at the district/provincial and national levels, you must establish processes to ensure that data collection and reporting is as complete and consistent as possible. At the health facility level, data should be double-entered to avoid errors and must be carefully checked before analysis. A frequency tabulation can be run after data are entered to re-check for implausible values. As the provincial health officer, you should follow up with any health facility site that has missing or inconsistent data. Do this before forwarding the forms to the regional or national level. When the district level carefully reviews facility forms, the quality of data received at the national level is high.

4. Due to sub-optimal prescribing practices and poor adherence to prescribed regimens, resistance to the drugs that treat *N. gonorrhoeae* has recently become a problem in Yamo province.

a. What are the laboratory requirements of monitoring anti-microbial resistance?

Surveillance surveys for anti-microbial resistance of STI pathogens are usually organised and conducted by the national AIDS/STI control programme. The laboratory should have the facilities necessary to culture the organism, perform biochemical and serologic confirmatory tests and perform minimum inhibitory concentration (MIC) agar dilution testing of anti-microbial agents.

b. If your country's national reference laboratory does not have the capacity to conduct susceptibility testing, what would you do?

If your country's national reference laboratory does not have the capacity, you may send isolates to a regional laboratory in another country for

testing. Regional networks supported by WHO Collaborating Centres have been established in several WHO regions to conduct anti-microbial susceptibility testing.

c. How often would you review the results of resistance testing?

Results of resistance testing should be reviewed each quarter to ensure that data are complete and that patterns are generally consistent from quarter to quarter.

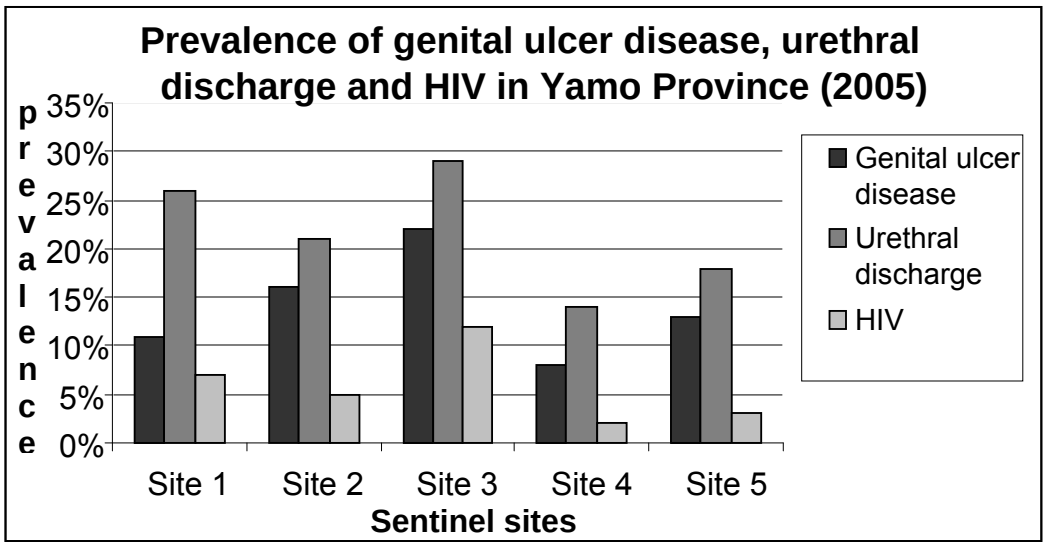
d. What information would you include when nationally distributing data on anti-microbial resistance? How frequently would you distribute this data?

Reports should summarise the proportion of isolates that were found to be resistant to the anti-microbial agents and should be stratified by sentinel site. It may also be useful to summarise the proportion of isolates that were of intermediate sensitivity. Reports should include: the gender of patients, the clinic setting where the patients were tested (for example, antenatal clinic, STI clinic or clinic for female sex workers) and changes that have occurred in the sentinel sites over time. These reports should be distributed nationally at least once a year. New resistant strains identified through resistance monitoring should be reported as soon as possible to a WHO Collaborating Centre.

5. Syndromic STI surveillance in Yamo Province conducted in 2005 found the following data:

	Site 1	Site 2	Site 3	Site 4	Site 5
Total number tested	158	209	196	233	240
Prevalence of:					
Genital ulcer disease	11%	16%	22%	8%	13%
Urethral discharge (among men only)	26%	21%	29%	14%	18%
HIV	7%	5%	12%	2%	3%

Create a figure that shows the prevalence of genital ulcer disease, urethral discharge and HIV in Yamo Province by site. What trends do you see? What are the limitations of this data?



At all sentinel sites, the prevalence of urethral discharge among men was higher than that of genital ulcer disease or HIV among men and women. Whereas, site 4 had the lowest prevalence of genital ulcer disease (8%), urethral discharge (14%) and HIV (2%), site 3 had the highest prevalence of genital ulcer disease (22%), urethral discharge (29%) and HIV (12%). The limitations of this data include: Only one year of data was presented; the sample size at each site was small; surveillance assess STI syndromes opposed to STI aetiologies.