

Global incidence and prevalence of selected curable sexually transmitted infections – 2008



World Health
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Introduction

Sexually transmitted infections (STIs) are a major global cause of acute illness, infertility, long-term disability and death with serious medical and psychological consequences of millions of men, women and infants. There are over 30 bacterial, viral and parasitic pathogens that have been identified to date that can be transmitted sexually. Quantifying the incidence and burden of these infections is important for planning appropriate interventions and advocating for resources, as necessary.

This report presents global and regional estimates for 2008 of the incidence and prevalence of four curable STIs – *Chlamydia trachomatis*, *Neisseria gonorrhoeae*, syphilis and *Trichomonas vaginalis* – in adults between 15 and 49 years of age. These estimates were generated using the same approach as used to generate the 2005 global estimates (see World Health Organization, 2011, for a detailed description of these methods).

The total number of new cases of the four STIs in 2008 in adults between the ages of 15 and 49 was estimated to be 498.9 million: 105.7 million cases of *C. trachomatis*, 106.1 million cases of *N. gonorrhoeae*, 10.6 million cases of syphilis and 276.4 million cases of *T. vaginalis*. In addition, at any point in 2008 it was estimated that 100.4 million adults were infected with *C. trachomatis*, 36.4 million with *N. gonorrhoeae*, 36.4 million with syphilis and 187.0 million with *T. vaginalis*.



Methods

The 2008 estimates were generated using the same approach used to generate the 2005 global estimates (see World Health Organization, 2011, for a detailed description of these methods). Briefly, for those regions and infections with good case-reporting surveillance systems the surveillance data were used to generate regional incidence estimates after adjusting for unreported and undiagnosed cases. Regional prevalence estimates were then generated from the incidence figures and the estimated mean duration of infection. This approach was used to generate estimates for *C. trachomatis*, *N. gonorrhoeae*, and syphilis in North America¹ and for syphilis in the WHO European Region.

For the other regions and infections regional prevalence estimates were generated from prevalence data compiled for this project (see annex). The regional estimates were based on the median value of the adjusted prevalence estimates² from all the studies in a particular region that met the study entry criteria. When there were fewer than three data points for a particular infection in females in a particular region or subregion it was assumed that the prevalence rate in 2008 was the same as in 2005. When there were insufficient data for males the same approach as in 2005 was followed, that is male estimates were based on the female estimates for 2008.

1 For the WHO Region of the Americas, the Region was divided into two: North America, and all other areas.

2 The prevalence studies that met the study entry criteria were adjusted to account for the sensitivity and specificity of the diagnostic tests used, the age group surveyed, and the geographic location.

The 2008 regional prevalence estimates were based on data collected from a series of PubMed searches³ and complemented by published and unpublished studies brought to the team's attention. The study entry criteria were the same as in 2005 except that for the 2008 estimates specimens had to be collected between 2003 and 2008, or in the absence of information on when the specimens were collected, the study had to be published in 2003 or later.

Global estimates

The total number of new cases in adults of the four STIs in 2008 was estimated to be 498.9 million.

- 105.7 million cases of *C. trachomatis*
- 106.1 million cases of *N. gonorrhoeae*
- 10.6 million cases of syphilis
- 276.4 million cases of *T. vaginalis*.

Males accounted for 266.1 million or 53% of the new cases.

At any point in 2008 it was estimated that the number of adults infected with each infection was:

- 100.4 million with *C. trachomatis*
- 36.4 million with *N. gonorrhoeae*
- 36.4 million with syphilis
- 187.0 million with *T. vaginalis*.

The number of adults with one or more infection however is less than the sum of the four infections as some individuals will have had multiple infections.

3 The last PubMed search was carried out on 15 September 2011.



Comparison of 2008 and 2005 estimates

The 2008 estimate of the number of new cases for the four infections combined is 11% higher than the estimate for 2005 (498.9 million versus 448.3 million) (see Table 1). Part of this increase is due to an increase in population; between 2005 and 2008 the number of adults aged 15–49 increased from 3.42 to 3.55 billion (4.1%). There was also a significant increase in the incidence of *N. gonorrhoeae* due to upwards revisions in the estimated prevalence of *N. gonorrhoeae* in all of the regions apart from the WHO

European Region and the WHO Eastern Mediterranean Region. The increase in incidence of *T. vaginalis* was driven primarily by an increase in the estimated prevalence of this infection in males and females in the WHO Region of the Americas.

The male to female ratio of the total number of new cases was very similar in 2005 and 2008 (1.19 and 1.14, respectively).

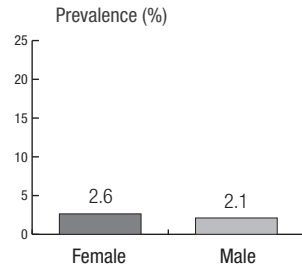
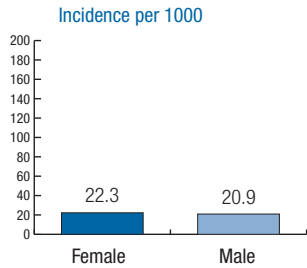
Table 1. Global incidence estimates for 2005 and 2008 (millions of cases)

	2005	2008	% change
<i>Chlamydia trachomatis</i>	101.5	105.7	4.1
<i>Neisseria gonorrhoeae</i>	87.7	106.1	21.0
Syphilis	10.6	10.6	0
<i>Trichomonas vaginalis</i>	248.5	276.4	11.2
Total	448.3	498.9	11.3

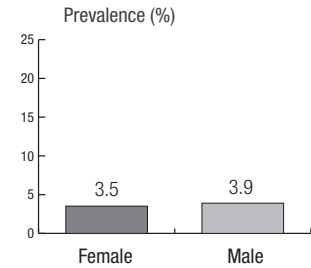
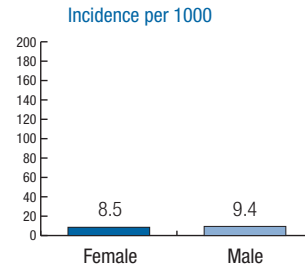


WHO African Region

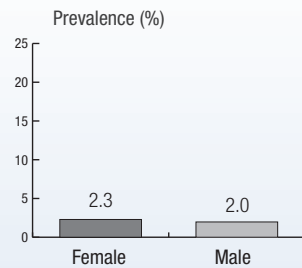
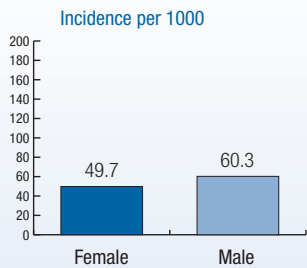
Chlamydia trachomatis



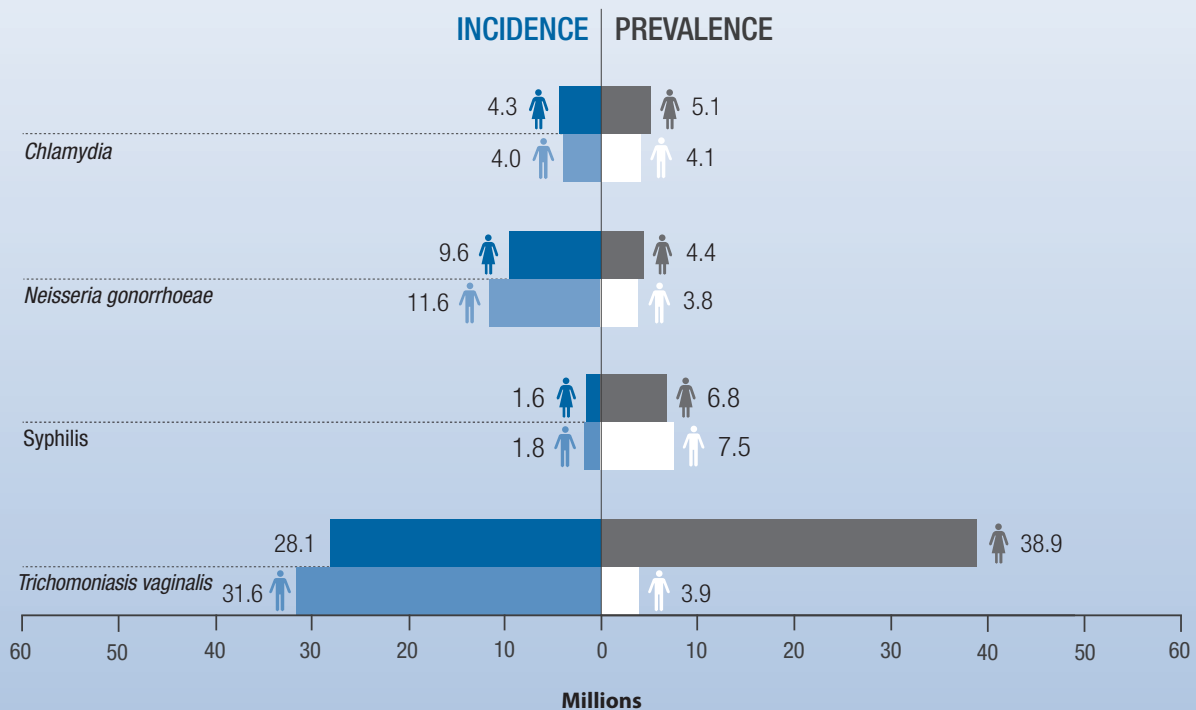
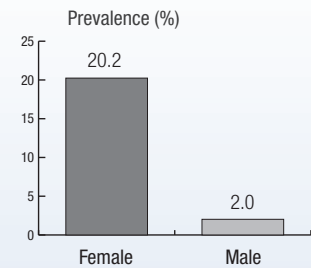
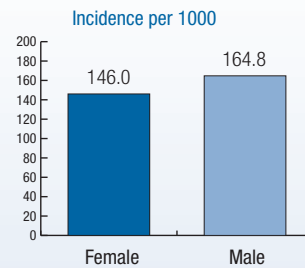
Syphilis



Neisseria gonorrhoeae



Trichomonas vaginalis





Total incidence of selected curable STIs for the WHO African Region:

92.6 million



The WHO African Region comprises 46 countries with an estimated population in 2008 of 384.4 million adults between the ages of 15 and 49.

● Incidence

The total number of new cases of the four STIs in 2008 was estimated to be 92.6 million: 8.3 million cases of *C. trachomatis*, 21.1 million cases of *N. gonorrhoeae*, 3.4 million cases of syphilis and 59.7 million cases of *T. vaginalis*.

● Prevalence

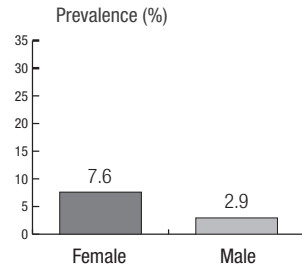
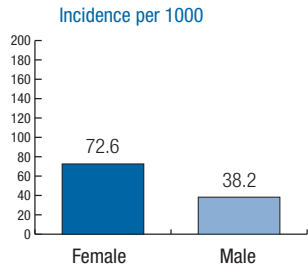
At any point in time 2008 it was estimated that 9.1 million adults were infected with *C. trachomatis*, 8.2 million with *N. gonorrhoeae*, 14.3 million with syphilis and 42.8 million with *T. vaginalis*.¹

¹ The prevalence of *T. vaginalis* in males in 2005 was based on a small number of data points. In 2008 there were insufficient data to generate an estimate and the global male to female ratio was used (0.1). This ratio was lower than the figure based on the data in 2005 hence there was a marked drop in the prevalence and incidence of *T. vaginalis* in the African Region between 2005 and 2008.

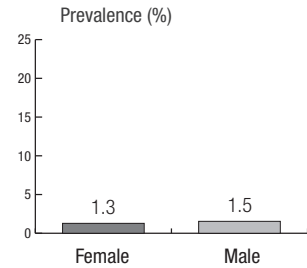
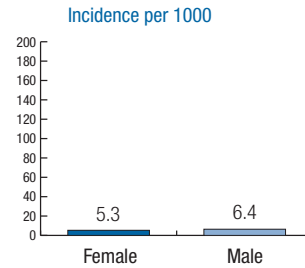


WHO Region of the Americas

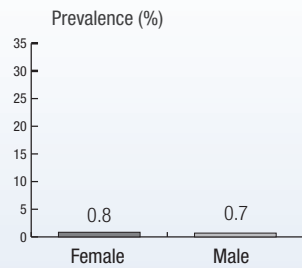
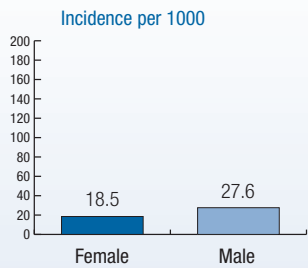
Chlamydia trachomatis



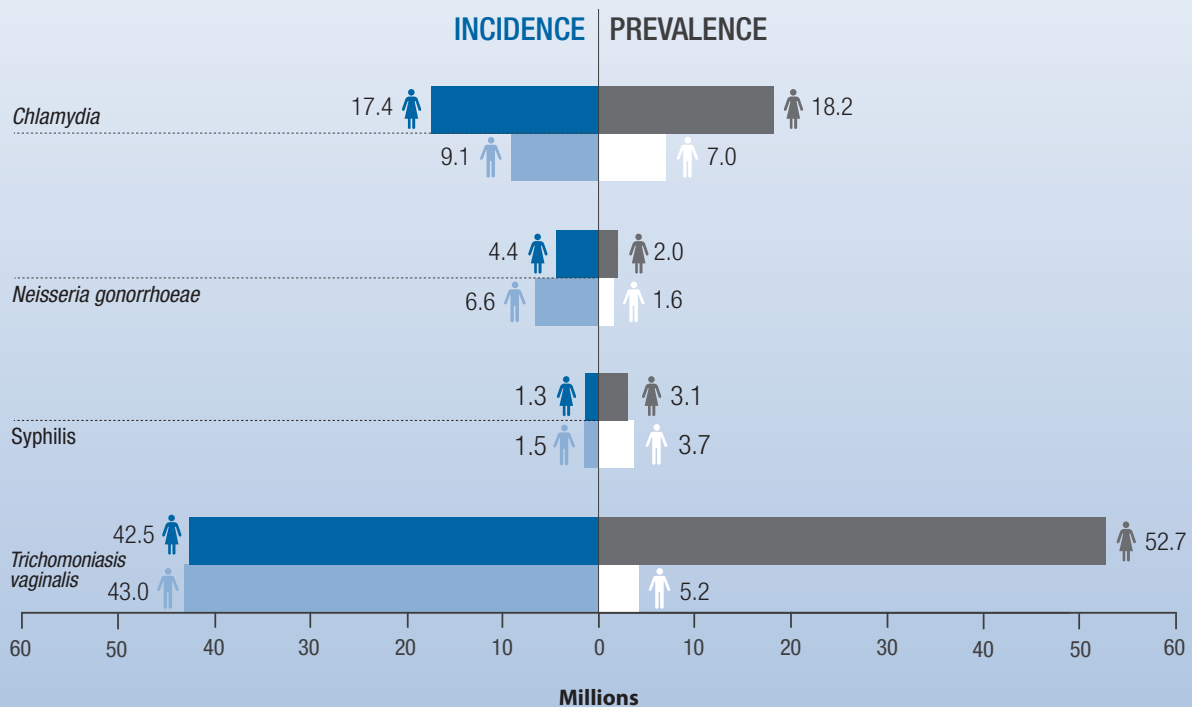
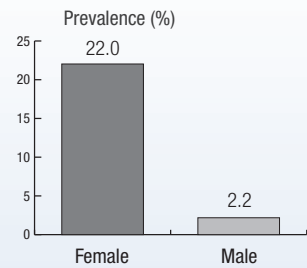
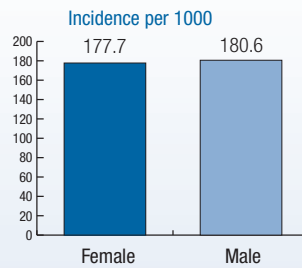
Syphilis



Neisseria gonorrhoeae



Trichomonas vaginalis





Total incidence of selected curable STIs for the WHO Region of the Americas:

125.7 million



The WHO Region of the Americas comprises 35 countries with an estimated population in 2008 of 476.9 million adults between the ages of 15 and 49. The estimates for this region are the sum of the estimates for North America and for the rest of the Region.

● Incidence

The total number of new cases of the four STIs in 2008 was estimated to be 125.7 million: 26.4 million cases of *C. trachomatis*, 11.0 million cases of *N. gonorrhoeae*, 2.8 million cases of syphilis and 85.4 million cases of *T. vaginalis*.

● Prevalence

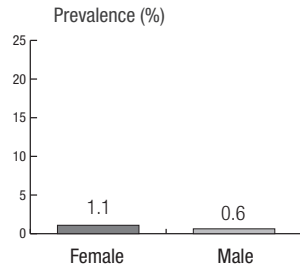
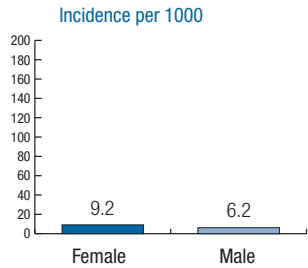
At any point in time 2008 it was estimated that 25.2 million adults were infected with *C. trachomatis*, 3.6 million with *N. gonorrhoeae*, 6.7 million with syphilis and 57.8 million with *T. vaginalis*¹.

¹ The prevalence estimates for *C. trachomatis* for females in both 2005 and 2008 were based on data – the 2008 median however was 1.4 times higher than the figure for 2005. The female prevalence estimate for *T. vaginalis* in 2008 was generated using the global *C. trachomatis* to *T. vaginalis* ratio (3.02) as there were insufficient data to generate an estimate. The 2005 estimate was based on three data points and was two thirds of the 2008 estimate.

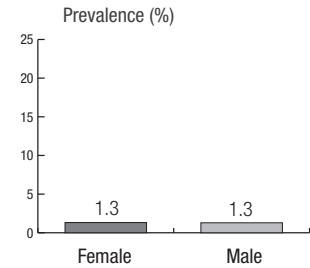
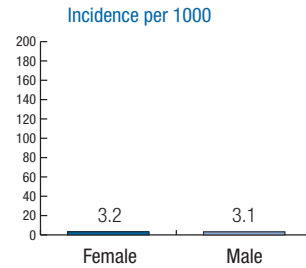


WHO South-East Asia Region

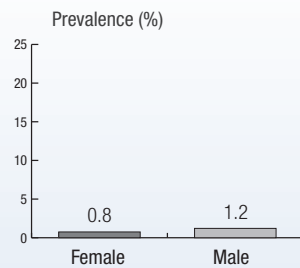
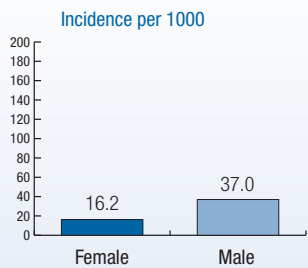
Chlamydia trachomatis



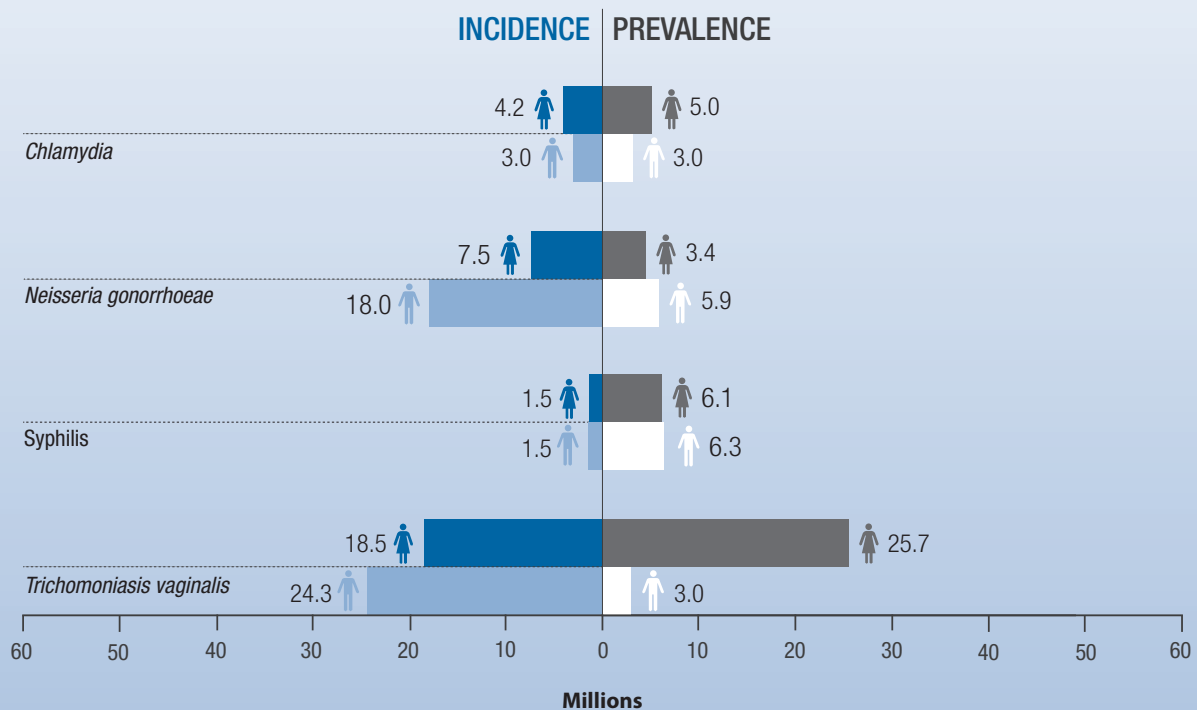
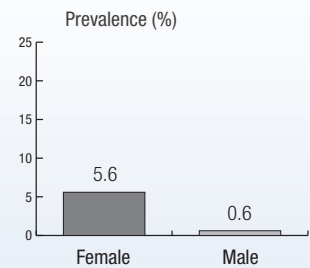
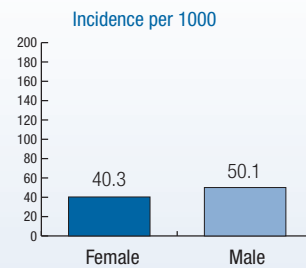
Syphilis



Neisseria gonorrhoeae



Trichomonas vaginalis





Total incidence of selected curable STIs for the WHO South-East Asia Region:

78.5 million



The WHO South-East Asia Region comprises 11 countries with an estimated population in 2008 of 945.2 million adults between the ages of 15 and 49.

● Incidence

The total number of new cases of the four STIs in 2008 was estimated to be 78.5 million: 7.2 million cases of *C. trachomatis*, 25.4 million cases of *N. gonorrhoeae*, 3.0 million cases of syphilis and 42.9 million cases of *T. vaginalis*.

● Prevalence

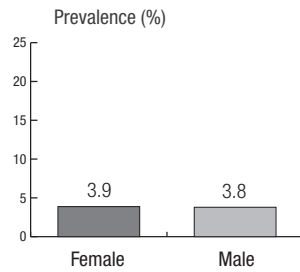
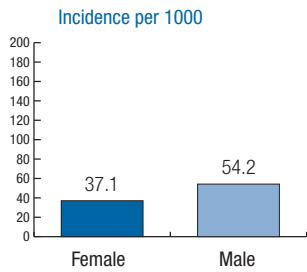
At any point in time 2008 it was estimated that 8.0 million adults were infected with *C. trachomatis*, 9.3 million with *N. gonorrhoeae*, 12.3 million with syphilis and 28.7 million with *T. vaginalis*¹.

¹ Insufficient data points were identified in 2008 to generate estimates for *C. trachomatis*, *N. gonorrhoeae*, or *T. vaginalis* in males or females. As a result, the prevalence of infection (%) for all four infections in females in 2008 was assumed to be the same as in 2005 and then the global ratios were applied.

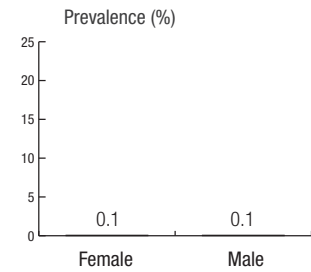
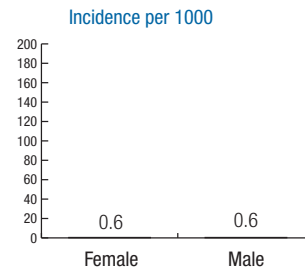


WHO European Region

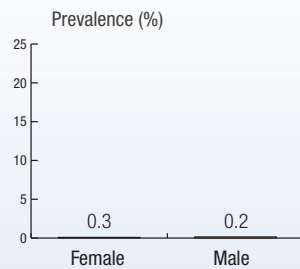
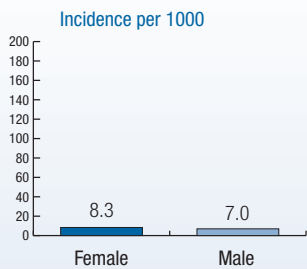
Chlamydia trachomatis



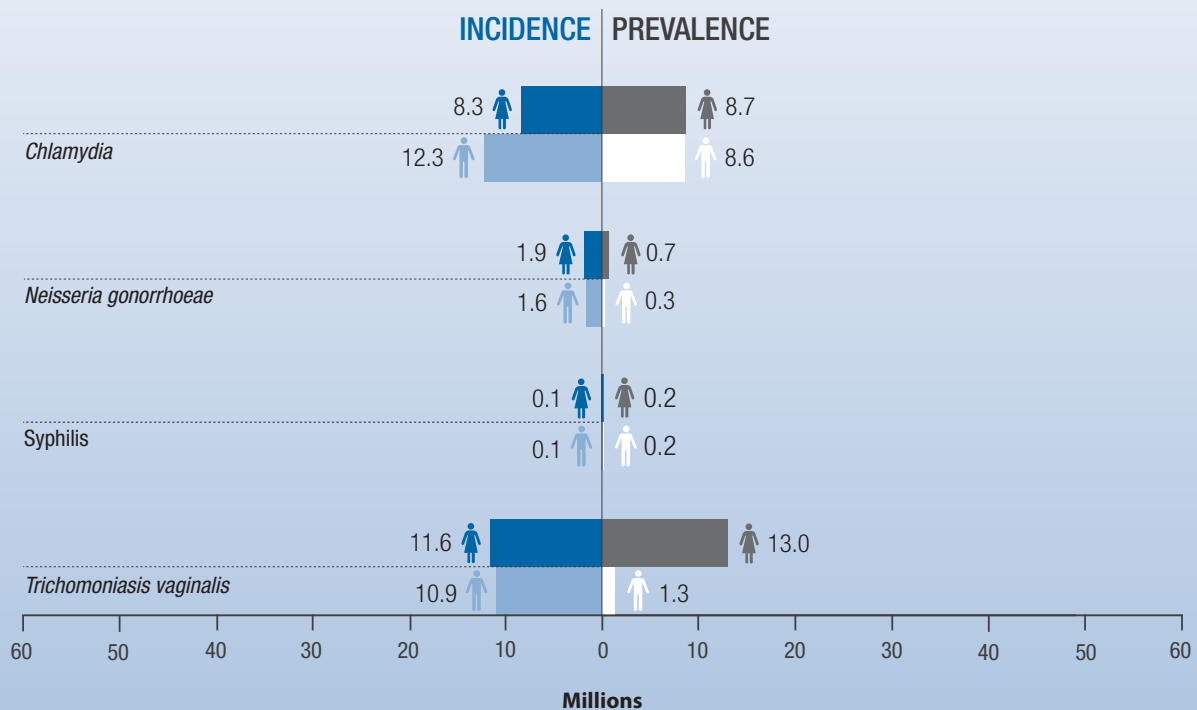
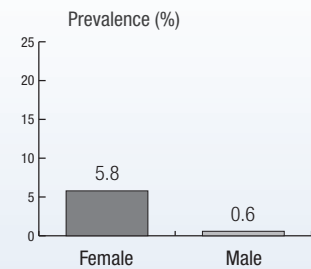
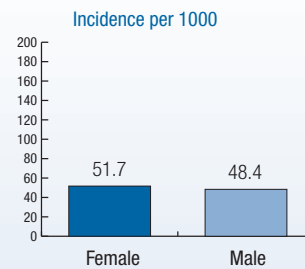
Syphilis



Neisseria gonorrhoeae



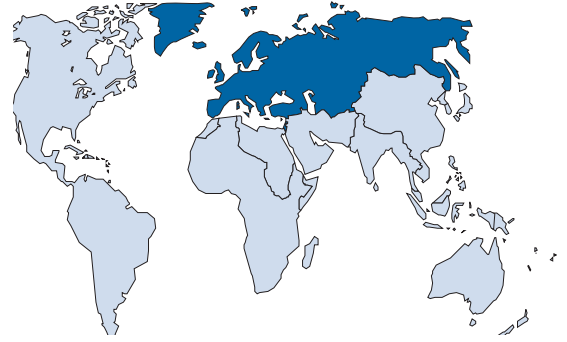
Trichomonas vaginalis





Total incidence of selected curable STIs for the WHO European Region:

46.8 million



The WHO European Region comprises 53 countries with an estimated population in 2008 of 450.8 million adults between the ages of 15 and 49.

- **Incidence**

The total number of new cases of the four STIs in 2008 was estimated to be 46.8 million: 20.6 million cases of *C. trachomatis*, 3.4 million cases of *N. gonorrhoeae*, 0.2 million cases of syphilis and 22.6 million cases of *T. vaginalis*.

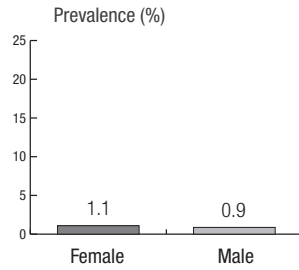
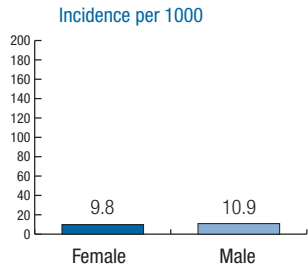
- **Prevalence**

At any point in time 2008 it was estimated that 17.3 million adults were infected with *C. trachomatis*, 1.0 million with *N. gonorrhoeae*, 0.3 million with syphilis and 14.3 million with *T. vaginalis*.

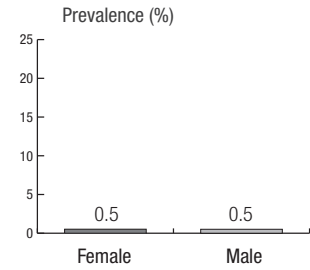
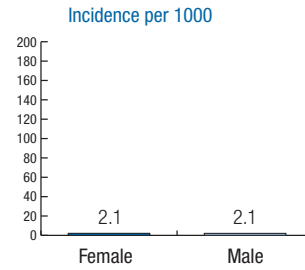


WHO Eastern Mediterranean Region

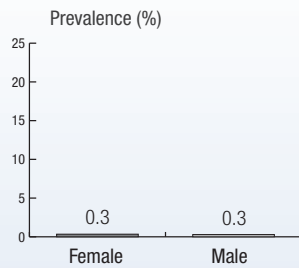
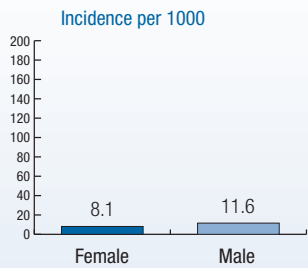
Chlamydia trachomatis



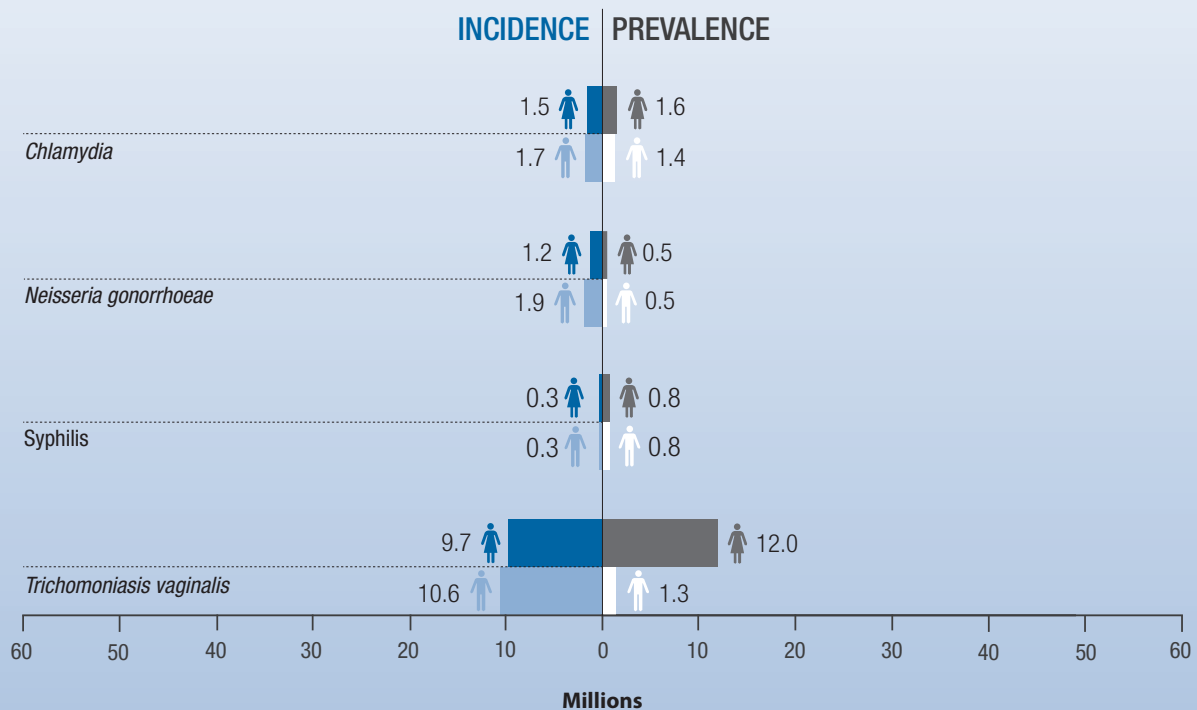
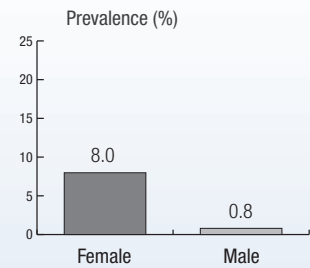
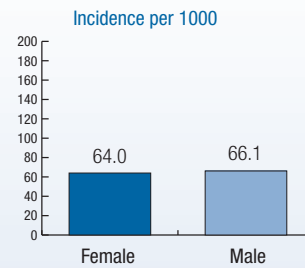
Syphilis



Neisseria gonorrhoeae



Trichomonas vaginalis





Total incidence of selected curable STIs for the WHO Eastern Mediterranean Region:

26.4 million



The WHO Eastern Mediterranean Region comprises 23 countries with an estimated population in 2008 of 309.6 million adults between the ages of 15 and 49.

● Incidence

The total number of new cases of the four STIs in 2008 was estimated to be 26.4 million: 3.2 million cases of *C. trachomatis*, 3.1 million cases of *N. gonorrhoeae*, 0.6 million cases of syphilis and 20.2 million cases of *T. vaginalis*.

● Prevalence

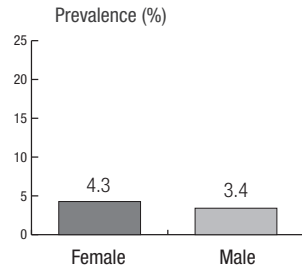
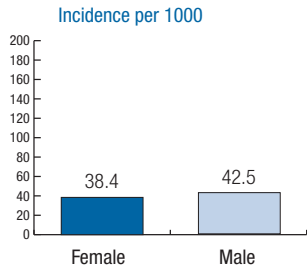
At any point in time 2008 it was estimated that 3.0 million adults were infected with *C. trachomatis*, 1.0 million with *N. gonorrhoeae*, 1.6 million with syphilis¹ and 13.2 million with *T. vaginalis*.

¹ The estimated prevalence for syphilis in women based on the available data was 0.0 for 2008. This was felt not to reflect the true picture in the region and after discussions with the regional advisers it was decided to use the 2005 estimates instead.

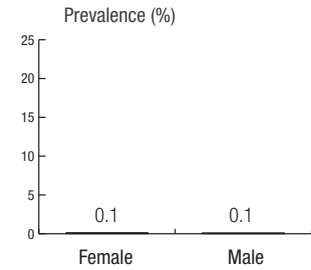
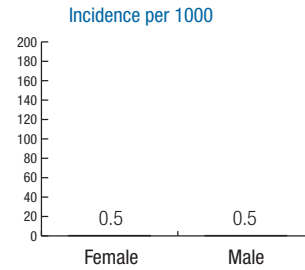


WHO Western Pacific Region

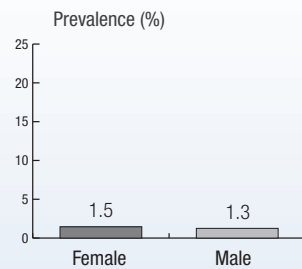
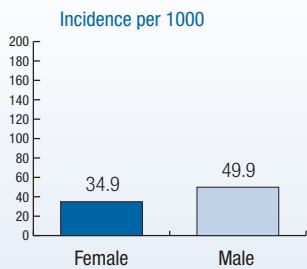
Chlamydia trachomatis



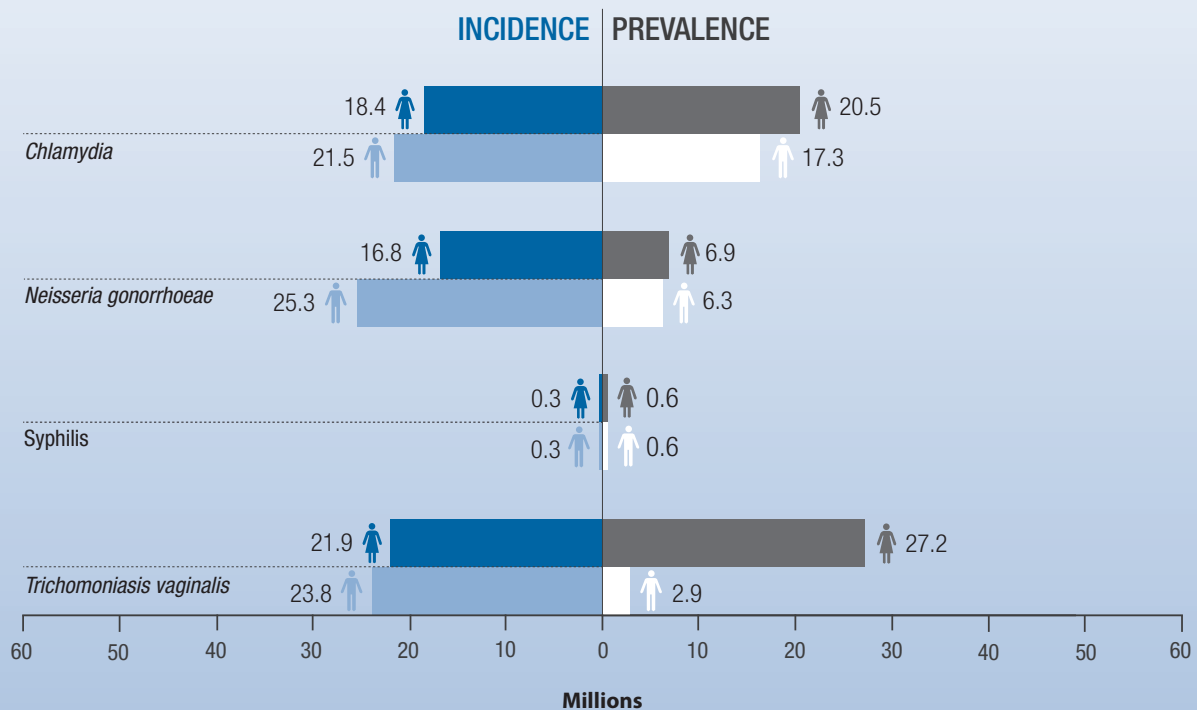
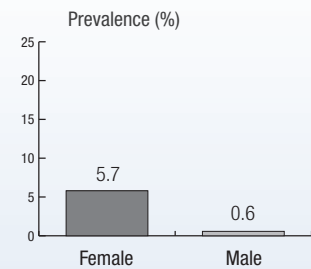
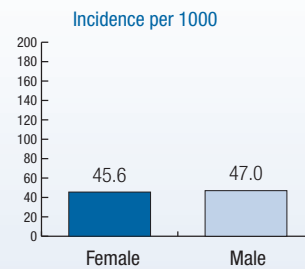
Syphilis



Neisseria gonorrhoeae



Trichomonas vaginalis





Total incidence of selected curable STIs for the WHO Western Pacific Region:

128.2 million



The WHO Western Pacific Region comprises 37 countries with an estimated population in 2008 of 986.7 million adults between the ages of 15 and 49.

● Incidence

The total number of new cases of the four STIs in 2008 was estimated to be 128.2 million: 40.0 million cases of *C. trachomatis*, 42.0 million cases of *N. gonorrhoeae*, 0.5 million cases of syphilis and 45.7 million cases of *T. vaginalis*.

● Prevalence

At any point in time 2008 it was estimated that 37.8 million adults were infected with *C. trachomatis*, 13.3 million with *N. gonorrhoeae*¹, 1.2 million with syphilis and 30.1 million with *T. vaginalis*.

1 The prevalence of *N. gonorrhoeae* in males in 2005 was based on a small number of data points. In 2008 there were insufficient data to generate an estimate and the global male to female *N. gonorrhoeae* ratio was used (0.86) to estimate the prevalence in males from the prevalence in females.



Discussion

More than 30 infections can be sexually transmitted. This paper presents global and regional prevalence and incidence estimates for four of these infections in 2008. In 2008 it was estimated that there were 498.9 million new cases of *C. trachomatis*, *N. gonorrhoeae*, syphilis and *T. vaginalis* in adults aged 15–49, and that at any point in 2008 there were 360.2 million prevalent cases of these infections among adults.

The 2008 incidence estimates for *C. trachomatis*, *N. gonorrhoeae*, and *T. vaginalis* are slightly higher than the equivalent figures for 2005. These apparent increases may be the result of a number of factors including the increasing number of youths entering the sexually active population each year, social changes that are conducive to the spread of STIs, and changing patterns in prevention and treatment practices.

There is, however, a great deal of uncertainty surrounding the global and regional STI estimates. If these uncertainties are to be reduced a determined effort is needed to obtain relevant data, in particular:

Prevalence data. There is a shortage of good quality prevalence studies. Specifically, there is a need for data from low risk urban and rural populations, disaggregated by age and sex; and for strengthened routine STI surveillance for incidence monitoring.

Estimates of the duration of infection. The average duration of infection for a pathogen depends upon the pathogen, the health care seeking behaviour of the population, and access to health care. Information on all three of these factors is very limited, leading to imprecise estimates of the duration of infection.

These data have an important role to play in improving our understanding of the burden of these infections. They are also crucial in helping improve the design and implementation of STI interventions and in lobbying for further resources and political support. Worryingly, the number of prevalence data points that met the 2008 study entry criteria was less than half the number that met the equivalent 2005 entry criteria (see Annex 1).

The number of new infections from these four infections highlights the global health problem posed by STIs in general. The direct clinical manifestations of STIs are uncomfortable for those affected, and if they are left untreated, can result in serious complications and sequelae (see Annex 2 for some of the complications of the four infections included in this paper). Growing resistance to the common treatment regimens is further compounding the problem.

STIs, apart from HIV, however, are not viewed as a public health priority. STI surveillance and STI prevention and treatment programmes are generally poorly resourced and staffed. This needs to be remedied. These actions will also help support the attainment of Millennium Development Goals 4, 5 and 6 by reducing infant mortality, improving maternal health, and reducing the incidence of HIV. But this will require a concerted effort by national governments, international organizations, funding agencies and individuals. New funding will need to be mobilized and mechanisms put in place to ensure that resources are used efficiently and effectively.



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Prevalence and incidence of selected sexually transmitted infections, Chlamydia trachomatis, Neisseria gonorrhoeae, syphilis and Trichomonas vaginalis. Methods and results used by WHO to generate 2005 estimates. Geneva, World Health Organization, 2011.



Annex 1. Availability of prevalence data

A series of PubMed searches was conducted to identify any studies published in 2003 or later providing information on the prevalence of one or more of the four infections. The last PubMed search was carried out on 15 September 2011. In addition, any other published and unpublished studies brought to the team's attention were also reviewed.

The number of studies that met the entry criteria fell between 2005 and 2008 even though the time between

the last date for specimen collection (31 December 2008) and the final PubMed search was greater in 2008 than in 2005. In 2008 180 data points were identified and in 2005 402 data points. Possible reasons for the decrease include: fewer studies being done in the general population; journals less interested in publishing this type of information; and longer publication lead times.

Table 2. Quantity of data meeting the study's entry criteria available for each of the four infections for females and males in each region

Infection	Total number of data points		Countries with data available		Countries with three or more data points	
	Females	Males	Females	Males	Females	Males
WHO African Region						
<i>C. trachomatis</i>	8	2	7	2	0	0
<i>N. gonorrhoeae</i>	6	1	5	1	0	0
syphilis	18	3	13	3	2	0
<i>T. vaginalis</i>	6	1	6	1	0	0
WHO Region of the Americas (excluding North America)						
<i>C. trachomatis</i>	5	3	4	3	0	0
<i>N. gonorrhoeae</i>	4	3	3	3	0	0
syphilis	14	5	7	3	2	1
<i>T. vaginalis</i>	2	1	2	1	0	0
WHO South-East Asia Region						
<i>C. trachomatis</i>	1	2	1	1	0	0
<i>N. gonorrhoeae</i>	1	2	1	1	0	0
syphilis	3	2	2	1	0	0
<i>T. vaginalis</i>	2	0	2	0	0	0
WHO Eastern Mediterranean Region						
<i>C. trachomatis</i>	4	2	3	1	0	0
<i>N. gonorrhoeae</i>	3	2	2	1	0	0
syphilis	4	2	3	1	0	0
<i>T. vaginalis</i>	5	0	3	0	0	0
WHO Western Pacific Region						
<i>C. trachomatis</i>	20	2	16	2	1	0
<i>N. gonorrhoeae</i>	12	1	12	1	0	0
syphilis	19	1	13	1	2	0
<i>T. vaginalis</i>	8	0	3	0	1	0

Annex 2. Basic facts about the four infections: symptoms and sequelae

Basic Facts about the four infections		
<i>Treponema pallidum</i> (syphilis)		
	Clinical manifestations	Other information
Adults	<p>Both sexes: open sore or ulcer on the genitals, mouth, or rectum (primary ulcer/chancere) with local lymph node swelling (adenopathy), skin rashes, genital warts (condylomata lata), bone, cardiovascular and neurological damage</p> <p>Women: miscarriage, stillbirth, and premature delivery</p>	<ul style="list-style-type: none"> • The risk of transmission from men to women is estimated to be less than 30%.¹ • Syphilis infection is estimated to increase the risk of HIV transmission by at least threefold.² • Syphilis is a classic example of an STI that can be successfully controlled by public health measures owing to the existence of a highly sensitive diagnostic test and a highly effective and affordable treatment.
Infants	Stillbirth, congenital syphilis	<ul style="list-style-type: none"> • The stillbirth rate from untreated early syphilis is estimated to be 25%.² • Early syphilis is estimated to be responsible for 14% of neonatal deaths.²
<i>Neisseria gonorrhoeae</i> (gonorrhoea)		
	Clinical manifestations	Other information
Adults	<p>Men: urethral discharge (urethritis), epididymitis, orchitis, infertility.</p> <p>Women: cervicitis (infection of the neck of the womb), endometritis, salpingitis (fallopian tube inflammation), pelvic inflammatory disease, infertility, preterm rupture of membranes during pregnancy ('waters breaking' too soon), perihepatitis (inflammation of the liver coating)</p>	<ul style="list-style-type: none"> • The risk of transmission of gonorrhoea from an infected female to her male partner is estimated to be about 20% for a single act of sexual intercourse.³ • It is estimated that 30–80% of women and 5% of men with genital gonorrhoea are asymptomatic.⁴ • It is estimated that up to 40% of women with an untreated infection will develop pelvic inflammatory disease (PID) and that one in four women with PID will develop infertility.² • In men untreated infections can lead to epididymitis, prostatitis, and infertility.
Infants	Conjunctivitis, corneal scarring and blindness	<ul style="list-style-type: none"> • It is estimated that globally up to 4000 newborn babies become blind every year because of eye infections attributable to untreated maternal gonococcal and chlamydial infections.²

Basic Facts about the four infections		
<i>Chlamydia trachomatis</i> (chlamydial infection)		
	Clinical manifestations	Other information
Adults	<p>Men: urethral discharge (urethritis), epididymitis, orchitis, infertility.</p> <p>Women: cervicitis (infection of the neck of the womb), endometritis, salpingitis (fallopian tube inflammation), pelvic inflammatory disease, infertility, preterm rupture of membranes during pregnancy ('waters breaking' too soon), perihepatitis (inflammation of the liver coating); commonly asymptomatic</p> <p>Both sexes: proctitis (inflammation of the rectum), pharyngitis (inflammation of the throat), Reiter's syndrome (reactive arthritis)</p>	<ul style="list-style-type: none"> • It is estimated that 85% of women and 40% of men are asymptomatic.⁵ • The risk of infection from an infected male to his female partner is estimated to be 40% and from an infected female to male 30%.⁶ • If untreated, chlamydial infection may persist for years. It is estimated that up to 40% of women with an untreated infection develop PID and that one in four women with PID will develop infertility.²
Infants	Conjunctivitis, pneumonia.	<ul style="list-style-type: none"> • It is estimated that worldwide up to 4000 newborn babies become blind every year because of eye infections attributable to untreated maternal chlamydial and gonococcal infections.²
<i>Trichomonas vaginalis</i> (trichomoniasis)		
	Clinical manifestations	Other information
Adults	<p>Men: urethral discharge (nongonococcal urethritis) often asymptomatic</p> <p>Women: vaginosis with profuse, frothy vaginal discharge; preterm birth, low birth weight babies</p>	<ul style="list-style-type: none"> • It is estimated that up to 80% of women with laboratory confirmed <i>T. vaginalis</i> infections are asymptomatic.⁷
Infants	Low birth weight ⁷	

¹ Over M. Health sector priorities review: HIV infection and sexually transmitted disease. In: Janisson DT, et al., eds. *Disease control priorities in developing countries*. New York, Oxford University Press, 1991:18–34.

² *Global strategy for the prevention and control of sexually transmitted infections: 2006–2015*. Geneva, World Health Organization, 2007.

³ Hooper RR, Reynolds GH, Jones OG, et al. The risk of gonorrhoea transmission from infected women to men. *American Journal of Epidemiology*, 1978, 108:136–144.

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⁵ Stam WE, Holmes KK. *Chlamydia trachomatis* infections in the adult. In: Holmes KK, Mardh PA, Sparling PE, et al., eds. *Sexually transmitted diseases*. New York, McGraw-Hill, 1980:181–193.

⁶ Katz B, Lee C, Kosar T, et al. Estimation of transmission probabilities for Chlamydia infection. In: Bowie W, et al., eds. *Chlamydial infections*. Toronto, Cambridge University Press, 1990:567–570.

⁷ Cotch MF, Pastorek JG 2nd, Nugent RP, et al. *Trichomonas vaginalis* associated with low birth weight and preterm delivery. The vaginal infection and prematurity study group. *Sexually Transmitted Diseases*, 1997, 24:353–360.

For more information, please contact:
Department of Reproductive Health and Research
World Health Organization
Avenue Appia 20, CH-1211 Geneva 27
Switzerland
Fax: +41 22 791 4171
E-mail: reproductivehealth@who.int
www.who.int/reproductivehealth



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