



Training Course in Sexual and Reproductive Health Research 2015
**Module: Principles and Practice of Sexually Transmitted Infections
Prevention and Care**

Epidemiology of STIs: factors, numbers and surveillance

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Overview of presentation

- Introduction: 3 – 6
- STI epidemiology: populations, transmission, determinants: 7 – 14
- Global and Regional STI Burden: 15 - 46
- Syphilis and pregnancy: 47 – 55
- Antimicrobial Resistance: 56 – 65
- STI Epidemiology: region and country specific examples: 66 – 99
- WHO STI Library: 100 - 104

... and, since BC, the STIs epidemic

1800

1700

1900

2002

1968

1500

2003



Sexually Transmitted Infections, STIs

There are about **30 STIs** or disease syndromes that result from STIs

STIs

Bacteria

- Gonorrhea (*Neisseria gonorrhoeae*)
- Chlamydia (*Chlamydia trachomatis*)
- Syphilis (*Treponema pallidum*)
- Chancroid (*Haemophilus ducreyi*)

Viruses

- Genital warts and cervical—mainly--cancer (human papillomavirus)
- Genital herpes (herpes simplex virus)
- Hepatitis B (hepatitis B virus)

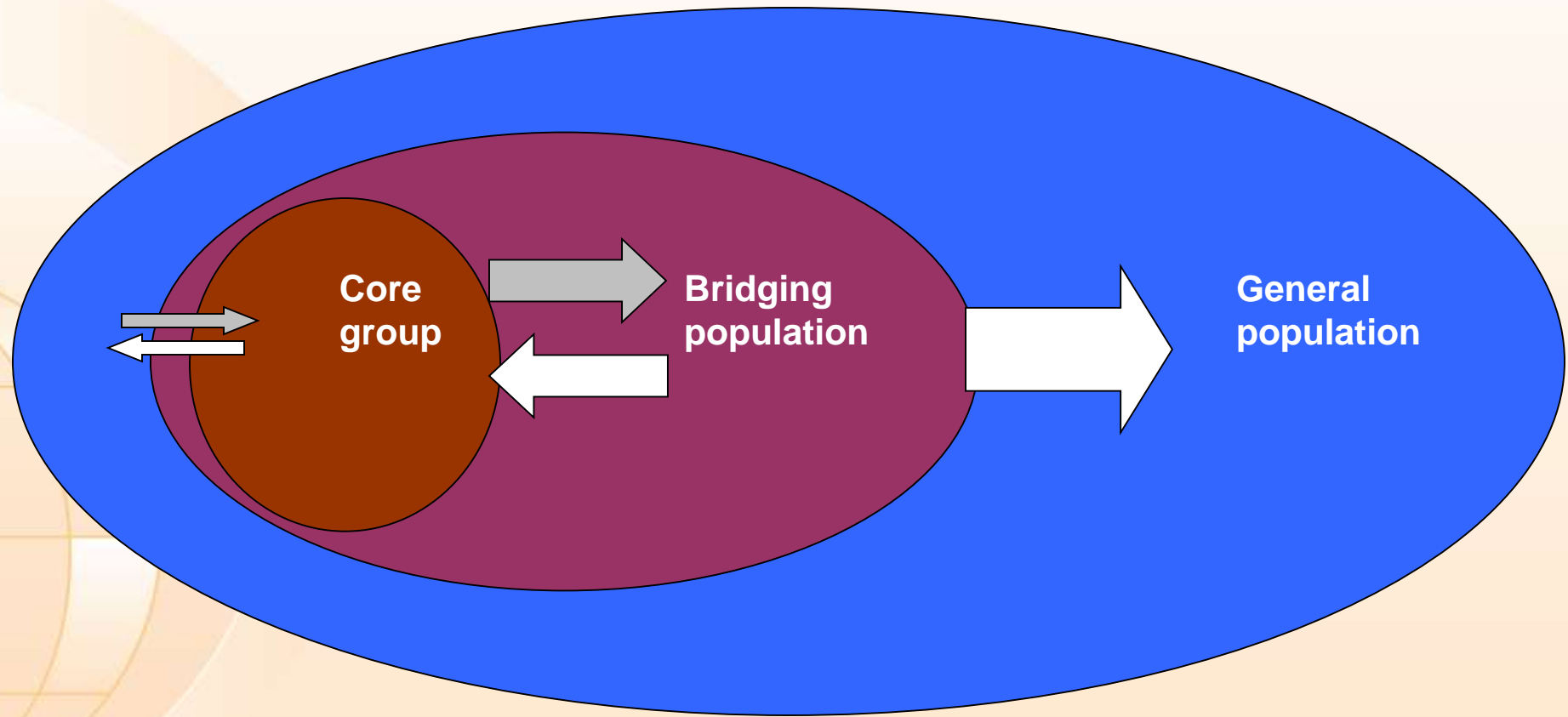
Parasites

- Trichomoniasis (*Trichomonas vaginalis*)
- Pubic lice (*Phthirus pubis*)

Since the 80's: HIV, the new, devastating, STI



STI transmission dynamics at population level



Rate of spread of STIs*

$$R_o = \beta \times c \times D$$

β - mean probability of transmission per exposure

C - mean rate of sexual partner change within the population

D - mean duration of infectiousness of the newly infected persons

If **R_o** < 1, the infection eventually disappears from the population!

* May RM, Anderson RM., Transmission dynamics of HIV infection, Nature. 1987 Mar 12-18;326(6109):137-42.

Average duration of infection for *Chlamydia* and *Neisseria gonorrhoeae**

Infection	Asymptomatic and not treated		Symptomatic and treated	
	Male	Female	Male	Female
<i>Chlamydia</i>	1.25 years	1.25 years	4 weeks	8 weeks
<i>Neisseria gonorrhoeae</i>	5 months	6 months	2 weeks	4 weeks

Average duration of infection for individuals with Syphilis depending on stage in which they are treated*

Primary	1 month
Secondary	3 months
Latent	3 years
Tertiary	15 years

* World Health Organization. Prevalence and incidence of selected Sexually Transmitted Infections, *Chlamydia*, *Neisseria Gonorrhoeae*, Syphilis and *Trichomonas vaginalis*: Methods and Results used by WHO to generate 2005 estimates. WHO, Geneva 2010.

Determinants of STIs epidemic*

Microenvironment	Macroenvironment
•Biological	•Cultural, Social and Economic
- gender	- poverty
- age	- gender inequality
- coexistence of other STIs	- health seeking behaviours
	- silent on sex issues
- pregnancy	- stigma and discrimination
•Immunological	•Epidemiological
	- STIs prevalence
•Behavioural	
- age at coital debut	•Demographic
- multiple sexual partners	- population age structure
- sexual practices:	- sex ratio
- anal sex	
- sex during menstruation	•Political and structural
- male circumcision	
- drug or alcohol use	

A stylized graphic of a globe on the left side of the slide, composed of concentric orange and white arcs representing latitude and longitude lines.

! Some STIs increase the risk of HIV transmission

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Studies on sexually transmitted infection as risk factor for HIV transmission*

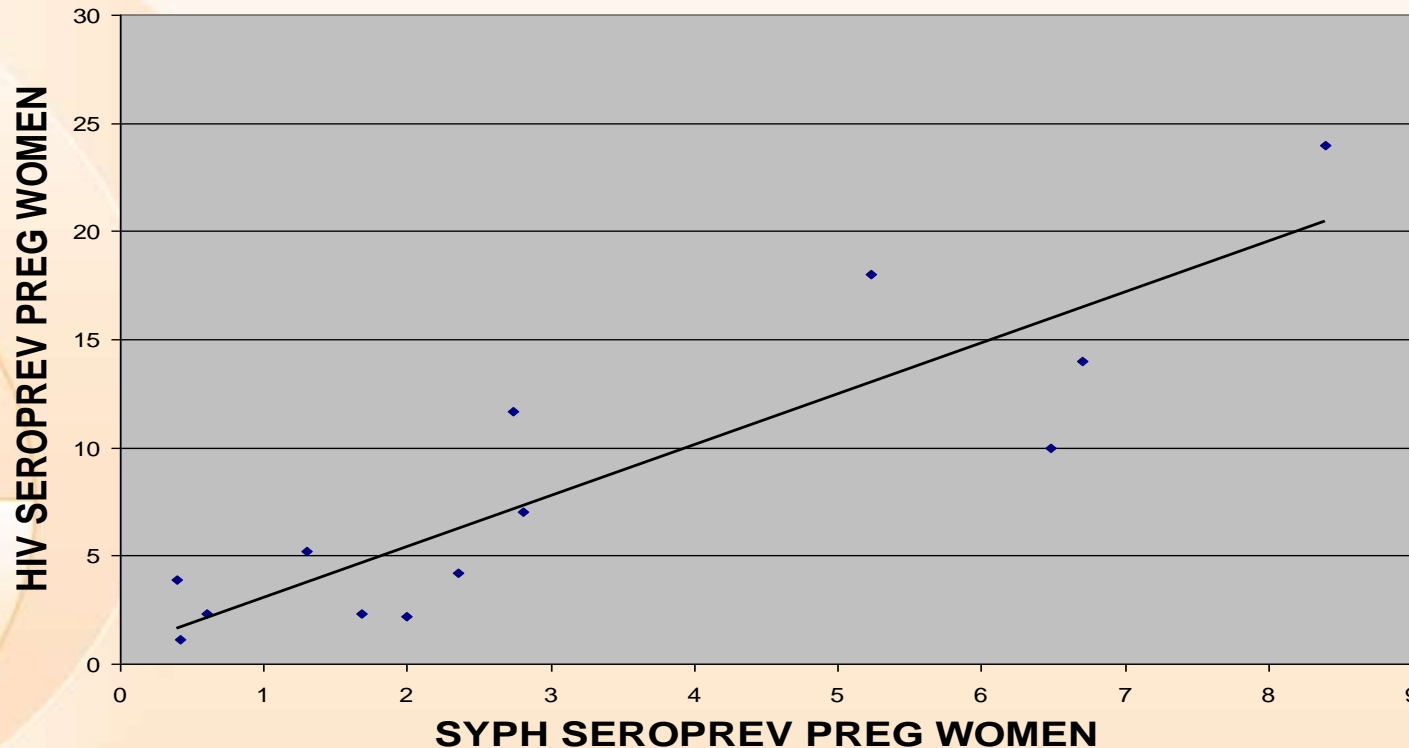
Reference	Study population	Sexually transmitted infection studied	Relative risk	Odds ratio
<i>Plummer, 1991</i>	Female sex workers, Kenya	Chlamydia		3.6
<i>Laga, 1993</i>	Female sex workers, Democratic Republic of the Congo	Chlamydia Gonorrhoea Trichomoniasis		3.6 4.8 1.9
<i>Kassler, 1994</i>	Heterosexual cohort, United States of America	Gonorrhoea		2.5
<i>Craib, 1995</i>	Cohort of MSM, Canada	Rectal gonorrhoea		3.18
<i>Cameron, 1989</i>	Heterosexual men, Kenya	Mainly chancroid	4.7	
<i>Telzak, 1993</i>	Heterosexual men, United States of America	GUD, chancroid	3.0	
<i>Limpakarnjanarat, 1999</i>	Female sex workers, Thailand	Syphilis GUD and herpes		3.7 2.0 – 2.4
<i>Mbizvo, 1996</i>	Antenatal care women, Zimbabwe	GUD + PID		5.8
<i>Bollinger, 1997</i>	Sexually transmitted infection clinic attendees, India	GUD		4.2
<i>Stamm, 1988</i>	MCM, United States of America	Herpes, syphilis	3.3 – 8.5	
<i>Holmberg, 1988</i>	MCM, United States of America	Herpes	4.4	
<i>Darrow, 1987</i>	MCM, United States of America	Syphilis	1.5 – 2.2	

World Health Organization. Global Strategy for the prevention and control of sexually transmitted infections: 2006-2015. ISBN 9789241563475. Geneva 2007.

! Syphilis infection may increase the HIV viral load of co-infected patients, and may increase the **risk of mother-to-child transmission of HIV***

* Victor Mwapasa et al, Maternal syphilis infection is associated with increased risk of mother-to-child transmission of HIV in Malawi, AIDS 2006, 20:1869-1877.

HIV–Syphilis seroconcordance in pregnant women* - African Region -



* Stoner BP, Schmid G, Guraiib M, Adam T, Broutet N, .Use of maternal syphilis seroprevalence data to estimate the global morbidity of congenital syphilis, oral presentation ISSTD Congress 2005.

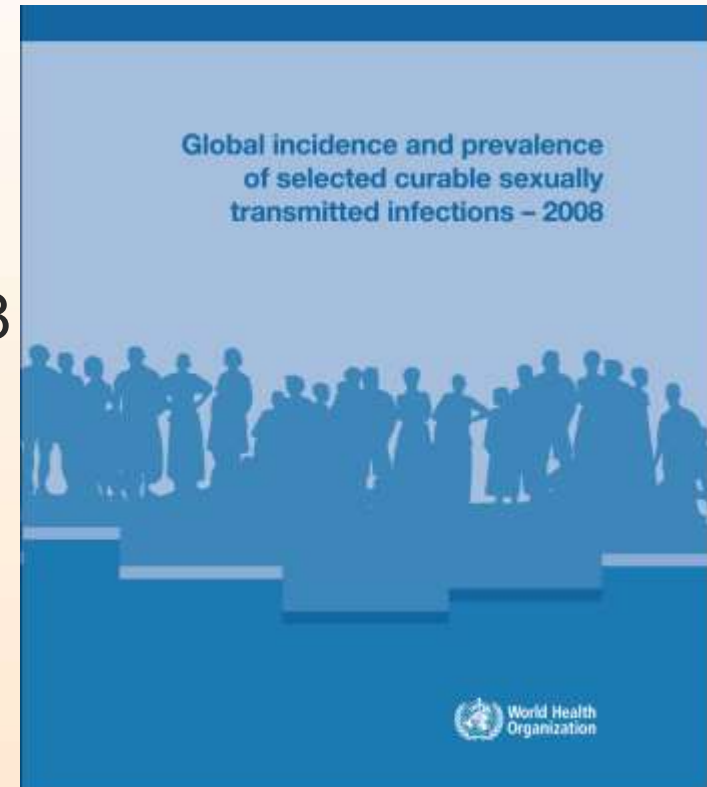
STI Global Burden

WHO approach to International STI "Surveillance"- **Estimations**

WHO did this in 1995, 1999, 2005 and 2008

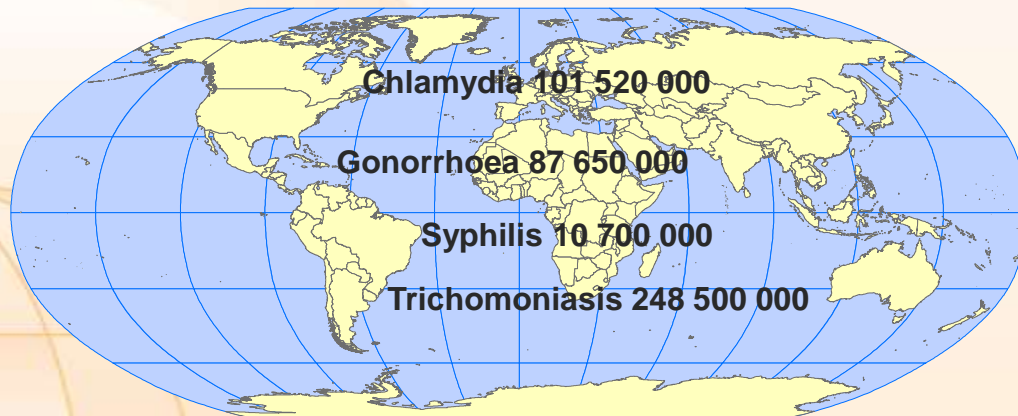
visit RHR at: <http://www.who.int/reproductive-health/>

visit WHO at: www.who.int



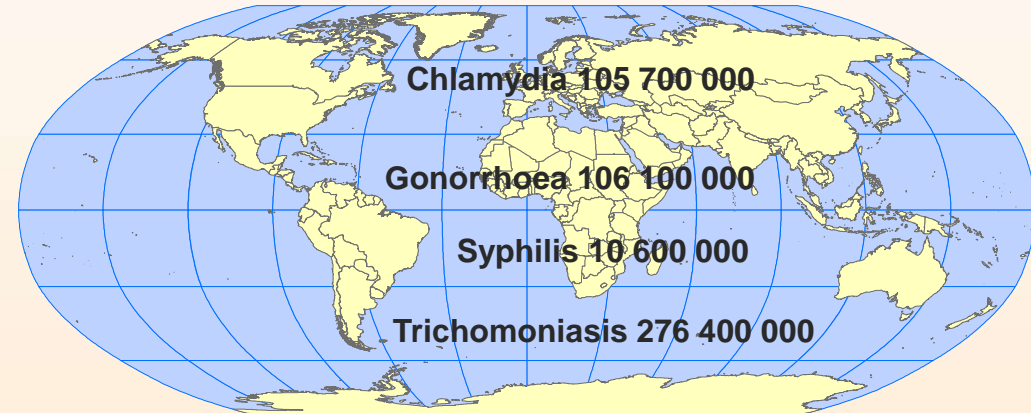
Estimated new cases of curable STIs (WHO; 2005, 2008)

2005



Total number of cases: 448 250 000
Female 204 750 000
Male 243 500 000

2008



Total number of cases: 498 900 000
Female 232 700 000
Male 266 200 000

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

* The 2008 estimate of the number of new cases for the four infections combined is 11% higher than the estimate for 2005. 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 (4.1%). There was also a significant increase in the incidence of **N. gonorrhoeae** due to upwards revision in the estimated prevalence of **N. gonorrhoea** 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.

Estimated incidence of curable STIs by region, (WHO 2005)*

<i>WHO Region</i>	<i>Chlamydia</i>	<i>Neisseria gonorrhoeae</i>	<i>Syphilis</i>	<i>Trichomonas vaginalis</i>	<i>Total</i>
African Region	10.0	17.5	3.4	78.8	109.70
Region of the Americas	22.4	9.5	2.4	54.9	89.20
Eastern Mediterranean Region	5.7	6.5	0.6	12.60	25.40
European Region	15.2	4.6	0.3	24.50	44.60
South-East Asia Region	6.6	22.7	2.9	38.60	70.80
Western Pacific Region	41.6	26.9	1.1	39.10	108.70
TOTAL	101.5	87.7	10.7	248.5	448.40

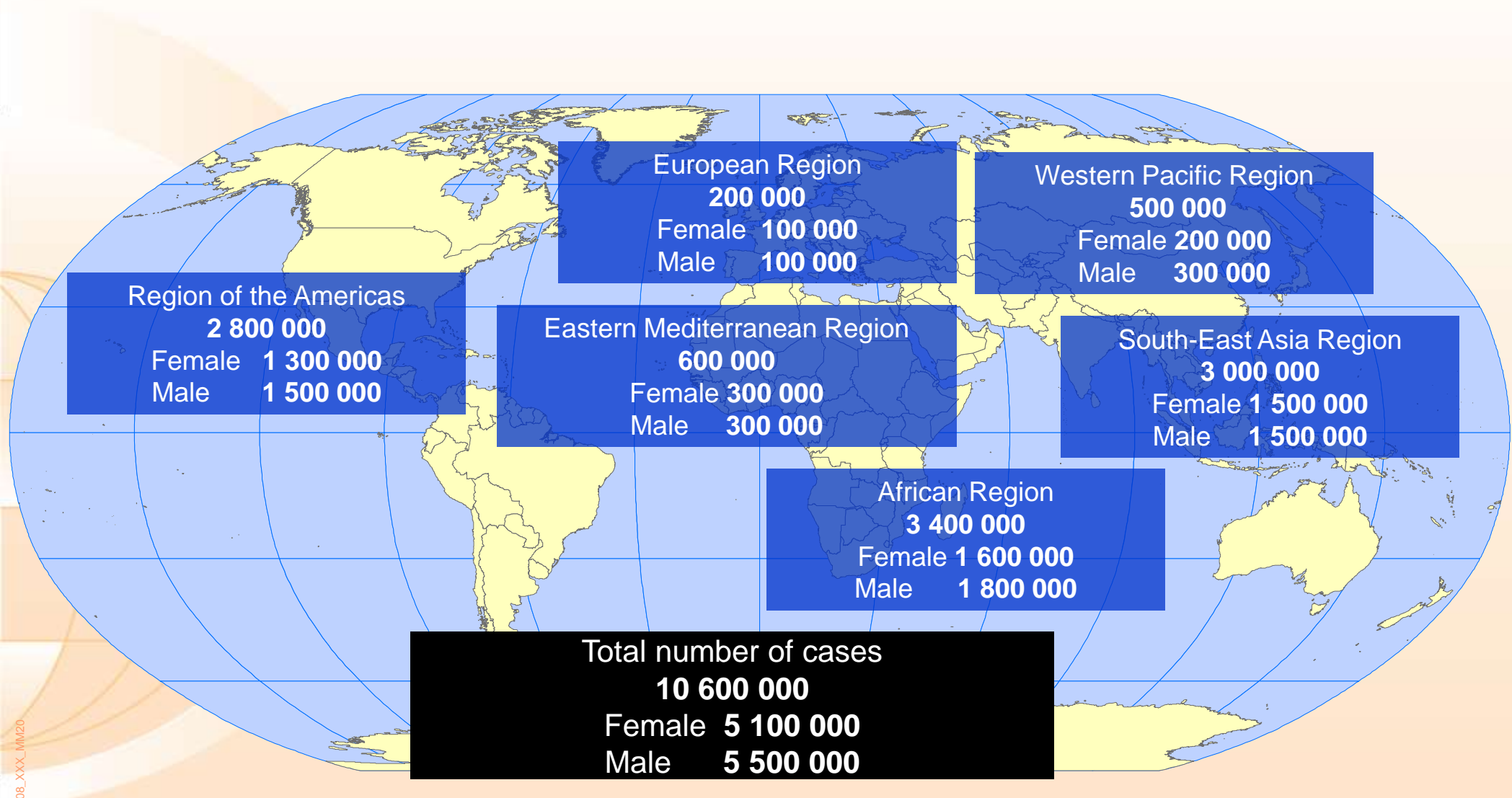
* World Health Organization. Prevalence and incidence of selected Sexually Transmitted Infections, *Chlamydia*, *Neisseria Gonorrhoeae*, Syphilis and *Trichomonas vaginalis*: Methods and Results used by WHO to generate 2005 estimates. WHO, Geneva 2010.

Estimated incidence of curable STIs by region, (WHO 2008)*

<i>WHO Region</i>	<i>Chlamydia</i>	<i>Neisseria gonorrhoeae</i>	<i>Syphilis</i>	<i>Trichomonas vaginalis</i>	<i>Total</i>
African Region	8.3	21.1	3.4	59.7	92.6
Region of the Americas	26.4	11.0	2.8	85.4	125.7
Eastern Mediterranean Region	3.2	3.1	0.6	20.2	26.4
European Region	20.6	3.4	0.2	22.6	46.8
South-East Asia Region	7.2	25.4	3.0	42.9	78.5
Western Pacific Region	40.0	42.0	0.5	45.7	128.2
TOTAL	105.7	106.1	10.6	276.4	498.9

* World Health Organization. Global incidence and prevalence of selected curable sexually transmitted infections – 2008. WHO, Geneva, 2012.

Estimated new cases of syphilis (WHO, 2008)



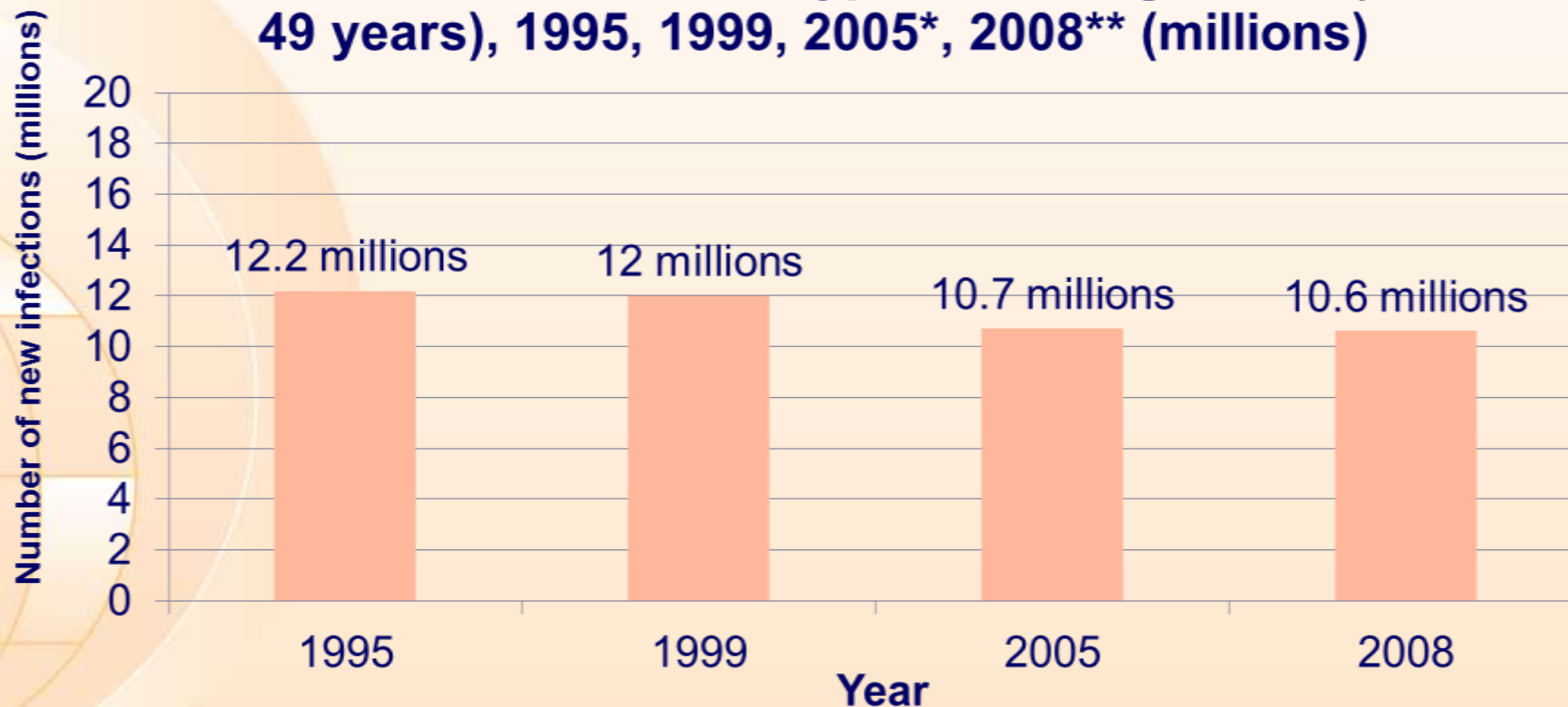
Estimated new cases of syphilis amongst adults, 2008*

<i>WHO Region</i>	<i>Incidence per 1000</i>		<i>New cases (in millions)</i>		
	<i>Females</i>	<i>Males</i>	<i>Females</i>	<i>Males</i>	<i>Total</i>
African Region	8.5	10.82	1.6	1.8	3.4
Region of the Americas	5.3	5.33	1.3	1.5	2.8
Eastern Mediterranean Region	2.1	2.1	0.3	0.3	0.6
European Region	0.6	0.6	0.1	0.1	0.2
South-East Asia Region	3.2	3.1	1.5	1.5	3.0
Western Pacific Region	0.5	0.5	0.2	0.3	0.5
Global Total	2.7	2.9	5.1	5.5	10.6

* * World Health Organization. Global incidence and prevalence of selected curable sexually transmitted infections – 2008. WHO, Geneva 2012.

Global incidence of syphilis (WHO, 1995, 1999, 2005*, 2008**)

Estimated new cases of syphilis among adults (15-49 years), 1995, 1999, 2005*, 2008 (millions)**



* The 2005 and 2008 Estimates were generated according to the methodology that differs from those used in 1995 and 1999. (For more details please use "Prevalence and Incidence of Selected Sexually Transmitted Infections: Methods and Results used by WHO to generate 2005 estimates". WHO, 2011)

** World Health Organization. Global incidence and prevalence of selected curable sexually transmitted infections – 2008. WHO, Geneva 2012.

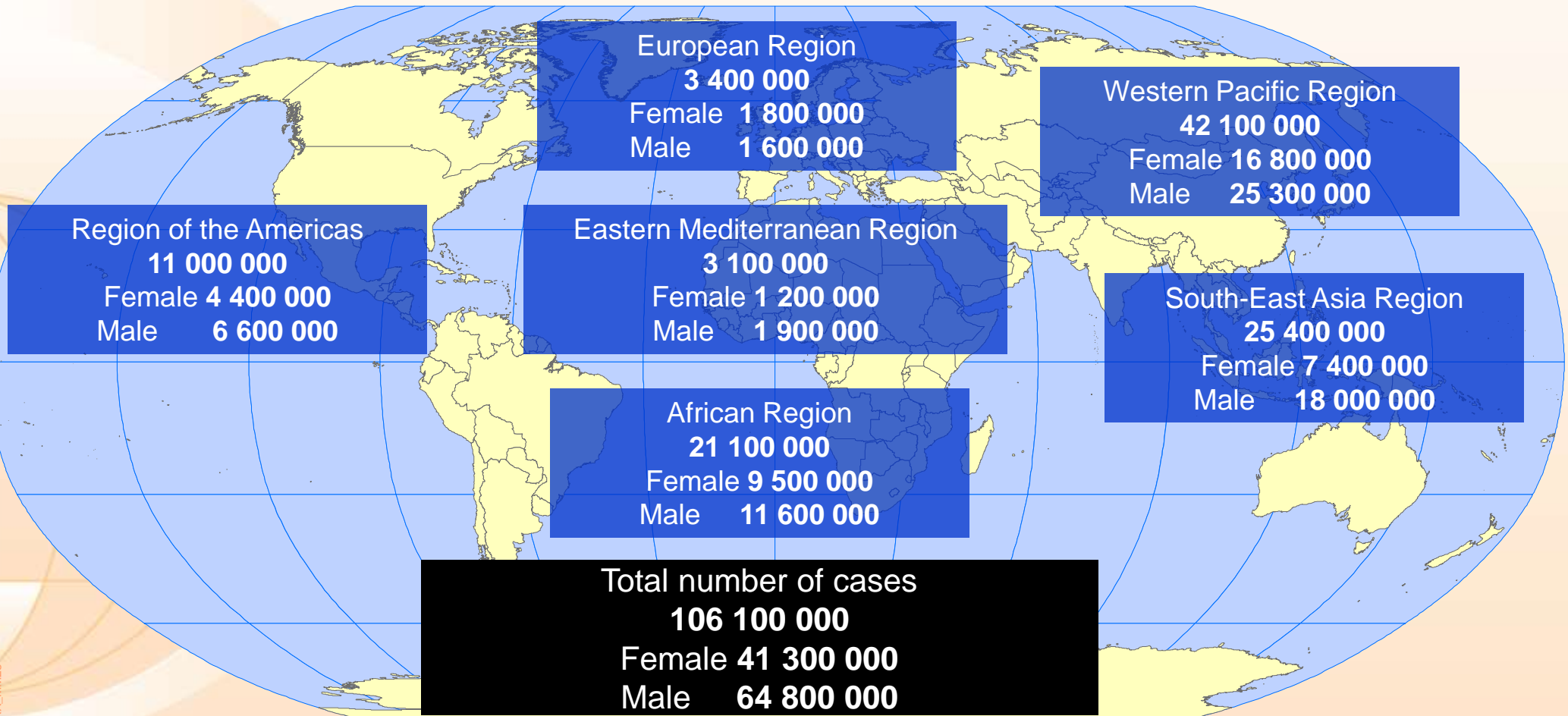
! In pregnancy, untreated early syphilis will result in a **stillbirth rate of 25%** and be responsible for **14% of neonatal deaths** – an overall **perinatal mortality of about 40%**.

World Health Organization. Global Strategy for the prevention and control of sexually transmitted infections: 2006-2015. ISBN 9789241563475. Geneva 2007.

Syphilis prevalence rates amongst pregnant women in Africa

Country	Prevalence	Studied population	Reference
Botswana	4,8	pregnant women attending ANC clinic	Romoren M, et al., 2007 ³⁵
Democratic Republic of Congo	0	pregnant women attending ANC clinic	Kinoshita-Moleka R, et al., 2008 ⁶⁷
Mozambique	4,7	pregnant women attending ANC clinic	Lujan et al, 2008 ⁴³
Nigeria	1,87	pregnant women attending ANC clinic for first visit	Federal Ministry of Health, Nigeria: 2005 National HIV/Syphilis seroprvalence sentinel survey among pregnant women attending ANC clinics. April 2006 ⁸⁶
Tanzania	1,6	women attending one of 6 ANC clinics, 15-49 y.o.	Yahya-Malima et al, 2008 ⁸⁷
Uganda	1,6	pregnant women attending booking visit at Entebbe district hospital, 15-40 y.o.	Tann CJ et al, 2006 ⁸⁸
Zambia	6,8	pregnant women attending ANC clinic, 14-44 y.o.	Zambia antenatal clinic sentinal surveillance report: 1994-2004. (2005). ⁸⁹

Estimated new cases of genital gonorrhoea (WHO, 2008)



Estimated new cases of gonorrhoea infections in adults, 2008*

<i>WHO Region</i>	<i>Incidence per 1000</i>		<i>New cases (in millions)</i>		
	<i>Females</i>	<i>Males</i>	<i>Females</i>	<i>Males</i>	<i>Total</i>
African Region	49.7	60.3	9.5	11.6	21.1
Region of the Americas	18.5	27.6	4.4	6.6	11.0
Eastern Mediterranean Region	8.1	11.6	1.2	1.9	3.1
European Region	8.3	7.0	1.8	1.6	3.4
South-East Asia Region	16.2	37.0	7.4	18.0	25.4
Western Pacific Region	34.9	49.9	16.8	25.3	42.1
Global Total	23.7	35.8	41.3	64.8	106.1

* * World Health Organization. Global incidence and prevalence of selected curable sexually transmitted infections – 2008. WHO, Geneva 2012.

! Worldwide, **up to 4000 newborn babies** become blind every year because of eye infections attributable to untreated maternal gonococcal and chlamydial infections.

World Health Organization. Global Strategy for the prevention and control of sexually transmitted infections: 2006-2015. ISBN 9789241563475. Geneva 2007.

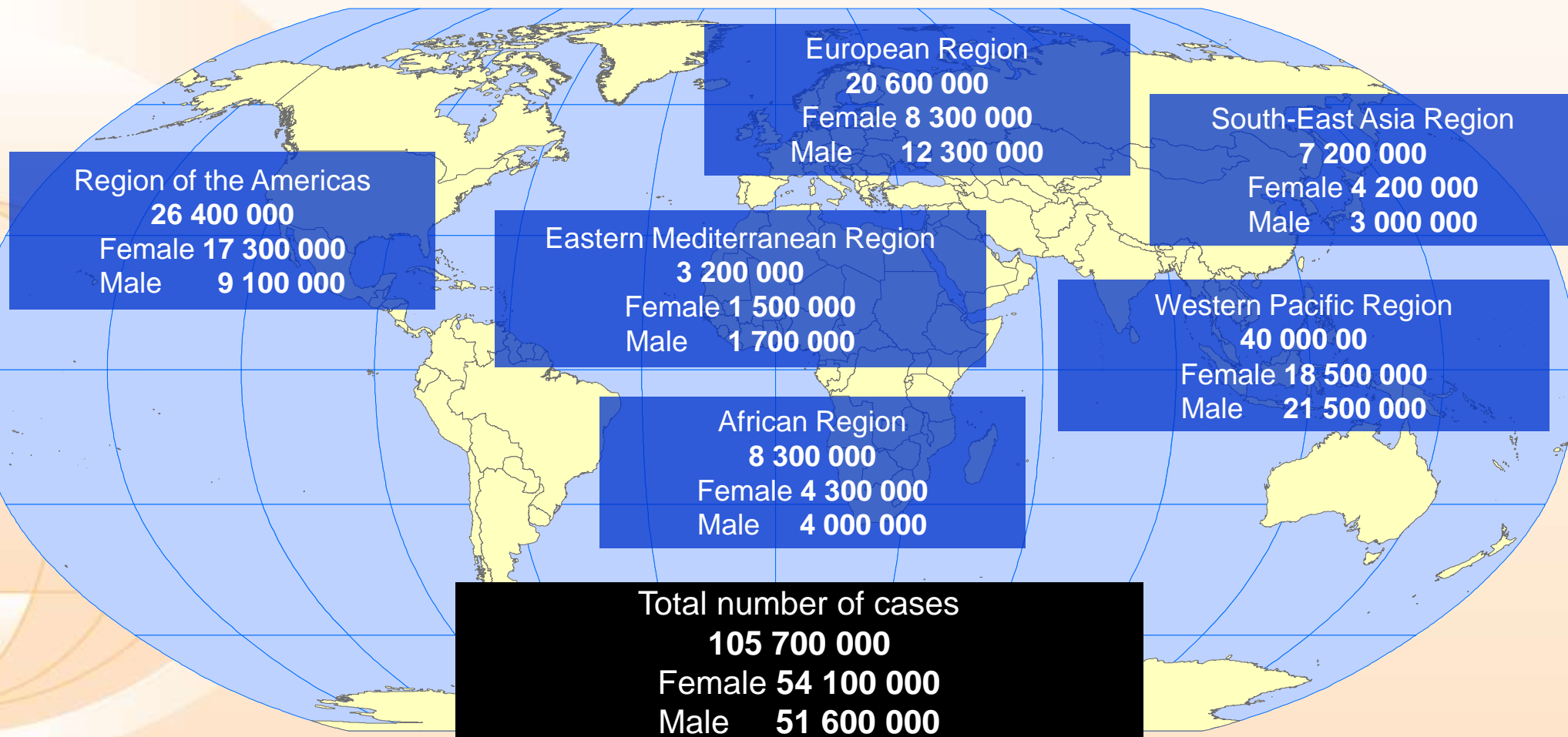
Neisseria gonorrhoeae prevalence studies among pregnant women

Country	Prevalence	Studied population	Reference
Botswana	3	pregnant women attending one of 13 ANC clinics	Romoren M, et al., 2007 ³⁵
China	0,8	pregnant women; 1st ANC visit	Chen XS et al, 2006 ³⁷
Democratic Republic of Congo	0,4	pregnant women attending ANC clinic	Kinoshita-Moleka R, et al., 2008 ⁶⁷
Fiji	1,7	ANC clinic attendees in Suva	Cliffe SJ et al, 2008 ³⁸
Ghana	0,6	pregnant women attending ANC at Korle Bu teaching hospital	Apea-Kubi et al, 2004 ³⁹
Kenya	1,2	pregnant women attending ANC clinic	Moses S et al, 2003 ⁶⁸
Lao	0,8	pregnant women (<20 weeks) at first visit to Sethiathirath or MCH hospital	Thammalangsy S et al, 2006 ⁴²
Mongolia	6,1	10 randomly selected ANC clinicals	Report from MOH Mongolia, 2007 ⁶⁹
Mozambique	2,5	pregnant women attending ANC clinic	Lujan et al, 2008 ⁴³
Nepal	2,3	Women who are 6 week postpartum with live birth residing in rural southeastern Nepal	Christian P et al, 2005 ⁷⁰
South Africa	8	pregnant women attending ANC clinic	Sturm PDJ et al, 2004 ⁷¹
Tonga	2,5	ANC clinic attendees attending central hospital	Cliffe SJ et al, 2008 ³⁸
Zimbabwe	1,1	pregnant women attending ANC clinic	Mbizvo EM et al, 2001 ⁷²

Chlamydia prevalence studies among pregnant women

Country	Prevalence	Population	Reference
Botswana	8	13 ANC clinics	Romoren M, et al., 2007 ³⁵
Brazil	9,4	ANC clinic - diverse emo and socio economic backgrounds, 11-47 y.o.	Brasil. Ministério da Saúde. Secretaria de Vigilância em Saúde. Programa Nacional de DST e Aids. 2008 ³⁶
China	10,1	pregnant women; 1st ANC visit	Chen XS et al, 2006 ³⁷
Fiji	29	ANC clinic attendees in Suva	Cliffe SJ et al, 2008 ³⁸
Ghana	3	pregnant women attending ANC at Korle Bu teaching hospital	Apea-Kubi et al, 2004 ³⁹
Ireland	3,7	pregnant women - asymptomatic, 15 – 50 y.o.	McMillan et al, 2006 ⁴⁰
Japan	3,7	pregnant women, 14-46 y.o.	Shimano S et al, 2004 ⁴¹
Lao	9,6	pregnant women (<20 weeks) at first visit to Sethiathirath or MCH hospital	Thammalangsy S et al, 2006 ⁴²
Mozambique	4,1	Pregnant women attending antenatal clinic	Lujan et al, 2008 ⁴³

Estimated new cases of genital *Chlamydia* infections (WHO, 2008)



Estimated new cases of genital *Chlamydia* infections (in million) among adults, 2008*

<i>WHO Region</i>	<i>Incidence per 1000</i>		<i>New cases (in millions)</i>		
	<i>Females</i>	<i>Males</i>	<i>Females</i>	<i>Males</i>	<i>Total</i>
African Region	22.3	20.9	4.3	4.0	8.3
Region of the Americas	72.6	38.2	17.3	9.1	26.4
Eastern Mediterranean Region	9.8	10.9	1.5	1.7	3.2
European Region	37.1	54.2	8.3	12.3	20.6
South-East Asia Region	9.2	6.2	4.2	3.0	7.2
Western Pacific Region	38.4	42.5	18.5	21.5	40.00
Global Total	30.99	28.6	54.1	51.6	105.7

** World Health Organization. Global incidence and prevalence of selected curable sexually transmitted infections – 2008. WHO, Geneva, 2012.

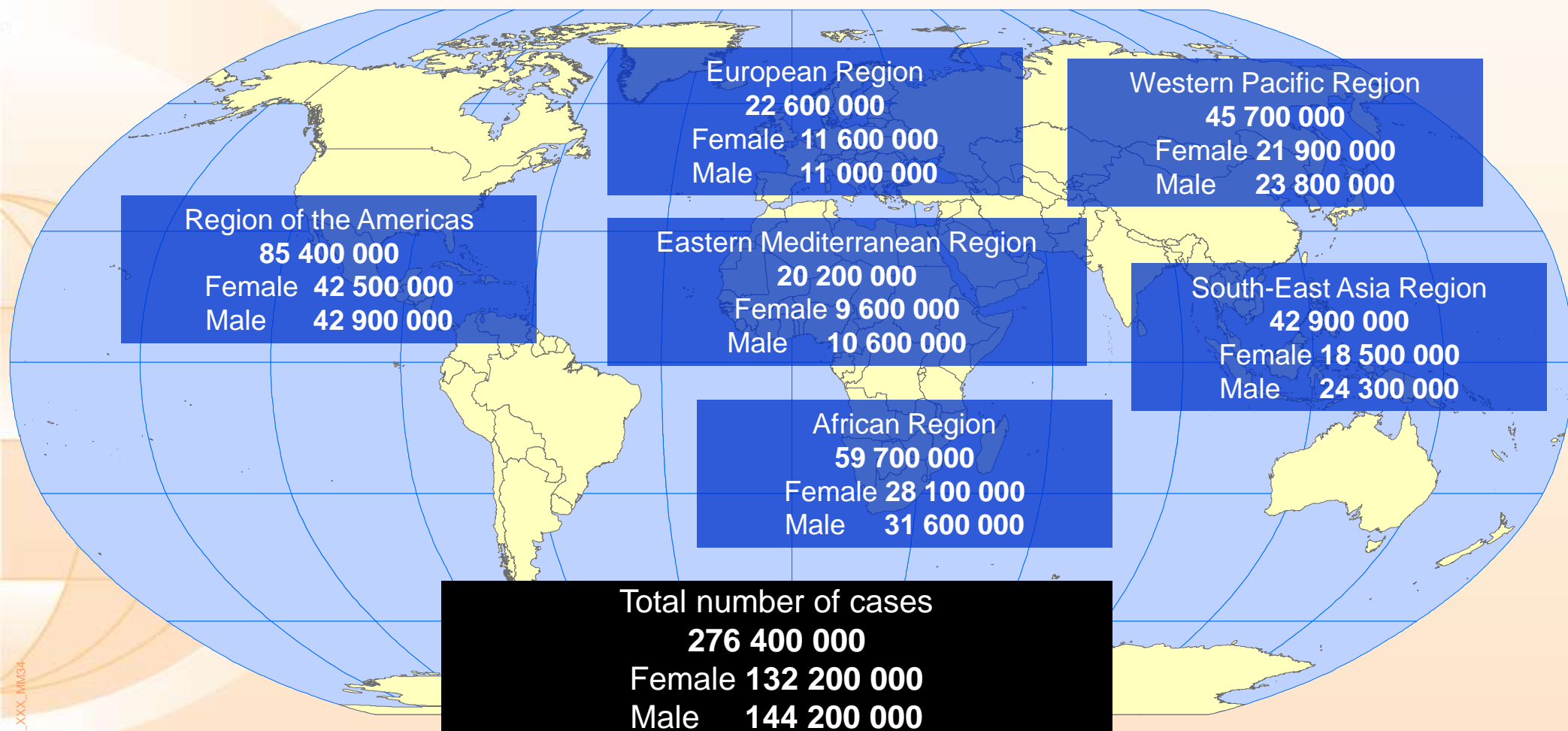
! Untreated gonococcal and chlamydial infections in women will result in **pelvic inflammatory disease in up to 40%** of cases. **One** in four of these will result in infertility.

World Health Organization. Global Strategy for the prevention and control of sexually transmitted infections: 2006-2015. ISBN 9789241563475. Geneva 2007.

Chlamydia prevalence studies in different populations

Country	Prevalence	Studied population	Reference
France	1,6 female	General population, 18 – 44 y.o.	ANRS. INED. INSERM. Quoted in ECDC Technical Report: Review of Chlamydia Control Activities in EU Countries. May 2008 ⁴⁸
	1,4 male		
Japan	6,8 female	students from nine schools (5 universities and 4 professional schools) located in the suburbs of Miyazaki City included students sexually active and not, 18-35 y.o.	Imai H et al, 2004 ⁴⁹
Korea	5 male	sexually and not sexually active university students, 18-25 y.o.	Lee SJ et al. 2005 ⁵⁰
Luxembourg	2,3 female	High school students, under 25 y.o.	ECDC. 2008. Technical Review of Chlamydia Activities in EU Countries ⁵¹
	0,9 male		
Netherlands	2,5 female	General population, 15 – 29 y.o.	Van Bergen J et al, 2005 ⁵²
	1,5 male		
New Zealand	2,7 female	university students, 18-25 y.o.	Baker M et al, 2005 ⁵³
Norway	6,7 female	General population, 18 – 25 y.o.	Steen et al, 2008 Referenced in ECDC ⁵⁴
	5,8 male		
Sweden	4,6 female	General population, 15 - 35 + y.o.	Novak DP & Karlsson RB, 2006 ⁵⁵
	6 male		
Thailand	7,5 female	students at 2 vocational colleges, 15- 21 y.o.	Whitehead et al, 2008 ⁵⁶
	6 male		

Estimated new cases of trichomoniasis (WHO, 2008)



Estimated new cases of trichomoniasis among adults in 2008*

<i>WHO Region</i>	<i>Incidence per 1000</i>		<i>New cases (in millions)</i>		
	<i>Females</i>	<i>Males</i>	<i>Females</i>	<i>Males</i>	<i>Total</i>
African Region	146.0	164.8	28.1	31.6	59.7
Region of the Americas	177.7	180.6	42.5	42.9	85.4
Eastern Mediterranean Region	64.0	66.1	9.6	10.6	20.2
European Region	51.7	48.4	11.6	11.0	22.6
South-East Asia Region	40.3	50.1	18.5	24.3	42.9
Western Pacific Region	45.6	47.0	21.9	23.8	45.7
Global Total	75.7	79.8	132.2	144.2	276.4

* * World Health Organization. Global incidence and prevalence of selected curable sexually transmitted infections – 2008. WHO, Geneva , 2012.

! ■ Trichomoniasis in the era of new generation diagnostics (**LCR** and **PCR**).

Whether the level of prevalence of TV infection has been underestimated?

World Health Organization. Global Strategy for the prevention and control of sexually transmitted infections: 2006-2015. ISBN 9789241563475. Geneva 2007.

Trichomoniasis prevalence studies amongst pregnant women

Country	Prevalence	Studied population	Reference
Australia	7,2	cohort of women attending aboriginal and islander health services in Townsville (provincial urban centre)	Panaretto KS et al, 2006 ¹²⁹
China	3,2	pregnant women; 1st ANC visit	Chen XS et al, 2006 ³⁷
Lao	1,8	pregnant women (<20 weeks) at first visit to Sethiathirath or MCH hospital, Population	Thammalangsy S et al, 2006 ⁴²
Mongolia	6,7	10 randomly selected ANC clinics	Report from MOH Mongolia, 2007 ⁶⁹
Samoa	20,8	pregnant women; out of the women living in villages outside of Apia on the main island of Upolu (28, 68.2%), with the remainder living in Apia (132, 31.4%).	Sullivan EA et al, 2004 ¹³⁰

Prevalence of pathogens in cases with urethral discharge in seven countries*

Country	Prevalence (%)				Negative for all four pathogens (%)	No. of specimens
	<i>Neisseria gonorrhoeae</i>	<i>Chlamydia trachomatis</i>	<i>Trachomonas vaginalis</i>	<i>Mycoplasma genitalium</i>		
Benin	65.1	8.1	8.1	10.5	20.9	86
Burkina Faso	81.0	15.0	12.0	11.0	11.0	100
Côte d'Ivoire	51.9	21.0	2.5	14.8	25.9	81
Ghana	52.4	10.5	19.0	10.5	23.8	105
Guinea	51.5	13.4	4.1	12.4	28.9	97
Mali	53.1	10.4	24.0	8.3	30.2	96
Senegal	77.7	16.0	24.5	3.2	10.6	94
Total	61.9	13.4	13.8	10.0	21.5	659
P-values	< 0.001	0.21	<0.001	0.24	0.001	

Percentages for countries add up to more than 100% due to multiple infections.

P-values indicate the level of significance of intercountry variation.

*Pepin J, et al. Etiology of urethral discharge in West Africa: The role of *Mycoplasma genitalium* and *Trichomonas vaginalis*. Bull World Health Organ 2001; 79: 118-126.

! ■ Herpes Simplex Virus Type II is responsible for over **two-third** of all episodes of genital herpes and more than **5%** of recurrent cases.

Corey L, et al. Genital herpes simplex virus infections: current concepts in diagnosis, therapy, and prevention. Ann Intern Med 1983; 98: 958-972.

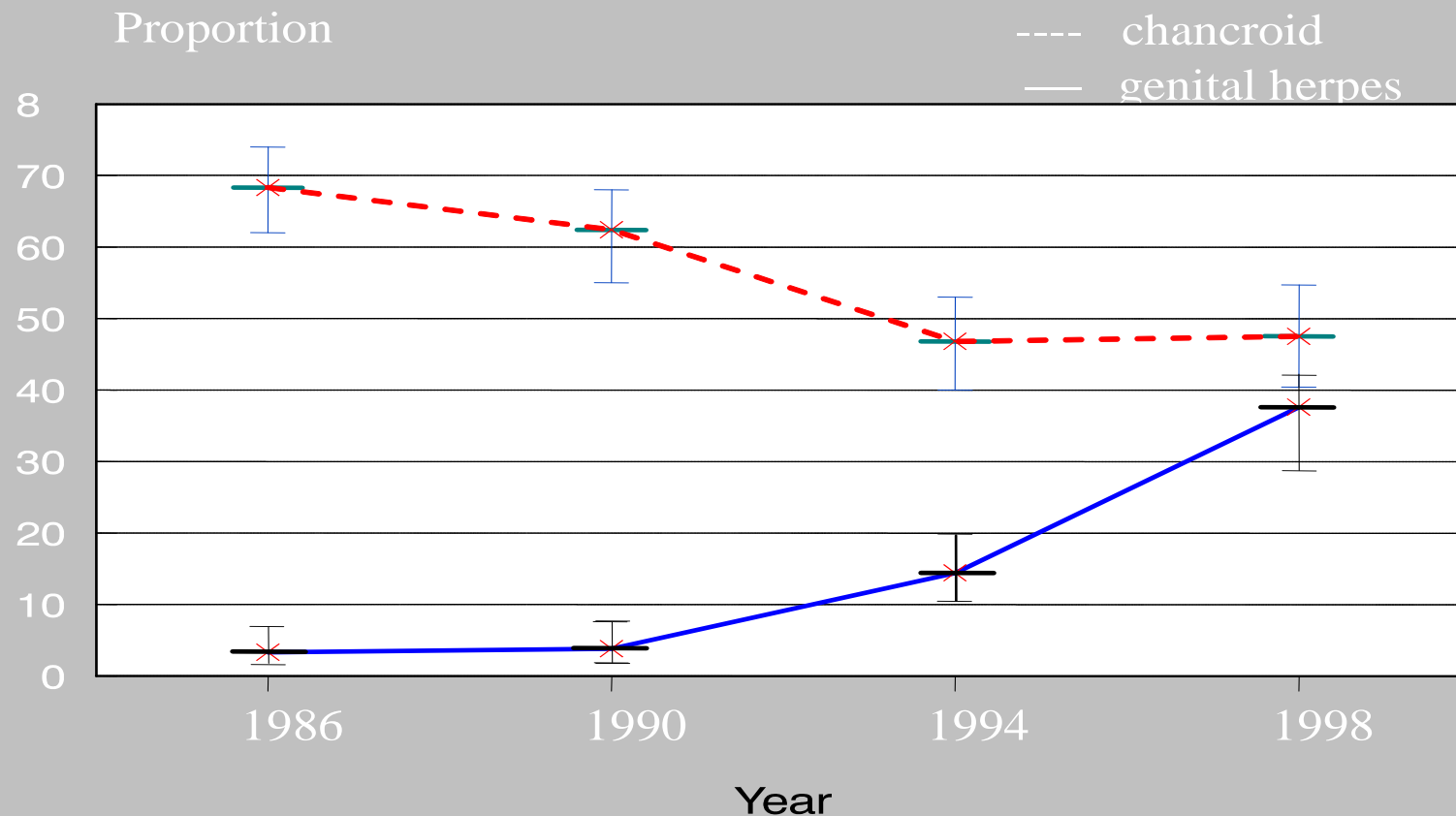
Regional estimates of the prevalence of the herpes simplex virus type 2 infection among males and females, in 2003*

Region	Regional prevalence in millions, by age															
	Female								Male							
	15-19 y.o	20-24 y.o	25-29 y.o	30-34 y.o	35-39 y.o	40-44 y.o	45-49 y.o	Total	15-19 y.o	20-24 y.o	25-29 y.o	30-34 y.o	35-39 y.o	40-44 y.o	45-49 y.o	Total
North America	0.9	1.5	2.0	2.6	3.2	3.8	3.9	17.9	0.6	1.0	1.4	1.7	2.2	2.5	2.6	11.9
Latin America and the Caribbean	2.6	4.5	5.8	6.4	6.7	6.6	6.0	38.6	0.9	1.6	2.1	2.4	2.7	2.8	2.7	15.1
North Africa and the Middle East	1.0	1.5	1.6	1.5	1.4	1.3	1.1	9.6	1.4	1.6	1.5	1.3	1.1	0.9	0.8	8.6
Sub-Saharan Africa	9.0	13.1	13.6	12.5	11.2	10.0	8.8	78.2	4.1	6.5	7.5	7.5	7.1	6.7	6.2	45.5
Western Europe	0.7	1.3	1.8	2.2	2.6	2.6	2.5	13.7	0.2	0.5	0.7	1.1	1.4	1.6	1.7	7.2
Eastern Europe and central Asia	2.7	3.9	4.3	4.3	4.3	4.7	4.7	28.9	0.6	1.1	1.5	1.8	2.1	2.6	2.8	12.3
Eastern Asia	2.6	4.4	7.1	11.1	12.8	11.9	12.0	61.8	2.0	3.4	5.4	8.4	9.8	9.3	9.5	47.8
Japan	0.4	0.6	0.7	0.7	0.6	0.6	0.6	4.1	0.02	0.05	0.08	0.1	0.1	0.1	0.2	0.7
Pacific	0.03	0.04	0.05	0.06	0.06	0.06	0.05	0.3	0.05	0.08	0.09	0.09	0.09	0.08	0.06	0.5
South Asia	4.1	5.4	5.5	5.4	4.9	4.3	3.7	33.2	1.8	3.1	4.0	4.8	5.2	5.4	5.2	29.4
South-east Asia	1.7	3.1	4.0	4.6	4.9	4.8	4.4	27.6	3.1	5.2	6.3	6.9	7.0	6.6	6.0	41.2
Australia and New Zealand	0.03	0.06	0.09	0.1	0.2	0.2	0.2	0.9	0.02	0.03	0.05	0.06	0.08	0.1	0.1	0.4
Total	25.8	39.4	46.5	51.5	52.9	50.8	47.9	314.8	14.6	24.1	30.5	36.1	38.8	38.8	37.8	220.7

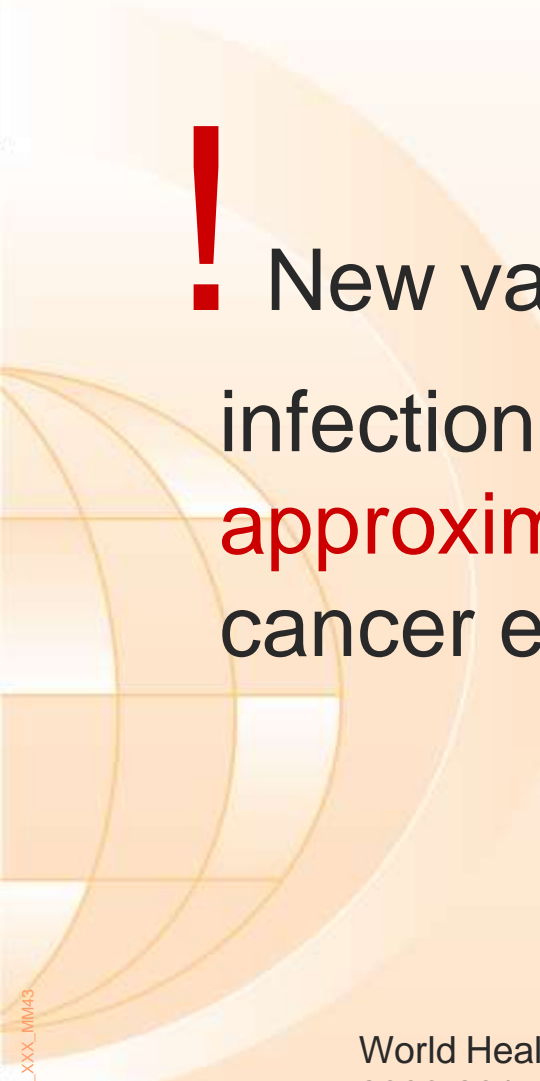
*Looker KJ, et al. An estimate of the global prevalence and incidence of herpes simplex virus type 2 infection. Bull World Health Organ. 2008 Oct;86(10):805-12, A.

! ■ Chancroid, caused by *Haemophilus ducreyi*, is a common cause of genital ulcer in developing countries, particularly in sub Saharan Africa, Caribbean and south-east Asia

Etiology of Genital Ulcer (Chancroid and Genital Herpes) by year of study in South Africa



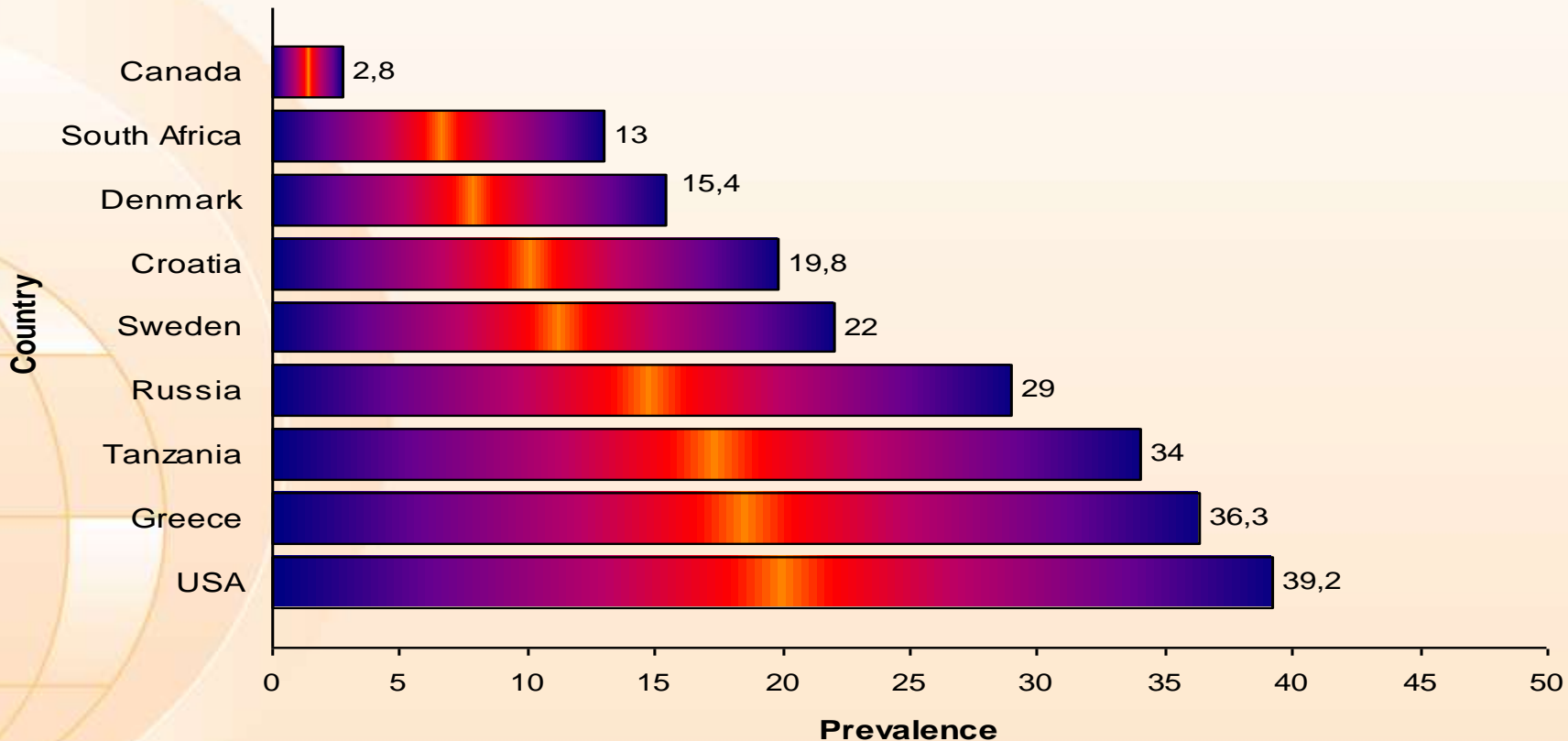
Source: WHO, Report of an Expert Consultation on Improving the Management of Sexually Transmitted Infections, 2001

A stylized graphic of a globe with orange and white curved lines, positioned on the left side of the slide.

! New vaccines against human papilloma virus infection could stop the **untimely death of approximately 240 000 women** from cervical cancer every year in resource-poor settings.

World Health Organization. Global Strategy for the prevention and control of sexually transmitted infections: 2006-2015. ISBN 9789241563475. Geneva 2007.

Human papilloma virus, prevalence studies among female population, 1995-2001*



* Sexually Transmitted Infections. Iyonne Camaroni, Antonio Gerbase. Chapter 4 « Global Epidemiology of Sexually Transmitted Infections », PP 27-43.

! Risk of contracting gonorrhoea, syphilis and HPV is higher among uncircumcised men than among circumcised ones.


Circumcision reduces the prevalence and incidence of Multiple High-Risk Papillomavirus infections in HIV-positive Men (Uganda, 2007)

Incidence of Single and Multiple HR-HPV infections over 24 Months, by Study Arm*

New HR-HPV Infections	No.(%) of samples with infection, by study arm		IRR, intervention vs control (95% CI)
	Intervantion (n=81)	Control (n=93)	
≥1 HR-HPV genotype infection	34 (42.0)	53 (57.0)	0.74 (0.54 – 1.01)
Single HR-HPV genotype infection	26 (32.1)	30 (32.2)	1.00 (0.65 – 1.53)
Multiple HR-HPV genotype infections	8 (9.9)	23 (24.7)	0.40 (0.19 - 0.84)

Note. – Samples are those that had amplifiable cellular or viral DNA at both enrolment and follow-up CI, confidence interval; IRR incidence risk ratio.

*David Serwadda et al. Circumcision of HIV-Infected Men: Effects on High-Risk Human Papillomavirus Infections in Randomized Trial in Rakai, Uganda. The Journal of Infectious Diseases 2010; 201(10):000-000.



! We Really Do Not Know How Common
Congenital Syphilis Is

We Rely on **Estimating the Numbers of
Pregnant Women with Syphilis**

And Multiply That By Estimating the Proportion
of These Women with an Affected Fetus/Infant

Use Of Maternal Syphilis Seroprevalence Data to Estimate the Global Morbidity of Congenital Syphilis*

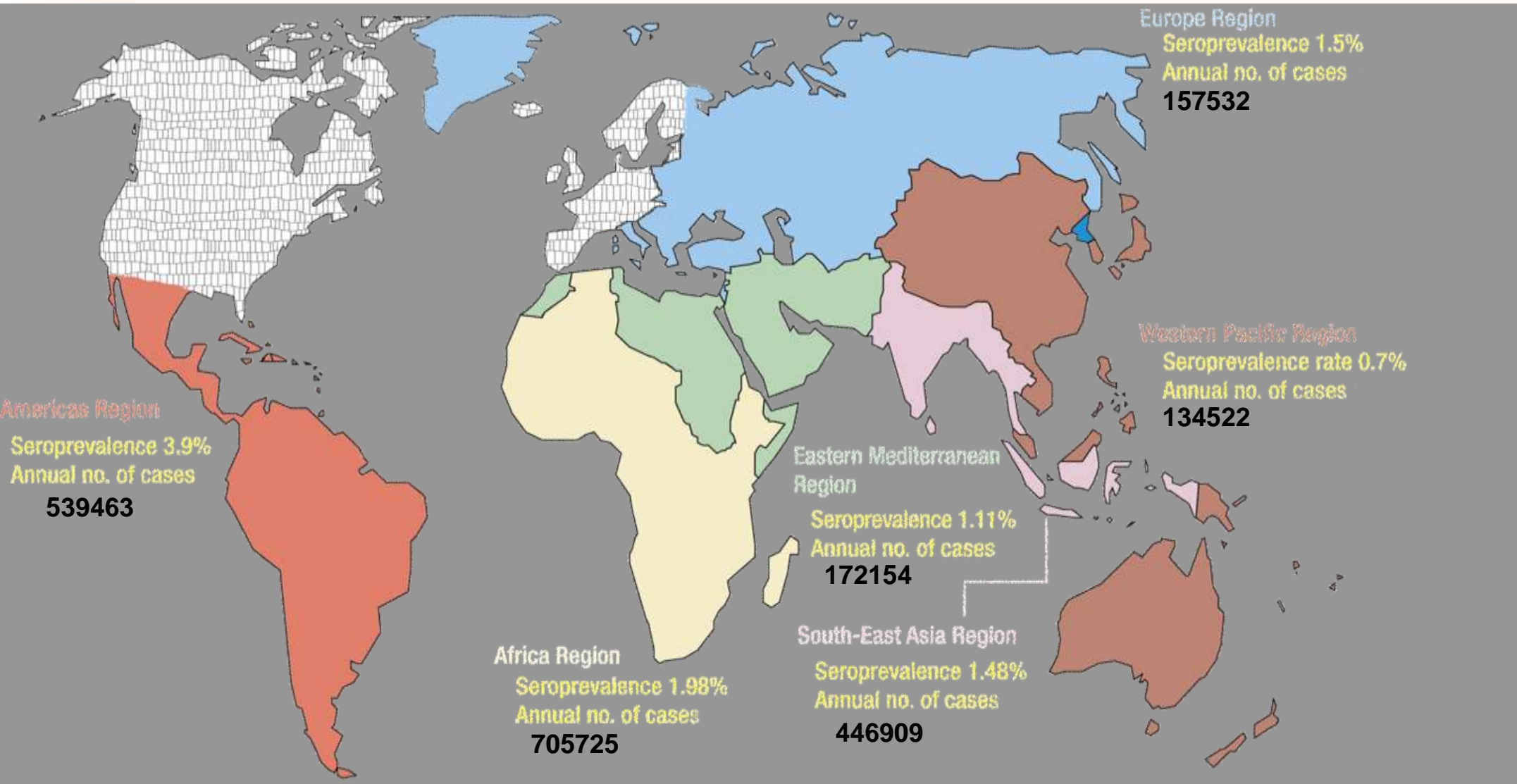
- Identified all published reports of syphilis seroprevalence in pregnant women, 1997-2003
- Constructed region-specific prevalence rates for maternal syphilis
- Using three models of the proportion of these women with an affected fetus/infant, to estimate the number of foetuses/infants infected

*Schmid GP, Stoner BP, Hawkes S, Broutet N. Sex Transm Dis (June 2007)

2005 WHO Estimates of maternal syphilis seroprevalence

- Data from studies done between 1997 – 2003:
 - 215 studies
 - 31 countries
 - total 431,452 women tested
- Overall prevalence was 1.76%.
- Estimation of 2,156,304 women with positive syphilis serology using regional estimate
- 95% CI= 1,559,888 - 2,751,032

Regional Estimates of Maternal Syphilis Seroprevalence



	More Conservative Watson-Jones ¹ 2002	Mid Range Schulz 1987	Less Conservative Global Burden of STI ³ 2000
Proportion of seropositive women with:			
A. Untreated syphilis	0.95*	1.0	1.0
B. High serologic titer ($\geq 1:8$)	0.73	--	--
C. Adverse pregnancy outcome due to syphilis**	0.49	0.65	0.75
Global Annual No. of Congenital Syphilis Cases (calculated as 2.1 million maternal cases x A x B x C)	713,600	1,365,000	1,575,000

Watson-Jones D et al. J Infect Dis 2002;186:940
²Schulz K et al Genitourin Med 1987;63:320 ³WHO
 (www.who.int)

*not included in original Watson-Jones model

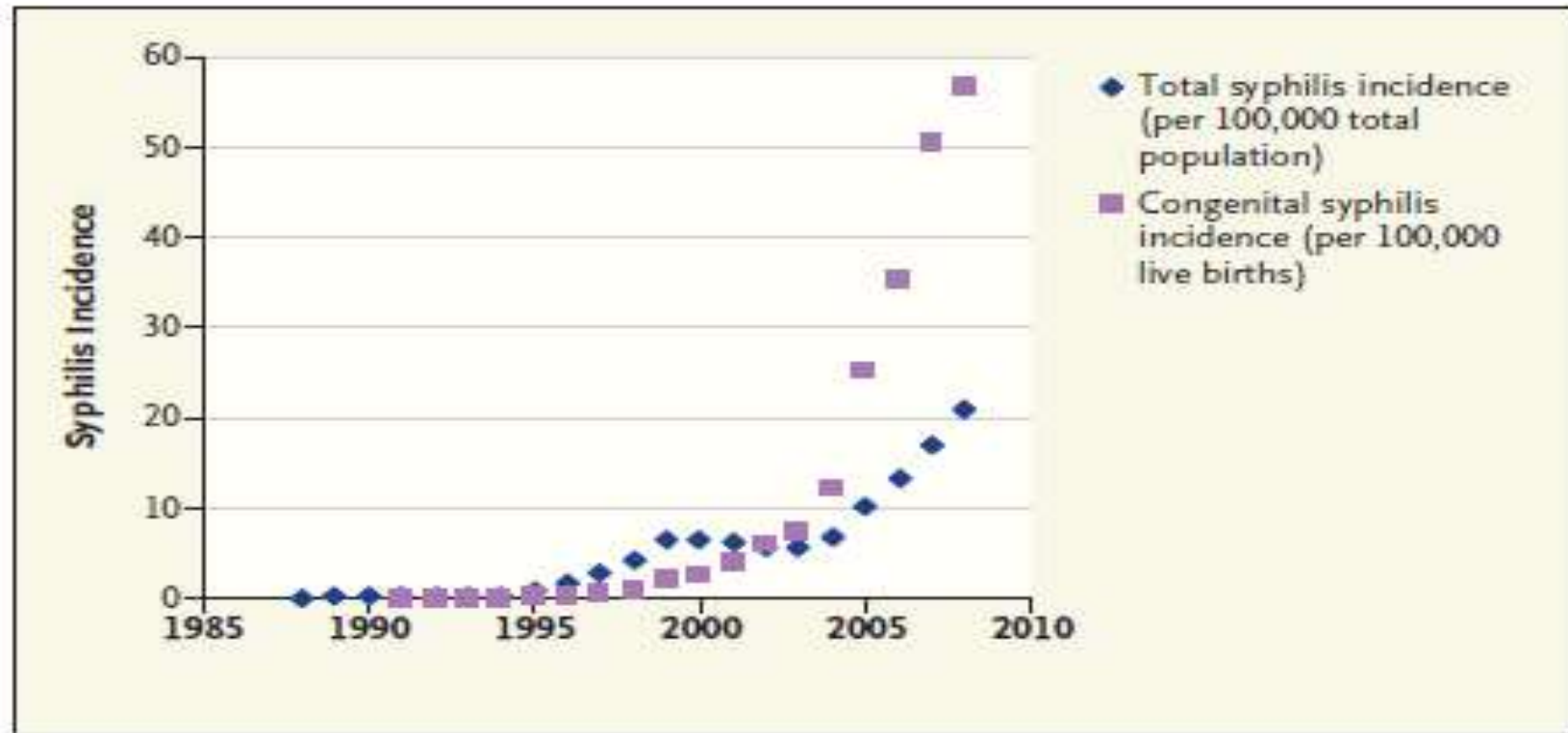
**includes miscarriage / fetal loss, perinatal death, prematurity / low birthweight, neonatal infection

08_XXX_#62

While Numbers Vary, and Estimates are Estimates, the Numbers of Women and Children Infected are "High"

In many parts of the world, **syphilis**
is common

Reported Overall Incidence of Syphilis per 100,000 Population and Incidence of Congenital Syphilis per 100,000 Live Births in China*



Data are from the National Center for STD Control in Nanjing, China.

*Joseph D., et al, Syphilis and Social Upheaval in China, N Engl J Med 2010; 362:1658-1661

Screening of syphilis antenatal mothers Malaysia, 2002-2008*

YEAR	2002		2003		2004		2005		2006		2007		2008	
New antenatal attendances in the public health facilities	445,283		382,345		381,921		379,461		388,388		381,686		396,951	
Number screened for syphilis	280,303		285,723		298,248		292,624		311,505		365,851		372,749	
Percentage screened for syphilis	62.95%		74.73%		79.09%		77.12%		80.20%		95.9%		94.0%	
Confirmed syphilis (TPHA+)	239	0.08 %	276	0.09 %	262	0.09 %	295	0.10 %	273	0.09 %	303	0.08%	287	0.08%

*Source : AIDS/STI Section, Ministry of Health. Malaysia Family Health Development Division, Ministry of Health.

Antimicrobial Resistance

Status quo or new challenges!?

08_XXX_MM56

The clinical implications of persistent gonococcal infections

In adults

- Pelvic inflammatory disease (PID)
- Chronic pelvic pain
- Ectopic pregnancy
- Spontaneous abortions
- Post-partum infections
- Infertility (male & female)
- Increased HIV transmission
- Epididymitis
- Orchitis
- Urethral strictures

In children

- Stillbirths
- Prematurity, low birth weight
- Conjunctivitis and blindness



Antimicrobial resistance in *Neisseria gonorrhoeae*

- **Penicillins**
- **Tetracyclines**
- **Aminoglycosides (gentamicin, kanamycin)**
- **Quinolones (norfloxacin, ciprofloxacin)**
- **Macrolides (azithromycin)**
- **Cephalosporins (ceftriaxone, cefixime)**

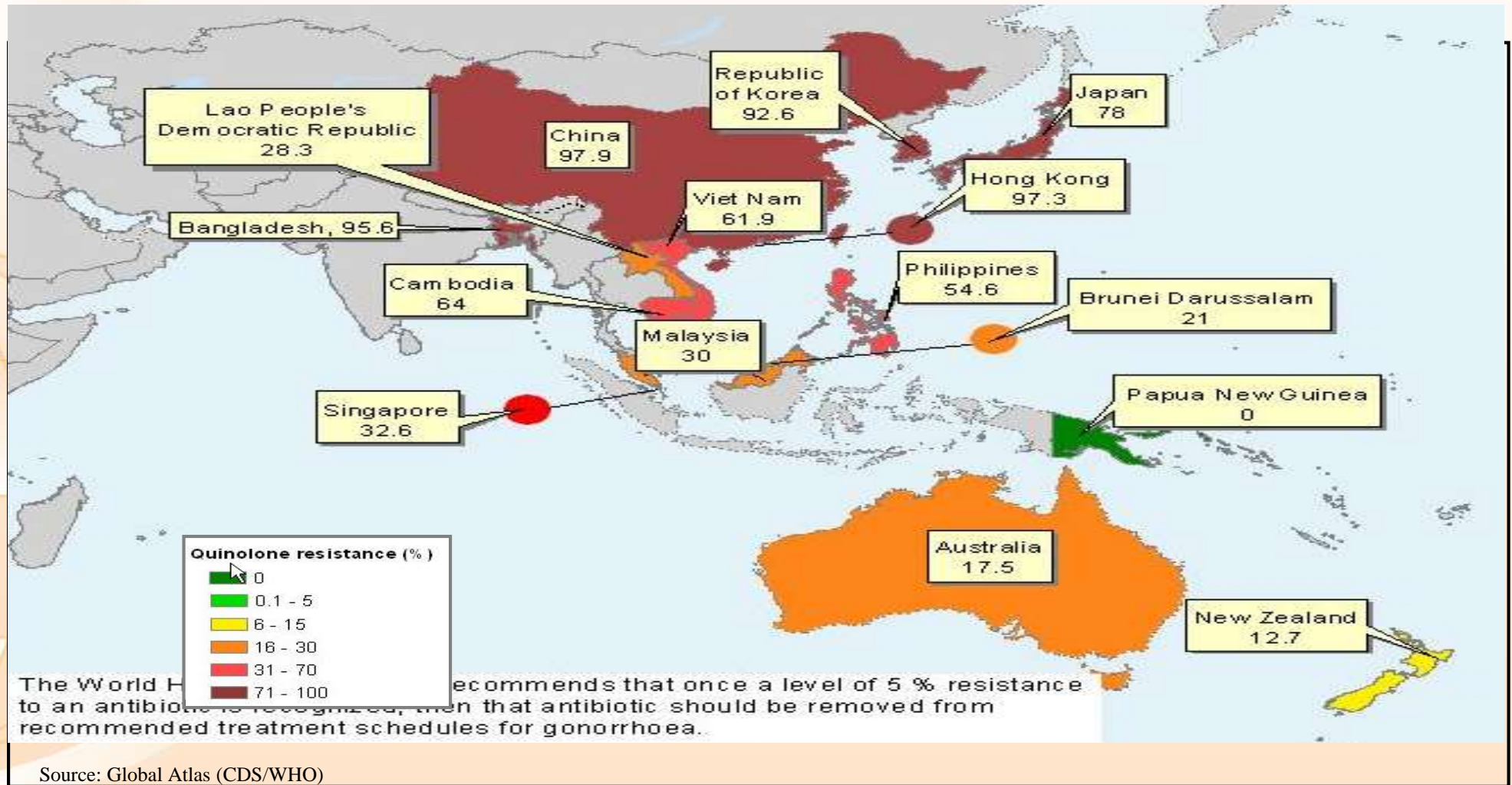
Penicillin resistance in 9048 strains of *N. gonorrhoeae* in 22 Asian countries in 2008

Country	n	PPNG		CMRP		All Pen R	
		No.	%	No.	%	No.	%
Australia	3110	373	12%	994	32	1367	44%
*#Bhutan	161					161	100%
Brunei	351	201	70.5%	44	12.5%	245	69.8%
China	1403	543	38.7%	ND^			
Fiji	320	20	6.3%	11	3.4%	31	9.7%
Hong Kong SAR	1393	434	31.2%	169	12.1%	603	43.3%
*India	60	20	33.3%	5	8.3%	25	41.7%
Japan	328	2	0.6%	88	26.8%	90	27.4%
Korea	141	18	12.8%	77	54.6%	95	67.4%
#Lao PDR	9					7#	78%
Malaysia	43	23	53.5%	0	0.0%	23	53.5%
Mongolia	91			3	3.3%	3	3.3%
*Myanmar	12	2	16.7%	8	66.7%	10	83.3%
New Caledonia	152	0	0.0%	2	1.3%	2	1.3%
New Zealand	258	6	2.3%	57	22.1%	63	24.4%
Papua New Guinea	32	20	62.5%	2	6.3%	22	68.8%
Philippines	84	76	90.5%	0	0.0%	76	90.5%
*Sri Lanka	34	18	52.9%	1	2.9%	19	55.9%
Singapore	160	90	56.3%	12	7.5%	102	63.8%
*@Thailand	733	592	80.8%	45/53	84.9%		
Tonga	14	1	7.1%	0	0.0%	1	7.1%
Vietnam	153	40	26.1%	9	5.9%	49	32%

Quinolone resistance in 8731 strains of *Neisseria gonorrhoeae* in 20 Asian countries in 2008

Country	n	Less susceptible		Resistant		All QRNG	
		No.	%	No.	%	No.	%
Australia	3110	34	1.1%	1651	53.1%	1685	54.2%
*Bhutan	161					153	95%
Brunei	353	92	26.1%	168	47.6%	260	73.7%
China	1403	53	3.8%	1348	96.1%	1401	99.9%
Hong Kong SAR	1393	12	0.9%	1362	97.80%	1374	98.6%
*India	60	10	16.7%	50	83.3%	60	100.0%
Japan	328	14	4.3%	240	73.2%	254	77.4%
Korea	141	29	20.6%	106	75.2%	135	95.7%
Lao PDR	9			1	11%	1	11%
Malaysia	43	6	14%	29	67.4%	35	81.4%
Mongolia	91	35	38.5%	34	37.4%	69	75.8%
*Myanmar	12	4	33.3%	6	50.0%	10	83.3%
New Caledonia	152	2	1.3%	3	2.0%	5	3.3%
New Zealand	258	2	0.8%	53	20.5%	55	21.3%
Papua New Guinea	32	0	0.0%	0	0.0%	0	0.0%
Philippines	84	4	4.8%	68	81.0%	72	85.7%
*Sri Lanka	34	0	0.0%	26	76.5%	26	76.5%
Singapore	160	10	6.3%	119	74.4%	129	80.6%
*Thailand	754	162	21.5%	570	75.6%	732	97.1%
Vietnam	153	5	3.3%	147	96.0%	152	99.3%

Antimicrobial Resistance: Quinolone resistance (%)



Ceftriaxone reduced-susceptibility strains of *Neisseria gonorrhoeae* – WHO/WPR/SEAR, 2006

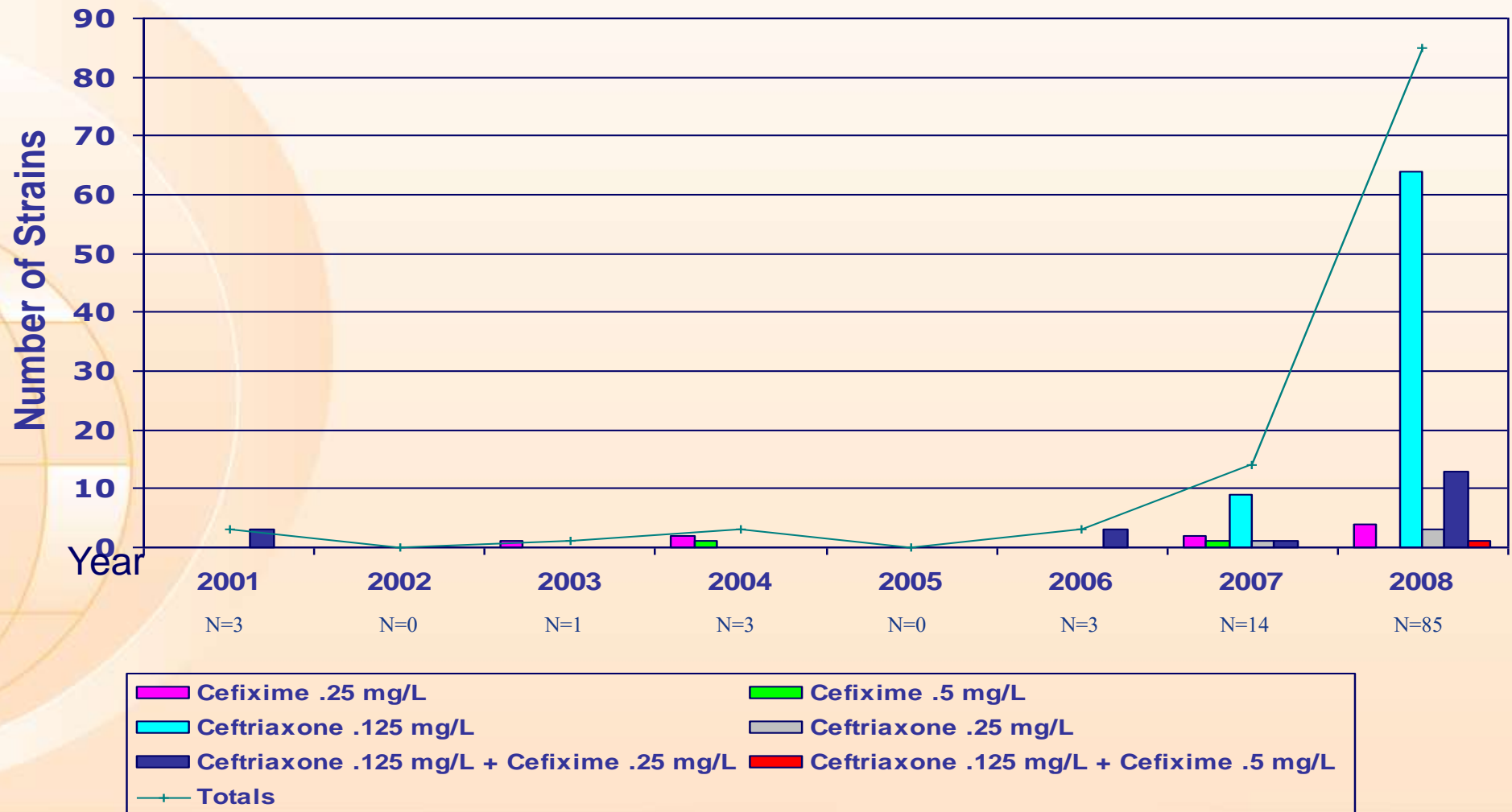


The boundaries and names shown and the designations used on this map do not imply the expression of any opinion whatsoever on the part of the World Health Organization concerning the legal status of any country, territory, city or area or of its authorities, or concerning the delimitation of its frontiers or boundaries. Dotted lines on maps represent approximate border lines for which there may not yet be full agreement. ©WHO 2008. All rights reserved.

Data Source: National Ministry of Health/WHO
Map Production: Public Health Mapping and GIS
World Health Organization

N. gonorrhoeae strains with decreased susceptibility to Cephalosporins*

Cefixime (0.25 mg/l and 0.5 mg/L) and
Ceftriaxone (0.125 mg/L and 0.25 mg/L) MICs



*Source: Public Health Agency of Canada

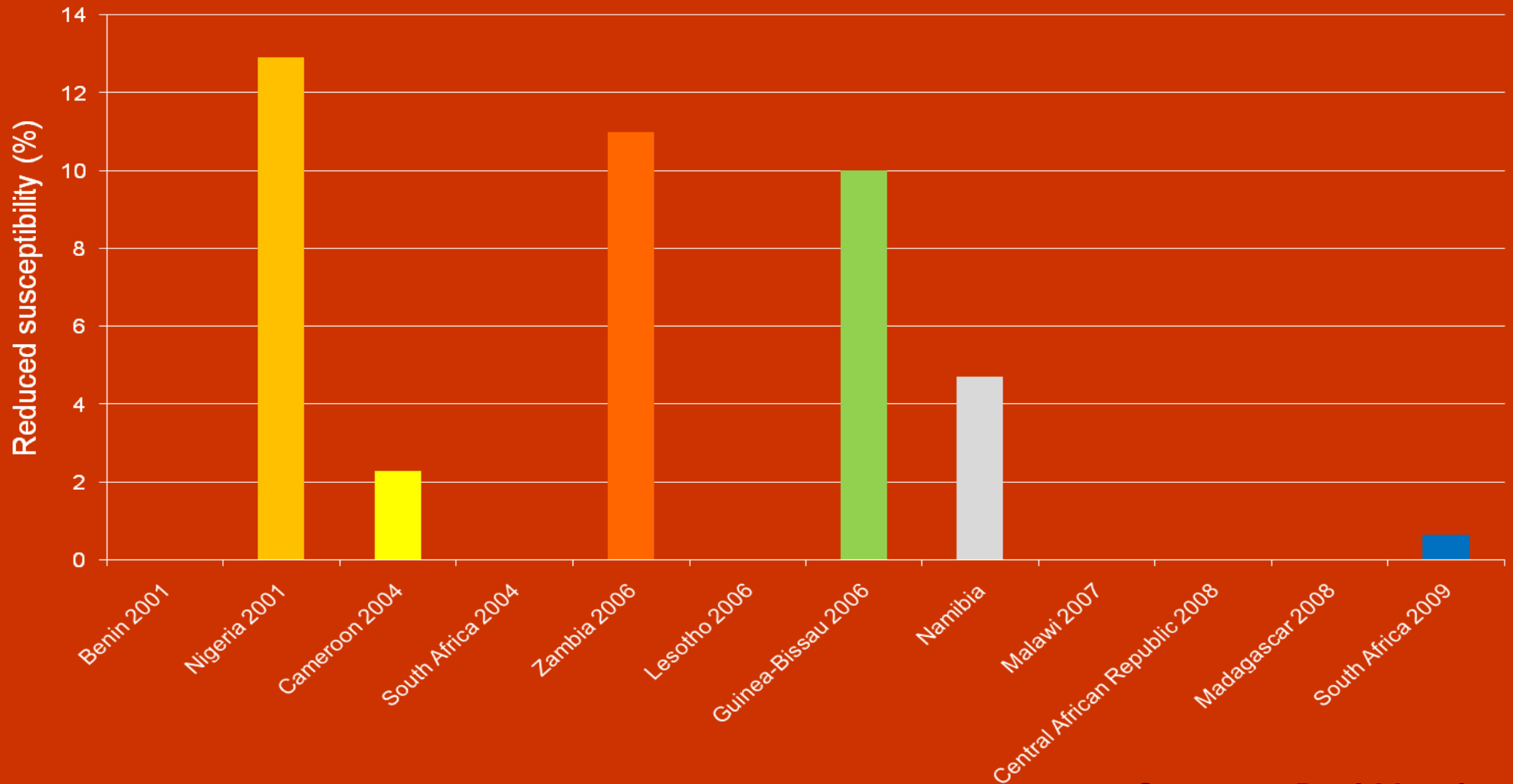
Modal ceftriaxone MICs – Europe data

	2004	2006	2007	2008	Fold increase (1 st to last year)
Austria	0.004	<0.002	0.016	0.016	4
Belgium	<0.002	<0.002	<0.002	0.008	4
Denmark	<0.002	0.016	0.016	0.016	8
England/Wales	<0.002	<0.002	<0.002	0.004	2
Netherlands	<0.002	0.016	0.008	0.004	2
Portugal	<0.002	0.004	0.004	0.004	2
Scotland	0.004	0.004	0.004	0.008	2
Slovenia		0.004	0.004	0.016	4
Spain	<0.002	0.008	0.004	0.004	2
Sweden	0.004	0.008	0.008	0.008	2
France	<0.002		0.016	0.004	2
Germany			0.016	0.008	Decrease
Greece	<0.002		0.004	0.004	2
Italy	<0.002		0.008		4
Malta			0.016	0.032	2

MICs rounded up to full dilution
<0.002 = 0.002 for fold calculation

Courtesy: Cathy Ison

Decreased susceptibility to ceftriaxone - Africa (2001-2009)



Courtesy: David Lewis

The STI Epidemic, Eastern Europe and Central Asia

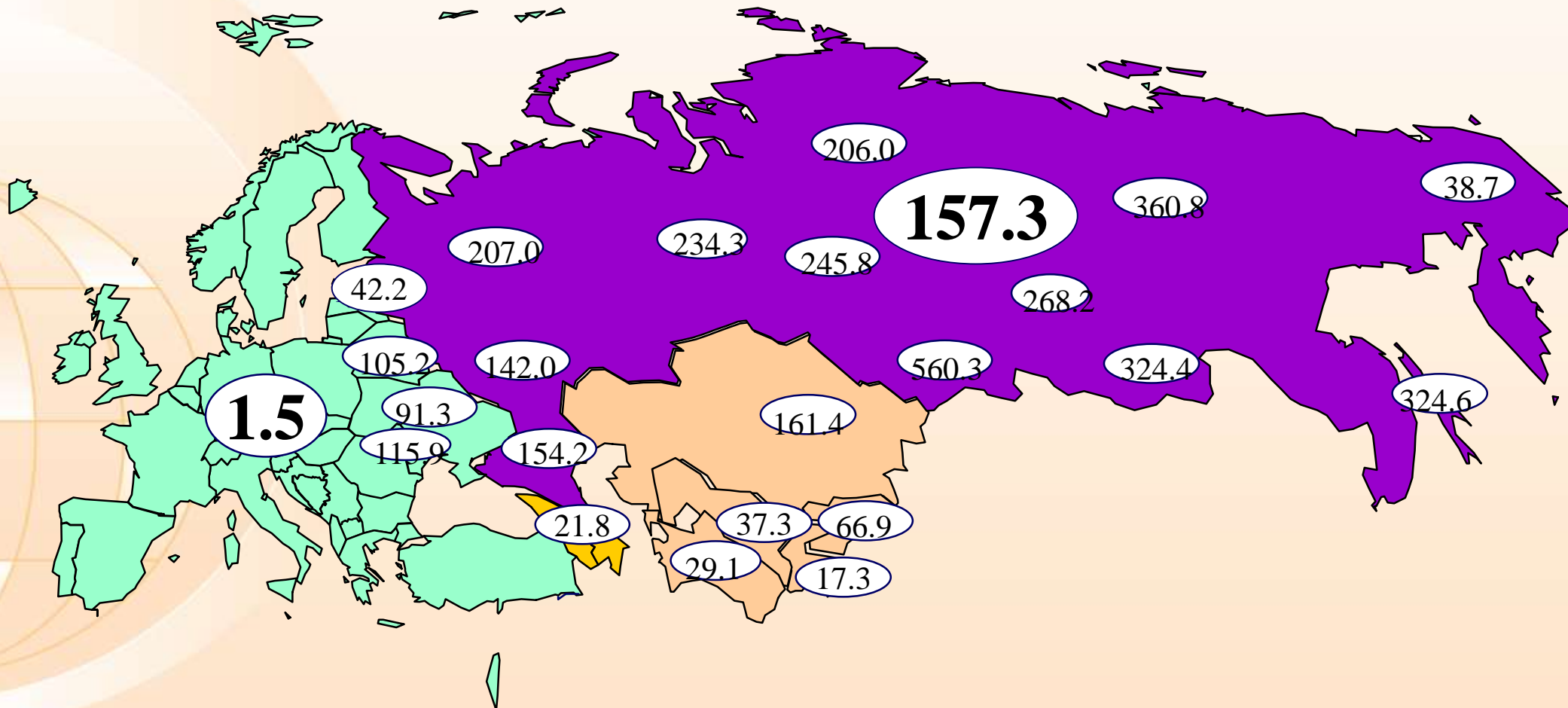
Late 1990s

Things are not the same anymore!

08_XXX_MM66

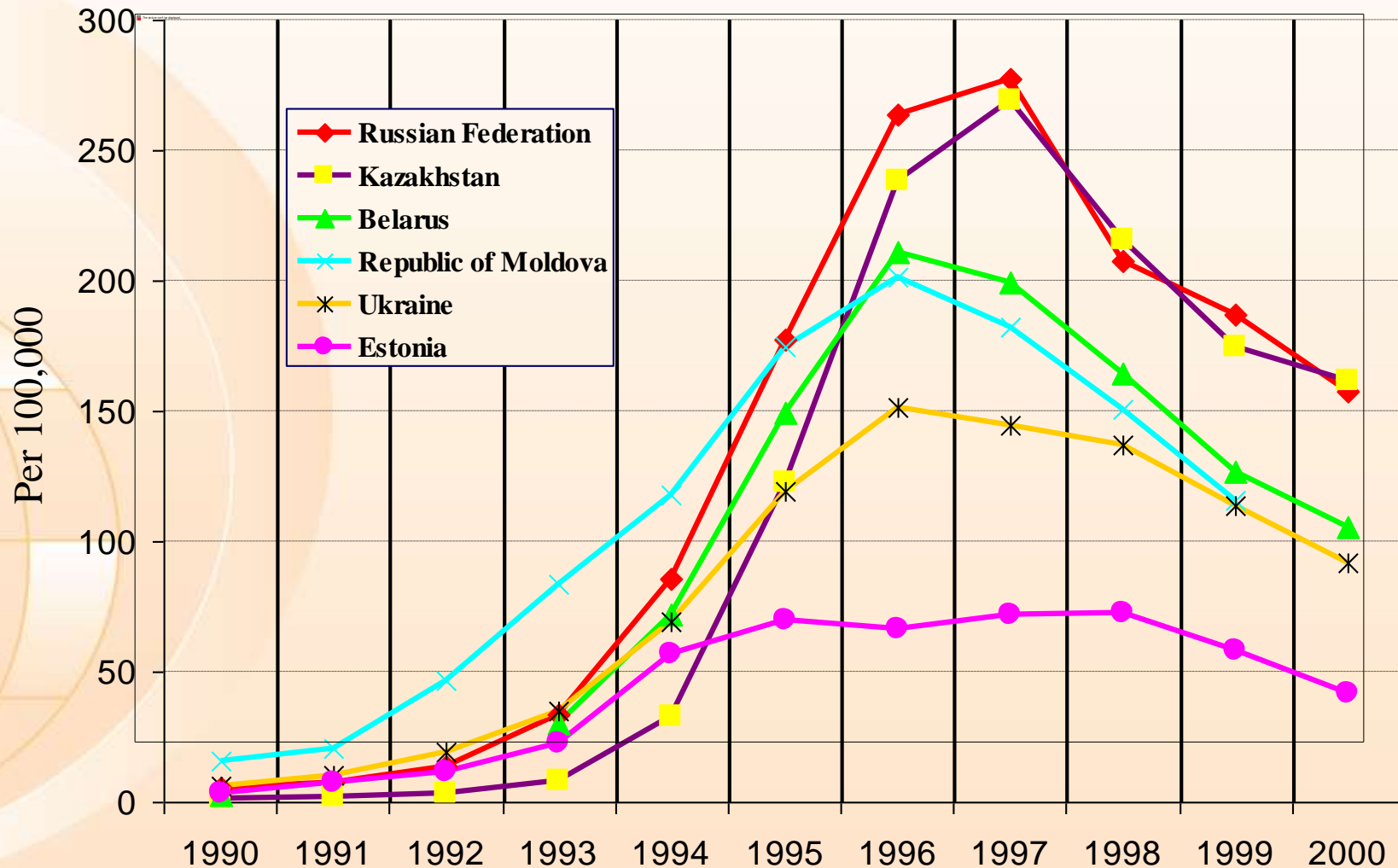
Incidence of syphilis in the WHO EURO Region 1999/2000

- rate per 100,000 population -



Incidence of syphilis in Belarus, Estonia, Kazakhstan, Moldova, Russia, Ukraine, 1990-2000

- rate per 100 000 -



The STI Epidemic, Eastern Europe and Central Asia

Late 1990s

Things are not the same anymore!

BUT....

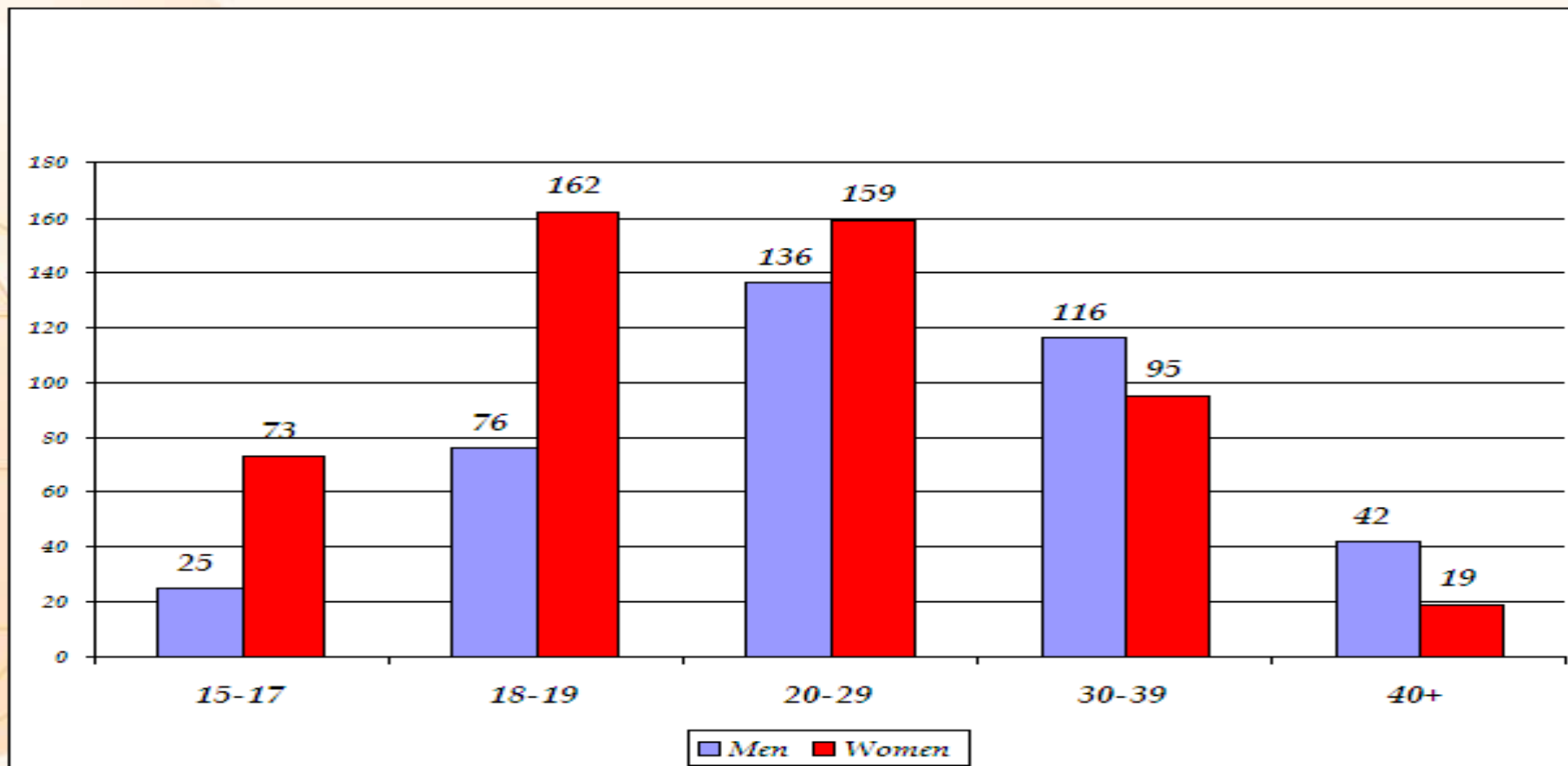
08_XXX_MM69

Prevalence and incidence of *Chlamydia trachomatis*, *Neisseria gonorrhoeae*, syphilis, and *Trichomonas vaginalis* in Kyrgyzstan (2005-2009)*

	2005		2006		2007		2008		2009	
	prevalence	Incident cases per 10000	prevalence	Incident cases per 10000	prevalence	Incident cases per 10000	prevalence	Incident cases per 10000	prevalence	Incident cases per 10000
Siphilis	2006	39,2	1691	32,7	1332	25,6	1165	22,9	1201	22,3
<i>Neisseria gonorrhoeae</i>	1414	27,6	1188	23,0	1170	22,5	1030	20,2	851	15,8
<i>Chlamydia trachomatis</i>	3412	66,7	3659	70,9	3312	63,6	2167	41,3	3382	62,8
<i>Trichomonas vaginalis</i>	7534	147,3	7020	135,9	6878	132,1	4831	92	6580	122,2

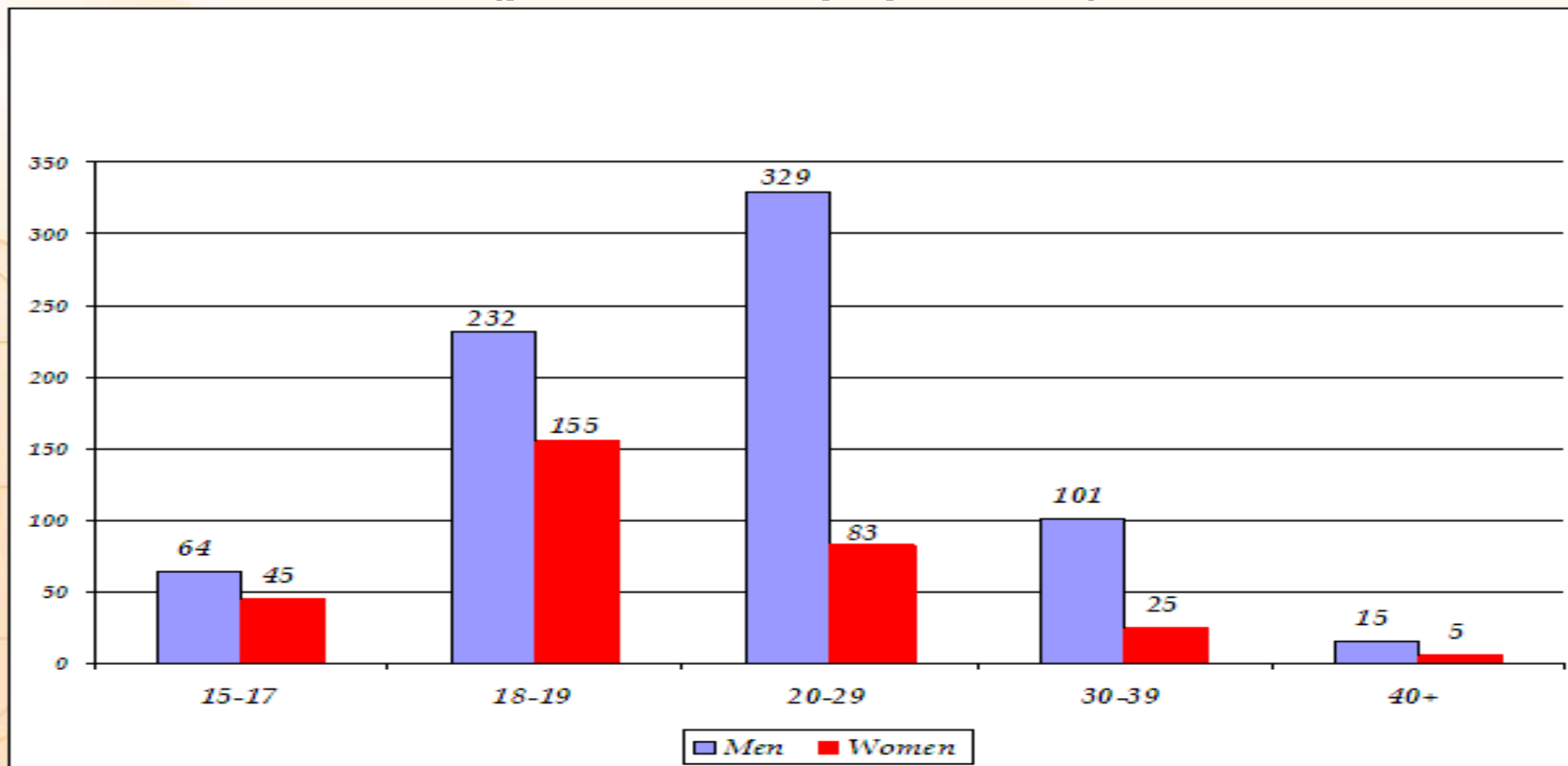
*Source : Ministry of Health, Kyrgyzstan.

Incidence rate of syphilis by age groups and sex in the Russian Federation (2009)* (per. 100,000 population)



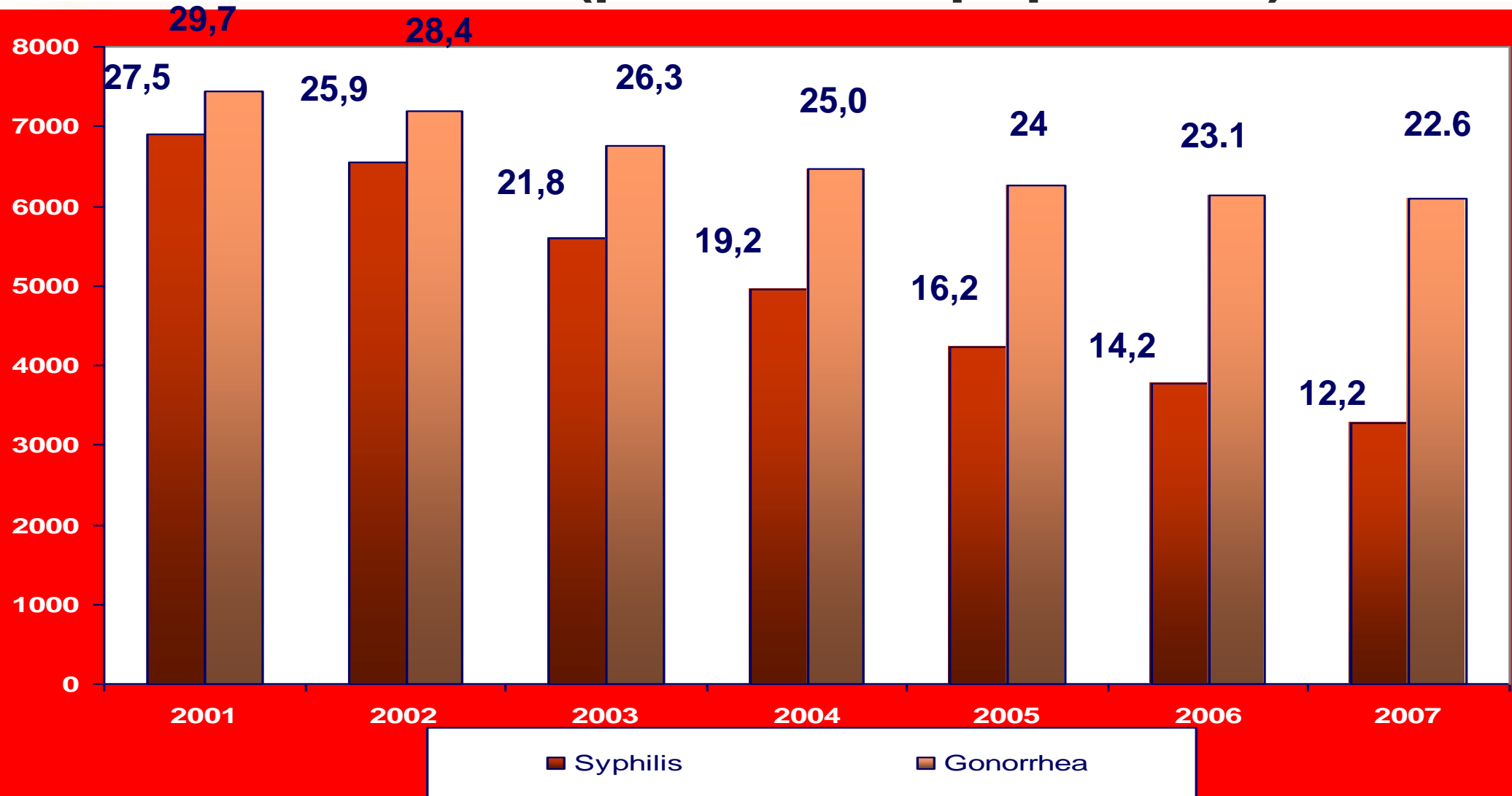
* Source: Здравоохранение в России. 2009: Стат.сб./Росстат. - М., 2009. - 365 с.

Incidence rate of gonorrhea by age groups and sex in the Russian Federation (2009)* (per. 100,000 population)



* Source: Здравоохранение в России. 2009: Стат.сб./Росстат. - М., 2009. - 365 с.

Estimated Incidence of syphilis and gonorrhea in Uzbekistan (per 100.000 population)*



*Source: Prof. Saidkasim Arifov. CURRENT STATUS OF STI SERVICES IN UZBEKISTAN. 24th Conference on Sexually transmitted infections and HIV/AIDS- IUSTI Europe 2008. September 4-6, 2008. Milan, Italy

Reported cases of *Chlamydia trachomatis*, *Neisseria gonorrhoeae*, syphilis, and *Trichomonas vaginalis* in Ukraine (1997-2007)*

	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007
Syphilis	147,1	138,4	113,9	91,5	77,1	63,8	54,7	48,7	42,0	34,3	29,9
<i>Neisseria gonorrhoeae</i>	60,1	55,6	55,4	52,7	50,6	46,5	42,8	40,8	38,6	33,0	29,8
<i>Chlamydia trachomatis</i>	31,7	48,1	47,3	67,5	70,1	61,5	65,8	68,9	72,5	78,1	75,7
<i>Trichomonas vaginalis</i>	284,3	312,7	304,6	330,8	329,1	300,3	290,2	279,3	272,2	251,0	245,3

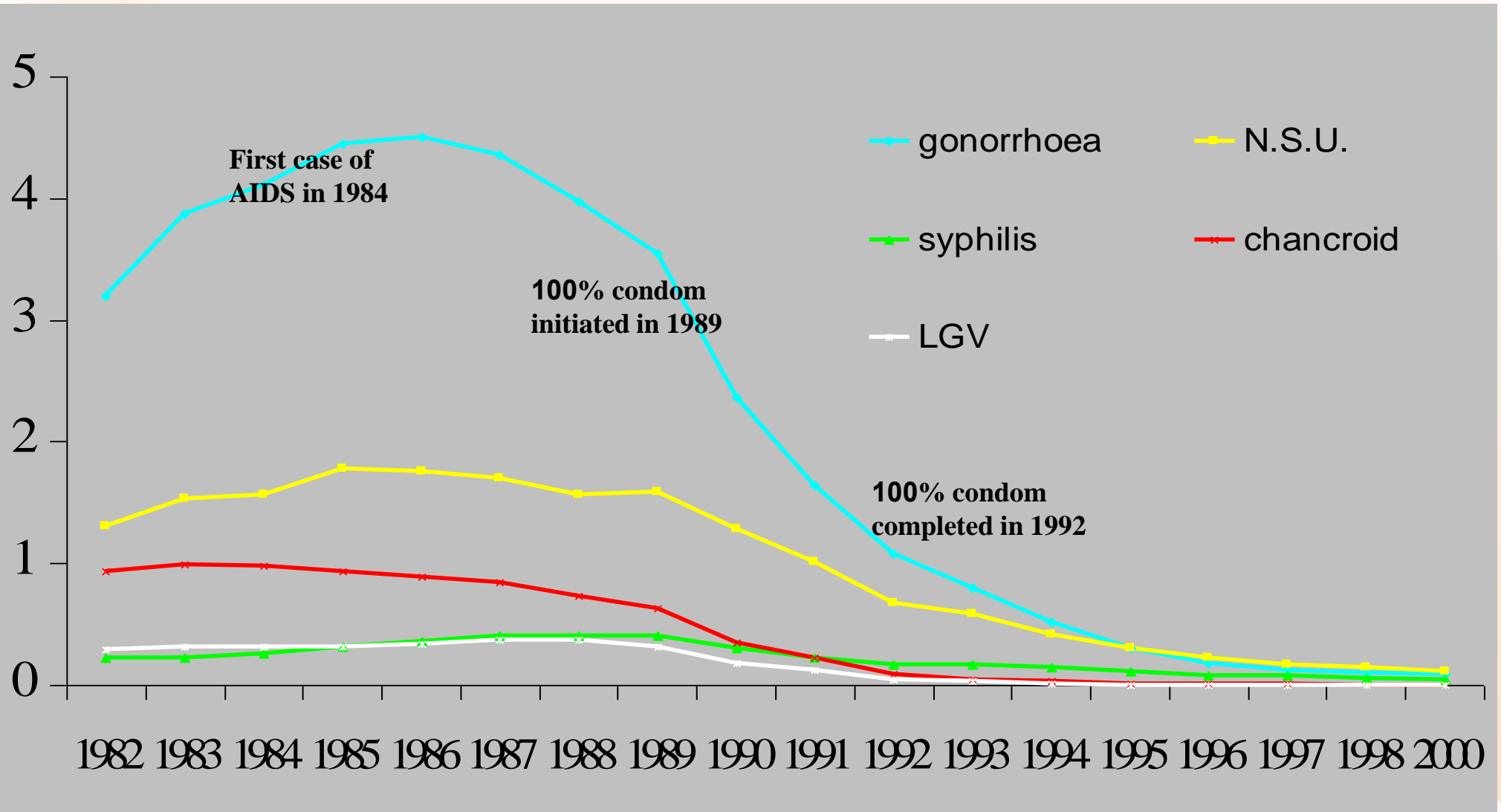
*Adapted from: Г. И. Мавров, А.Е. Нагорный, Г.П.Чинов. "ИНФЕКЦИИ, ПЕРЕДАЮЩИЕСЯ ПОЛОВЫМ ПУТЕМ И ПРОБЛЕМА СЕКСУАЛЬНОГО И РЕПРОДУКТИВНОГО ЗДОРОВЬЯ НАЦИИ". Клінічна імунологія, алергологія, інфектологія. 2010.- №1 (спецвипуск).- С. 5-14.

Thailand 100% Condom Use Programme

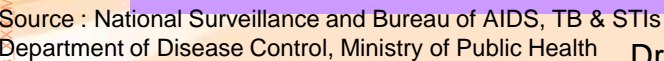


Dr Chavalit Mangkalaviraj, Bangrak Hospital, Bangkok Thailand. “ The HIV Epidemic – how Thailand cut back its STI rates in the light of the HIV epidemic” 16th International Against Sexually Infection, Bali, Indonesia May 4-6, 2010.

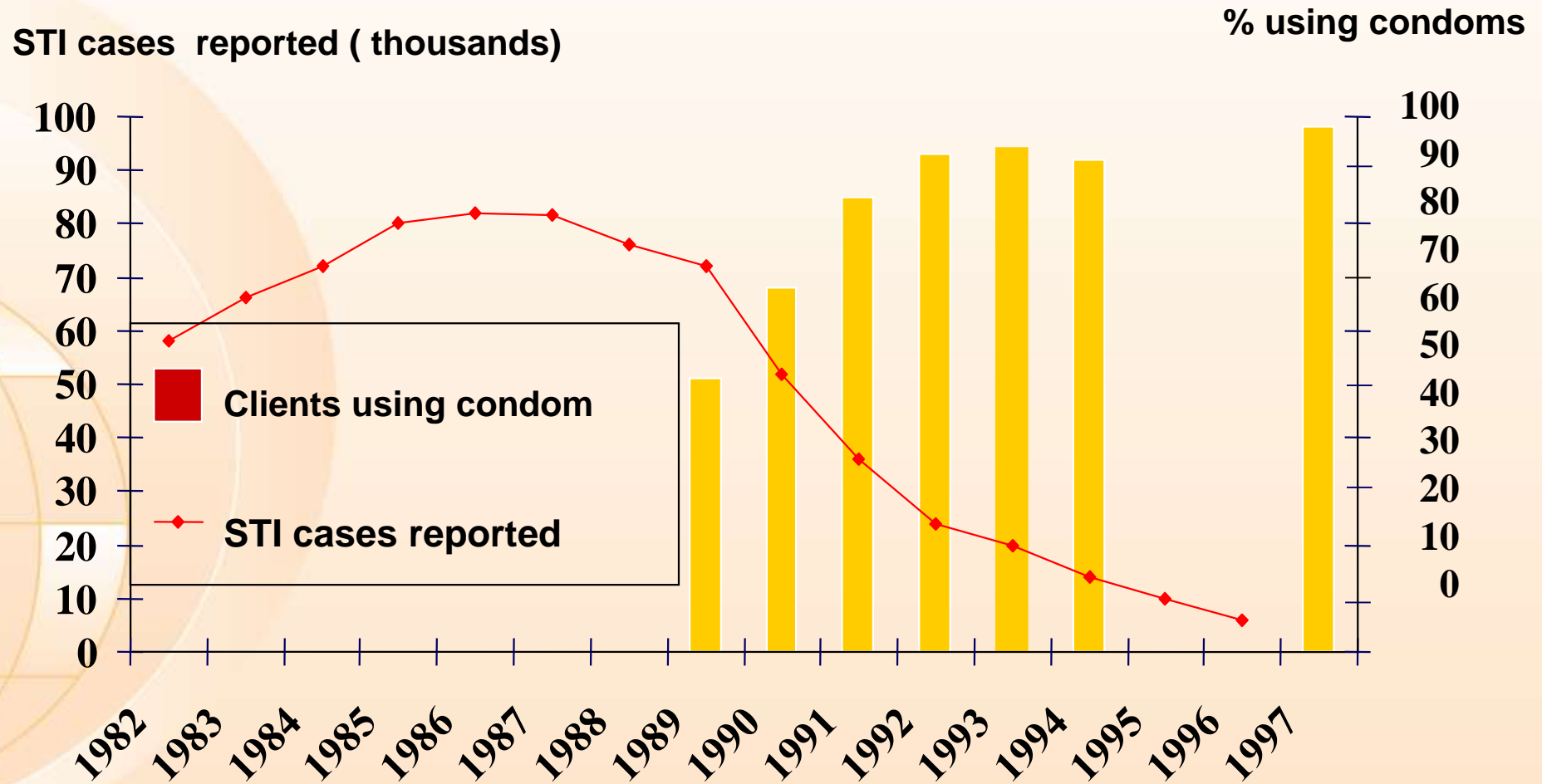
Incidence of STDs in Thailand (1982-2000)



De_Sc



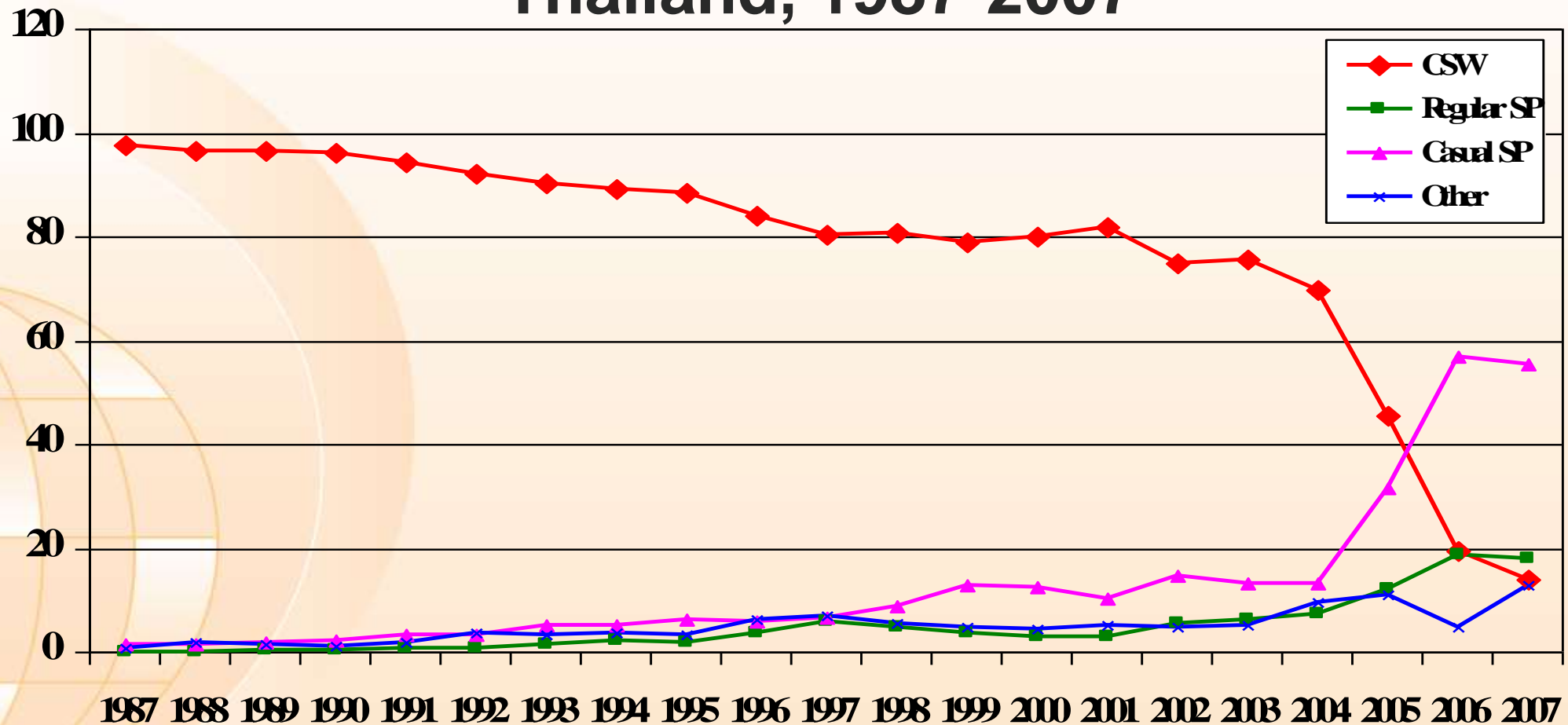
Clients Using Condoms and STI Cases Reported - Thailand



Source: Sentinel Serosurveillance, Division of Epidemiology, Ministry of Public Health.



Sources of infection in Male STDs patients Thailand, 1987-2007*

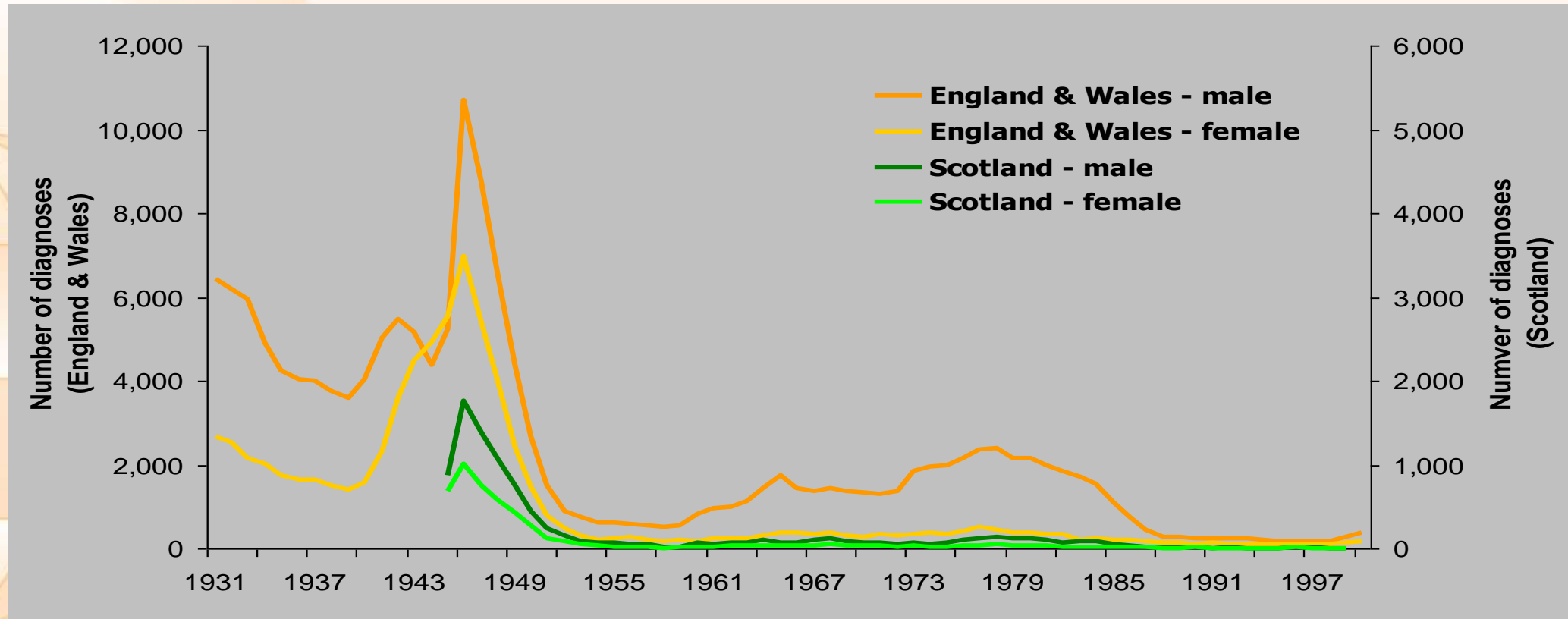


*Dr Chavalit Mangkalaviraj, Bangrak Hospital, Bangkok Thailand. "The HIV Epidemic – how Thailand cut back its STI rates in the light of the HIV epidemic" 16th International Against Sexually Infection, Bali, Indonesia May 4-6, 2010.

The STI Epidemic, Western Europe, North America and Australia

Whether we are **missing something**!?

Diagnoses of syphilis (primary, secondary and latent in the first 2 years of infection) seen in GUM clinics, England, Scotland# and Wales, 1931 to 2000*



Source: PHLS, UK

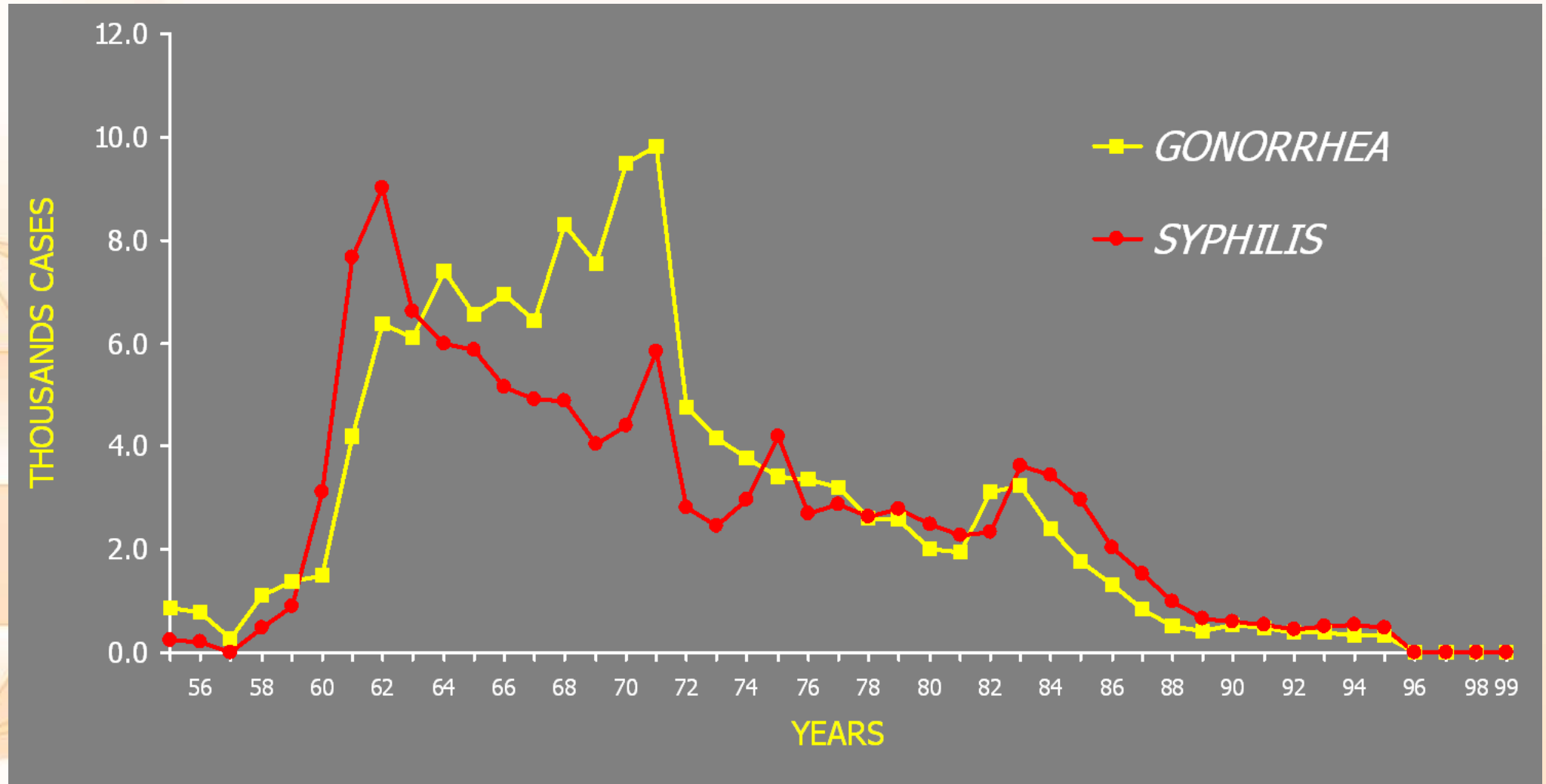


Equivalent Scottish data are not available prior to 1945 and for 2000

*As Northern Ireland data from the time period 1931 to 2000 are incomplete they have been excluded from this figure

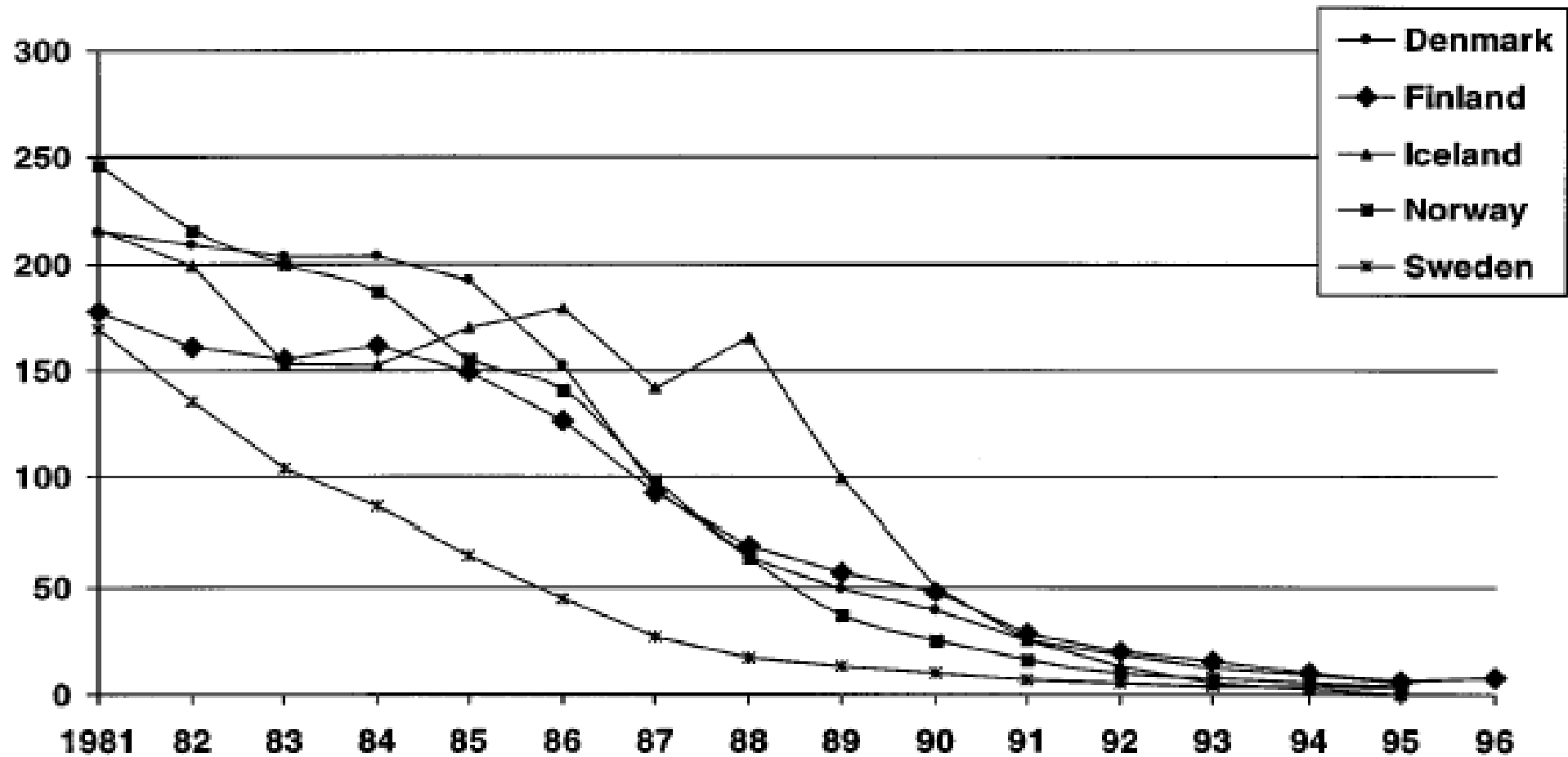
Gonorrhea and syphilis in Italy

Mandatory notifications, 1955-1999



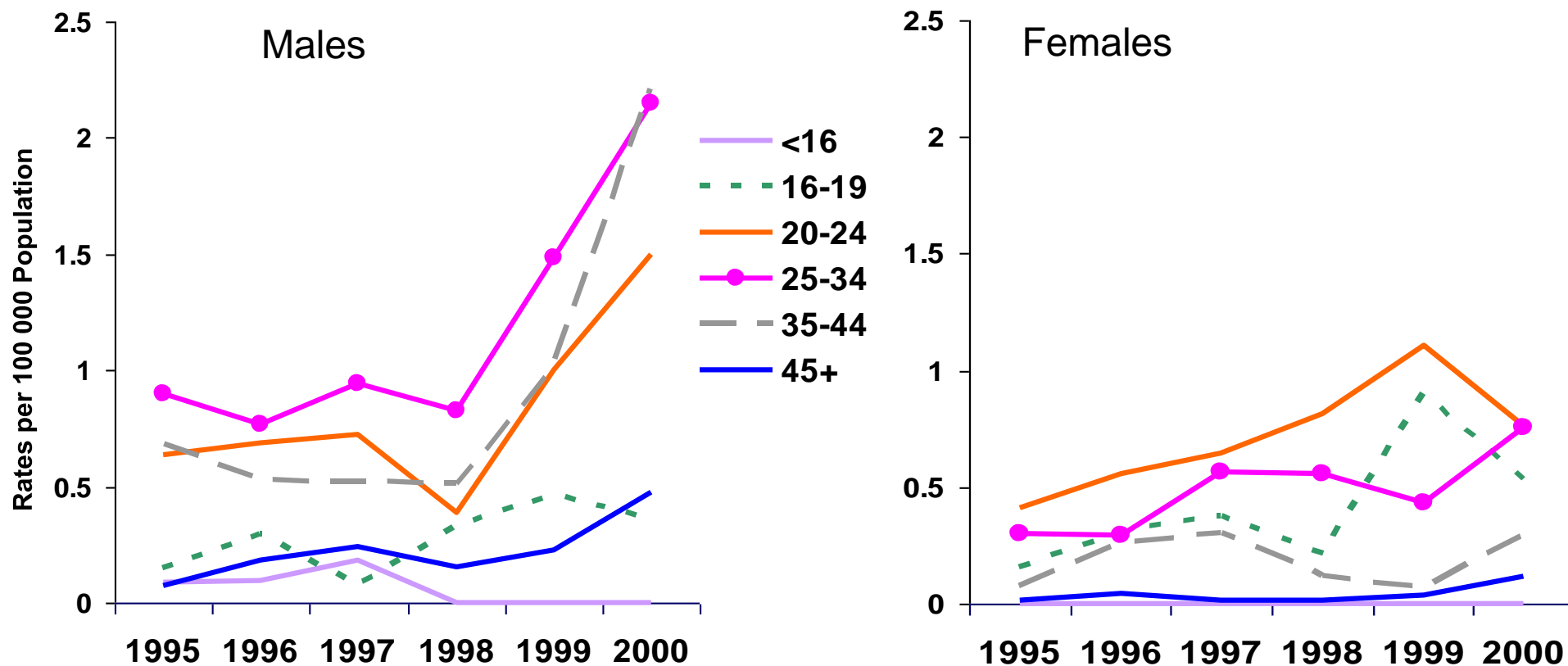
Source: Suligo et al.

Annual incidence of gonorrhoea per 100 000 population in Nordic countries (1981 – 1996)



Source: Adler, Meheus, *JEADV* 2000;14:370 - 377

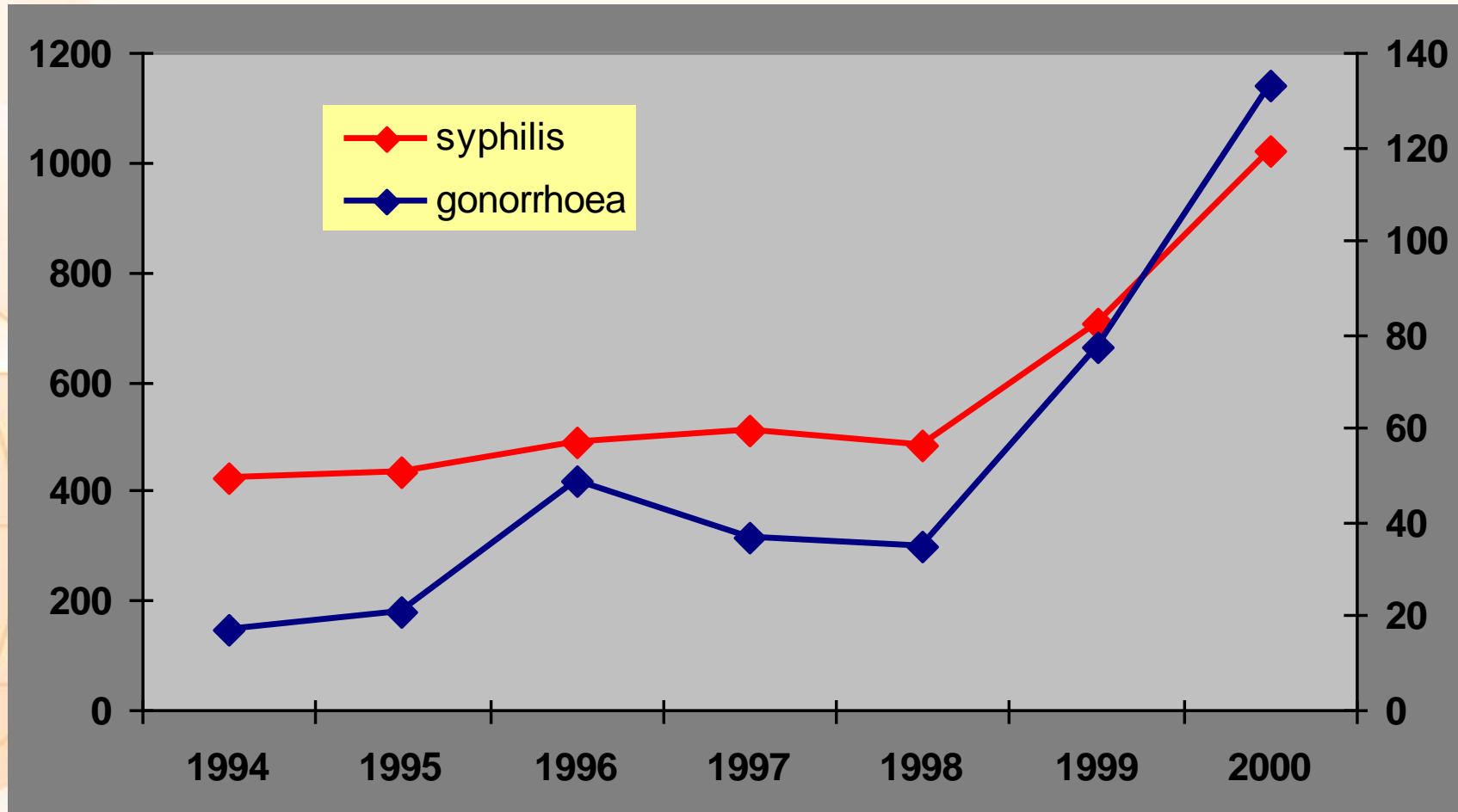
Diagnoses of infectious syphilis (primary and secondary) in GUM clinics by sex and age group, UK: 1995-2000*



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

Source: ESSTI/PHLS, UK

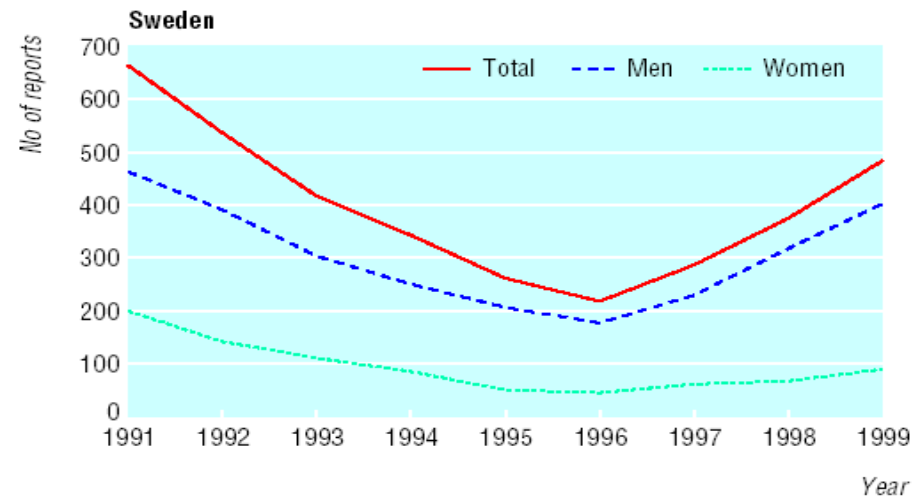
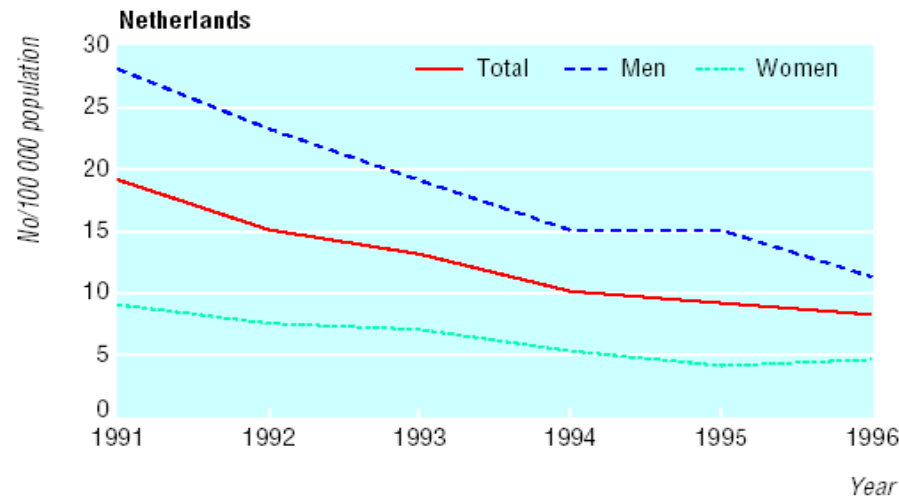
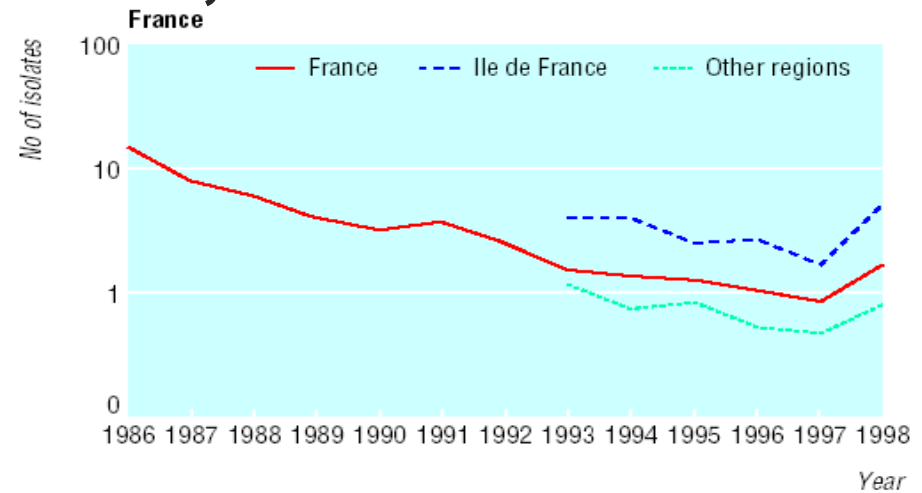
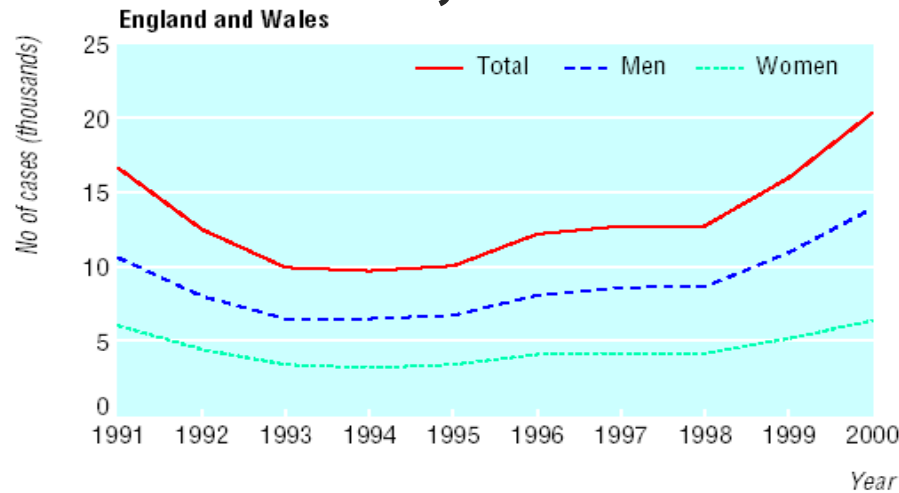
Netherlands: Gonorrhoea and syphilis, STD clinic (annual reports, GG&GD, Amsterdam).



GO: 1999: + 46%; MSM 59% heter 16% fem 66%; 2000: + 45%; 33% 56% 72%
Lues: 1999: + 120%; MSM 333% heter 54% fem 40%; 2000: + 63% (MSM 136%)

Source: ESSTI/PHLS, UK

Trends in gonorrhoea in England and Wales, France, the Netherlands, and Sweden

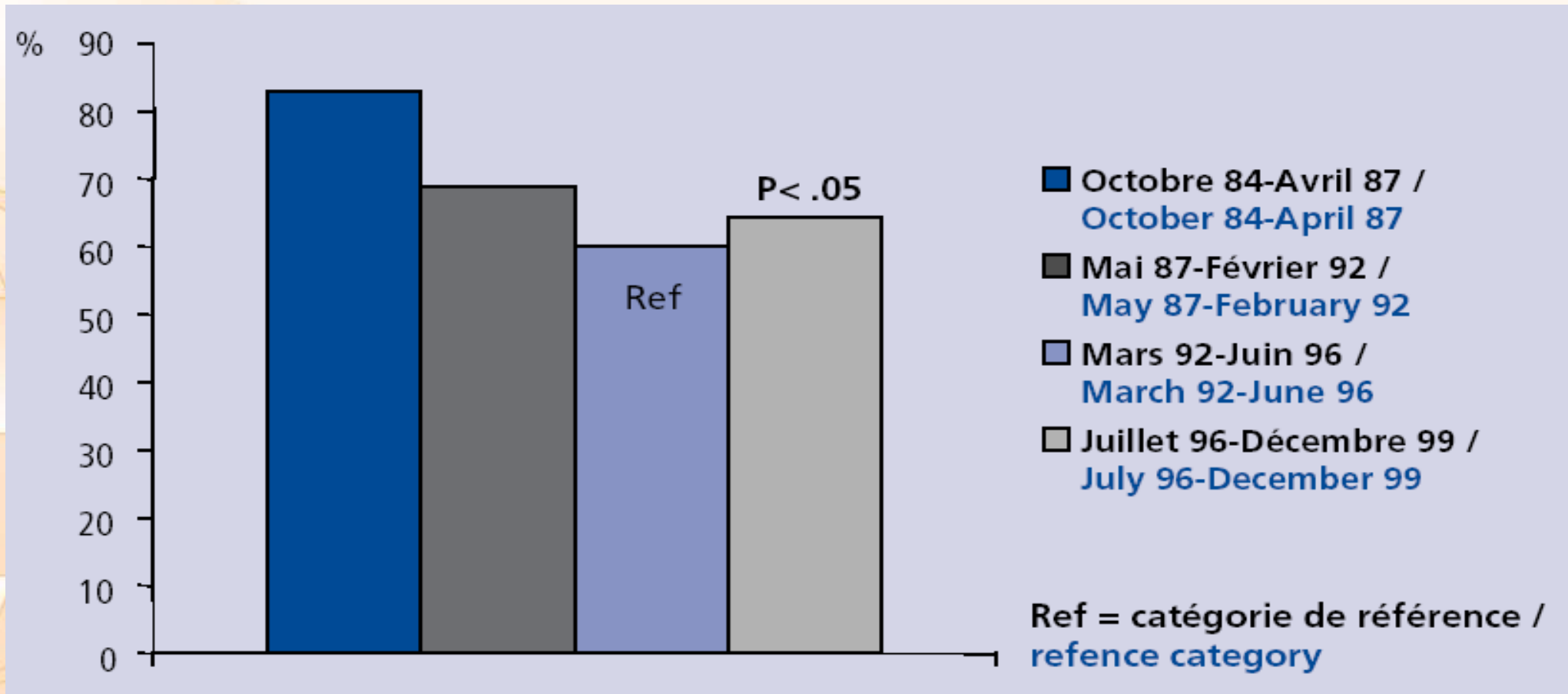


SOURCES:

England and Wales: cases of gonorrhoea seen in GUM clinics, 1991-2000; France: trends in gonococcal infections in RENAGO laboratories, 1991-1999; Netherlands: notified cases of gonorrhoea per 100 000 inhabitants, 1976; Sweden: number of clinically reported *Neisseria gonorrhoeae* cases, 1991-1999 (adapted from Smittskyddsinstitutet (Swedish Institute for Infectious Disease Control), *Smittsamma Sjukdomar* 1999, Stockholm: Smittskyddsinstitutet, 2000)

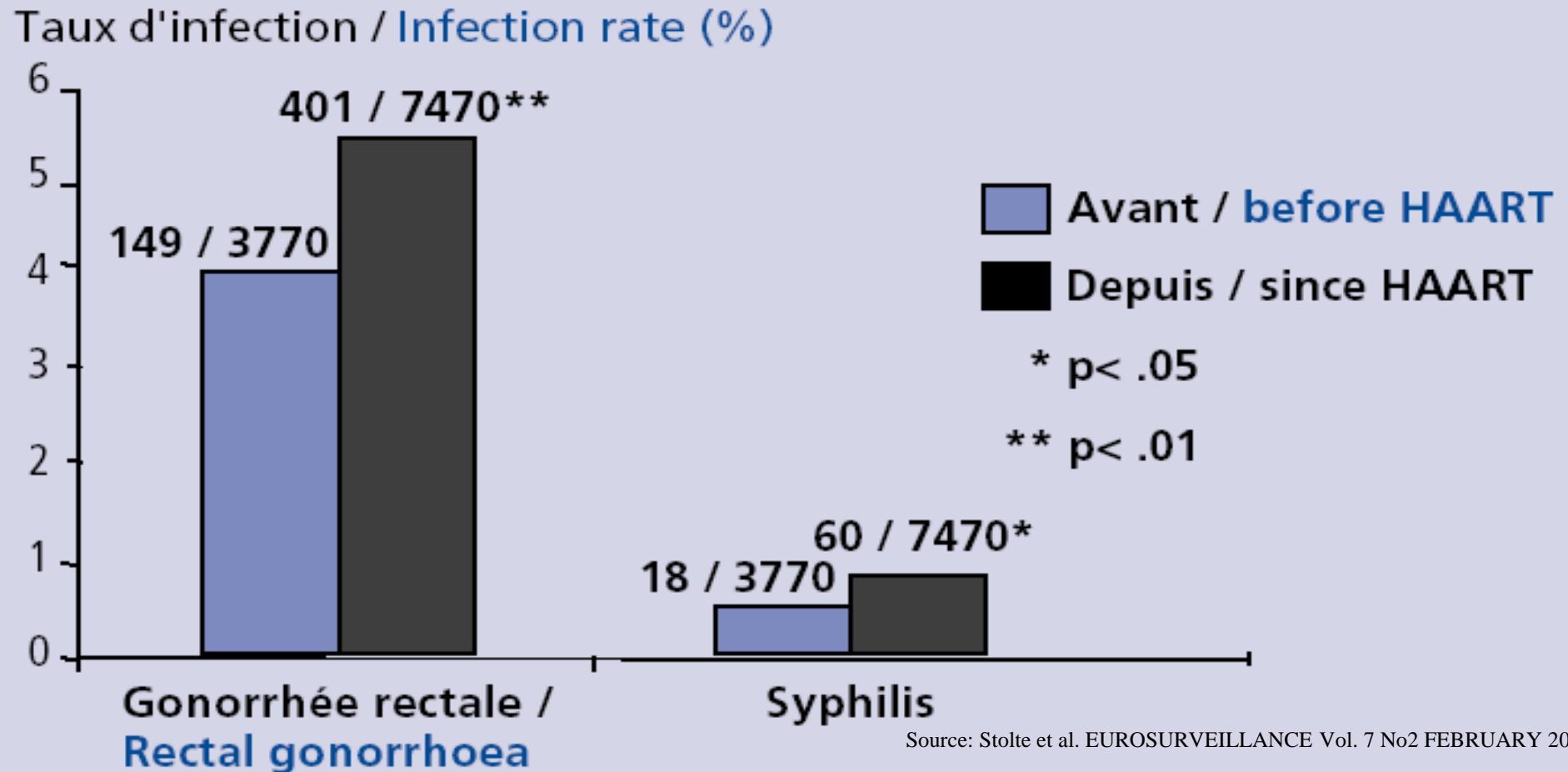
Source: Nicoll & Hamers, *BMJ* 2002;324:1324-7

Percentage of unprotected anal intercourse among HIV-negative young (< 35 years) homosexual men (n=877), Amsterdam, 1984-1999




Source: Stolte et al. EUROSURVEILLANCE Vol. 7 No2 FEBRUARY 2002

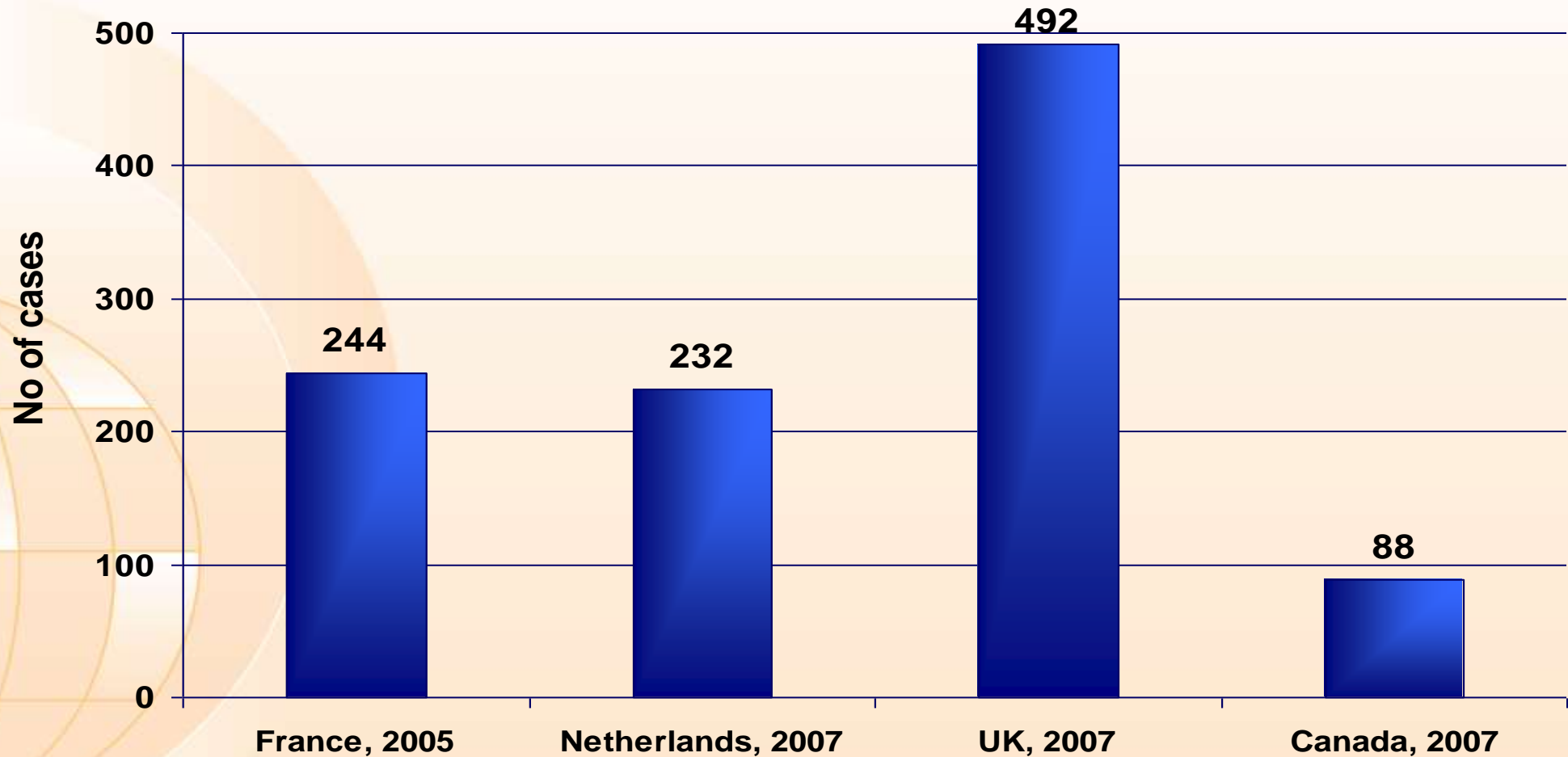
Relative numbers (infection rate) of rectal gonorrhoea and early syphilis diagnosed among homo- and bisexual men before and after the introduction of anti HIV therapies, Amsterdam STD outpatients clinic, 1994-1999



Source: Stolte et al. EUROSURVEILLANCE Vol. 7 No2 FEBRUARY 2002

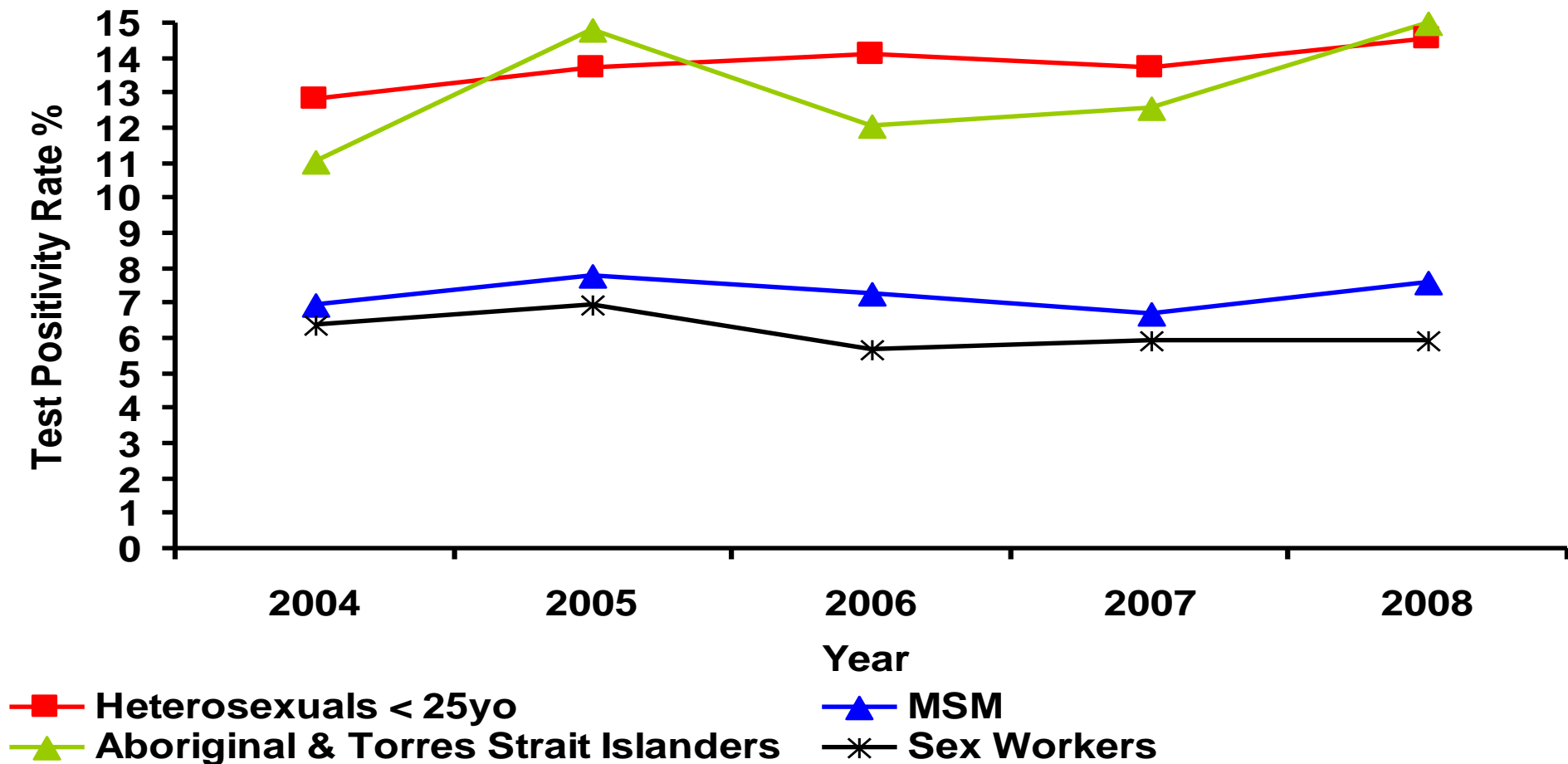
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- !
- Recent outbreaks of proctitis due to **Lymphogranuloma Venereum among men who have sex with men** in Western Europe, North America and Australia.

Number of LGV proctitis reported in Europe, North America, 2005-2007*



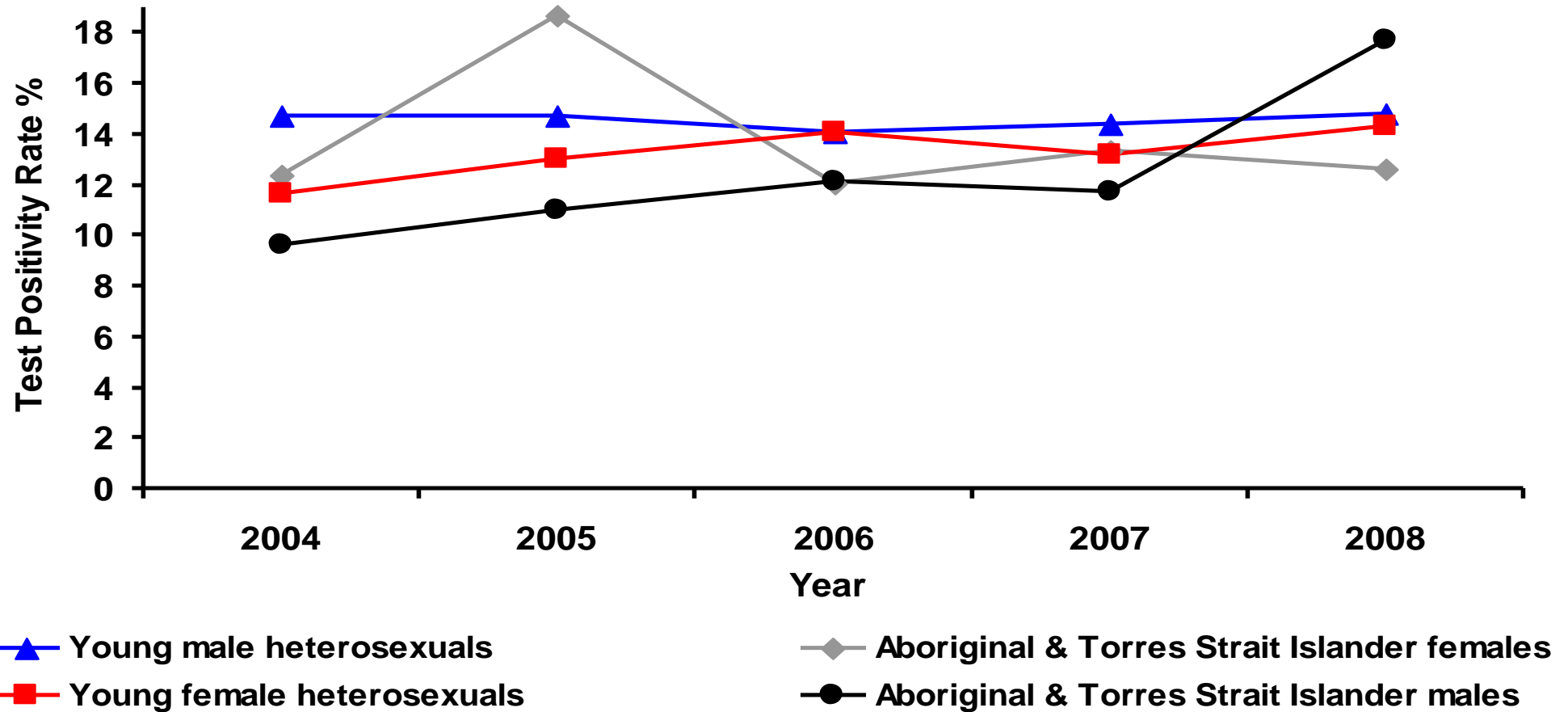
Martin-Iguacel R, et al. Lymphogranuloma venereum proctocolitis: a silent endemic disease in men who have sex with men in industrialised countries. Eur J Clin Microbiol Infect Dis. 2010 Aug;29(8):917-25

Chlamydia positivity rates, by priority population, Australia, 2004-2008*



*Prof Basil Donovan. National Centre in HIV Epidemiology and Clinical Research University of New South Wales; and Sydney Sexual Health Centre, Sydney Hospital. "CHLAMYDIA". 16th International Against Sexually Infection, Bali, Indonesia May 4-6, 2010.

Chlamydia positivity rates by priority population and sex, Australia, 2004-2008*



*Prof Basil Donovan. National Centre in HIV Epidemiology and Clinical Research University of New South Wales; and Sydney Sexual Health Centre, Sydney Hospital. "CHLAMYDIA". 16th International Against Sexually Infection, Bali, Indonesia May 4-6, 2010.

Characteristics of women with and without *Trichomonas vaginalis* (TV) by PCR*

- Australia, 2008 -

Characteristic	Women with TV n=17	Women without TV N=339	P Value**
Mean age (years)	33.4	30.7	0.221
Culturally and linguistically diverse***	11 (65%)	104 (31%)	0.003
Condoms always	2 (24%)	25 (22%)	0.892
>1 partner last 3 months	6 (35%)	95 (28%)	0.516
Commercial sex workers	5 (29%)	58 (17%)	0.195
Concomitant STI****	2 (12%)	24 (7%)	0.469
Signs and symptoms			
Dysuria	7 (41%)	59 (17%)	0.014
Vaginal discharge	11 (65%)	143 (42%)	0.067
Bacterial vaginosis*****	6 (35%)	79 (23%)	0.258

** p Values <0.05 are statistically significant.

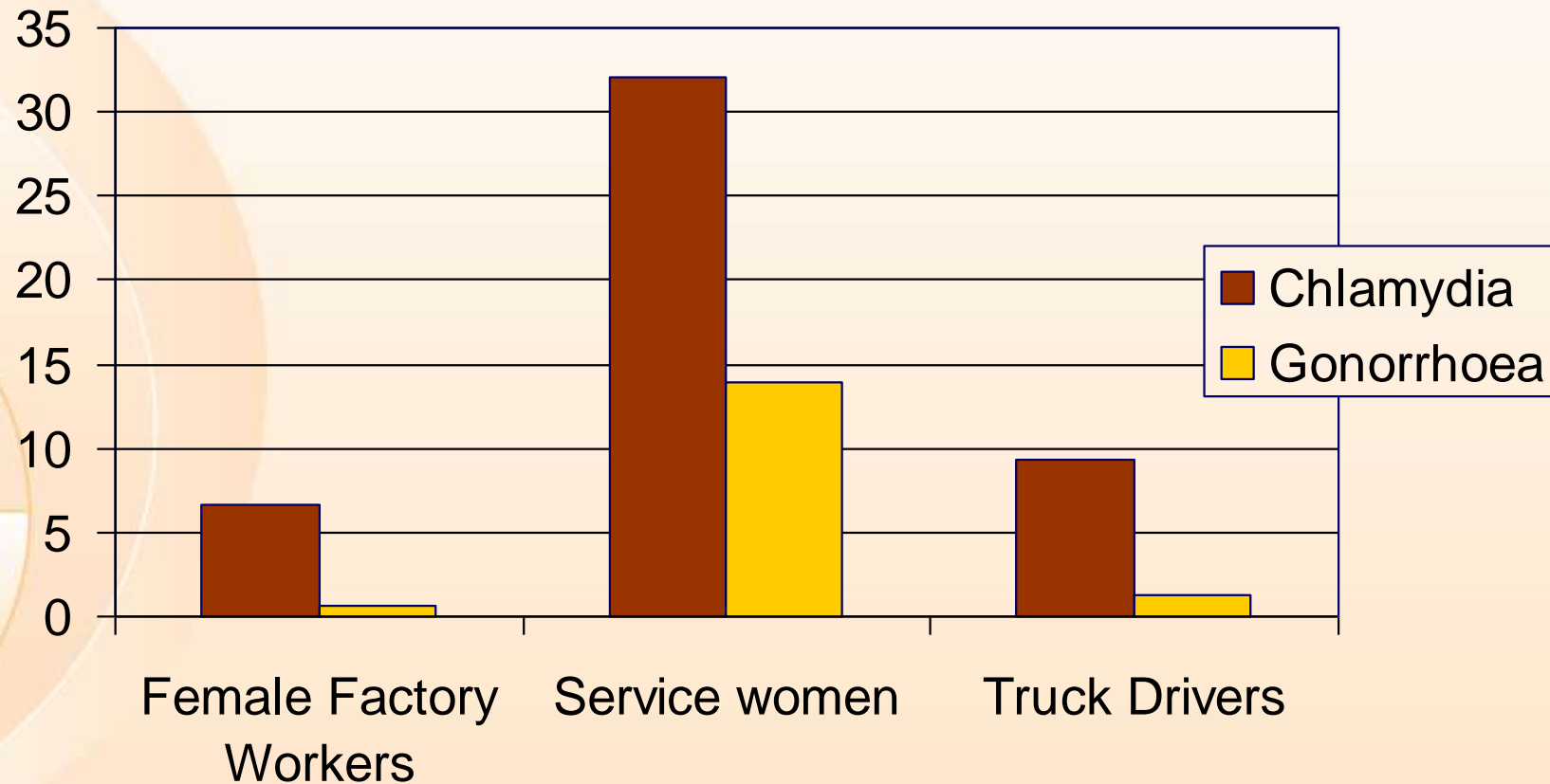
*** Defined as women identifying at clinic registration as preferring a language other than English, speaking a language other than English at home, or identifying a non-English ethnic background.

**** Concomitant chlamydia or gonorrhoea.

***** Defined by Nugent score on Gram stain of high vaginal swab.

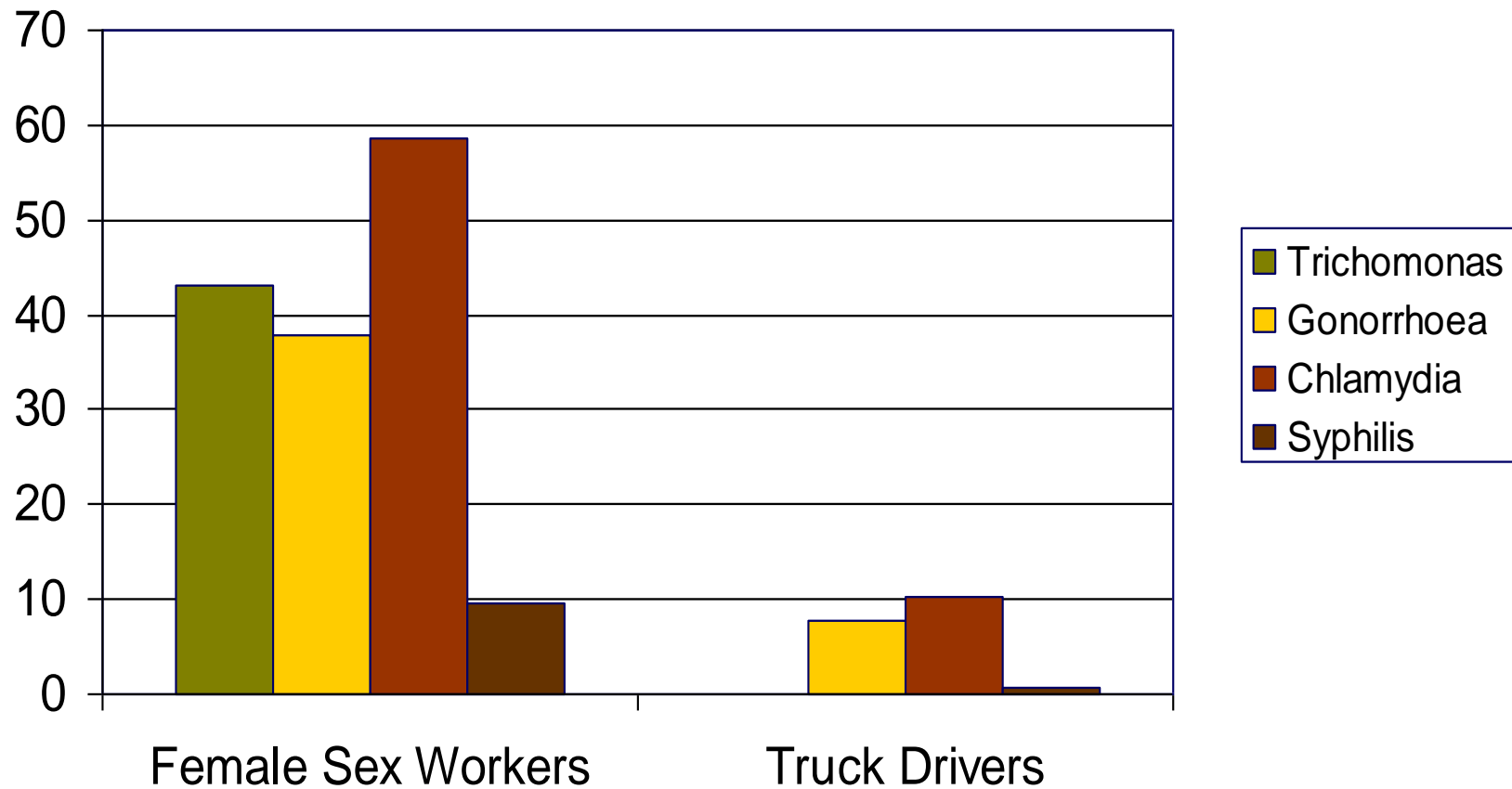
*Lusk MJ, et al., *Trichomonas vaginalis*: underdiagnosis in urban Australia could facilitate re-emergence, Sex Transm Infect. 2010 Jun;86(3):227-30. Epub 2009 Nov 1.

National level prevalence assessment studies: Lao People's Democratic Republic, 2001*



*Adapted from: HIV Surveillance Survey (HSS) and Sexually Transmitted Infection Period Prevalence Survey (SPPS)

National level prevalence assessment studies: People's Republic of China, 2000*



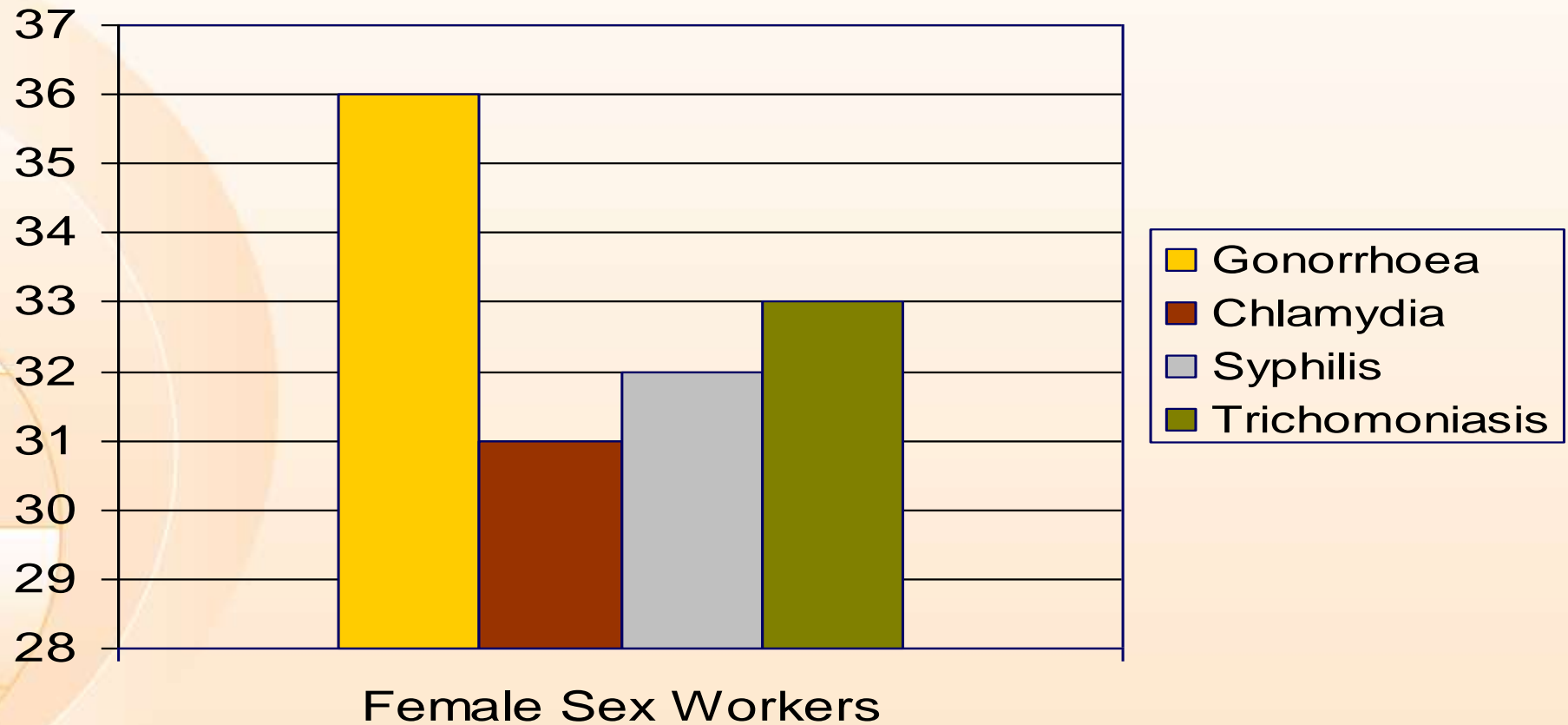
Adapted from: Prevalence survey of STIs among female Sex Workers and Truck Drivers in China 1999-2000

National level prevalence assessment studies: Cambodia, 2002*



*Adapted from: Low prevalence of STIs in Cambodia supports recent behavioral and HIV prevalence trends, 2002

Cross-sectional prevalence assessment studies: Papua New Guinea, 2000*



*Source: Adapted from Consensus Report on STI, HIV and AIDS Epidemiology, 2000

Peru's Ministry of Health HIV and STD Control Programme: Community Randomized Trial, 2002.

- Objective: To assess the prevalence of STD among young adults of mid-sized Peruvian cities.
- Methods: Cross-sectional survey. Household random sample of 18 to 29 year old resident of 24 Peruvian cities.
- Demographic and risk behaviour questionnaires
- STI assessed: Syphilis, HIV, Gonorrhoea and Chlamydia infection in men and women and *T. vaginalis* infection in women.
- Results:

	Chlamydia (%)		Gonorrhoea (%)		Trichomonas (%)	Syphilis (%)
	<i>Urine</i>	<i>Swabs</i>	<i>Urine</i>	<i>Swabs</i>	<i>Swabs</i>	<i>Blood</i>
Female	2.7	6.8	0.2	0.8	5.2	0-3.8
Male	4		0.3			0-3.4

STI trends and risks in Eastern Mediterranean and North Africa, 2003

- 74 000 STIS reported in 2002 from 5 countries of the Region
- Most reported STIs are Trichomoniasis, gonorrhoea and syphilis.
- Observed increased rate of syphilis among pregnant women in Bahrain from 0.25% in 2001 to 0.35% in 2002
- In Pakistan 78% of women are reported to have vaginal pathogenic discharge, 29.4% had pelvic tenderness, 17% had cervical ulcers, 4.5% had abdominal tenderness and 2.9% had vesicles on the genitalia

Source: Abu Dhabi Meeting, July 2003

Never ending story?

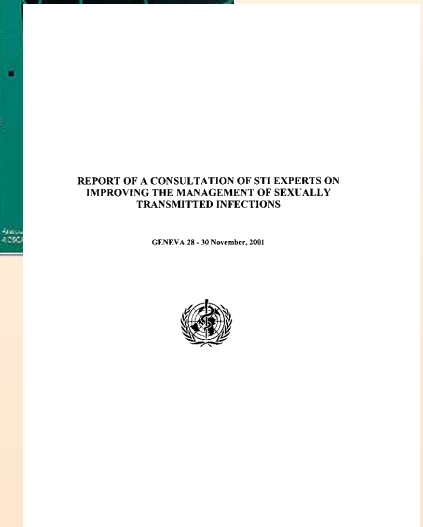
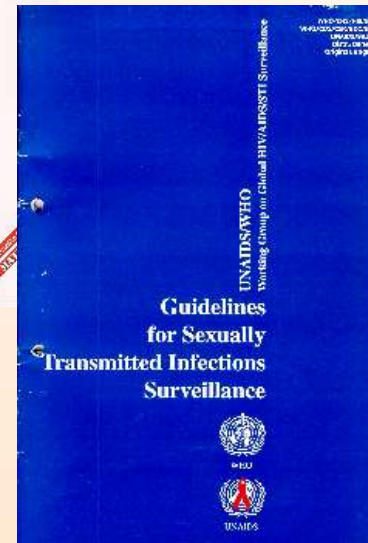
The past started



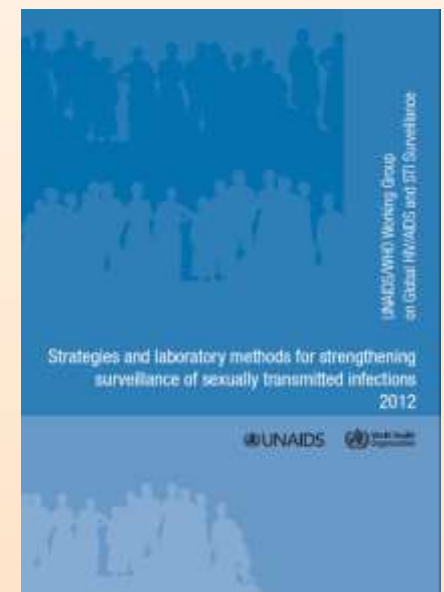
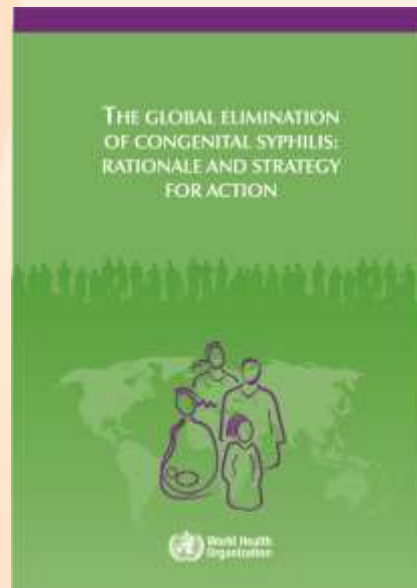
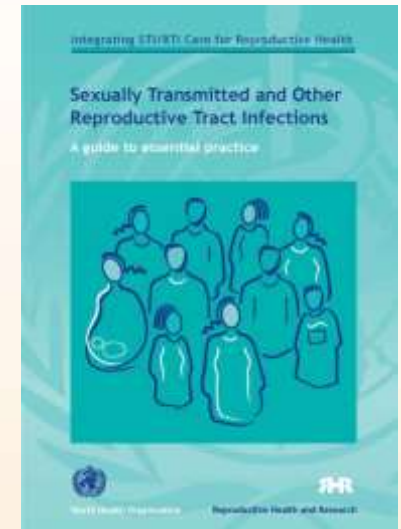
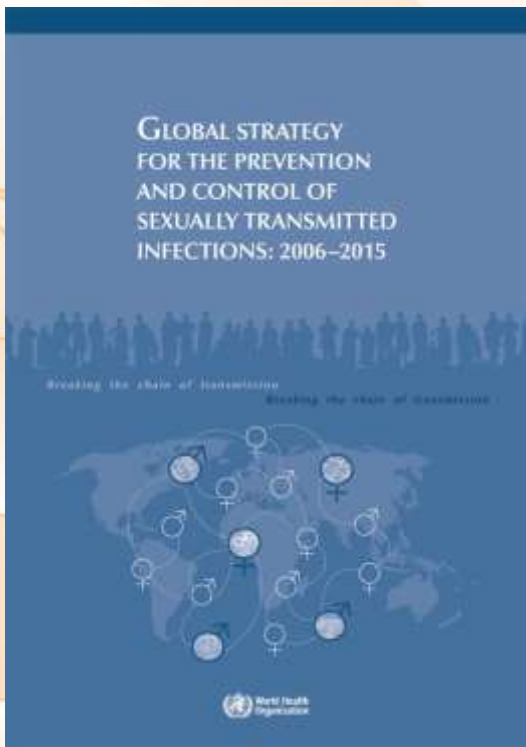
The present is working



Tradition exits



Progress is made



Acknowledgements

Drs Nathalie Broutet, Francis Ndowa and Igor Toskin, *Controlling Sexually Transmitted and Reproductive Tract Infections (STI) Team, Department of Reproductive Health & Research (RHR), World Health Organization*

Dr Antonio Carlos Gerbase, Department of HIV/AIDS, *Prevention in the Health Sector, World Health Organization*