

Global burden of Sexually Transmitted Diseases (excluding HIV) in the year 2000

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Introduction

Sexually transmitted diseases affect millions of people each year and cause considerable disease burden. The Global Burden of Disease Study (GBD) 1990 (1) estimated that over 24 million DALYs were lost due to syphilis, gonorrhoea and chlamydia alone. This chapter presents the methods and results for estimating the global burden of these diseases in the year 2000.

1. Case and sequelae definitions

The case definition and sequelae used are given in Table 1.1 below. *Trichomonas* infections are not considered in the GBD because of a) the low rate of symptomatic infections, b) absence of systemic complications, c) the self-limited nature of the disease and d) its short duration.

Table 1.1 Case definitions for Sexually Transmitted Diseases

Cause category	GBD 2000 Code	ICD 9 codes	ICD 10 codes
Syphilis	W005	090-097	A50-A53
Chlamydia	W006	N/A	A55-A56
Gonorrhoea	W007	098	A54

Table 1.2 Case and sequelae definitions for Sexually Transmitted Diseases

Case/Sequela	Definition
Syphilis	
Congenital syphilis	Syphilis in the newborn due to maternal-fetal transmission in utero
Low birth weight	Birthweight of less than 2500 g
Primary	Initial infection (acute and chronic infection with <i>Treponema pallidum</i>) in adults resulting in primary chancre at the site of inoculation
Secondary	Disseminated disease, which appears 2-8 weeks after the primary stage and usually marked by a rash
Tertiary -- Cardiovascular	Late stage of the disease characterised by chronic inflammation and necrosis of the arteries and heart, particularly the aorta.
Tertiary -- Gummas	Late stage of the disease with painless nodules in potentially all organs, but mainly in skeletal system, skin and mucosae.
Tertiary -- Neurologic	Late stage of the disease with varied neurological manifestations
Chlamydia	
Ophthalmia neonatorum	Purulent conjunctivitis in infants less than 30 days, which was acquired during passage through an infected birth canal
Low birth weight	Birthweight of less than 2500 g
Corneal scar -- Blindness	Permanent corneal scar resulting from corneal ulceration due to infection with <i>Chlamydia trachomatis</i> and leading to blindness
Corneal scar -- Low vision	Permanent corneal scar resulting from corneal ulceration due to infection with <i>Chlamydia trachomatis</i> and to low vision
Cervicitis	Inflammation of the cervix uteri due to <i>Chlamydia trachomatis</i>
Neonatal pneumonia	Pneumonia in infants due to infection with <i>Chlamydia</i> .
Pelvic inflammatory disease	Inflammation of the adnexa of the uterus (includes endometritis)
Ectopic pregnancy	Pregnancy located outside the uterus
Tubo-ovarian abscess	Abscess located in the fallopian tubes or ovaries
Chronic pelvic pain	Chronic pelvic pain following reproductive tract infection with <i>Chlamydia</i>
Infertility	Total of infertility due to chlamydia-related PID and ectopic pregnancy in women and epididymitis in men.
Symptomatic urethritis	Inflammation of the urethra causing symptoms including dysuria and/or haematuria
Epididymitis	Inflammation of the sperm ducts
Stricture	Narrowing of the urethra due to urethritis
Gonorrhoea	
Ophthalmia neonatorum	Purulent conjunctivitis in infants less than 30 days, which was acquired during passage through an infected birth canal
Low birth weight	Birthweight of less than 2500 g
Corneal scar -- Blindness	Permanent corneal scar resulting from corneal ulceration due to infection with <i>Chlamydia trachomatis</i> and leading to blindness
Corneal scar -- Low vision	Permanent corneal scar resulting from corneal ulceration due to infection with <i>Chlamydia trachomatis</i> and to low vision
Cervicitis	Inflammation of the cervix uteri due to <i>Chlamydia trachomatis</i>
Pelvic inflammatory	Inflammation of the adnexa of the uterus (includes endometritis)

disease

Ectopic pregnancy	Pregnancy located outside the uterus
Tubo-ovarian abscess	Abscess located in the fallopian tubes or ovaries
Chronic pelvic pain	Chronic pelvic pain following reproductive tract infection with Chlamydia
Infertility	Total of infertility due to chlamydia-related PID and ectopic pregnancy in women and epididymitis in men.
Symptomatic urethritis	Inflammation of the urethra causing symptoms including dysuria and/or haematuria
Epididymitis	Inflammation of the sperm ducts
Stricture	Narrowing of the urethra due to urethritis

2. Population prevalence and incidence studies

Over 300 community-based and ante-natal care based prevalence and incidence studies of pregnant women were used to generate region-specific estimates of prevalence of syphilis, chlamydia and gonorrhoea. The methodology is described in detail elsewhere (2,3) and was used for the update of the literature to the year 2000.

3. Disease model for Sexually Transmitted Diseases

Syphilis in adults and infants were considered separately. The diagram below shows the disease model for syphilis in adults in the year 2000 (Figure 3.1). Gummas and cardiovascular complications of syphilis, which were estimated in the GBD 1990, were excluded as they are considered no longer prevalent by over 40 experts in the field who were consulted.

Syphilis (adults) - 2000

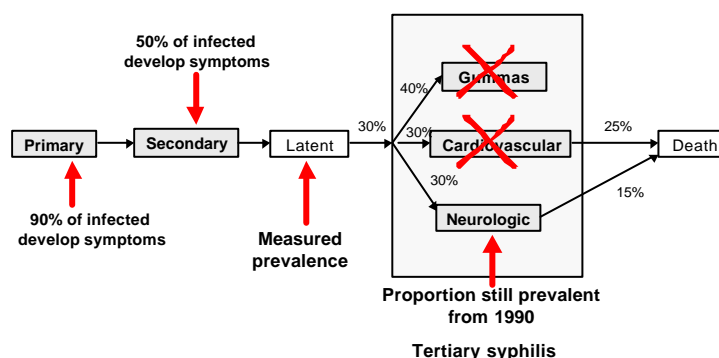
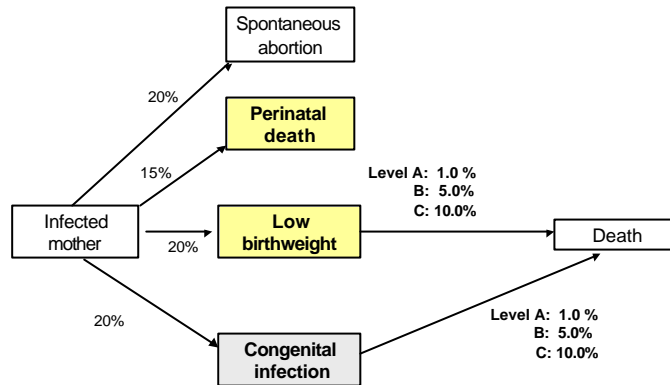


Figure 3.1. Adult syphilis disease model.

(The **red crosses** indicate the sequelae excluded from the GBD 2000 estimation)

Syphilis (infants)



YLD calculated for boxes with bold outline and grey shading.

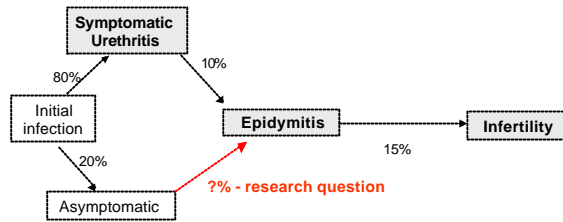
The following model was applied for syphilis in infancy (Figure 3.2):

Figure 3.2. Infant syphilis disease model.

Figure 3.3. Female chlamydia disease model

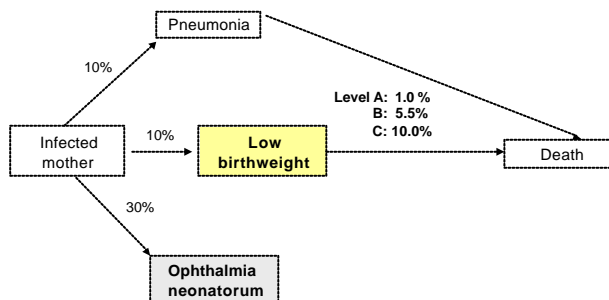
Chlamydia (♀)

Chlamydia (♀)



YLD calculated for boxes with bold outline and grey shading.

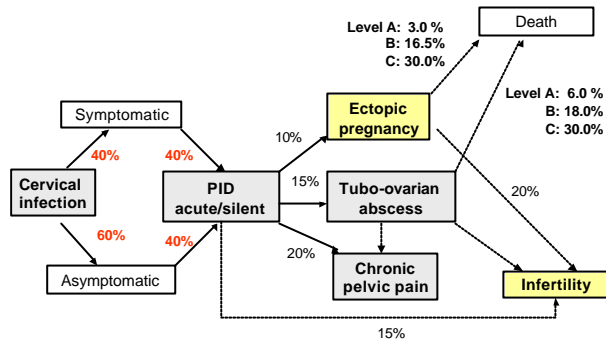
Chlamydia (infants)



YLD calculated for boxes with bold outline and grey shading.

Figure 3.5. Infant chlamydia disease model

Gonorrhoea (♀)



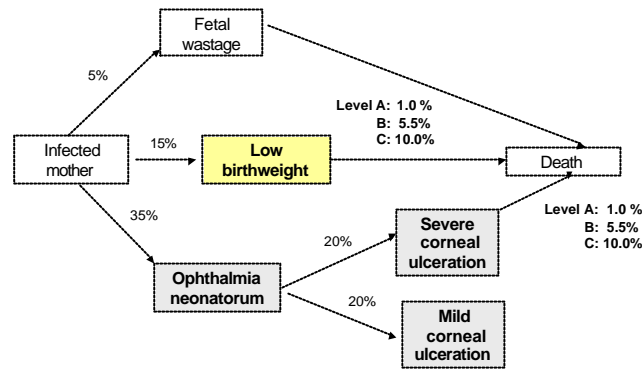
YLD calculated for boxes with bold outline and grey shading.

Figure 3.6. Female gonorrhoea disease model

Figure 3.7. Male gonorrhoea disease model

Gonorrhoea (♀)

Gonorrhoea (infants)



YLD calculated for boxes with bold outline and grey shading.

Figure 3.8. Infant gonorrhoea disease model

The tables below give more detail about the assumptions shown in the disease model diagrams.

Table 3.1. Disease model assumptions

Definitions	As above
Prevalence	Prevalence from community based studies in pregnant women (for details, see reference list)
Mortality	The assumptions used for mortality are highlighted in Table 4.1
Other assumptions	<ul style="list-style-type: none"> Incidence was estimated using the formula: $\frac{P}{1-P} \times D$ Duration of infection: See Table 3.2 Proportion of cases treated: Depending on level of health care (see Table 3.4)
Data	Community based prevalence studies as indicated on reference list.

The estimated average duration of infection (years) varied according to causative organism (4) and are displayed below. The figures shown in black give the assumptions used for the GBD 1990 study, while those in red are the revised figures after expert consultation.

Table 3.2. Estimated average duration (years) of infection for adults according to level of health care (GBD 2000 figures highlighted in red)

		Levels of health care					
Disease	Sex	A		B		C	
Gonorrhoea	Male	0.12	0.12	0.23	0.23	0.35	0.35
	Female	0.30	0.30	0.37	0.37	0.44	0.44
Chlamydia	Male	0.39	0.39	0.63	0.63	0.92	0.92
	Female	0.91	0.96	1.03	1.06	1.15	1.16
Syphilis	Male	0.48	0.48	1.28	1.28	2.63	2.63
	Female	0.48	0.48	1.28	1.28	2.63	2.63

Regions were grouped according to level of health care as shown in Table 3.3 (4).

Table 3.3. Level of health care according to regions of the world.

Level A (High & easy access)	Level B (mixed with some high in urban areas)	Level C mostly low)
EME	FSE LAC MEC China	SSA OAI India

The proportion of infected treated was also grouped according to the level of health care available (4). This is shown in Table 3.4 below.

Table 3.4. Estimated proportion of infected treated according to levels of health care.

		Levels of health care		
Disease		A	B	C
Gonorrhoea	Male	0.9	0.65	0.35
	Female	0.85	0.55	0.25
Chlamydia	Male	0.9	0.65	0.35
	Female	0.85	0.55	0.25
Primary Syphilis	Symptomatic	0.85	0.6	0.35
	Asymptomatic	0.00	0.00	0.00
Secondary Syphilis	Symptomatic	0.85	0.6	0.35
	Asymptomatic	0.00	0.00	0.00
Latent		0.95	0.85	0.75

These proportions are consistent with the assumptions made in the GBD 1990 (4). A round of expert consultation did not produce any new evidence which gave reason to change these proportions.

Table 1.2 has listed the sequelae for which DALYs were estimated in the GBD 2000. There are minor differences when compared with the GBD 1990, which are listed below. The results from a literature review and expert consensus guided the decisions to remove the sequelae highlighted in red from the list (Table 3.5).

Table 3.5. GBD 2000 sequelae (those removed from the original 1990 list are highlighted in red).

Sequela	Chlamydia	Gonorrhoea	Syphilis
Ophthalmia neonatorum	✓	✓	
Low birthweight	✓	✓	✓
Corneal scar (blindness)	✓	✓	
Corneal scar (low vision)	✓	✓	
Cervicitis	✓	✓	
Neonatal pneumonia	✓		
PID	✓	✓	
Ectopic pregnancy	✓	✓	
Tubo-ovarian abscess	✓	✓	
Chronic pelvic pain (↓)	✓	✓	
Infertility	✓	✓	
Symptomatic urethritis (↓)	✓	✓	
Epididymitis	✓	✓	
Urethral stricture (↓)	✓	✓	

4. Mortality and case fatality

The sources of mortality in the three sexually transmitted diseases shown here are described in detail elsewhere (4). The table below gives a summary of these assumptions. The review of the literature and expert consultation did not result in new evidence, which should have changed the original 1990 assumptions.

Table 4.1. Sources of mortality among those infected with sexually transmitted disease and their case fatality rates (%) according to level of health care provided.

Source		CFR Assumption
Chlamydia	Tubo-ovarian abscess	Level A: 6.0 % B: 18.0% C: 30.0%
	Severe corneal ulceration	Level A: 1.0 % B: 5.5% C: 10.0%
Gonorrhoea	Tubo-ovarian abscess	Level A: 6.0 % B: 18.0% C: 30.0%
	Severe corneal ulceration	Level A: 1.0 % B: 5.5% C: 10.0%
Syphilis	Congenital infection	Level A: 1.0 % B: 5.0% C: 10.0%
	Neurologic tertiary syphilis	CFR = 15%

5. Health State descriptions and disability weights

The health state descriptions are given in Table 1.2 at the beginning of this document. The disability weights used are those of the GBD 1990 and are listed below.

Table 5.1 Disability weights for Sexually Transmitted Diseases

Sequela	GBD 1990 disability weight
Syphilis	
Congenital syphilis	0.315
Low birth weight	0.000
Primary	0.015
Secondary	0.048 (age group 60+: 0.044)
Tertiary -- Cardiovascular	0.196
Tertiary -- Gummas	0.102
Tertiary -- Neurologic	0.283
Chlamydia	
Ophthalmia neonatorum	0.180
Low birthweight	0.000
Cervicitis	0.049
Neonatal pneumonia	0.280
Pelvic inflammatory disease	0.420 (untreated), 0.169 (treated)
Ectopic pregnancy	0.549
Tubo-ovarian abscess	0.549
Chronic pelvic pain	0.122
Infertility	0.180
Symptomatic urethritis	0.067
Epididymitis	0.167
Gonorrhoea	
Ophthalmia neonatorum	0.180
Low birth weight	0.000
Corneal scar -- Blindness	0.600
Corneal scar -- Low vision	0.233 (age 0-4), 0.245 (other ages)
Cervicitis	0.049
Pelvic inflammatory disease	0.420 (untreated), 0.169 (treated)
Ectopic pregnancy	0.549
Tubo-ovarian abscess	0.549
Chronic pelvic pain	0.122
Infertility	0.180
Symptomatic urethritis	0.067

Epididymitis
Stricture

0.167
0.151

6. Global burden of Sexually Transmitted Diseases in 2000

General methods used for the estimation of the global burden of disease are given elsewhere (1,5). The tables and graphs below summarise the global burden of the Sexually Transmitted Diseases estimates for the GBD 2000 and compare them with the estimates from the GBD 1990 (4). Estimates are given separately for syphilis, chlamydia and gonorrhoea.

Table 6.1. Syphilis: global total YLD, YLL and DALY estimates, 1990 and 2000.

	<i>Males</i>	<i>Females</i>	<i>Persons</i>
YLD('000)			
<i>GBD1990</i>	339	405	743
<i>GBD2000</i>	167	195	362
YLL('000)			
<i>GBD1990</i>	2998	2854	5852
<i>GBD2000</i>	3011	2390	5401
DALY('000)			
<i>GBD1990</i>	3337	3259	6596
<i>GBD2000</i>	3179	2585	5763

Table 6.2. Syphilis YLD, YLL and DALY estimates for WHO epidemiological subregions, 2000.

Subregion	YLD/100,000		YLL/100,000		YLD	YLL	DALY
	Males	Females	Males	Females	('000)	('000)	('000)
AFRO D	20.4	24.0	598.6	432.3	74	1,720	1,794
AFRO E	20.4	23.9	605.6	440.0	75	1,763	1,838
AMRO A	0.2	0.2	0.2	0.1	1	1	1
AMRO B	8.0	9.5	3.3	2.1	39	12	51
AMRO D	7.9	9.4	3.1	2.2	6	2	8
EMRO B	1.7	2.1	0.0	0.0	3	0	3
EMRO D	1.8	2.1	45.5	35.7	3	56	59
EURO A	0.5	0.5	0.3	0.1	2	1	3
EURO B1	0.5	0.6	15.8	9.3	1	21	22
EURO B2	1.7	2.0	4.9	3.0	1	2	3
EURO C	0.5	0.5	1.6	0.9	1	3	4
SEARO B	8.7	10.3	3.9	2.6	38	13	50
SEARO D	7.0	8.3	127.7	127.1	103	1,718	1,821

WPRO A	0.5	0.5	0.4	0.0	1	0	1
WPRO B1	0.1	0.1	0.2	0.1	2	2	3
WPRO B2	8.9	10.4	66.8	57.7	14	88	102
WPRO B3	8.5	10.0	0.0	3.0	1	0	1
World	5.5	6.5	98.9	79.7	362	5,401	5,763

Figure 6.1. Syphilis prevalence rates, age group and sex, broad regions, 2000.

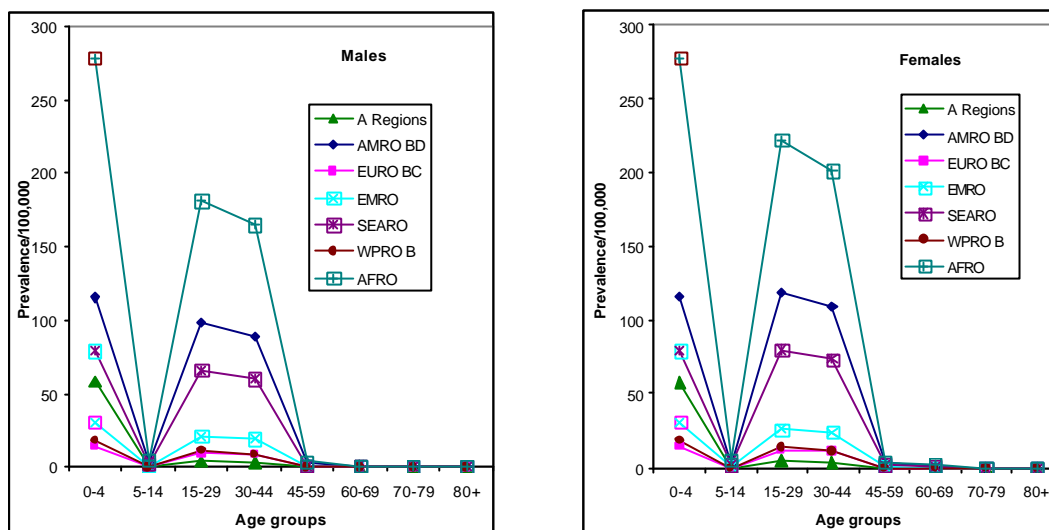


Figure 6.2. Syphilis YLD rates, by sex, broad regions, 1990 and 2000.

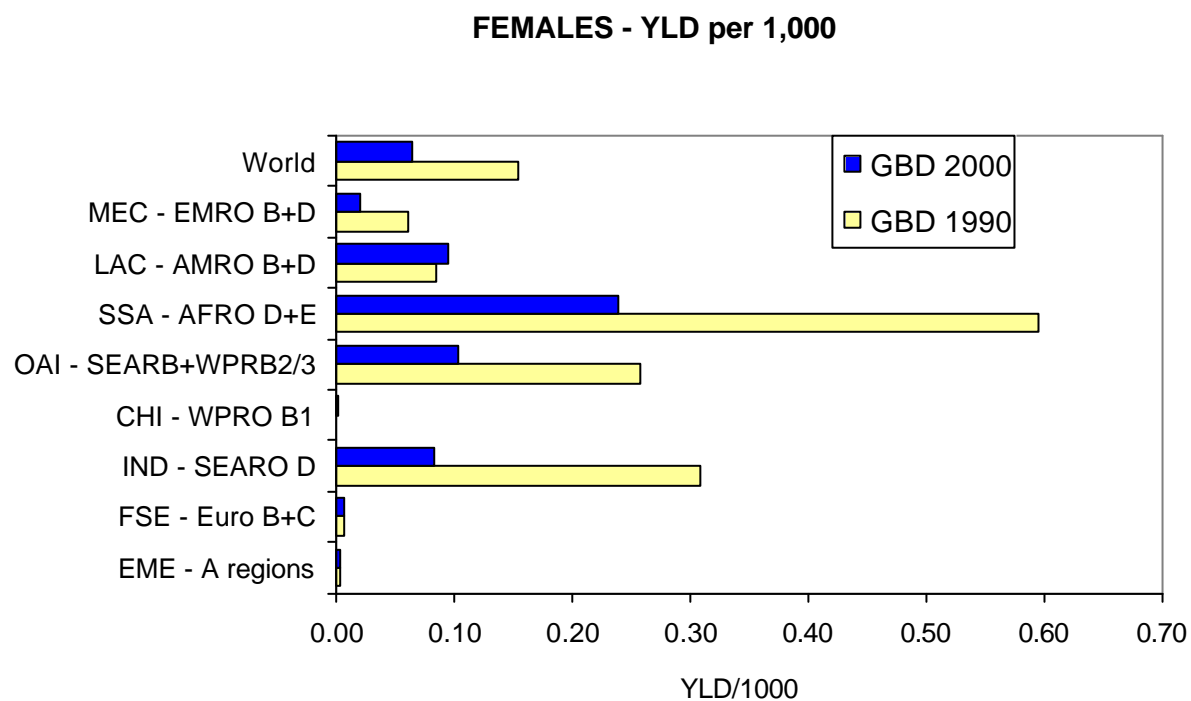
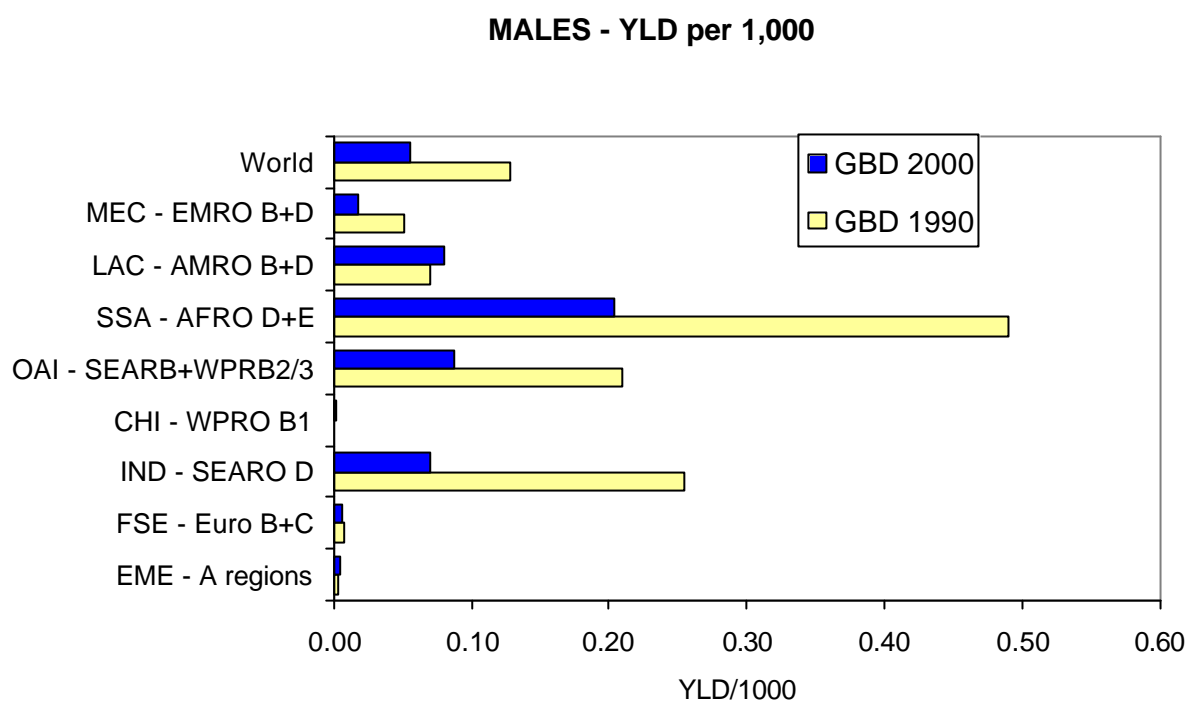


Figure 6.3. Global syphilis YLD rates, by age and sex, 1990 and 2000.

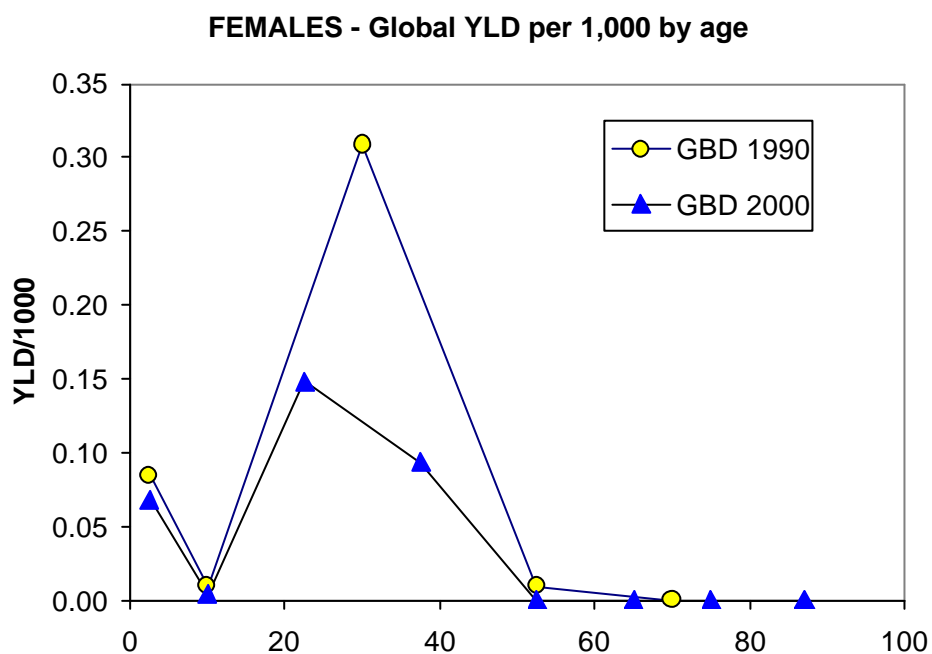
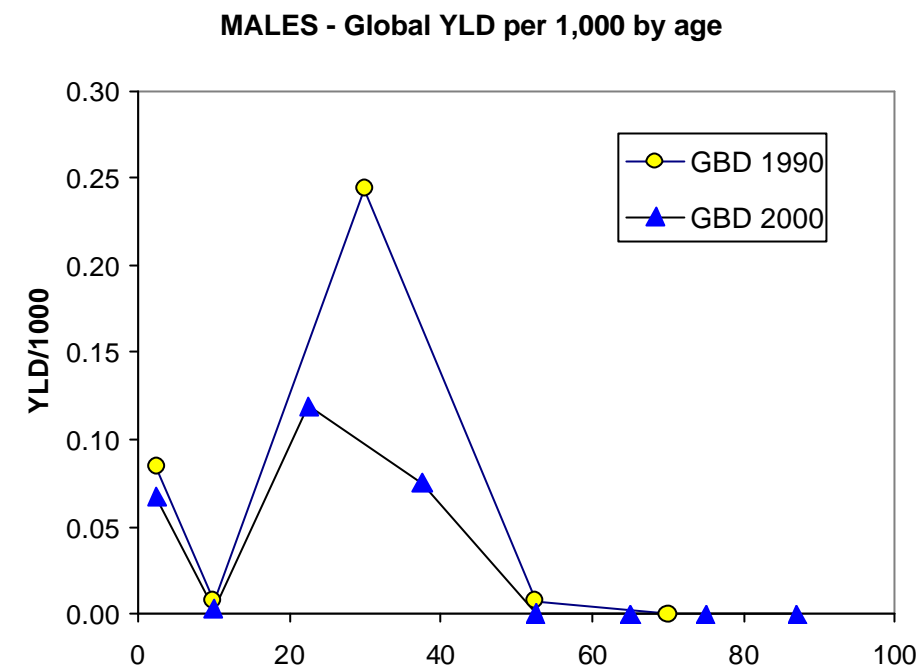


Table 6.3. Chlamydia: global total YLD, YLL and DALY estimates, 1990 and 2000.

	<i>Males</i>	<i>Females</i>	<i>Persons</i>
YLD('000)			
<i>GBD1990</i>	871	5834	6706
<i>GBD2000</i>	569	3084	3654
YLL('000)			
<i>GBD1990</i>	-	463	463
<i>GBD2000</i>	-	199	199
DALY('000)			
<i>GBD1990</i>	871	6298	7169
<i>GBD2000</i>	569	3283	3852

Table 6.4. Chlamydia YLD, YLL and DALY estimates for WHO epidemiological subregions, 2000.

Subregion	YLD/100,000		YLL/100,000		YLD	YLL	DALY
	Males	Females	Males	Females	('000)	('000)	('000)
AFRO D	40.2	216.0	0.0	18.9	429	32	461
AFRO E	40.4	215.2	0.0	21.5	433	37	470
AMRO A	2.7	27.6	0.0	0.0	47	0	47
AMRO B	12.3	99.8	0.0	0.0	250	0	250
AMRO D	12.2	32.4	0.0	0.0	16	0	16
EMRO B	17.8	128.0	0.0	0.0	99	0	99
EMRO D	18.0	121.2	0.0	0.0	95	0	95
EURO A	2.6	26.4	0.0	0.0	61	0	61
EURO B1	8.2	66.0	0.0	0.0	62	0	62
EURO B2	17.7	117.9	0.0	0.0	35	0	35
EURO C	7.8	56.8	0.0	0.0	83	0	83
SEARO B	30.6	157.0	0.0	0.5	370	1	371
SEARO D	35.8	175.9	0.0	14.3	1,398	93	1,491
WPRO A	2.5	27.0	0.0	0.0	22	0	22
WPRO B1	2.0	14.7	0.0	0.0	111	0	111
WPRO B2	31.5	157.9	0.0	50.3	135	36	172
WPRO B3	31.2	155.9	0.0	0.0	6	0	6
World	18.7	102.8	0.0	6.6	3,654	199	3,852

Figure 6.4. Chlamydia incidence rates, age group and sex, broad regions, 2000.

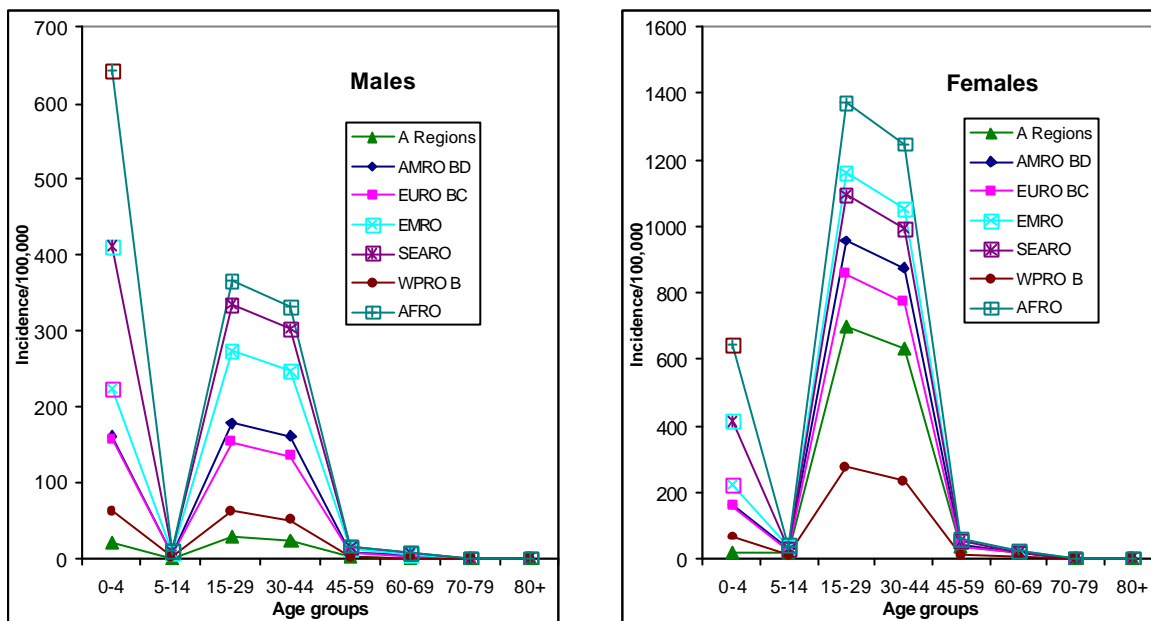


Figure 6.5. Chlamydia YLD rates, by sex, broad regions, 1990 and 2000.

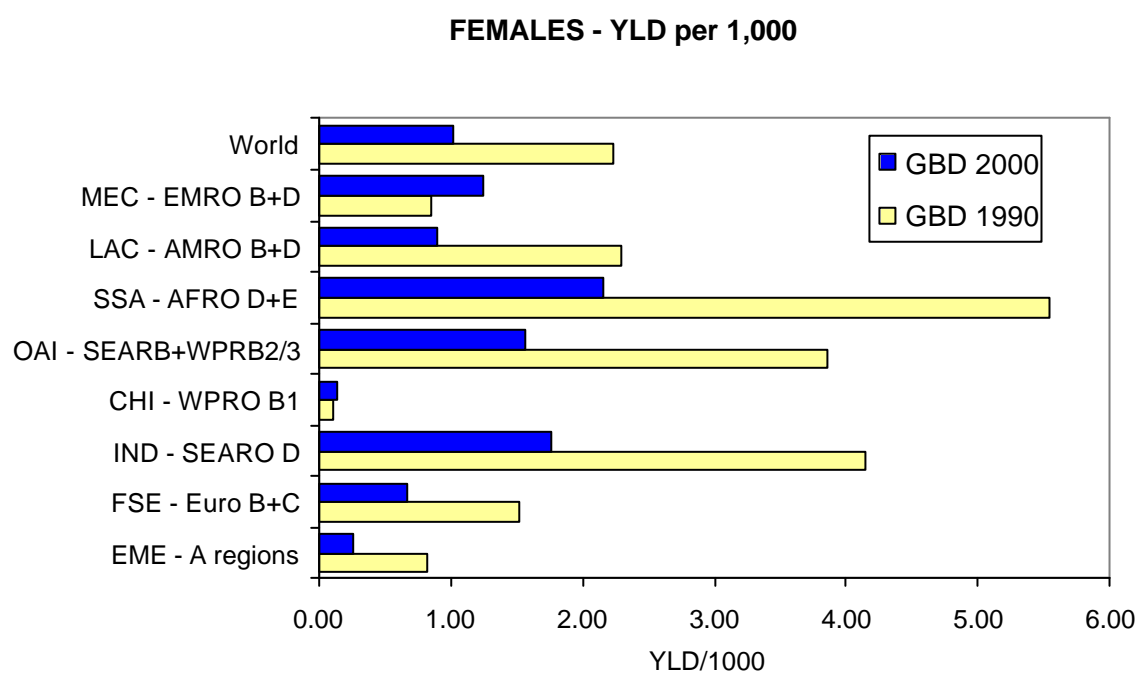
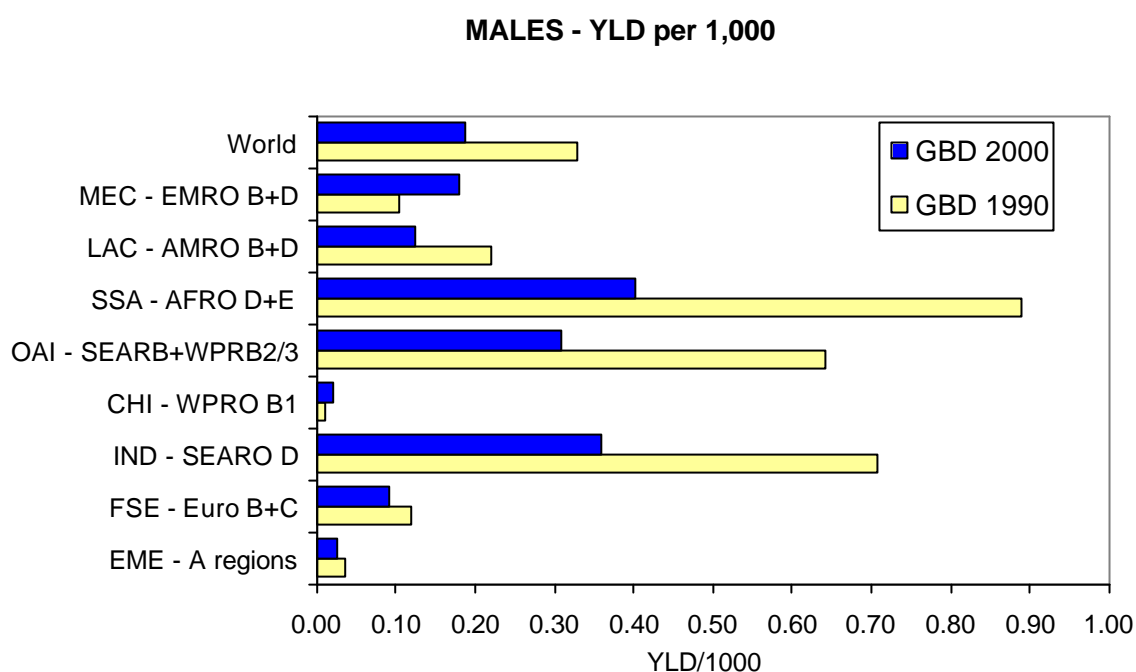


Figure 6.6. Global chlamydia YLD rates, by age and sex, 1990 and 2000.

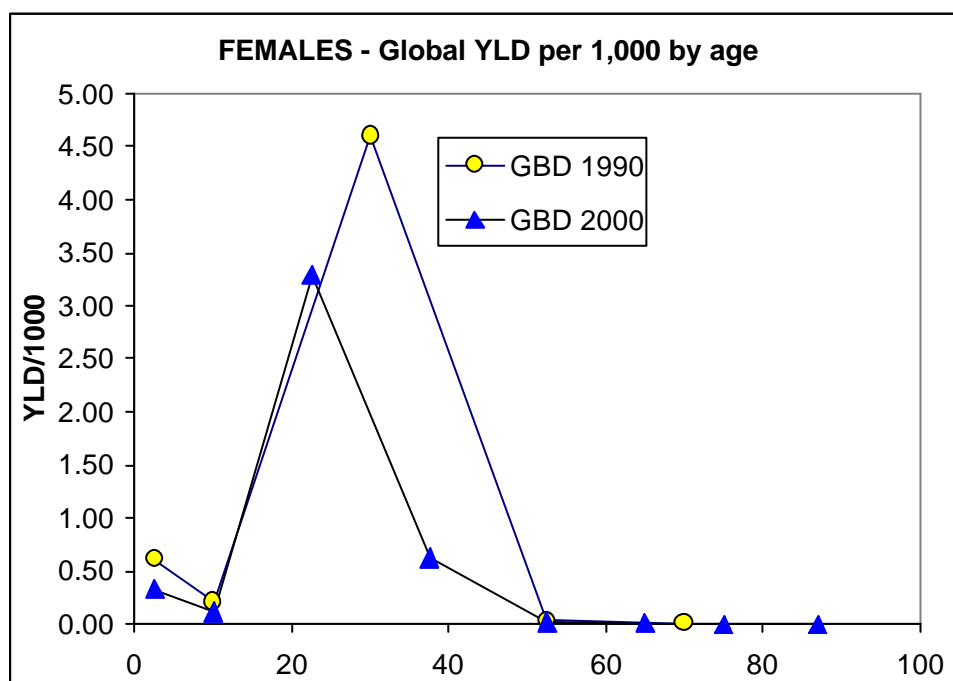
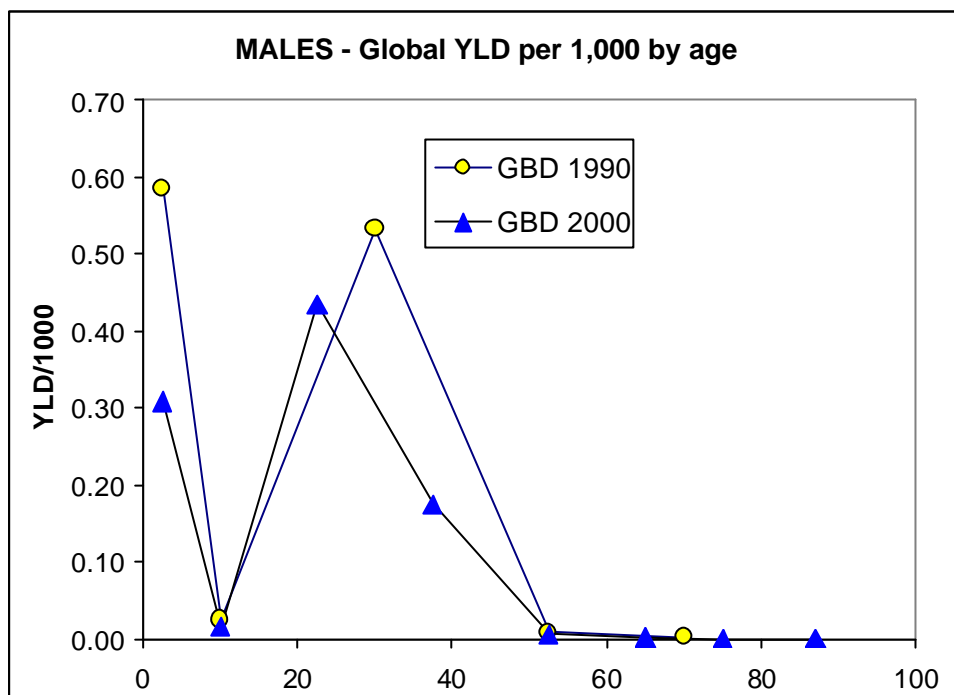


Table 6.5. Gonorrhoea: global total YLD, YLL and DALY estimates, 1990 and 2000.

	<i>Males</i>	<i>Females</i>	<i>Persons</i>
YLD('000)			
<i>GBD1990</i>	2033	2614	4646
<i>GBD2000</i>	1408	1797	3205
YLL('000)			
<i>GBD1990</i>	-	263	263
<i>GBD2000</i>	2	120	122
DALY('000)			
<i>GBD1990</i>	2033	2876	4909
<i>GBD2000</i>	1410	1917	3327

Table 6.6. Gonorrhoea YLD, YLL and DALY estimates for WHO epidemiological subregions, 2000.

Subregion	YLD/100,000		YLL/100,000		YLD	YLL	DALY
	Males	Females	Males	Females	('000)	('000)	('000)
AFRO D	142.3	185.4	0.0	10.0	547	17	564
AFRO E	126.1	185.6	0.0	14.8	527	25	552
AMRO A	2.5	4.8	0.0	0.0	11	0	11
AMRO B	31.9	49.5	0.1	0.1	180	0	181
AMRO D	31.9	50.8	0.8	0.4	30	0	30
EMRO B	20.5	32.4	0.0	0.0	37	0	37
EMRO D	21.0	31.6	0.0	9.6	36	7	43
EURO A	2.5	4.6	0.0	0.0	15	0	15
EURO B1	14.9	19.3	0.0	0.0	28	0	28
EURO B2	20.6	31.2	0.0	0.0	13	0	13
EURO C	14.5	17.4	0.0	0.0	39	0	39
SEARO B	50.3	62.0	0.0	0.3	221	1	222
SEARO D	92.4	112.3	0.2	8.1	1,376	54	1,430
WPRO A	2.4	4.5	0.0	0.0	5	0	5
WPRO B1	3.5	4.4	0.0	0.0	54	0	54
WPRO B2	51.3	62.2	0.0	25.0	81	18	99
WPRO B3	52.9	64.3	0.0	0.0	4	0	4
World	46.2	59.9	0.1	4.0	3,205	122	3,327

Figure 6.7. Gonorrhoea incidence rates, age group and sex, broad regions, 2000.

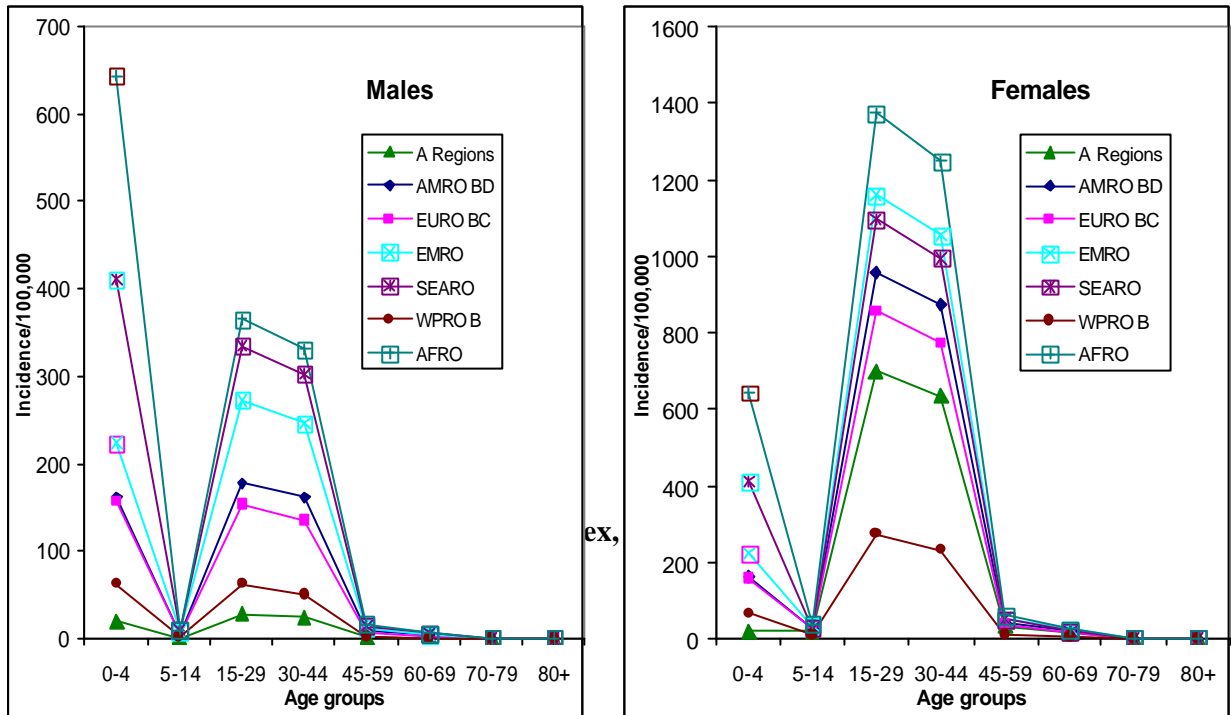


Figure 6.8. Gonorrhoea YLD rates, by sex, broad regions, 1990 and 2000.

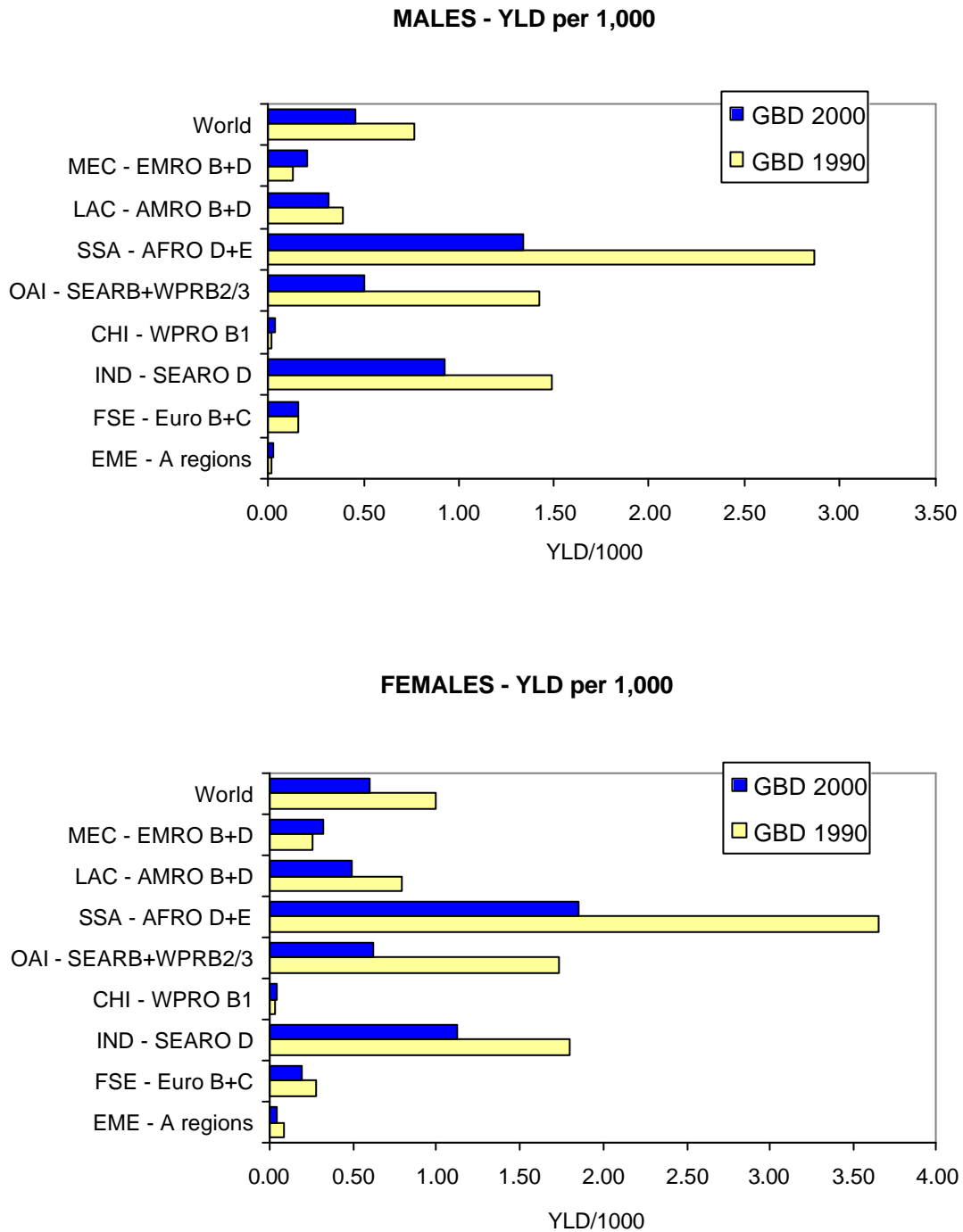
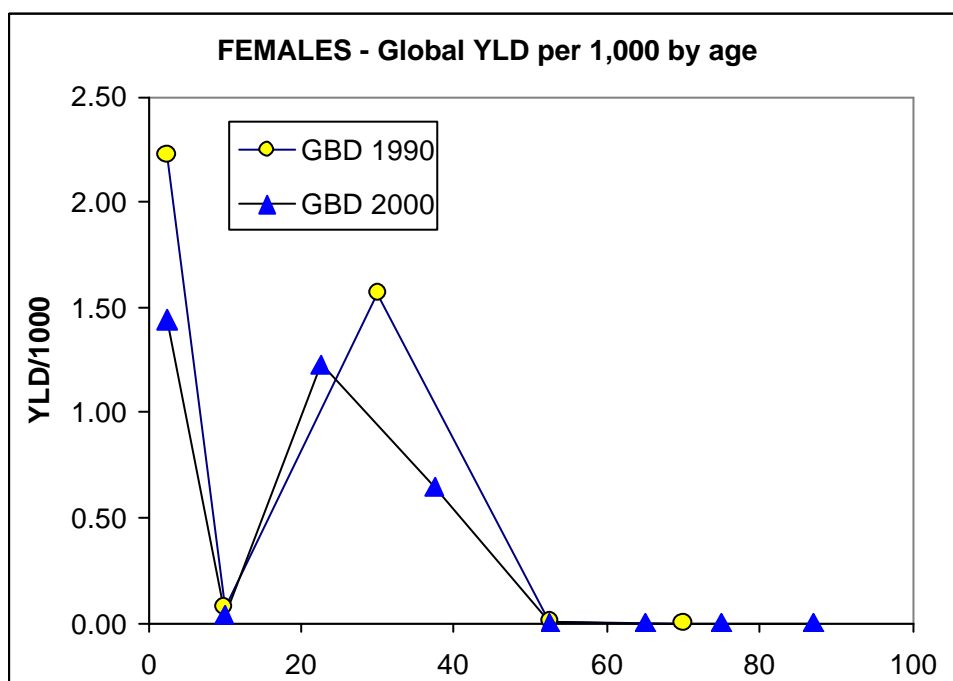
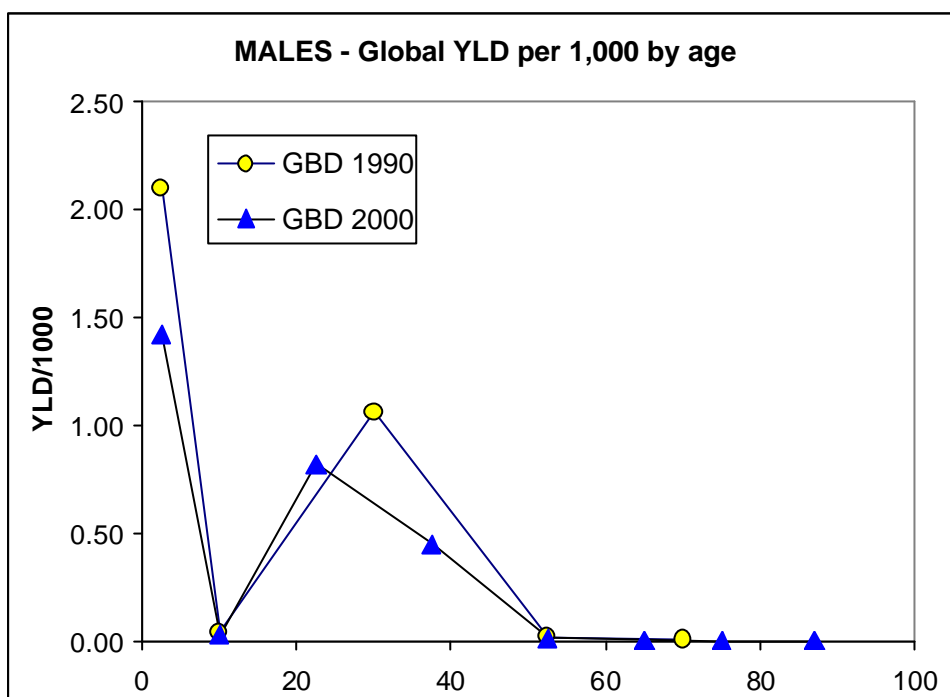


Figure 6.9. Global gonorrhoea YLD rates, by age and sex, 1990 and 2000.



8. Uncertainty analysis

General methods for uncertainty analysis of estimates for the Global Burden of Disease 2000 are outlined elsewhere (6). Uncertainty analysis for sexually transmitted diseases has not yet been completed.

9. Conclusions

These are version 2 estimates for the GBD 2000. Apart from the uncertainty analysis, updating estimates to reflect revisions of mortality estimates and any new or revised epidemiological data or evidence, it is not intended to undertake any major addition revision of these estimates. However, there is a need for improved and updated data in some countries, which can be incorporated into the model.

We welcome comments and criticisms of these draft estimates, and information on additional sources of data and evidence. Please contact Claudia Stein (EBD/GPE) on email steinc@who.ch

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