

Global burden of poliomyelitis in the year 2000

1. Introduction

Poliomyelitis is an infectious disease caused by one of three related enteroviruses (poliovirus types 1-3), which usually affects small children under the age of 3 years. The virus enters the human host through the oral-faecal route, multiplies in the intestines and passes into the blood stream. From here it may invade the central nervous system destroying nerve cells and causing paralysis. The paralysis is almost always irreversible, and the legs are usually more often affected than the muscles of the upper body. However, the polio virus may invade the brain stem, potentially leading to breathing difficulty and even death.

2. Case and sequelae definitions

The case definition and sequelae used for poliomyelitis are given in Table 1 below.

Table 1. Case and sequelae definitions for poliomyelitis

Cause category	GBD 2000 Code	ICD 9 codes	ICD 10 codes
Poliomyelitis	U013	045	A80

Sequela	Definition
Episode=Lameness	Viral infection characterised by acute flaccid paralysis and proven by isolation of the poliomyelitis wild virus (types 1-3) from stool.

3. Disease model

Years lived with disability (YLDs) were calculated for the boxes shaded in grey.

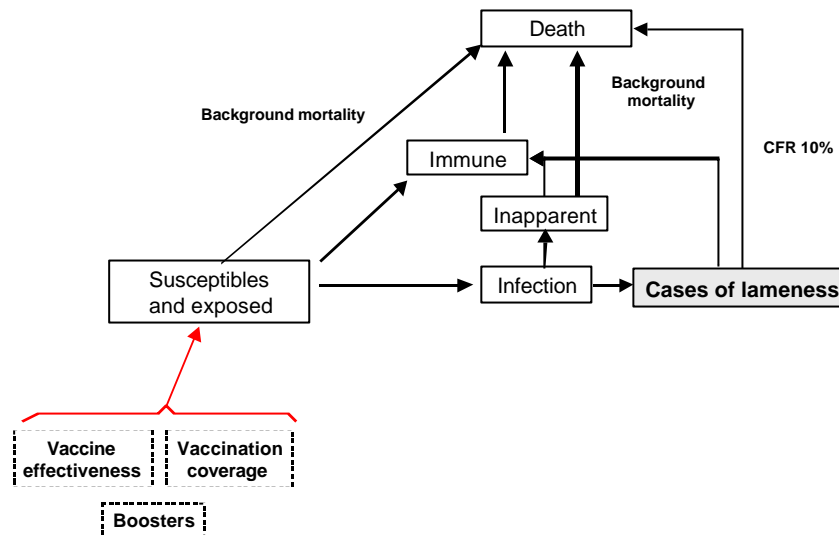


Figure 1. Poliomyelitis disease model.

Table 2. Disease model assumptions

Definitions	As above
Incidence/Prevalence	Incidence and prevalence studies from lameness surveys and intensive global surveillance
Remission	No remission assumed
Case fatality	RR=1.0
Other assumptions	Reporting correction factor applied to each country according to Acute Flaccid Paralysis rate (Source: Dr M Birmingham, V&B, WHO/HQ)
Data	Incidence and prevalence studies from lameness surveys and intensive global surveillance

4. Disability weights and health state descriptions

Disability weights from the Global Burden of Disease 1990 study have been used.

Table 3. Disability weights

Sequela/stage/severity level	Disability weight	Health state description
Episode=Lameness	0.369 for treated and untreated	Acute painful, asymmetric paralysis (with or without fever) of the arms or (more commonly) the legs, reaching its maximum extent over the course of 3-4 days and leading to permanent lameness of the affected limbs. Life-threatening paralysis of the respiratory

5. Epidemiological data

The acceleration of the polio eradication initiative has resulted in intensive surveillance of poliomyelitis cases around the world. These unparalleled surveillance data, which report laboratory confirmed cases of wild virus infection in symptomatic persons (1) were used to estimate global cases of poliomyelitis.

Such data were corrected using the country-specific acute flaccid paralysis (AFP) rate, which is a sensitivity indicator of a country's surveillance system. As the AFP rate is stable across populations, a system should detect at least one case of AFP for every 100,000 children under the age of 15 years, even in the absence of polio. Lower rates imply that polio cases may be missed, and surveillance data were corrected on the basis of AFP reporting.

This methodology differs from the approach applied in the GBD 1990 study (2) when enhanced surveillance data were still unavailable. The authors used existing community-based lameness surveys and assumed that 80% of cases had been identified, thus stipulating that:

$$\text{Point prevalence per year of age} = \frac{\text{Prevalence (surveys)} \times 1.25}{\text{years in age group}}$$

Mortality from polio was estimated assuming a case fatality rate of 10% (the same case fatality rate as was assumed in the GBD 1990).

Table 4. Data sources and assumptions - summary

AFRO D	Incidence and prevalence studies from lameness surveys and intensive surveillance for each country
AFRO E	Incidence and prevalence studies from lameness surveys and intensive surveillance for each country
AMRO A	Incidence and prevalence studies from lameness surveys and intensive surveillance for each country – polio free
AMRO B	Incidence and prevalence studies from lameness surveys and intensive surveillance for each country – polio free
AMRO D	Incidence and prevalence studies from lameness surveys and intensive surveillance for each country – polio free
EMRO B	Incidence and prevalence studies from lameness surveys and intensive surveillance for each country
EMRO D	Incidence and prevalence studies from lameness surveys and intensive surveillance for each country
EURO A	Incidence and prevalence studies from lameness surveys and intensive surveillance for each country – polio free
EURO B1	Incidence and prevalence studies from lameness surveys and intensive surveillance for each country – polio free
EURO B2	Incidence and prevalence studies from lameness surveys and intensive surveillance for each country – polio free
EURO C	Incidence and prevalence studies from lameness surveys and intensive surveillance for each country
SEARO B	Incidence and prevalence studies from lameness surveys and intensive surveillance for each country
SEARO D	Incidence and prevalence studies from lameness surveys and intensive surveillance for each country
WPRO A	Incidence and prevalence studies from lameness surveys and intensive surveillance for each country – polio

	free
WPRO B1	Incidence and prevalence studies from lameness surveys and intensive surveillance for each country – polio free
WPRO B2	Incidence and prevalence studies from lameness surveys and intensive surveillance for each country – polio free
WPRO B3	Incidence and prevalence studies from lameness surveys and intensive surveillance for each country – polio free

6. Incidence, prevalence and mortality estimates for 2000

Table 5. Age-standardized incidence, prevalence and mortality rate estimates for polio, WHO epidemiological subregions, 2000.

Subregion	Age-std. Incidence/100,000		Age-std. prevalence/100,000		Age-std. mortality/100,000	
	Males	Females	Males	Females	Males	Females
AFRO D	0.2	0.2	25.8	20.7	0.1	0.0
AFRO E	0.1	0.1	23.8	18.5	0.0	0.0
AMRO A	0.0	0.0	0.0	0.0	0.0	0.0
AMRO B	0.1	0.1	13.4	19.0	0.0	0.0
AMRO D	0.1	0.1	13.4	19.0	0.0	0.0
EMRO B	0.3	0.3	21.6	16.6	0.0	0.0
EMRO D	0.3	0.3	21.6	16.6	0.0	0.0
EURO A	0.0	0.0	0.0	0.0	0.0	0.0
EURO B1	0.0	0.0	0.0	0.0	0.1	0.1
EURO B2	0.3	0.3	21.6	16.6	0.0	0.0
EURO C	0.0	0.0	0.0	0.0	0.0	0.0
SEARO B	0.3	0.3	17.6	13.6	0.0	0.0
SEARO D	0.4	0.4	56.0	42.4	0.0	0.0
WPRO A	0.0	0.0	0.0	0.0	0.0	0.0
WPRO B1	0.3	0.3	8.7	6.9	0.0	0.0
WPRO B2	0.3	0.3	17.6	13.6	0.0	0.0
WPRO B3	0.3	0.3	17.6	13.6	0.0	0.0
World	0.3	0.3	19.8	15.6	0.0	0.0

- Age-standardized to World Standard Population (3).

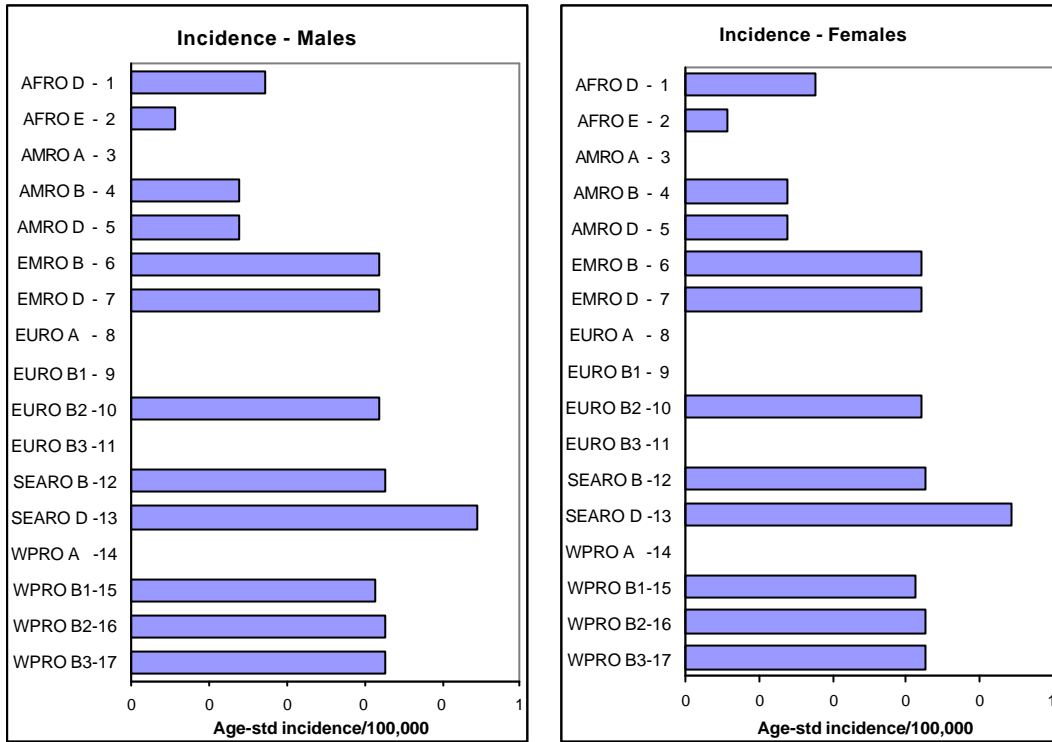


Figure 2. Age-standardized polio incidence rate estimates, WHO epidemiological subregions, by sex, 2000.

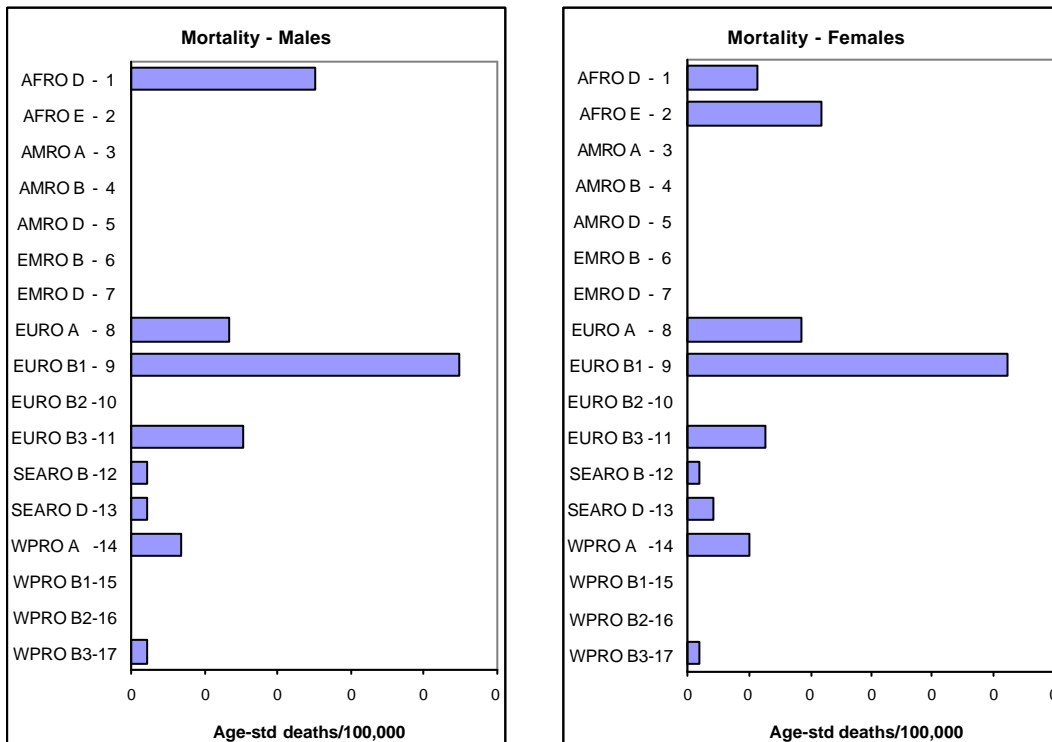


Figure 3. Age-standardized polio mortality rate estimates, WHO epidemiological subregions, by sex, 2000.

7. Global burden of poliomyelitis in 2000

General methods used for the estimation of the global burden of disease are given elsewhere (4). The tables and graphs below summarise the global burden of leprosy estimates for the GBD 2000 and compare them with the leprosy estimates from the GBD 1990 (5).

Table 6. Global total YLD, YLL and DALY estimates for polio, 1990 and 2000.

	<i>Males</i>	<i>Females</i>	<i>Persons</i>
YLD('000)			
<i>GBD1990</i>	1,408	1,055	2,462
<i>GBD2000</i>	84	82	166
YLL('000)			
<i>GBD1990</i>	521	387	908
<i>GBD2000</i>	10	7	18
DALY('000)			
<i>GBD1990</i>	1,929	1,442	3,371
<i>GBD2000</i>	95	89	184

Table 7. YLD, YLL and DALY estimates for polio, WHO epidemiological subregions, 2000.

Subregion	YLD/100,000		YLL/100,000		YLD	YLL	DALY
	Males	Females	Males	Females	('000)	('000)	('000)
AFRO D	3.8	3.9	2.9	0.5	13	6	19
AFRO E	1.2	1.3	0.0	1.5	4	2	7
AMRO A	0.0	0.0	0.0	0.0	0	0	0
AMRO B	1.4	1.4	0.0	0.0	6	0	6
AMRO D	1.4	1.4	0.0	0.0	1	0	1
EMRO B	3.3	3.4	0.0	0.0	5	0	5
EMRO D	3.3	3.3	0.0	0.0	5	0	5
EURO A	0.0	0.0	0.4	0.3	0	1	1
EURO B1	0.0	0.0	2.5	1.6	0	3	3
EURO B2	3.3	3.3	0.0	0.0	2	0	2
EURO C	0.0	0.0	0.9	0.3	0	1	1
SEARO B	3.6	3.6	0.2	0.1	14	0	15
SEARO D	4.9	4.9	0.2	0.2	66	3	69
WPRO A	0.0	0.0	0.2	0.2	0	0	0
WPRO B1	3.3	3.3	0.0	0.0	45	0	45
WPRO B2	3.6	3.6	0.0	0.0	5	0	5
WPRO B3	3.4	3.5	0.2	0.1	0	0	0

World	2.8	2.7	0.3	0.2	166	18	184
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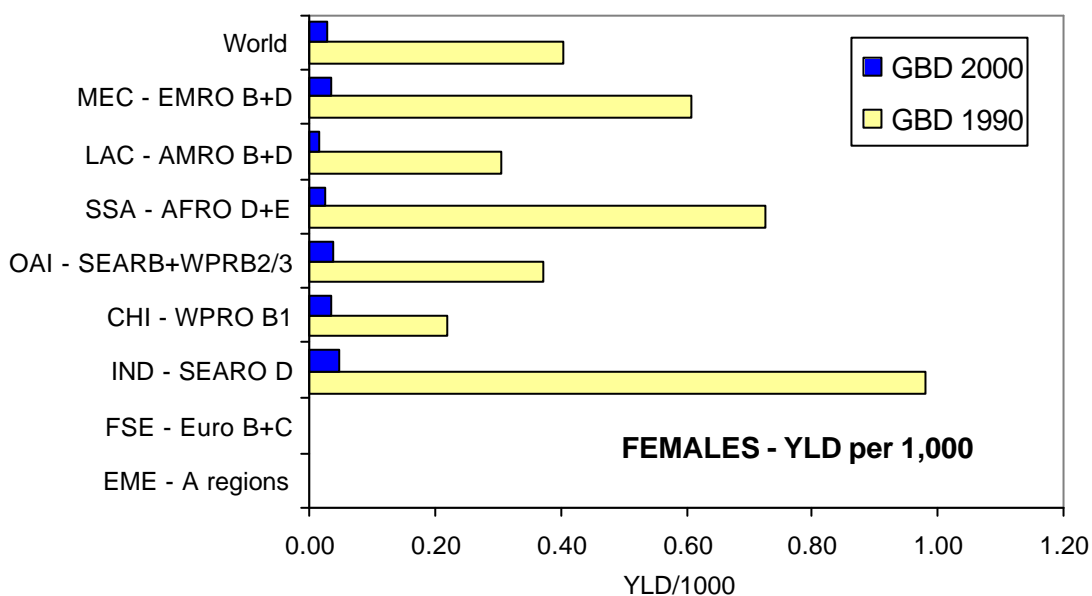
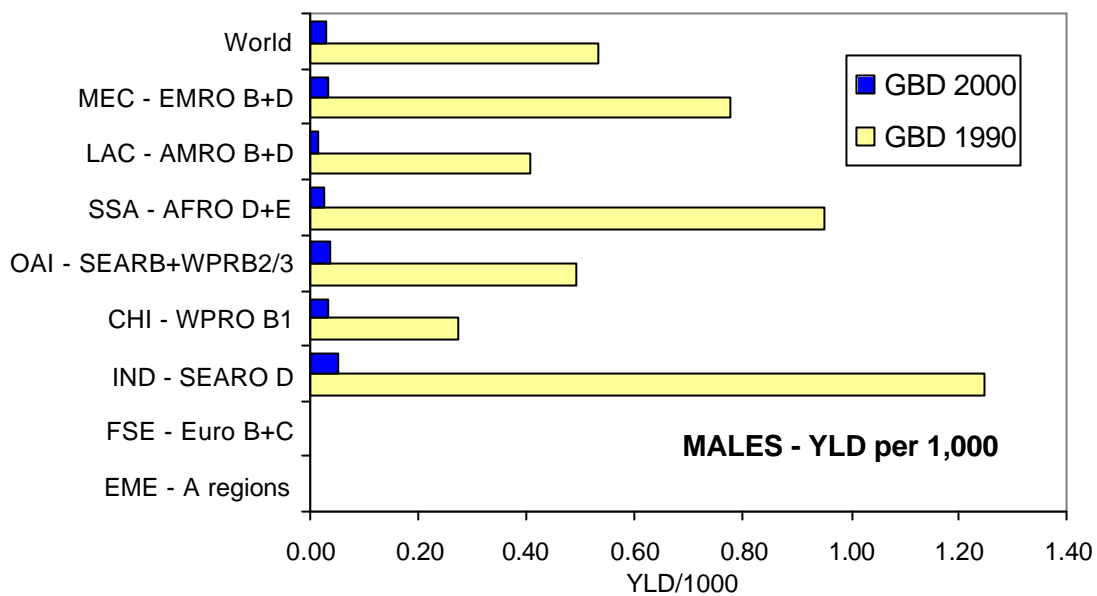


Figure 4. Total YLD rates, by sex, broad regions, 1990 and 2000.

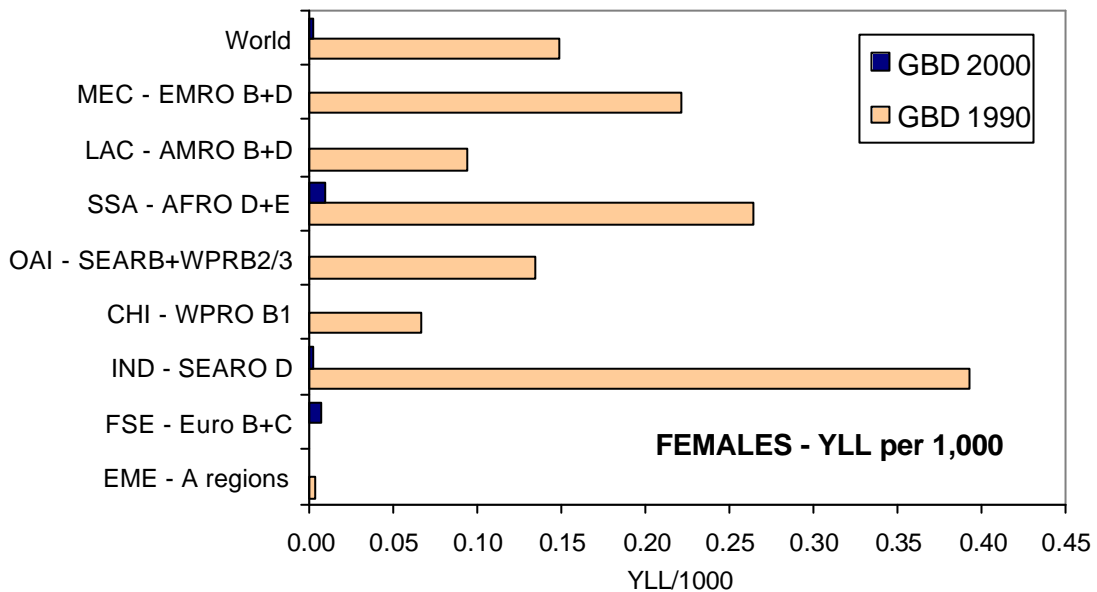
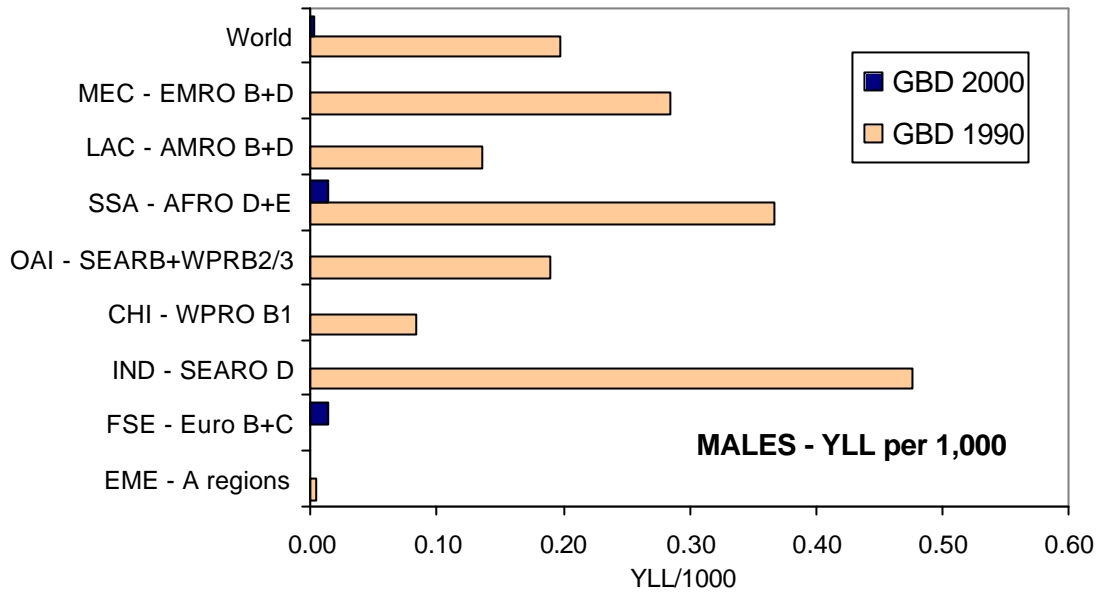


Figure 5. Total YLL rates, by sex, broad regions, 1990 and 2000.

8. Uncertainty analysis

General methods for uncertainty analysis of estimates for the Global Burden of Disease 2000 are outlined elsewhere (6). Uncertainty analysis for poliomyelitis estimates 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.

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.int.

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10. References

1. <http://www.who.int/vaccines-polio/>
2. Shibuya K, Murray CJL. Poliomyelitis. In: Stein CE, Murray CJL, Lopez AD (eds). *The Global Burden of Disease and Injuries Series, Volume 4: The Global Epidemiology of Infectious Diseases*. WHO, 2002 (forthcoming).
3. Ahmad O, Boschi-Pinto C, Lopez AD, Murray CJL, Lozano R, Inoue M. *Age standardization of rates: a new WHO standard*. GPE Discussion Paper No. 31. Geneva, WHO. 2001.
4. Murray CJL, Lopez AD, Mathers CD, Stein C. *The Global Burden of Disease 2000 project: aims, methods and data sources*. GPE Discussion Paper No. 36. Geneva, WHO. 2001.
5. Murray CJL, Lopez, AD (eds.). *The global burden of disease: a comprehensive assessment of mortality and disability from diseases, injuries and risk factors in 1990 and projected to 2020*. Cambridge, Harvard University Press (Global Burden of disease and Injury Series, Vol. 1) 1996.
6. Salomon JA, Mathers CD, Murray CJL, Ferguson B. *Methods for life expectancy and healthy life expectancy uncertainty analysis*. GPE Discussion Paper No. 10. Geneva, WHO. 2001.