



## *Statistical Annex*

*The first five tables in this technical annex present updated information on the burden of disease, summary measures of population health and national health accounts for WHO Member States and Regions. Population health measures for 2000 have been revised to take new data into account and differ from those published in The World Health Report 2001 for many Member States. The work leading to these annex tables was undertaken mostly by the WHO Global Programme on Evidence for Health Policy and the Department of Health Financing and Stewardship in collaboration with counterparts from the Regional Offices of WHO. The material in these tables will be presented on an annual basis in each World Health Report. This annex also contains tables on the selection of risk factors considered in this report, with ranges of uncertainty for global estimates of their attributable burden. The prevalence of risk factors, attributable mortality, attributable years of life lost and attributable DALYs is also given. The risk factors have been grouped under seven separate headings. These are childhood and maternal undernutrition, other diet-related risk factors, sexual and reproductive health, addictive substances, environmental risks, occupational risks, and other risks to health.*

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# STATISTICAL ANNEX

## EXPLANATORY NOTES

The tables in this technical annex present updated information on the burden of disease, summary measures of population health and national health accounts for WHO Member States and Regions. Population health measures for 2000 have been revised to take new data into account and differ from those published in *The World Health Report 2001* for many Member States. The work leading to these annex tables was undertaken mostly by the WHO Global Programme on Evidence for Health Policy and the Department of Health Financing and Stewardship in collaboration with counterparts from the Regional Offices of WHO. The material in these tables will be presented on an annual basis in each *World Health Report*. Working papers have been prepared which provide details on the concepts, methods and results that are only briefly mentioned here. The footnotes to these technical notes include a complete listing of the detailed working papers.

As with any innovative approach, methods and data sources can be refined and improved. It is hoped that careful scrutiny and use of the results will lead to progressively better measurement of health attainment and health expenditure data in the coming *World Health Reports*. All the main health results are reported with uncertainty intervals in order to communicate to the user the plausible range of estimates for each country on each measure. Where data are presented by country, initial WHO estimates and technical explanations were sent to Member States for comment. Comments or data provided in response were discussed with them and incorporated where possible. The estimates reported here should still be interpreted as the best estimates of WHO rather than the official viewpoint of Member States.

### ANNEX TABLE 1

To assess overall levels of health achievement, it is crucial to develop the best possible assessment of the life table for each country. New life tables have been developed for all 191 Member States starting with a systematic review of all available evidence from surveys, censuses, sample registration systems, population laboratories and vital registration on levels and trends in child mortality and adult mortality.<sup>1</sup> This review benefited greatly from the work undertaken on child mortality by UNICEF<sup>2</sup> and on general mortality by the United States Census Bureau<sup>3</sup> and the UN Population Division 2000 demographic assessment.<sup>4</sup> All estimates of population size and structure for 2000 and 2001 are based on the 2000 and 2001 demographic assessments prepared by the United Nations Population Division.<sup>4</sup> UN estimates refer to the de facto resident population, and not the de jure population in each Member State. To aid in demographic, cause of death and burden of disease analyses, the

191 Member States have been divided into five mortality strata on the basis of their level of child and adult male mortality. The matrix defined by the six WHO Regions and the five mortality strata leads to 14 subregions, since not every mortality stratum is represented in every Region. These subregions are defined in the List of Member States by WHO Region and mortality stratum and used in Annex Tables 2 and 3 for presentation of results.

Because of increasing heterogeneity of patterns of adult and child mortality, WHO has developed a model life table system of two-parameter logit life tables using a global standard, with additional age-specific parameters to correct for systematic biases in the application of a two-parameter system.<sup>5</sup> This system of model life tables has been used extensively in the development of life tables for those Member States without adequate vital registration and in projecting life tables to 2000 and 2001 when the most recent data available are from earlier years.

Demographic techniques (Preston–Coale method, Brass Growth–Balance method, Generalized Growth–Balance method and Bennett–Horiuchi method) have been applied, as appropriate, to assess the level of completeness of recorded mortality data for Member States with vital registration systems. For Member States without national vital registration systems, all available survey, census and vital registration data were assessed, adjusted and averaged to estimate the probable trend in child mortality over the past few decades. This trend was projected to estimate child mortality levels in 2000 and 2001. In addition, adult sibling survival data from available population surveys was analysed to obtain additional information on adult mortality.

The World Health Organization uses a standard method to estimate and project life tables for all Member States with comparable data. This may lead to minor differences compared with official life tables prepared by Member States. Life expectancies for the year 2000 for many Member States have been revised from those published in *The World Health Report 2001* to take into account more recently available mortality data.

To capture the uncertainty due to sampling, indirect estimation technique or projection to 2000, a total of 1000 life tables have been developed for each Member State. Ninety-five per cent uncertainty bounds are reported in Annex Table 1 by giving key life table values at the 2.5th percentile and the 97.5th percentile. This uncertainty analysis was facilitated by the development of new methods and software tools.<sup>6</sup> In countries with a substantial HIV epidemic, recent estimates of the level and uncertainty range of the magnitude of the HIV epidemic have been incorporated into the life table uncertainty analysis.<sup>7</sup>

## ANNEX TABLES 2 AND 3

Causes of death for the 14 subregions and the world have been estimated based on data from national vital registration systems that capture about 18.6 million deaths annually. In addition, information from sample registration systems, population laboratories and epidemiological analyses of specific conditions has been used to improve estimates of the cause of death patterns.<sup>8</sup> WHO is intensifying efforts with Member States to obtain and verify recent vital registration data on causes of death.

Cause of death data have been carefully analysed to take into account incomplete coverage of vital registration in countries and the likely differences in cause of death patterns that would be expected in the uncovered and often poorer subpopulations. Techniques to undertake this analysis have been developed based on the global burden of disease study<sup>9</sup> and further refined using a much more extensive database and more robust modelling techniques.<sup>10</sup>

Special attention has been paid to problems of misattribution or miscoding of causes of death in cardiovascular diseases, cancer, injuries and general ill-defined categories. A correction algorithm for reclassifying ill-defined cardiovascular codes has been developed.<sup>11</sup> Cancer mortality by site has been evaluated using both vital registration data and population-based cancer incidence registries. The latter have been analysed using a complete age, period cohort model of cancer survival in each region.<sup>12</sup>

Annex Table 3 provides estimates of the burden of disease using disability-adjusted life years (DALYs) as a measure of the health gap in the world in 2001. DALYs along with healthy life expectancy are summary measures of population health.<sup>13,14</sup> One DALY can be thought of as one lost year of “healthy” life and the burden of disease as a measurement of the gap between the current health of a population and an ideal situation where everyone in the population lives to old age in full health. DALYs for a disease or health condition are calculated as the sum of the years of life lost due to premature mortality (YLL) in the population and the years lost due to disability (YLD) for incident cases of the health condition. For a review of the development of the DALY and recent advances in the measurement of the burden of disease, see Murray & Lopez.<sup>15</sup> For a more comprehensive review of the conceptual and other issues underlying summary measures of population health, see Murray et al.<sup>14</sup> DALYs for 2001 have been estimated based on cause of death information for each Region and regional assessments of the epidemiology of major disabling conditions. For this report, burden of disease estimates have been updated for many of the cause categories included in the Global Burden of Disease 2000 study, based on the wealth of data on major diseases and injuries available to WHO technical programmes and through collaboration with scientists worldwide.<sup>8</sup> Examples are the extensive data sets on tuberculosis, maternal conditions, injuries, diabetes, cancer, and sexually transmitted infections. These data, together with new and revised estimates of deaths by cause, age and sex, for all Member States, have been used to develop internally consistent estimates of incidence, prevalence, duration and DALYs for over 130 major causes, for 14 subregions of the world.

#### ANNEX TABLE 4

Annex Table 4 reports the average level of population health for WHO Member States in terms of healthy life expectancy. Based on more than 15 years of work, WHO introduced disability-adjusted life expectancy (DALE) as a summary measure of the level of health attained by populations in *The World Health Report 2000*.<sup>16,17</sup> To better reflect the inclusion of all states of health in the calculation of healthy life expectancy, the name of the indicator used to measure healthy life expectancy has been changed from disability-adjusted life expectancy (DALE) to health-adjusted life expectancy (HALE). HALE is based on life expectancy at birth (see Annex Table 1) but includes an adjustment for time spent in poor health. It is most easily understood as the equivalent number of years in full health that a newborn can expect to live based on current rates of ill-health and mortality.

The measurement of time spent in poor health is based on combining condition-specific estimates from the Global Burden of Disease 2000 study with estimates of the prevalence of different health states by age and sex derived from health surveys.<sup>17,18</sup> As noted above, for this year's *World Health Report*, burden of disease estimates of prevalences for specific diseases, injuries and their sequelae have been updated for many of the cause categories included in the Global Burden of Disease (GBD) 2000 study.<sup>8</sup>

Analyses of over 50 national health surveys for the calculation of healthy life expectancy in *The World Health Report 2000* identified severe limitations in the comparability of self-reported health status data from different populations, even when identical survey instru-

ments and methods are used.<sup>19, 20</sup> The WHO Household Survey Study<sup>21</sup> carried out 69 representative household surveys in 60 Member States in 2000 and 2001 using a new health status instrument based on the International Classification of Functioning, Disability and Health,<sup>22</sup> which seeks information from a representative sample of respondents on their current states of health according to six core domains. These domains were identified from an extensive review of the currently available health status measurement instruments. To overcome the problem of comparability of self-report health data, the WHO survey instrument used performance tests and vignettes to calibrate self-reported health on selected domains such as cognition, mobility and vision. WHO has developed several statistical methods for correcting biases in self-reported health using these data, based on the hierarchical ordered probit (HOPIT) model.<sup>23-25</sup> The calibrated responses are used to estimate the true prevalence of different states of health by age and sex.

Annex Table 4 reports average HALE at birth for Member States for 2000 and 2001, and for 2001 the following additional information: HALE at age 60, expected lost healthy years (LHE) at birth, per cent of total life expectancy lost, and 95% uncertainty intervals. LHE is calculated as life expectancy (LE) minus HALE and is the expected equivalent number of years of full health lost through living in health states of less than full health. The percentage of total life expectancy lost is LHE expressed as a percentage of total LE and represents the proportion of total life expectancy that is lost through living in health states of less than full health. HALEs for 2000 differ from those published in *The World Health Report 2001* for many Member States, as they incorporate new epidemiological information, new data from health surveys, and new information on mortality rates, as well as improvements in survey analysis methods.<sup>24</sup>

The uncertainty ranges for healthy life expectancy given in Annex Table 4 are based on the 2.5th percentile and 97.5th percentile of the relevant uncertainty distributions.<sup>6</sup> The ranges thus define 95% uncertainty intervals around the estimates. HALE uncertainty is a function of the uncertainty in age-specific mortality measurement for each country, of the uncertainty in burden of disease based estimates of country-level disability prevalence, and of uncertainty in the health state prevalences derived from health surveys.

## ANNEX TABLE 5

### *Sources and methods*

The estimates for the six years 1995–2000 exhibited in Annex 5 have been submitted for comments to the national authorities of Member States. They remain, however, WHO estimates. As in every developmental work of this kind, some estimates change from the previous exhibit, i.e. Annex Table 5 of *The World Health Report 2001*. The resulting synthesis of expenditure on health trends represents a measurement of the state-of-the-art in the middle of 2002 and orders of magnitude, that extends beyond what was achieved in the previous exercise.

### *Content*

The indicators selected emphasize the financing agents facet. Macroeconomic and social accounting processes are multidimensional in nature, consisting in monitoring the origin of funds and the operations of managers that mobilize these funds. This monitoring also includes the allocation to providers of care and other interventions necessary for a health system to operate, the use of the resources delivered, and the benefits that accrue to different population segments. Several hundred rows of statistical data and calculations for each health system are thus necessary.



The table shown tracks the details of two groups of entities: general government and private agents. General government comprises the central or federal government, regional/state/provincial authorities, municipal and local authorities, and autonomous trust funds or boards implementing government policies, principally social protection agencies or social security schemes. In many countries, subnational authorities obtain their resources from the national taxation system and other intragovernment transfer mechanisms. This implies that a simple addition of the various layers of government would lead to double counting. The deconsolidation procedure in the absence of detailed records also entails, however, a risky procedure: national and subnational authorities or autonomous funds dealing with the health system do not systematically adhere to the same accounting conventions.

External resources earmarked for health programmes, a financing source, is also included, comprising concessional loans and grants for medical care and medical goods channelled through the Ministry of Health or via the Ministry of Finance or Central Bank.

General government expenditure on health (GGHE) is the sum of outlays on health paid for by taxes, social security contributions and external resources (without double-counting the government transfers to social security and extrabudgetary funds). Social security and extrabudgetary funds on health include the expenditure to purchase health goods and services by schemes that are compulsory, under governmental control, and covering a sizeable segment of the population. A major hurdle has consisted in verifying that no double counting occurs and that no cash benefits for sickness and/or loss of employment are included in the estimates, as these are classified as income maintenance expenditure.

The private sector comprises four types of entities: those that pool resources in order to purchase medical goods and services and, sometimes, to finance delivery facilities; these prepaid private risk-pooling plans include the outlays of private social insurance schemes, commercial and non-profit (mutual) insurance schemes, health maintenance organizations and other agents managing prepaid medical and paramedical benefits, including the operating costs of these schemes. Non-financial corporations provide medical and paramedical goods and services to their employees on top of compulsory social insurance or resource pooling entities. Nongovernmental organizations and non-profit institutions use resources to purchase health goods and services that are not allowed to be a source of income, profit or other financial gain for the units that establish, control or finance them. Households share out-of-pocket in the costs of many publicly funded programmes, top-up benefits accessible through private pooling, and initiate self-diagnose and self-care without intervention of the health system which they belong. Included are gratuities and payments in-kind made to health practitioners and to suppliers of pharmaceuticals and therapeutic appliances.

In Annex Table 5, the general government and private expenditure on health flows are expressed as ratios. The denominators are the gross domestic product (GDP), which corresponds to the total sum of expenditure (consumption and investment) of the private and government agents of the economy, and general government expenditure (GGE), which corresponds to the consolidated outlays of all levels of government (territorial authorities: central/federal, provincial/regional/state/district, municipal/local), social security institutions, and extrabudgetary funds, including capital outlays. The per capita figures reported here are calculated using population data supplied by the UN Population Division (for non-OECD Member States) and the OECD (for OECD countries). UN estimates refer to the de facto resident population rather than the de jure population. These figures are not necessarily the official estimates of all Member States, and the per capita expenditures reported here may differ from official estimates of Member States accordingly. Per capita figures are

expressed in US\$ at exchange rates, as the observed annual average number of units at which a currency is traded in the banking system, or in international dollar estimates, derived by dividing local currency units by an estimate of their purchasing power parity (PPP) compared to US\$, i.e. a rate or measure that eliminates the consequences of differences in price levels existing between countries.

### *Sources of data*

A modelling process is inherent to the construction of any accounting system, private or public, but for all 191 countries part of the health accounting construct rests on national information. Only a minority of Member States have released health accounts data for all years from 1995–2000 contained in Annex Table 5.

The International Monetary Fund at the level of 101 nations has pioneered in releasing a “functional” breakdown of central government expenditure, which has served as a pilot to track government expenditure. When no national source was accessed, the IMF *Government finance statistics yearbook 2001*, Washington 2001, has been the source that served as a base. An exception relates to the OECD Member countries for which OECD *Health data 2002* served as the reference, requiring a few extrapolations to the year 2000 for a small number of cases or missed-out figures for the mid-1990s.

For the remainder, sources included United Nations national accounts, both for public and/or private expenditure on health; World Bank Development indicators; national statistical yearbooks and other reports containing estimates consistent with the principles underlying the data lifted from the sources quoted; household surveys; WHO secretariat estimates and correspondence with officials in Member States; and partial entries have had to be supplemented. As with all accounts constructed in the world, this set of accounts comprises numbers of imputations of missing cells: the foundations are the statistical series of what countries release about their health systems, statements which are rarely comprehensive, consistent, or timely.

The Development Assistance Committee of the OECD has a huge database of the commitments made by the principal external financing countries; it cross-classifies these by country in favour of which programmes are earmarked and by purpose. By courtesy of the OECD secretariat, a file has been processed from the data stored by that institution. Appropriations for external assistance are not spent overnight but vary according to the absorptive capacity of the recipient country and the nature and size of the programme. The funds are typically spent between two and ten years after commitment. The amounts on record have been crudely distributed as spent over periods ranging usually from two to five years, an element of uncertainty that has been corrected by “importing” data from a few recipient health ministries, finance – economic development – or economic planning ministries whenever accessed.

Although standardized methods to calculate GDP have been agreed to at world level, many Member States continue to release GDP figures that are partly based on other concepts. For the purposes of *The World Health Report 2002* annex, standardized concepts are used. The GDP was obtained from United Nations National accounts, a prepublication compilation supplied by courtesy of the UN Statistics Department, or IMF International financial statistics, Yearbook 2001 and June 2002 issue, or OECD National accounts 2002, and follows the new standard of the System of National Accounts (SNA93) time series whenever the Member States’ statistical agencies moved to the new concepts and definitions, or of the SNA68 for the others. General government expenditures are taken from United Nations National accounts 1995–1997, Table 1.4 extrapolated to 2000; OECD Na-

tional accounts; volume II; IMF *International financial statistics*, Yearbook 2001 and June 2002 issue (central government disbursements grossed up to include where possible regional and local authorities). Exchange rates were taken from IMF *International financial statistics*, June 2002 issue. International dollars have been estimated by WHO using methods similar to those used by the World Bank. PPPs are based on price comparison studies for 1996 where they exist. For other countries they are estimated using the GDP per capita in US \$, inflation trends, and various dummy variables accounting for regional differences. Forward projections to 2000 are made using the real GDP growth rate adjusted by the relative rate of inflation between the country in question and the United States.

The System of health accounts methodology pioneered by the OECD has served as an overall guideline to compile the estimates contained in Annex Table 5 and to mould hundreds of heterogeneous sources of information into a rigorous and comparative format. The estimates presented are as honest as possible a measurement of what Member States release about their health systems for one or more years. The records accessible, though intended to be those relating to executed and, preferably, audited budgets, relate sometimes only to "prospective" spending of the institutions which have health in their portfolio. These may also be accountable for other environmental and social policy goals and, in parallel, non-health ministries conduct programmes that pursue mainly the achievement of the nation's health goals.

For statistical purposes, the data for China do not include those for the Hong Kong Special Administrative Region and the Macao Special Administrative Region. For Jordan, data for territory under occupation since 1967 by Israel are excluded.

The following section gives a list of all the risk factors considered in this report according to the groupings that have been used, with ranges of uncertainty for global estimates of attributable burden. The prevalence of risk factors, attributable mortality, attributable years of life lost and attributable DALYs is also given.

The risk factors have been grouped under seven separate headings. The first, childhood and maternal undernutrition, includes underweight, deficiencies in iron, vitamin A and zinc. The second group, referring to other diet-related risk factors, consists of high blood pressure, high cholesterol, overweight, low fruit and vegetable intake, and also physical inactivity. The third group is concerned with sexual and reproductive health and consists of unsafe sex and lack of contraception. The fourth group comprises addictive substances, which includes smoking and oral tobacco use, alcohol use and illicit drug use. The fifth group, on environmental risks, consists of unsafe water, sanitation and hygiene, urban air pollution, indoor smoke from solid fuels, lead exposure and climate change. The sixth group is a selection of occupational risks, namely work-related risk factors for injuries, and work-related carcinogens, airborne particulates, ergonomic stressors and noise. The seventh group comprises other selected risks to health of unsafe medical injections and childhood sexual abuse. A full description of the methods used is contained in the Explanatory Notes of the Statistical Annex on *The World Health Report 2002* web site ([www.who.int/whr](http://www.who.int/whr)).



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- <sup>3</sup> United States Bureau of the Census: International database available at <http://www.census.gov/ipc/www/idbnew.html>
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- <sup>5</sup> Murray CJL, Ferguson B, Lopez AD, Guillot M, Salomon JA, Ahmad O (2001). *Modified-logit life table system: principles, empirical validation and application*. Geneva, World Health Organization (GPE Discussion Paper No. 39).
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- <sup>7</sup> Salomon JA, Murray CJL (2001). Modelling HIV/AIDS epidemics in sub-Saharan Africa using seroprevalence data from antenatal clinics. *Bulletin of the World Health Organization* 79(7): 596-607.
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- <sup>19</sup> Sadana R, Mathers CD, Lopez AD, Murray CJL (2000). *Comparative analysis of more than 50 household surveys on health status*. Geneva, World Health Organization (GPE Discussion Paper No. 15).
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