



statistical annex

explanatory notes

The tables in this technical annex present information on core indicators of population health in WHO Member States and regions for the year 2002, selected national health accounts aggregates for 1997–2001, and baseline estimates for health-related Millennium Development Goal indicators in WHO Member States. These notes provide an overview of concepts, methods and data sources, together with references to more detailed documentation. It is hoped that careful scrutiny and use of the results will lead to progressively better measurement of core indicators of population health and health system financing. The main results in the population health tables are reported with uncertainty intervals in order to communicate to the user the plausible range of estimates for each country on each measure.

Because the production time of *The World Health Report 2004* has been much shorter than usual, it was not possible to carry out consultations on new figures with Member States. Annex Tables 1–6 thus present figures for the same years as the Annex Tables published in *The World Health Report 2003*. 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, however, still be interpreted as the best estimates of WHO rather than the official viewpoint of Member States. Only new information received from Member States following consultations in 2003, which was received too late for inclusion in *The World Health Report 2003*, has been used to update Annex

Tables 1–6. Additionally, revisions to Annex Tables 2 and 3 have taken into account new data for some causes of death as described below.

The work leading to the production of these annex tables was undertaken mostly by the WHO Evidence and Information for Policy cluster in collaboration with counterparts from the WHO regional offices and WHO representatives in Member States. All six WHO regional offices provided updated health expenditure information obtained from Member States in their regions. The WHO Regional Offices for the Americas and Europe also provided cause-of-death data from their 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. Life tables have been developed for all 192 Member States for 2002, starting with a systematic review of all available evidence from surveys, censuses, sample registration systems, population laboratories and vital registration on levels of and trends in child mortality and adult mortality (1). This review benefited greatly from a collaborative assessment of child mortality levels for 2001 by WHO and UNICEF and from analyses of general mortality by the United States Census Bureau (2) and the United Nations Population Division (3). WHO uses a standard method to estimate and project life tables for all Member States using comparable data. This may lead to minor differences compared with official life tables prepared by Member States.

All estimates of population size and structure for 2002 are based on the 2002 demographic assessments prepared by the United Nations Population Division (3). These estimates refer to the de facto population, and not the de jure population in each Member State. The annual growth rate, the dependency ratio, the percentage of population aged 60 years and more, and the total fertility rate are also derived from the United Nations Population Division database. To aid in demographic, cause-of-death and burden of disease analyses, the 192 Member States have been divided into five mortality strata on the basis of their levels of child and adult male mortality. The matrix defined by the six WHO regions and the five mortality strata leads to 14 epidemiological subregions, since not every mortality stratum is represented in every region. These subregions are defined on pages 156–157 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, and with additional age-specific parameters to correct for systematic biases in the application of a two-parameter system (4). 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 2002 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 2002. In addition, adult sibling survival data from available population surveys were analysed to obtain additional information on adult mortality. Life expectancy, under-five mortality in terms of probability of dying by five years of age and adult mortality in terms of probability of dying between 15 and 60 years of age derive directly from the life tables.

To capture the uncertainty resulting from sampling, indirect estimation technique or projection to 2002, a total of 1000 life tables have been developed for each Member State. 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 (5). In countries with a substantial HIV/AIDS epidemic, recent estimates of the level and uncertainty range of the magnitude of the epidemic have been incorporated into the life table uncertainty analysis.

ANNEX TABLES 2 AND 3

Causes of death for the 14 epidemiological subregions and the world have been estimated based on data from 112 national vital registration systems that capture about 18.6 million deaths annually, representing one-third of all deaths occurring in the world. 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 (6–16). These data are used to estimate death rates by age and sex for underlying causes of death as defined by the International Statistical Classification of Diseases and Related Health Problems (ICD) classification rules.

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 (17) and further refined using a much more extensive database and more robust modelling techniques (18).

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 (19). 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 (15).

The regional and global estimates of mortality and burden of disease by cause for 2002 published in Annex Tables 2 and 3 have been updated from those published in *The World Health Report 2003*, not only to take into account revisions to life tables for a few countries but also to include revised estimates of mortality for some causes, based on improved data and recent evidence.

Estimates of HIV/AIDS mortality have been revised to take into account new and different sources of data, such as national household surveys, as well as improved information on emerging epidemics in the Americas, Asia and eastern Europe (8). Latest estimates available for countries (as at February 2004) have been incorporated into the revision of Annex Tables 2 and 3. Tuberculosis prevalence and mortality for 2002 have been revised based on latest tuberculosis notification data, treatment rates, and case-fatality rate data, as published in WHO's *Global tuberculosis control report 2004*.

Estimates of measles mortality have been revised to take into account new information on the effects of supplemental immunization campaigns in reducing measles mortality. The number and quality of supplemental immunization campaigns have substantially increased since 2000 in Africa. Estimates of deaths from pertussis and poliomyelitis for 2002 have also been revised to take into account new information on notifications and immunization coverage. Neonatal tetanus and maternal tetanus incidence and mortality have been revised, to take into account the implementation of tetanus toxoid supplemental immunization activities. These activities target all women of childbearing age in the highest-risk districts, and have been implemented in 29 countries since 1999.

Annex Table 3 provides estimates of the burden of disease for the 14 epidemiological subregions using disability-adjusted life years (DALYs). 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 into old age in full health (20, 21). DALYs for a disease

or health condition are calculated as the sum of the years of life lost (YLL) owing to premature mortality in the population and the years lost through disability (YLD) for incident cases of the health condition. DALYs for 2002 have been estimated based on cause-of-death information for each subregion and regional or country-level assessments of the incidence and prevalence of diseases and injuries. The latter are based on a systematic assessment and analysis of data on major diseases and injuries available to WHO technical programmes and through collaboration with scientists worldwide (16). WHO programme participation in the development of these estimates and consultation with Member States ensure that estimates reflect all information and knowledge available to WHO. Estimates of incidence and point prevalence for selected major causes by subregion are also available on the WHO web site at www.who.int/evidence/bod.

ANNEX TABLE 4

Annex Table 4 reports the average level of population health for WHO Member States in terms of healthy life expectancy (HALE). HALE is based on life expectancy at birth (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 (22, 23). The methods used by WHO to calculate HALE have been developed to maximize comparability across populations. WHO analyses of over 50 existing national health surveys for the calculation of healthy life expectancy identified severe limitations in the comparability of self-reported health status data from different populations, even when identical survey instruments and methods were used (24). These comparability problems are a result of unmeasured differences in expectations and norms for health, so that the meaning that different populations attach to the labels used for response categories in self-reported questions (such as mild, moderate or severe) can vary greatly (25). To resolve these problems, WHO undertook a Multi-Country Survey Study (MCSS) in 2000–2001 in collaboration with Member States, using a standardized health status survey instrument together with new statistical methods for adjusting biases in self-reported health (25, 26).

The MCSS carried out 71 representative household surveys in 61 Member States in 2000 and 2001, using a new health status instrument based on the *International classification of functioning, disability and health* (27), which seeks information from a representative sample of respondents on their current states of health according to seven core domains. 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 in each of the core domains (26). The calibrated responses are used to estimate the prevalence of different states of health by age and sex.

The measurement of *time spent in poor health* is based on combining condition-specific estimates from the Global Burden of Disease study with estimates of the prevalence of different health states by age and sex derived from the MCSS, and weighted using health state valuations (28). Data from the Global Burden of Disease study were used to estimate severity-adjusted prevalences for health conditions by age and sex for all 192 WHO Member States for 2002. Data from 62 surveys in the MCSS were used to make independent estimates of severity-adjusted prevalences by age and sex. Finally, posterior prevalences for all Member States for 2002 were calculated based on the Global Burden of Disease study and survey prevalences.

Household surveys including a valuation module were conducted in fourteen countries: China, Colombia, Egypt, Georgia, India, Indonesia, Islamic Republic of Iran,

Lebanon, Mexico, Nigeria, Singapore, Slovakia, Syrian Arab Republic and Turkey. Data on nearly 500 000 health state valuations from over 46 000 respondents were used to develop average global health state valuations for the calculation of HALE (29).

The methods used by WHO to calculate healthy life expectancy were peer-reviewed during 2001 and 2002 by the Scientific Peer Review Group (SPRG) constituted by the Director-General, in response to a request by the WHO Executive Board (EB107.R8). The SPRG's final report to the Director-General (30) considered that the methodology for the measurement of HALE was well advanced, and made a number of technical recommendations which have been followed for the calculations reported in Annex Table 4. In particular, steps have been taken to include residents in health institutions and dependent comorbidity (16).

Annex Table 4 reports for all Member States for 2002 the following: average HALE at birth, HALE at age 60, expected lost healthy years (LHE) at birth, percentage of total life expectancy (LE) lost, and 95% uncertainty intervals. LHE is calculated as LE minus HALE and is the expected equivalent number of years of full health lost through living in health states other than full health. LHE expressed as a percentage of total LE represents the proportion of total life expectancy that is lost through living in health states of less than full health.

ANNEX TABLE 5

National health accounts (NHA) are a synthesis of the financing and spending flows recorded in the operation of a health system, with the potential to monitor all transactions from funding sources to the distribution of benefits across geographical, demographic, socioeconomic and epidemiological dimensions. NHA are related to the macroeconomic and macrosocial accounts whose methodology they borrow.

Annex Table 5 provides the best estimates that were available to WHO up to July 2003 for each of its 192 Member States. Although more and more countries collect health expenditure data, only a limited number have produced full national health accounts. Nationally and internationally available information that has been identified and obtained has been compiled for each country. Standard accounting estimation and extrapolation techniques have been applied to provide adequate time series. A policy-relevant breakdown of the data (for example, public/private expenditure) is also provided. Each year draft templates are sent to ministers of health for their comments and their assistance in obtaining additional information as appropriate. The constructive responses from ministries have provided valuable information for the NHA estimates reported here.

An important methodological contribution to producing national health accounts is now available in the *Guide to producing national health accounts with special applications for low-income and middle-income countries* (31). This guide is based on the Organisation for Economic Co-operation and Development (OECD) *System of health accounts* (32). Both reports are built on the principles of the United Nations *System of national accounts* (commonly referred to as SNA93) (33).

The principal international references used to produce the tables are the International Monetary Fund (IMF) *Government finance statistics yearbook, 2002* (34), *International financial statistics yearbook, 2003* (35) and *International financial statistics* (September 2003) (36); the Asian Development Bank *Key indicators 2002* (37); *OECD Health Data 2003* (38) and *International development statistics* (39); and the United Nations *National accounts statistics: main aggregates and detailed tables, 2000* (40). The organizations charged with producing these reports facilitated the supply of advance copies for WHO and gave additional related information, and their contributions are acknowledged here with gratitude.

National sources include: national health accounts reports, public expenditure reports, statistical yearbooks and other periodicals, budgetary documents, national accounts reports, statistical data on official web sites, nongovernmental organization reports, academic studies, and reports and data provided by central statistical offices, ministries of health, ministries of finance and economic development, planning offices, and professional and trade associations.

Annex Table 5 provides both updated and revised figures for 1997–2001. Figures have been updated when new information that changes the original estimates has become available. This category includes benchmarking revisions, whereby an occasional wholesale revision is made by a country owing to a change in methodology, when a more extensive NHA effort is undertaken, or when shifting the denominator from SNA68 to SNA93. Colombia is a case in point.

Total expenditure on health has been defined as the sum of general government expenditure on health (GGHE or public expenditure on health), and private expenditure on health (PvtHE). All estimates are calculated in millions of national currency units (million NCU). The estimates are presented as ratios to gross domestic product (GDP), to total health expenditure (THE), to total general government expenditure (GGE), or to private expenditure on health (PvtHE).

GDP is the value of all goods and services provided in a country by residents and non-residents without regard to their allocation among domestic and foreign claims. This (with small adjustments) corresponds to the total sum of expenditure (consumption and investment) of the private and government agents of the economy during the reference year. The United Nations *National accounts statistics: main aggregates and detailed tables, 2000 (40)*, Table 1.1, was the main source of GDP estimates. For the 30 Member countries of the OECD, the macroeconomic accounts have been imported from the *National accounts of OECD countries: detailed tables 1990/2001*, 2003 edition, Volume II (41), Table 1. Collaborative arrangements between WHO and the United Nations Statistics Division and the Economic Commission for Europe of the United Nations have permitted the receipt of advance information on 2001. For Iraq, Lebanon and the United Arab Emirates, United Nations Economic and Social Commission for Western Asia data were used.

When United Nations data were unavailable, GDP data reported by the IMF (*International financial statistics*, September 2003) as well as unpublished data from the IMF Research Department have been used. They included Cape Verde, Comoros, Djibouti, Eritrea, the Gambia, Ghana, Guinea, Mauritania, and Sao Tome and Principe. In the few cases where none of the preceding institutions reported updated GDP information, WHO has used data from other institutions or national series. National series were used for Andorra, Federated States of Micronesia, Nicaragua, Niue, Palau, Samoa, Solomon Islands and Tonga. Figures for Kiribati were obtained from the Asian Development Bank. The estimates for the Democratic People's Republic of Korea and Timor-Leste originate from policy reports, as no standard statistical sources had any information on these countries. Likewise, the estimates for Afghanistan, Liberia and Somalia originate from the web site of the United Nations Statistical Department (UNSTAT). Estimates for Equatorial Guinea originate from the Banque des Etats de l'Afrique Centrale (BEAC).

The data for China exclude estimates for Hong Kong Special Administrative Region and Macao Special Administrative Region. The health expenditure data for Jordan exclude the contributions from United Nations Relief and Works Agency for Palestine Refugees in the Near East (UNRWA), which provided basic health services support to

Palestinian refugees residing on Jordanian territories, but include UNRWA expenditures to UNRWA clinics. The 1997 and 1998 health expenditure data for Serbia and Montenegro included the provinces of Kosovo and Metohia, but for 1999 and 2000 the data excluded them, since these territories have been placed under the administration of the United Nations. The estimate for 2001 was also extrapolated without Kosovo and Metohia.

General government expenditure (GGE) includes consolidated direct outlays and indirect outlays (for example, subsidies to producers, transfers to households), including capital of all levels of government (central/federal, provincial/regional/state/district, and municipal/local authorities), social security institutions, autonomous bodies, and other extrabudgetary funds. *National accounts of OECD countries: detailed tables 1990/2001*, 2003 edition, Volume II, Table 12, row 51, supplies the information for 27 member countries. The IMF *Government finance statistics yearbook* supplies an aggregate figure for 133 central/federal governments with complements for 23 regional and 45 local/municipal governments (as well as some social security payments for health data received from the IMF). It reports central government disbursement figures in its *International financial statistics*, row 82. Several other public finance audits, executed budgets, budget plans, statistical yearbooks, web sites, World Bank and Regional Development Bank reports, and academic studies have been consulted to verify total government expenditure. Extrapolations were made on incomplete time series using, inter alia, the differential between current disbursement plus savings in the United Nations *National accounts* up to 1995 and the IMF central government disbursement level. Several national authorities have also confirmed the GGE series during the consultative process.

GGHE comprises the outlays earmarked for the enhancement of the health status of population segments and/or the distribution of medical care goods and services among population segments by:

- central/federal, state/provincial/regional, and local/municipal authorities;
- extrabudgetary agencies, principally social security schemes, which operate in several countries;
- external resources (mainly grants and credits with high grant components to governments).

The figures for social security and extrabudgetary expenditure on health include purchases of health goods and services by schemes that are compulsory and under governmental control. A major hurdle has been the need to verify 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.

All expenditures are to be accounted for, including final consumption, subsidies to producers, transfers to households (chiefly reimbursements for medical and pharmaceutical bills), investment and investment grants (also referred to as capital transfers). The classification of the functions of government, promoted by the United Nations, IMF, OECD and other institutions, sets the boundaries. In many instances, the data contained in the publications are limited to those supplied by ministries of health. Expenditures on health, however, should include expenditures where the primary intent is for health regardless of the implementing entity. An effort has been made to obtain data on health expenditures by other ministries, the armed forces, prisons, schools, universities and others, to ensure that all resources accounting for health expenditures are included. Information on external resources was received courtesy

of the Development Action Committee of the OECD (DAC/OECD). A quarter of Member States explicitly monitor the external resources entering their health system, information that has been used to validate or amend the order of magnitude derived from the DAC entries.

OECD health data 2003 supplies GGHE entries for its member countries, with some gaps for the year 2001. In addition, the data for the year 2001 for Austria, Belgium, Iceland, Japan, Luxembourg, Republic of Korea and Turkey have been largely developed by WHO as they were not yet available through the OECD. Those have been projected by WHO. NHA studies were available for 54 non-OECD countries for one or more years. The detailed information in these reports permitted a more reliable basis for estimation than in other years. The IMF *Government finance statistics* reports central government expenditure on health for 122 countries, regional government outlays for health for 23 countries, and local government outlays on health for 45 countries. The entries are not continuous time series for all countries, but the document serves as an indicator that a reporting system exists in the 122 countries. A thorough search was conducted for the relevant national publications in those countries. In some cases it was observed that expenditures reported under the government finance classification were limited to those of the ministry of health rather than all expenditures on health regardless of ministry. In such cases, other series were used to supplement that source. Government finance data, together with external resources data, statistical yearbooks, public finance reports, and analyses reporting on the implementation of health policies, have led to GGHE estimates for most WHO Member States. Information on Brunei Darussalam, for example, was accessed from national sources, but also from an International Medical Foundation of Japan data compendium (42). This source provided a means for double checking health budget data for seven countries.

Several processes have been used to judge the validity of the data. For example, the aggregate expenditure obtained has been compared against inpatient care expenditure, pharmaceutical expenditure data and other records (including programme administration and other costs entering the *System of health accounts* classifications) to cross-validate the information, in order to ensure: that the outlays for which details have been assembled constitute the bulk of the government expenditure on health; that intra-government transfers are consolidated; and that the estimates obtained are judged plausible in terms of systems' descriptions. The aggregate governmental health expenditure data have also been compared with total GGE, providing an additional source of verification. Sometimes the GGHE and, therefore, the figures for total health expenditure, may be an underestimate if it is not possible to estimate for local government, nongovernmental organizations and insurance. For example THE for India may not include some agents leading to a possible underestimate of between 0.3% and 0.6% of GDP. Information for Afghanistan and Iraq was received from the Regional Office for the Eastern Mediterranean, and for Cambodia from the country office.

Private expenditure on health has been defined as the sum of expenditures by the following entities:

- Prepaid plans and risk-pooling arrangements: the outlays of private and private social (with no government control over payment rates and participating providers but with broad guidelines from government) 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).

- Firms' expenditure on health: outlays by public and private enterprises for medical care and health-enhancing benefits other than payment to social security.
- Non-profit institutions serving mainly households: resources used to purchase health goods and services by entities whose status does not permit them to be a source of income, profit or other financial gain for the units that establish, control or finance them. This includes funding from internal and external sources.
- Household out-of-pocket spending: the direct outlays of households, including gratuities and in-kind payments made to health practitioners and suppliers of pharmaceuticals, therapeutic appliances, and other goods and services, whose primary intent is to contribute to the restoration or the enhancement of the health status of individuals or population groups. This includes household payments to public services, non-profit institutions or nongovernmental organizations and non-reimbursable cost sharing, deductibles, copayments and fee-for-service. It excludes payments made by enterprises which deliver medical and paramedical benefits, mandated by law or not, to their employees and payments for overseas treatment.

Most of the information on private health expenditures comes from NHA reports, statistical yearbooks and other periodicals, statistical data on official web sites, reports of nongovernmental organizations, household expenditure surveys, academic studies, and relevant reports of and data provided by central statistical offices, ministries of health, professional and trade associations. For the 30 OECD member countries they are obtained from the *OECD health data 2003*. Standard extrapolation and estimation techniques were used to obtain the figures for missing years.

ANNEX TABLE 6

Annex Table 6 presents total expenditure on health and general government expenditure on health in per capita terms. The methodology and sources to derive THE and GGHE have been discussed in the notes to Annex Table 5. Ratios are represented in per capita terms by dividing the expenditure figures by population figures. These per capita figures are expressed first in US dollars at an average exchange rate, which is the observed annual average number of units at which a currency is traded in the banking system. It is then also presented in international dollar estimates, derived by dividing local currency units by an estimate of their purchasing power parity (PPP) compared to US dollars, i.e. a rate or measure that minimizes the consequences of differences in price levels existing between countries.

OECD health data 2003 is the major source for population estimates for the 30 OECD member countries, just as it is for other health expenditure and macroeconomic variables. All estimates of population size and structure, other than for OECD countries, are based on demographic assessments prepared by the United Nations Population Division (3). This report uses the estimates referred to as the de facto population, and not the de jure population, in each Member State. An exception was made for Serbia and Montenegro for 2001, as expenditure figures excluded the provinces of Kosovo and Metohia, which became territories under the administration of the United Nations. Estimates for Serbia and Montenegro, excluding the populations of Kosovo and Metohia, were obtained from the *Statistical yearbook of Yugoslavia 2002*, thus ensuring consistency of the basis for the numerator and denominator.

Three-quarters of the exchange rates (average for the year) have been obtained from the IMF's *International financial statistics, September 2003*, row rf. Where information

was lacking, available data from the United Nations, the World Bank and ad hoc donor reports (in the case of Afghanistan for example) were used. The euro:US dollar rate has been applied for Andorra, Monaco and San Marino. The New Zealand dollar:US dollar rate has been applied for Niue. The Australian dollar:US dollar rate has been applied for Nauru and Palau. Ecuador dollarized its economy in 2000, but the entire dataset has been recalculated in dollar terms for the five-year period reported.

For OECD member countries, the OECD PPP has been used to calculate international dollars. For countries that are part of the UNECE but are not members of OECD, the UNECE PPPs were calculated on the same basis as the OECD PPP. The remaining calculations for international dollars have been estimated by WHO using methods similar to those used by the World Bank.

ANNEX TABLE 7

In September 2000, representatives of 189 countries met at the Millennium Summit in New York and committed themselves to working towards a world in which sustaining development and eliminating poverty would have the highest priority. The Millennium Development Goals (MDGs) summarize these commitments and have been commonly accepted as a framework for measuring development progress. They are an integral part of the *Road map towards the implementation of the United Nations Millennium Declaration*, which was endorsed by the United Nations General Assembly (43). The MDGs give high prominence to health: three of the eight goals and 17 indicators of progress are health-related. They assist in the development of national policy frameworks, such as poverty reduction strategies and national health policies focusing on the poor, and help track the performance of health programmes and systems. Although the MDGs do not cover the whole range of public health domains, a broad interpretation of the goals provides an opportunity to tackle important cross-cutting issues and key constraints to health and development. Some common constraints include human resources for health, health care financing and government capacity, especially in the area of stewardship.

WHO is working closely with other United Nations agencies in reporting on the health-related MDGs. WHO shares lead agency responsibility with UNICEF for reporting on child mortality, maternal health, childhood nutritional status, malaria prevention measures and access to clean water, and with UNAIDS on HIV prevention. At global level, interagency mechanisms have been established to ensure technical coherence in the collection, analysis and validation of MDG-related data, and to define reporting responsibilities. At country level, WHO, through its country representatives, is the lead authority for the health content of the MDGs within United Nations country teams.

Annex Table 7 provides baseline information for WHO Member States for selected MDG health indicators. The notes below summarize definitions, measurement methods, sources of information and give further references for the MDG health indicators.

Percentage of underweight children among children under five years of age

The internationally recommended way to assess malnutrition at population level is to take body measurements (e.g. weight and height) and to relate them to an individual's age or height. In children the three most commonly used anthropometric indices are weight-for-height, height-for-age and weight-for-age. Anthropometric values are compared across individuals or populations in relation to a set of reference values and the choice of the reference population has a significant impact on the proportion of

children identified as being undernourished and overnourished. Since the late 1970s WHO has been recommending the National Center for Health Statistics (NCHS) growth reference, the so-called NCHS/WHO international reference population, for the comparison of child growth data.

The data sources presented in Annex Table 7 are population-based surveys which fulfil the following main criteria:

- a defined population-based sampling frame;
- a probabilistic sampling procedure involving at least 400 children;
- use of standard anthropometric measurement techniques;
- presentation of prevalence of underweight in z-scores cut-off points (i.e. standard deviation scores) in relation to the NCHS/WHO international reference or availability of the raw data, allowing a standardized analysis.

The figures shown in the table are estimated for each Member State from the most recent population-based survey available that fulfil these criteria (44–46).

Under-five mortality rate

Under-five mortality rate is the probability (expressed as rate per 1000 live births) of a child born in a specific year dying before reaching five years of age, if subject to current age-specific mortality rates. Under-five mortality represents over 90% of child deaths under the age of 18 worldwide.

Age-specific mortality rates calculated from birth and death data are derived from vital registration, census, and/or household surveys. When using household surveys, under-five mortality estimates are obtained in a direct Multiple Indicators Cluster Survey (MICS) (using birth history as in demographic and health surveys) or in an indirect way (such as in MICS Brass method). When mortality is high, the indirect method tends to overestimate infant mortality and underestimate child mortality.

Sources used for the calculation of child mortality rates for WHO Member States include the demographic and health surveys, MICS, national vital registration systems and national censuses (16). Under-five mortality rates for 2000 published here have been revised for consistency with the 2002 figures given in Annex Table 1, using the same cycle of information, and may differ from previously published estimates of under-five mortality for the year 2000.

Infant mortality rate

Infant mortality rate is the probability (expressed as rate per 1000 live births) of a child born in a specific year dying before reaching one year of age, if subject to current age-specific mortality rates.

When using household surveys, infant mortality estimates are obtained in a direct (using birth history as in demographic and health surveys) or indirect way (such as in MICS Brass method). When using indirect estimates, the infant mortality estimates must be consistent with the under-five mortality estimates. Sources used for the calculation of infant mortality rates for WHO Member States include national vital registration systems, demographic and health surveys, MICS, and national censuses (16).

Percentage of one-year-old children immunized against measles

Estimates of immunization coverage are generally based on two sources of empirical data: reports of vaccinations performed by service providers (routinely recorded data) and surveys containing items on children's vaccination history (coverage surveys). For estimates based on routinely recorded data, the immunization coverage is derived by

dividing the total number of vaccinations given by the number of children in the target population. For most vaccines the target population is the national annual number of births or number of surviving infants (this may vary depending on countries' policies and the specific vaccine).

For estimates based on immunization coverage surveys the denominator corresponds to children aged 12–23 months who had received at least one measles vaccination by the time of the survey or had done so before the age of 12 months.

Measles immunization coverage for 2001 is based on the WHO and UNICEF review of coverage data based on administrative records, surveys, national reports and consultation with local and regional experts (47–49).

Maternal mortality ratio

The International statistical classification of diseases and related health problems, tenth revision (ICD-10) defines a maternal death as: the death of a woman while pregnant or within 42 days of termination of pregnancy, irrespective of the duration and site of the pregnancy, from any cause related to or aggravated by the pregnancy or its management, but not from accidental or incidental causes. Measuring maternal mortality both reliably and in a cost-effective way is not possible except where comprehensive registration of deaths and causes of death exists. Elsewhere, survey methods or models have to be used to estimate levels of maternal mortality. WHO recommends a variety of measurement methods depending on a country's vital registration system and its capacity to provide direct observation of maternal deaths.

For Member States with good vital registration (90% coverage, medical certification of cause of death), the vital registration system is the main source for direct counting of maternal deaths in a given period. Misclassification and miscoding of maternal deaths are frequent, especially where the pregnancy status of the woman is not included in the death certificate. Adjustment methods are therefore required to produce a more accurate estimate of maternal mortality (reported maternal deaths are adjusted by a nationally reported adjustment factor if available, or by 1.5 if not).

For Member States with incomplete vital registration, but with maternal mortality estimates derived from population-based surveys, demographic and health survey and the MICS use a sibling survival method, asking respondents questions about the survival of their adult sisters in relation to the period around pregnancy and childbirth.

For Member States with no reliable national data on maternal mortality, statistical modelling is the only possibility. WHO, UNICEF and UNFPA have developed model-based estimates. A statistical model is used to estimate the proportion of deaths of women of reproductive age from maternal causes. Estimates of the number of maternal deaths are then obtained by applying this proportion to the best available figure of the total number of deaths among women in reproductive age, which is currently the WHO HIV-adjusted envelope of female deaths.

Alternative methods used include reviews of all deaths of women of reproductive age (Reproductive Age Mortality Study (RAMOS)), longitudinal studies of pregnant women, repeated large-scale household surveys and inclusion of maternal mortality-related questions in national censuses. All these methods, however, still rely on accurate reporting of deaths of pregnant women and of the cause of death, which are difficult to obtain.

Full details of methods and data sources used by WHO, UNICEF and UNFPA are given in a recent joint publication, *Maternal mortality in 2000: estimates developed by WHO, UNICEF and UNFPA* (14).

Percentage of live births attended by skilled health personnel

The term skilled attendant refers exclusively to people with midwifery skills (for example doctors, midwives and nurses) who have been trained to proficiency in the skills necessary to manage normal deliveries and diagnose or manage obstetric complications. They must be able to manage normal labour and delivery, recognize the onset of complications, perform essential interventions, start treatment, and supervise the referral of mother and baby for interventions that are beyond their competence or not possible in the setting in question. Traditional birth attendants, trained or not, are excluded from the category of skilled attendant at delivery.

For most countries, the main sources of information on skilled attendance at delivery are household surveys (14). While efforts are made to standardize definitions of skilled birth attendants, there are concerns about the comparability of some of the results across countries and within countries at different times. Although WHO has defined the specific competencies that the skilled attendant should have, there have been no systematic efforts to ensure that the groups classified under the heading of skilled attendant actually have them. In some settings, groups of providers in the skilled attendant category include those unlikely to have the skills and experience required to manage childbirth complications safely.

Issues related to the way data on skilled attendance at delivery are collected include:

- the extent to which respondents can accurately report the skills of the birth attendant;
- potential bias introduced by the fact that most household surveys report on live births in the past five years, thus missing many adverse health outcomes which are disproportionately concentrated among women experiencing adverse outcomes such as stillbirths or miscarriages;
- the potential overrepresentation of women with short birth intervals who are almost certain to exhibit other risk factors for adverse pregnancy outcome, including high parity, low levels of education and absence of contact with other health services such as family planning. Surveys should only include the most recent birth for the survey period.

HIV prevalence among adults aged 15 to 49 years

This indicator measures the proportion of the total population aged 15 to 49 years infected with HIV. It includes people who have progressed to AIDS, but does not include people who have died from the disease. Estimates of HIV prevalence have been developed by UNAIDS and WHO for most Member States and revised periodically to account for new data and improved methods (7, 8, 50). For the most recent round of estimates, two different types of model have been used, depending on the nature of the epidemic in a particular country. For generalized epidemics, in which infection is spread primarily through heterosexual contact, a simple epidemiological model was used to estimate epidemic curves based on sentinel surveillance data on HIV seroprevalence. For countries with epidemics concentrated in high-risk groups, prevalence estimates were derived from the estimated population size and prevalence surveillance data in each high-risk category.

The HIV prevalence figures shown for 2000 have been revised from previously published figures to take into account new data and are consistent with the latest UNAIDS and WHO estimates of prevalences for 2003.

For a few countries where prevalence estimates for HIV seropositive cases (including

AIDS) are not directly available, they have been derived by scaling regional prevalence estimates by the ratio of country-specific HIV mortality to regional HIV mortality. Because different countries may be at different phases of the epidemic, the relationship between prevalence and mortality may vary across countries.

Malaria mortality rate

Malaria-specific mortality cannot be monitored routinely in most malaria endemic African countries since there are few systems in place for reliable measurement of malaria deaths. Symptoms and signs of malaria (such as fever or convulsions) are non-specific and overlap with other diseases, so verbal autopsy methods have low sensitivity and specificity for malaria. Since malaria may increase the susceptibility of young children to other infections, many child deaths may be malaria-related rather than directly attributable to malaria. Moreover, a majority of deaths do not occur in hospitals and are not routinely recorded in the health information system, and these are unlikely to be picked up in the – usually incomplete – vital registration.

Malaria mortality estimates for all regions except the African Region were derived from the cause-of-death data sources described above in the notes to Annex Table 2. For Africa, country-specific estimates of malaria mortality were based on analyses by Snow et al. (13) and updated using the most recent geographical distributions produced by malaria risks in Africa (MARA) mapping, together with available information on total child mortality rates, and the contributions of other specific causes. Work is currently under way in collaboration with expert groups to refine and revise these country-specific estimates of malaria mortality.

Tuberculosis prevalence (excluding HIV-infected people)

In 1997 WHO began to develop country estimates of tuberculosis incidence, prevalence and mortality. The data sources and methods have been described in detail elsewhere (6). Briefly, estimates of incidence are derived from case notifications adjusted by estimated case detection rates, prevalence data on active disease combined with estimates of average case durations, or estimates of infection risk multiplied by a scalar factor relating incidence of smear-positive pulmonary tuberculosis to annual risks of infection.

Since the original estimates for 1997 were completed, revised and updated estimates have been prepared. The majority of countries reporting to WHO have provided notification data with interpretable trends, and with no other evidence for a significant change in the case detection rate. For most countries, therefore, except those with evidence of changes in case detection rates, it has been assumed that trends in notification rates represent trends in incidence rates. Annual reports on tuberculosis control have included further details on surveillance methods, case notifications and incidence estimates by country (51).

Tuberculosis cases include all people in whom tuberculosis has been bacteriologically confirmed or diagnosed by a clinician: *definite cases* (positive culture for the mycobacterium tuberculosis), *smear-positive pulmonary cases*, *smear-negative pulmonary cases with clinical evidence*, *extrapulmonary tuberculosis*, and *relapse cases* (previously declared cured case with new episode).

Tuberculosis prevalence rates reported here are for all forms of tuberculosis excluding cases in HIV-positive people. Under the rules of the International Classification of Diseases, HIV is classified as the underlying cause of morbidity or death in HIV-positive people with tuberculosis. Although total tuberculosis prevalence rates, including

cases of tuberculosis in HIV-positive people, have been reported elsewhere for this MDG indicator, Annex Table 7 reports the prevalence of tuberculosis not associated with HIV infection, for consistency with the tuberculosis mortality indicator. The total prevalence of tuberculosis in 2000 is estimated at approximately 8 million; an additional 700 000 HIV-positive people have the disease.

Estimated prevalence of all forms of tuberculosis (excluding HIV-positive people) for 2000 was calculated by multiplying estimated incidence by estimated duration. Country-specific estimates of duration were weighted for the proportion of cases treated and the proportion smear-positive. These prevalences may differ from previously published figures for 2000, as they have been updated to take into account new data from Member States. For Member States where vital registration data have been used to estimate tuberculosis mortality, incidence and prevalence estimates have been revised to be consistent with estimated deaths, estimated case-fatality rates for treated and untreated cases, and the proportion of incident cases treated.

Tuberculosis mortality rate

The *death rate* from tuberculosis is estimated from incidence by multiplying by the estimated case-fatality rate, weighted for the proportion of cases treated and the proportion of smear-positive cases (6, 51). Tuberculosis deaths in HIV-infected individuals are not included but are attributed to HIV/AIDS. For Member States with reasonably good-quality or complete death registration data, death rates are derived from direct observation and counting of registered tuberculosis deaths. These death rates may differ from previously published figures for 2000, as they have been updated to take into account new data from Member States.

Proportions of smear-positive tuberculosis cases detected and successfully treated under DOTS

The recommended approach to tuberculosis control is via DOTS, an inexpensive strategy that could prevent millions of cases and deaths in years to come. DOTS is a five-pronged strategy for tuberculosis control consisting of: (i) sustained government commitment; (ii) detection of cases through sputum smear microscopy among symptomatic people; (iii) regular and uninterrupted supply of high-quality drugs; (iv) 6–8 months of regularly supervised treatment (including direct observation of drug-taking for at least the first two months); (v) reporting systems to monitor treatment progress and programme performance.

The success of DOTS depends on expanding case detection while ensuring high treatment success rates. These two indicators reflect the two main national targets of the strategy to be achieved for each implementing country: 85% treatment success rate and 70% case detection rate. Many of the 155 national DOTS programmes in existence by the end of 2001 have shown that they can achieve high treatment success rates, close to or exceeding the target of 85%. The global average treatment success rate for DOTS programmes was 82% for the cohort of patients registered in 2000, though cure rates tend to be lower, and death rates higher, where drug resistance is frequent or HIV prevalence is high.

These indicators are constructed from country notification of cases detected and successfully treated (51). The *DOTS detection rate* is the percentage of estimated new infectious tuberculosis cases detected under the DOTS case detection and treatment strategy. Case notifications represent only a fraction of the true number of cases arising in a country because of incomplete coverage by health services, inaccurate

diagnosis, or deficient recording and reporting.

The *DOTS treatment success rate* is the percentage of new, registered smear-positive (infectious) cases that were cured (identified as a bacteriological conversion from positive to negative) or in which a full course of DOTS treatment was completed. “Successfully treated” is therefore the sum of “cured” cases and the cases that “completed the full treatment course”. WHO routinely compiles data on the six standard, mutually exclusive outcomes of treatment. Figures are reported as percentages of all registered cases, so that the six possible outcomes plus the fraction of cases not evaluated sum to 100%. Although treatment success is expressed as a percentage, it is usually referred to as the “treatment success rate”.

Percentage of population using solid fuels

Solid fuels include biomass fuels such as wood, agricultural residues, animal dung, charcoal and coal. In many countries in which a large proportion of the population cooks with solid fuels, household energy data are widely, although not universally, available. This is the case for around 60 countries. For countries where there are no data, WHO has developed a statistical model to predict household solid fuel use from development-related parameters. As countries develop, people gradually shift from solid to cleaner fuels.

A wide range of development indicators were tested in the modelling process, including average annual growth rates, per capita electricity and petroleum consumption, Gini coefficient, per capita fuel wood production, and traditional fuel use at the national level. As information on traditional fuel use at the national level performs similarly to gross national product (GNP) per capita, but GNP per capita is more reliable, more routinely updated, and widely available, the model uses per capita GNP rather than traditional fuel use. The final model includes percentage rural population, location within the WHO Eastern Mediterranean Region (thought to be important as it indicates oil production), GNP per capita (log transformed), and per capita petroleum use (52). This is consistent with the theory that household solid fuel use declines with increases in economic growth and urbanization.

Percentage of population with sustainable access to an improved water source

The monitoring of the population with access to adequate water supply has proved problematic, because the data are often limited when estimated by service providers. Therefore WHO and UNICEF have now turned to consumer-based information to estimate water and sanitation coverage (53). For data collection, two main sources are used: household surveys and assessment questionnaires (to complement survey data or to provide estimates where survey data are not available). This allows for a far more detailed picture of the water supply technologies being used. It also captures information related to use and breakdown of self-built water facilities, of which service providers may be unaware.

Population-based surveys do not provide specific information on the adequacy of water supply facilities. It is assumed that certain types of technology are safer than others and that some of them cannot be considered as “coverage”. The term “safe” was replaced with “improved”. The population with access to improved water supply is considered to be covered. It is assumed that if the user has access to an “improved source” then such a source would be likely to provide 20 litres per capita per day at a distance no longer than 1000 metres. The following technologies represent improved

water supply: household connection, public standpipe, borehole, protected dug well, protected spring, rainwater collection.

Percentage of urban population with access to improved sanitation

The monitoring of access to adequate sanitation facilities has proved to be complicated for the same reasons that apply to water source. WHO and UNICEF have now turned to consumer-based information to estimate sanitation coverage by using household surveys and assessment questionnaires (to complement survey data or to provide estimates where survey data are not available) as the two main sources (53). This allows for a far more detailed picture of the sanitation technologies being used. It also captures information related to usage and breakdown of self-built facilities, of which service providers may be unaware.

As for access to improved water, population-based surveys do not provide specific information on the adequacy of sanitation facilities. By assuming that certain types of technology are better than others and that some of them cannot be considered as “coverage”, the term “adequate” was replaced with “improved” to accommodate these limitations. The following technologies represent improved sanitation: connection to a public sewer, connection to septic system, pour-flush latrine, simple pit latrine, ventilated improved pit latrine.

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