WHO methods and data sources for country-level causes of death 2000-2012

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Estimates and analysis are available at:
http://www.who.int/gho/mortality_burden_disease/en/index.html

For further information about the estimates and methods, please contact healthstat@who.int

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1 Introduction

Global, regional, and country statistics on population and health indicators are important for assessing development and health progress and for guiding resource allocation. The demand is growing for timely data to monitor progress in health outcomes such as child mortality, maternal mortality, life expectancy and age- and cause-specific mortality rates. Much of the current focus is on monitoring progress towards the targets of the (health-related) Millennium Development Goals (MDGs), including time series and country-level estimates that are regularly updated. But increasingly, the demand is for comprehensive estimates across the full spectrum, including noncommunicable diseases (NCDs) and injuries.

WHO has previously published summary estimates of deaths by cause, age and sex for years 2004 (*1*) and 2008 (*2,3*) for its Member States. These successive single year estimates did not form a time series, as each revision involved revisions to data and methods for a range of inputs. To address the increasing demand for time series, for country-level estimates, and for comprehensive estimates across NCD and injury causes, as well as the more traditional priorities in infectious and parasitic diseases, updated Global Health Estimates (GHE) are being released. This commenced with the release in mid-2013 of regional-level estimates of deaths by cause, age and sex for years 2000-2011 (*4*), and is now followed by the release of summary estimates of deaths by cause, age and sex for Member States[1] for years 2000-2012 (5).

This technical paper documents the data sources and methods used for preparation of these country-level cause of death estimates for years 2000-2012. Annex Table A lists the cause of death categories and their definitions in terms of the International Classification of Diseases, Tenth Revision (ICD-10) (6). These estimates are also available on the WHO website (6) for years 2000 and 2012 for selected regional groupings of countries, areas and territories defined in Annex Table C.

Comprehensive estimates of mortality, causes of death, DALYs for diseases, injuries and risk factors were released in December 2012 (7-9) by the Institute of Health Metrics and Evaluation (IHME) as part of the Global Burden of Disease 2010 study (GBD 2010). WHO has drawn on the GBD 2010 analyses for selected causes for Member States without comprehensive death registration data as described in Section 6 below.

One of the six core functions of WHO is monitoring of the health situation, trends and determinants in the world. Over the years it has cooperated closely with other UN partner agencies like UNICEF, UNAIDS, UNFPA and the UN Population Division to collect and compile global health statistics. There are a number of established UN multi-agency expert group mechanisms for cross cutting topics such as child mortality (the UN-IGME including UNICEF/WHO/UNPD/World Bank and the UN-IGME Technical Advisory Group) and child causes of death (CHERG, WHO/UNICEF), specific diseases such as HIV/AIDS (UNAIDS Reference Group), maternal mortality (MMEIG including WHO/UNICEF/UNFPA/World Bank), tuberculosis (WHO STAG), malaria (Malaria Reference Group and Roll Back Malaria- Malaria Monitoring and Evaluation Reference Group).

These WHO Global Health Estimates provide a comprehensive and comparable set of cause of death estimates from year 2000 onwards, consistent with and incorporating UN agency, interagency and WHO estimates for population, births, all-cause deaths and specific causes of death, including:

- most recent vital registration (VR) data for all countries where the VR data quality is assessed as useable;

[1] Estimates are available for Member States whose population were over 250,000 in 2012.

- updated and additional information on levels and trends for child and adult mortality in many countries without good death registration data
- improvements in methods used for the estimation of causes of child deaths in countries without good death registration data.
- Updated assessments of levels and trends for specific causes of death by WHO programs and interagency groups. These include:
    - Tuberculosis –WHO
    - HIV – UNAIDS and WHO
    - Malaria – WHO
    - Vaccine-preventable child causes – WHO
    - Other major child causes – WHO and CHERG
    - Maternal mortality –MMEIG
    - Cancers – IARC
    - Road traffic accidents – WHO
    - Conflict and natural disasters – WHO and the Collaborating Center for Research on the Epidemiology of Disasters (CRED)
- GBD 2010 study estimates for other causes in countries without useable VR data or other nationally representative sources of information on causes of death.

Because these estimates draw on new data and on the result of the GBD 2010 study, and there have been substantial revisions to methods for many causes, these estimates for the years 2000-2012 are not directly comparable with previous WHO estimates for 2000-2011, 2008 and earlier years. These Global Health Estimates represent the best estimates of WHO, based on the evidence available to it up until May 2013, rather than the official estimates of Member States, and have not necessarily been endorsed by Member States. They have been computed using standard categories, definitions and methods to ensure cross-national comparability and may not be the same as official national estimates produced using alternate, potentially equally rigorous methods. The following sections of this document provide explanatory notes on data sources and methods for preparing mortality estimates by cause.

2 Population and all-cause mortality estimates for years 2000-2012

WHO life tables have been revised and updated for all Member States for years 1990- 2012, drawing on the recently released UN World Population Prospects 2012 revision (10), recent and unpublished analyses of all-cause and HIV mortality for countries with high HIV prevalence (11) and on vital registration data and UN-IGME estimates of levels and trends for under-5 mortality (11). Annex table E summarizes the methods used for preparing life tables. Data sources are documented in more detail in Technical Paper 2014.5 (11).

In recent years, WHO has liaised more closely with the UN Population Division (on life tables for countries, in order to maximize the consistency of UN and WHO life tables, and to minimize differences in the use and interpretation of available data on mortality levels. For countries where WHO previously predicted levels of adult mortality from estimated levels of child mortality, this update has taken into account additional country-specific sources of information on levels of adult mortality as reflected in the life tables prepared by the UN Population Division for its World Population Prospects (WPP).

Total deaths by age and sex were estimated for each country by applying the WHO life table death rates to the estimated de facto resident populations prepared by the UN Population Division in its 2012 revision (10)**.** They may thus differ slightly from official national estimates for corresponding years.

3 Countries with useable death registration data

3.1 Data and estimates

Cause-of-death statistics are reported to WHO on an annual basis by country, year, cause, age and sex. These statistics can be accessed in the WHO Mortality Database (*12*). The number of countries reporting data using ICD-10 has continued to increase. For these estimates, a total of 60 countries had data that met our inclusion criteria, of which 54 countries were reporting data coded to the third or fourth character of ICD-10 and 45 countries had data for years 2010 or later.

For countries with a high-quality vital registration system including information on cause of death, we used the vital registration data recorded in the WHO Mortality Database. We analyzed the data using the following steps:

1) application of inclusion criteria to select countries with high-quality vital registration data;
2) extraction of deaths by cause group, with a short or a detailed cause list used depending on the ICD revision used in each country-year;
3) redistribution of deaths of unknown sex/age and deaths assigned to garbage codes and adjustment for incomplete registration of deaths in some countries;
4) interpolation/extrapolation of number of deaths for missing country-years;
5) adjustments for certain specific causes using additional information to adjust for over- or under-reporting; and
6) scaling of total deaths by age and sex to previously estimated WHO all-cause envelopes for years 2000-2012.

Details are provided below.

3.2 Inclusion criteria for countries with high quality death registration data

We applied the following inclusion criteria to data in the WHO mortality database:

- At least five years of data are available during 1998-present;
- The data are available for 5-year age groups to ages 85 and over;
- The data are for a country whose population in 2012 was greater than 300,000;
- The data are for a country that is currently a WHO Member State;
- The data fulfill quality criteria pertaining to garbage codes and completeness, as described below.

For 131 Member States with vital registration systems who have provided summary data to WHO, demographic techniques (such as Brass Growth–Balance method, Generalized Growth–Balance method or Bennett– Horiuchi method) were first applied to assess the level of completeness of recorded mortality data in the population above five years of age. We then calculated the proportion of deaths with underlying cause coded to a short list of so-called "garbage" codes:

- symptoms, signs and ill-defined conditions (ICD10 codes R00-R99),
- injuries undetermined whether intentional or unintentional (ICD10 Y10-Y34, Y87.2),
- ill-defined cancers (C76, C80, and C97), and
- ill-defined cardiovascular diseases (I47.2, I49.0, I46, I50, I51.4, I51.5, I51.6, I51.9 and I70.9).

A summary usability score was calculated as follows:

(Percent Usable) = Completeness (%) * (1 - Proportion Garbage)

All countries with a mean percent usable below 70% during the period 2000 to latest available year were excluded (see Table 3.1).

The quality of cause-of-death coding was further investigated in the remaining countries. The proportion of deaths assigned to an expanded list of ill-defined causes (Table 3.2) was calculated for each year in the period 2000-2011. For the period 2005-2011 countries had reported an average of 5 years of data. Data from a country were excluded if the average proportion of ill-defined causes was above 25% for 2005-2011 (if available) or 2000-2004 (if more recent data were not available). Based on this analysis, data from Argentina, Azerbaijan, Bulgaria, Greece, Guatemala, Poland, and Qatar were excluded (Table 3.1).

3.3 Redistribution of unknown sex/age and 'garbage' codes and adjustment for completeness

First, deaths of unknown sex pro-rata within cause-age groups of known sexes were redistributed, and then deaths of unknown age pro-rata within cause-sex groups of known ages. Deaths coded to garbage codes were reassigned using previously published methods (*13*). We redistributed deaths coded to symptoms, signs and ill-defined conditions pro-rata to all non-injury causes of death, and injuries with undetermined intent pro-rata to all injury causes of death. Cancers with unspecified site were redistributed pro-rata to all sites excluding liver, pancreas, ovary, and lung. Additionally, we redistributed cancer of uterus, part unspecified (C55) pro-rata to cervix uteri (C53) and corpus uteri (C54). Ill-defined cardiovascular causes were redistributed to ischaemic heart disease and other

Table 3.1. *Characteristics of useable country vital registration data*

(Only countries fulfilling the first four inclusion criteria listed above are included in this table. ICD-10 codes included in the "garbage" category are given in the text above).

Country	First year 1998+ available	Last year available	Average usability 2000+	Range of completeness		Range of garbage fraction		Notes
Albania	1998	2004	55%	67%	71%	18%	20%	Excluded due to low usability
Argentina	1998	2010	79%	100%	100%	20%	22%	Excluded due to high proportion garbage
Armenia	1998	2011	66%	66%	81%	3%	6%	Excluded due to low usability
Australia	1998	2011	95%	100%	100%	5%	6%	
Austria	1998	2011	90%	100%	100%	1%	14%	
Azerbaijan	1998	2007	84%	81%	96%	2%	34%	Excluded due to high proportion garbage
Belarus	1998	2009	88%	99%	100%	10%	13%	Summarized cause list used
Belgium	1998	2009	88%	100%	100%	12%	15%	
Belize	1998	2009	89%	98%	100%	6%	13%	
Brazil	1998	2010	76%	87%	91%	12%	21%	
Bulgaria	1998	2011	79%	100%	100%	16%	28%	Excluded due to high proportion garbage
Canada	1998	2009	94%	100%	100%	6%	8%	
Chile	1998	2009	94%	100%	100%	6%	11%	
Colombia	1998	2009	89%	93%	96%	6%	8%	
Costa Rica	1998	2011	87%	90%	95%	4%	7%	
Croatia	1998	2011	87%	98%	100%	8%	17%	
Cuba	1998	2010	90%	96%	98%	1%	9%	
Cyprus	2004	2011	73%	90%	91%	16%	24%	
Czech Republic	1998	2011	88%	99%	100%	10%	15%	
Denmark	1998	2011	87%	100%	100%	12%	14%	
Dominican	1998	2010	48%	56%	61%	9%	21%	Excluded due to low

Country	First year 1998+ available	Last year available	Average usability 2000+	Range of completeness		Range of garbage fraction		Notes
Republic								usability
Ecuador	1998	2010	59%	72%	73%	16%	23%	Excluded due to low usability
Egypt	2000	2011	61%	99%	100%	32%	41%	Excluded due to low usability
El Salvador	1998	2009	58%	75%	75%	18%	25%	Excluded due to low usability
Estonia	1998	2012	94%	100%	100%	5%	8%	
Finland	1998	2011	97%	100%	100%	2%	3%	
France	1998	2010	85%	100%	100%	14%	16%	
Georgia	1998	2010	53%	78%	83%	7%	69%	Excluded due to low usability
Germany	1998	2011	87%	100%	100%	11%	14%	
Greece	1998	2011	75%	100%	100%	24%	27%	Excluded due to high proportion garbage
Guatemala	1998	2009	73%	89%	90%	12%	22%	Excluded due to high proportion garbage
Guyana	1998	2009	58%	62%	64%	6%	22%	Excluded due to low usability
Haiti	1999	2004	4%	2%	10%	32%	52%	Excluded due to low usability
Hungary	1998	2011	94%	99%	100%	4%	7%	
Iceland	1998	2009	94%	100%	100%	5%	6%	
Ireland	1998	2010	94%	100%	100%	5%	8%	Summarized cause list used for some years
Israel	1998	2011	90%	100%	100%	8%	14%	
Italy	1998	2010	90%	100%	100%	8%	12%	Summarized cause list used for some years
Jamaica	2000	2006	64%	69%	87%	8%	25%	Excluded due to low usability
Japan	1998	2011	89%	100%	100%	9%	13%	
Kazakhstan	1998	2010	83%	84%	89%	3%	11%	Summarized cause list

Country	First year 1998+ available	Last year available	Average usability 2000+	Range of completeness		Range of garbage fraction		Notes
								used
Kuwait	1998	2011	87%	98%	98%	9%	14%	
Kyrgyzstan	1998	2010	90%	91%	95%	3%	8%	
Latvia	1998	2010	92%	99%	100%	5%	11%	
Lithuania	1998	2010	94%	99%	100%	2%	6%	
Luxembourg	1998	2011	85%	100%	100%	14%	16%	
Malaysia	2000	2008	43%	49%	60%	21%	24%	Excluded due to low usability
Maldives	2000	2011	49%	73%	85%	13%	77%	Excluded due to low usability
Malta	1998	2011	92%	100%	100%	5%	12%	
Mauritius	1998	2011	90%	100%	100%	8%	15%	Summarized cause list used for some years
Mexico	1998	2010	95%	100%	100%	5%	6%	
Montenegro	2000	2009	70%	93%	93%	23%	28%	Excluded due to low usability
Netherlands	1998	2011	86%	100%	100%	13%	15%	
New Zealand	1998	2009	97%	100%	100%	3%	4%	
Nicaragua	1998	2011	65%	69%	71%	4%	11%	Excluded due to low usability
Norway	1998	2012	89%	100%	100%	11%	12%	
Panama	1998	2009	80%	84%	91%	8%	14%	
Peru	1998	2010	61%	67%	67%	5%	24%	Excluded due to low usability
Philippines	1998	2008	83%	91%	93%	10%	13%	Summarized cause list used
Poland	1999	2011	74%	100%	100%	25%	28%	Excluded due to high proportion garbage
Portugal	1998	2011	82%	100%	100%	17%	22%	
Qatar	2004	2011	73%	100%	100%	22%	33%	Excluded due to high proportion garbage

Country	First year 1998+ available	Last year available	Average usability 2000+	Range of completeness		Range of garbage fraction		Notes
Republic of Korea	1998	2011	85%	90%	100%	13%	21%	
Republic of Moldova	1998	2012	89%	89%	100%	2%	7%	
Romania	1998	2011	92%	99%	100%	0%	8%	
Russian Federation	1998	2010	95%	100%	100%	4%	6%	Summarized cause list used
Serbia	1998	2011	72%	84%	89%	12%	18%	
Singapore	1998	2011	74%	74%	84%	2%	4%	Summarized cause list used
Slovakia	1998	2010	94%	100%	100%	4%	11%	
Slovenia	1998	2010	89%	99%	100%	9%	12%	
South Africa	1998	2009	68%	81%	88%	19%	32%	Excluded due to low usability
Spain	1998	2011	89%	100%	100%	9%	13%	
Sri Lanka	1998	2006	55%	74%	74%	23%	32%	Excluded due to low usability
Suriname	1998	2009	71%	72%	86%	12%	22%	
Sweden	1998	2010	89%	100%	100%	10%	12%	
Switzerland	1998	2010	89%	100%	100%	10%	13%	
TFYR Macedonia	1998	2010	84%	96%	98%	9%	15%	Summarized cause list used for some years
Tajikistan	1998	2005	56%	54%	64%	4%	9%	Excluded due to low usability
Thailand	1998	2006	48%	78%	88%	39%	54%	Excluded due to low usability
Trinidad and Tobago	1998	2008	95%	100%	100%	2%	5%	
Ukraine	1998	2011	96%	100%	100%	3%	6%	Summarized cause list used
United Kingdom	1998	2010	93%	100%	100%	6%	8%	

Country	First year 1998+ available	Last year available	Average usability 2000+	Range of completeness		Range of garbage fraction		Notes
United States of America	1998	2010	93%	100%	100%	7%	10%	
Uruguay	1998	2009	83%	100%	100%	16%	17%	
Uzbekistan	1998	2005	83%	85%	87%	2%	6%	Summarized cause list used for some years
Venezuela (Bolivarian Republic of)	1998	2009	86%	93%	95%	7%	9%	

Table 3.2. *Expanded list of garbage codes*

ICD-10 code(s)	Description
A40-A41	Streptococcal and other septicaemia
C76, C80, C97	Ill-defined cancer sites
D65	Disseminated intravascular coagulation [defibrination syndrome]
E86	Volume depletion
I10	Essential (primary) hypertension
I269	Pulmonary embolism without mention of acute cor pulmonale
I46	Cardiac arrest
I472	Ventricular tachycardia
I490	Ventricular fibrillation and flutter
I50	Heart failure
I514	Myocarditis, unspecified
I515	Myocardial degeneration
I516	Cardiovascular disease, unspecified
I519	Heart disease, unspecified
I709	Generalized and unspecified atherosclerosis
I99	Other and unspecified disorders of circulatory system
J81	Pulmonary oedema
J96	Respiratory failure, not elsewhere classified
K72	Hepatic failure, not elsewhere classified
N17	Acute renal failure
N18	Chronic renal failure
N19	Unspecified renal failure
P285	Respiratory failure of newborn
Y10-Y34, Y872	External cause of death not specified as accidentally or purposely inflicted

cardiovascular causes of death. Finally, the total number of deaths was adjusted to match all-cause envelopes calculated as described in Section 2.

3.4 Mapping to GHE cause lists

Included vital registration data were coded according to ICD9, ICD10, or one of several abbreviated cause lists derived from ICD9 or ICD10. Total deaths by cause, age and sex were mapped to the GHE cause list (Annex Table A). We used the complete cause list in Annex Table A if the data were coded using 3- or 4-digit ICD-10 codes. In other cases, we extracted the number of deaths by cause, age and sex, using only the broad cause categories listed in Table 3.3. This shortlist in Table 3.3 was used for all data from the Philippines.

For Russia, Belarus and Ukraine, HIV deaths recorded in the death registration data were substantially miscoded to tuberculosis (GHE3), lower respiratory infections (GHE39), other infectious diseases (GHE37), lymphomas and multiple myeloma (GHE76), other malignant neoplasms (GHE78), and endocrine, blood and immune disorders (GHE81). Deaths in these categories falling in the characteristic HIV age pattern were recoded to HIV (GHE10), according to the age-sex-specific HIV mortality estimates from UNAIDS (Section 5.2).

For countries with deaths data grouped by the shortlist in Table 3.3, shortlist categories were expanded to the full cause list using the cause-fraction distribution within each shortlist category by year, age, sex and GBD 2010 region from the GBD 2010 study results (*14*).

3.5 Interpolation and extrapolation for missing country-years

For many countries, data were missing for some years. In order to create a continuous time-series of data, we interpolated mortality rates for each country and cause, and then extrapolated up to three years of data at the beginning and end of the data series. To interpolate, a logistic regression was fitted for each missing country-sex-cause group, using death rates six years prior and six years after the missing data year as the dependent variable and year as the independent variable. In some cases, few deaths were recorded for a specific country-sex-cause group and the logistic regression did not converge. In that case, the death rate was estimated as the average rate in the three years prior and three years following the missing data year. To extrapolate for up to three years, a logistic regression was fitted to the first or the final six years of data (including interpolated estimates) for each country-sex-cause. Again, if the logistic regression did not converge due to the small number of deaths recorded, the death rate was estimated as the average of the first or last three years' death rates.

3.6 Adjustment of specific causes

Estimates for HIV deaths were compared with UNAIDS/WHO estimates for 46 countries where fewer HIV deaths were recorded in the death registration data than estimated by UNAIDS/WHO (*11*). UNAIDS/WHO estimates were used except in the cases of Australia, Chile, Costa Rica, France, Mauritius, Trinidad and Tobago, Uruguay and USA.

Estimates for malaria deaths were compared with WHO estimates (see Section 5.3) and replaced by WHO estimates for 63 country years where the WHO estimates were larger than those from the death registration data. This affected malaria deaths for Brazil (12 years), Columbia (10), Venezuela (9), Philippines (8) and Panama (3).

***Table 3.3**. Short cause list used for vital registration data coded using ICD-9 or ICD-10 abbreviated cause lists*

GHE code	Shortlist cause category
1	**I. Communicable, maternal, perinatal and nutritional conditions**
3	A1. Tuberculosis
9	A3. HIV/AIDS
20	A. Infectious and parasitic diseases
38	B. Respiratory infections
39	B1. Lower respiratory infections
42	C. Maternal conditions
49	D. Neonatal conditions
60	**II. Noncommunicable diseases**
61	A. Malignant neoplasms
62	A1. Mouth and oropharynx cancers
63	A2. Oesophagus cancer
64	A3. Stomach cancer
65	A4. Colon and rectum cancers
66	A5. Liver cancer
68	A7. Trachea, bronchus and lung cancers
70	A9. Breast cancer
71	A10. Cervix uteri cancer
72	A13. Prostate cancer
80	C. Diabetes mellitus
82+94	E/F. Mental and neurological disorders
110	H. Cardiovascular diseases
117	I. Respiratory diseases
121	J. Digestive disorders
126	K. Genitourinary diseases
140	N. Congenital anomalies
151	**III. Injuries**
152	A. Unintentional injuries
153	A1. Road injury
160	B. Intentional injuries
161	B1. Self-harm
162	B2. Interpersonal violence
163	B3. Collective violence and legal intervention

WHO estimates for maternal deaths include an upwards adjustment for under-recording of maternal deaths in death registration data (*15*). Maternal deaths were adjusted using these country-specific factors, and all other causes adjusted pro-rata.

Deaths due to alcohol and drug use disorders include alcohol and drug poisoning deaths coded to the injury chapter of ICD (see Annex Table A). Further adjustments for under-reporting in some countries will be undertaken in the next revision of these estimates.

Where necessary, road injury deaths were adjusted upwards to take account of additional surveillance data provided by countries (see Section 5.11).

Estimates of deaths due to conflicts (see Section 5.12) were compared with estimates from the death registration data year by year and added "outside-the-envelope" for country-years where they are not included in death registration data.

3.7 Other national-level information on causes of death

Cause of death estimates for a number of countries drew on non-national death registration data or other data sources with cause of death information as follows.

China

Cause-specific mortality data for China were available from two sources – the sample vital registration system data for years 1987 to 2010 (16) and summary deaths tabulations from the Diseases Surveillance Points (DSP) system for years 1995-1998 and 2004-2010 (17, 18). Table 3.4 summarizes the deaths and population covered by these two systems. The sample vital registration system data for years 1987 to 2010 was provided in separate tabulations for urban and rural sampled populations, with more urban than rural sampling. The urban and rural crude deaths rates by age, sex and cause were weighted for each year using the UN Population Division's estimated urban and rural population fractions, and the resulting death rates re-applied to the UN total estimated population by age and sex. The DSP sample sites are considered to be nationally representative and the resulting total deaths by age, sex and cause were not reweighted. For both sets of data, annual data were rescaled so total deaths by age and sex matched the estimated all-cause envelopes for China (see Section 2.5).

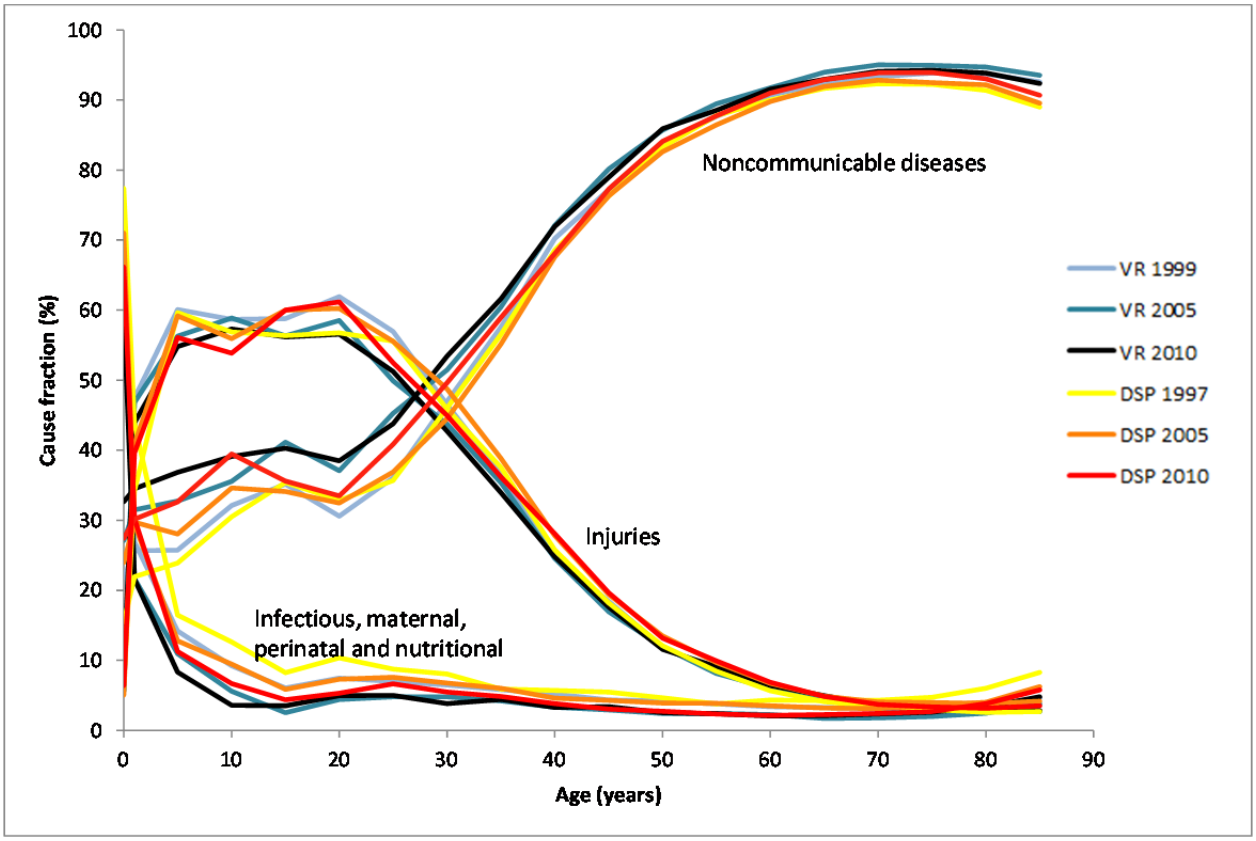
Table 3.4. *Total deaths and population covered by the Chinese vital registration system (VR) and the Disease Surveillance Points system (DSP)*

	Vital registration system	Disease Surveillance Points	Vital registration system	Disease Surveillance Points
Year	Number of deaths		Population	
2000	711,946	…	117,183,678	…
2001	…	…	…	…
2002	…	…	…	…
2003	626,392	…	102,889,945	…
2004	295,906	430,994	55,288,841	71,173,205
2005	310,826	437,490	57,272,144	71,487,277
2006	379,057	347,057	72,240,261	66,012,299
2007	475,289	401,008	79,101,646	71,476,477
2008	471,219	424,683	…	73,928,499
2009	505,021	437,550	…	75,020,489
2010	558,915	453,211	90,158,748	78,766,626

… data not available.

Both sets of data were assessed and compared for suitability in estimating 2000-2012 cause-specific mortality for China at the national level. As seen in Figure 3.1, both sets of data gave quite similar cause distributions at major cause group level by age, across the period 2000-2010. Additionally, comparison for more detailed major causes of death did not give any clear indication that one data set was of systematically higher quality than the other. We therefore based the update of cause of death estimates for China on an average of the estimates from the two systems.

Figure 3.1. *Sample vital registration data (VR) and Disease Surveillance Points data (DSP), China: comparison of cause fractions for three major cause groups by age, late 1990s, 2005 and 2010.*



For all except the leading causes of death, there are considerable fluctuations across 5-year age groups and year in numbers of deaths, due to stochastic variation and perhaps also variations in recording cause of death from year to year or sample site to sample site. In order to smooth these fluctuations and to estimate underlying trends, cubic spline smoothing was used as follows. For the VR data, cubic spline curves were fitted to age-sex-cause specific deaths for years 1987-2010 using a negative binomial model with population as offset and with knot points at years 1992, 1997, 2003, and 2007. For the DSP data, cubic spline curves were fitted to age-sex-cause specific deaths for years 1995-2010 using a negative binomial model with population as offset and with knot points at years 2004, 2007 and 2010. Final estimates for China were calculated as the average of the fitted spline estimates from VR and DSP for years 2000-2012.

The resulting cause-specific estimates were further adjusted with information from WHO technical programs and UNAIDS on specific causes (see Section 5) and from the GBD 2010 for certain specific subcause categories where deaths were either not recorded or recorded to only selected categories in the DSP and/or VR datasets. GBD 2010 analyses were used for GHE causes 5-9 (STDs), 20 (hepatitis C), 26 (leishmaniasis), 34-36 (intestinal nematode infections), 115 (inflammatory heart diseases), and 119 (asthma). Additionally, DSP broad cause group totals were redistributed to detailed subcauses using GBD 2010 cause fractional distributions for the following categories: 82+94 (mental and behavioural disorders and neurological conditions), 134 (musculoskeletal disorders) and 147 (oral conditions). Rabies deaths were revised using data on reported human rabies deaths from the Chinese Center for Disease Control and Prevention (19).

For estimates of causes of death under age 5, a separate analysis was undertaken based on an analysis of 206 Chinese community-based longitudinal studies that reported multiple causes of child death (see Section 4.5 below. The CHERG conducted a systematic search of publically available Chinese databases in collaboration with researchers from Peking University. Information was obtained from the Chinese Ministry of Health and Bureau of Statistics websites, Chinese National Knowledge Infrastructure (CNKI) database and Chinese Health Statistics Yearbooks published between 1990-2008. A model was developed to assign the total number of child deaths to provinces, age groups and main causes of child death.

India

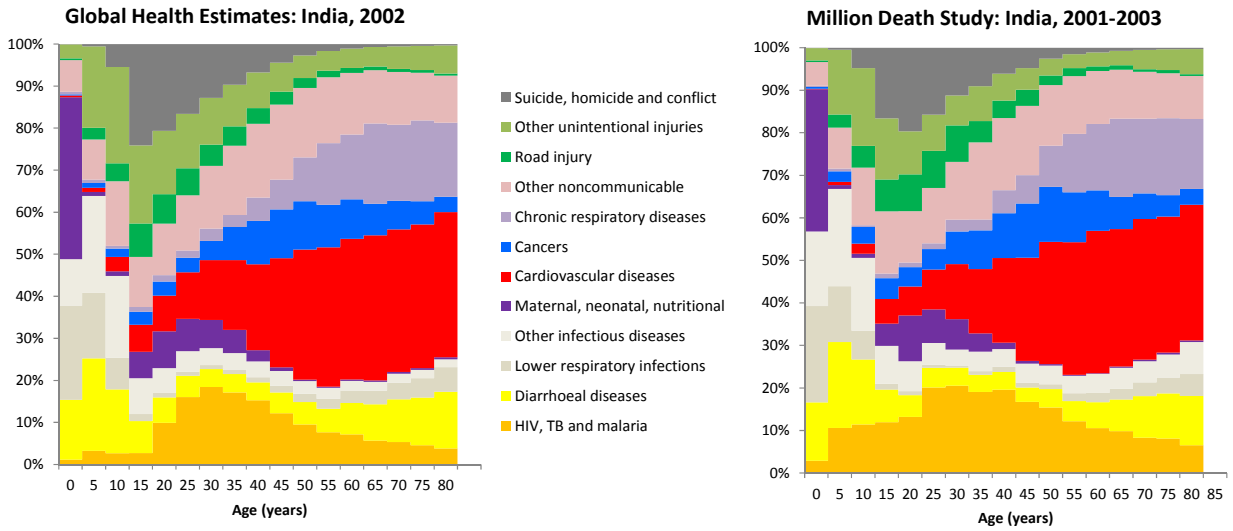
Analysis of causes of death for India was based on data over a period of 3 years (2001–2003) recorded by the Million Death Study (20, 21), a comprehensive study based on verbal autopsy that assigned causes to all deaths in areas of India covered by the Sample Registration System. The Sample Registration System monitors a representative sample population of 6.3 million people in over 1 million homes in India. The 1991 census was used to randomly select 6671 areas from approximately 1 million having about 1000 inhabitants in each.

In 2001 the Indian Registrar General Surveyor introduced an enhanced form of verbal autopsy for assessing the cause of death. Verbal autopsy is a method of ascertaining the cause of death by interviewing a family member or caretaker of the deceased to obtain information on the clinical signs, symptoms and general circumstances that preceded the death. Details of methods and validation have been reported elsewhere (21). Verbal autopsy reports were independently coded to ICD-10 categories by at least two of a total of 130 physicians trained in ICD-10 coding. In case of disagreement on the ICD-10 codes at the chapter level, reconciliation between reports was conducted, followed by a third senior physician's adjudication.

A total of 136,000 deaths were enumerated between January 2001 and December 2003. Verbal autopsies could not be conducted for 12% of the deaths for reasons such as family migration or change of residence. An additional 9% of the reports could not be coded because of data quality problems, resulting a final dataset of 122,848 coded records.

The cause-specific proportion of deaths in each five-year age category from 0 to 79 years and for people aged 80 years and over was weighted by the inverse probability of a household being selected within rural and urban subdivisions of each state to account for the sampling design. National estimates for deaths and mortality rates were based on United Nations 2005 estimates for India, by age, sex and area.

Figure 3.2. *Percentage of deaths by cause and age for India: comparison of final GHE estimates for year 2002 with national-level results from the Million Death Study, 2001-2003.*



The GHE analysis is based on the resulting national-level cause-specific mortality proportions derived for GHE cause categories from the Million Death Study. The mapping of the MDS cause categories to GHE cause categories, and the use of GBD 2010 analyses to redistribute deaths to detailed subcause categories is summarized in Annex Table D. GHE cause categories 26 (leishmaniasis) and 124 (appendicitis) were also estimated using GBD 2010 results.

The resulting cause-specific estimates were further adjusted with information from WHO technical programs and UNAIDS on specific causes (see Section 5) and adjusted to match WHO estimates of age-sex specific all-cause mortality for India in 2002. Cause-specific trends for India estimated in the GBD 2010 study (9) were used to project cause-fractions forwards to 2012 and backwards to 2000.

Figure 3.2 provides a comparison of the final proportional distributional estimates of deaths by cause and age for India in the year 2002 with the original distributions in the Million Death Study for 2001-2003.

4 Child mortality by cause

4.1 CHERG-WHO analysis for major causes

Cause-specific estimates of deaths for children under age 5 were estimated for 15 cause categories using methods described elsewhere by Liu et al. (*22*) and a companion technical paper in this series (23). Previously published regional estimates for years 2000-2011 have been updated to take account of revisions in child mortality levels (*24*), as well as cause-specific estimates for HIV, tuberculosis, measles, pertussis and malaria deaths (as described in Section 5). Inputs to the multivariate cause composition models are also updated.

4.2 Causes of child death for China and India

In order to estimate trends in under 5 causes of death for India, the previously developed subnational analyses were further refined and used to develop national estimates for years 2000-2012. For neonates, a verbal autopsy multi-cause model (VAMCM) based on 37 sub-national Indian community-based VA studies was used to predict the cause distribution of deaths at state level. The resulting cause-specific proportions were applied to the estimated total number of neonatal deaths to obtain the estimated number of deaths by cause at state level prior to summing to obtain national estimates.

For children who died in the ages of 1-59 months in India, the previously developed multicause model (25) was rerun for years 2000-2012 after an updated systematic review was conducted to identify 27 new study data points of sub-national community-based VA studies, plus 22 sets of observations for the Indian states derived from the Million Death Study (26). Nine cause categories were specified, including measles plus the eight specified in the post-neonatal VAMCM for other countries. State-level measles deaths were then normalized to fit the national measles estimates produced by the WHO IVB. State-level AIDS and malaria estimates were provided by UNAIDS and WHO malaria program, respectively. All cause fractions were adjusted to sum to one. The state-level estimates were collapsed to obtain national estimates at the end.

For China, updated IGME U5MR estimates in 2000-2012 were applied to the VA-based national cause-specific models developed by Rudan and colleagues (27) to derive cause-fractions annually in this period. Together with cause-specific inputs from WHO technical programs and UNAIDS for measles, meningitis, malaria and AIDS, the resulting cause-specific inputs for China were adjusted to fit the estimated total deaths at ages 0-1 month and 1-59 months, respectively.

4.3 Inclusion of WHO-CHERG estimates in GHE 2000-2012

The fifteen cause categories used for the WHO-CHERG estimates of under 5 deaths for years 2000-2012 (see Annex Table B) include all the major causes of neonatal (0-27 days), postneonatal (1-59 months) and 1-4 year deaths and two residual categories containing all remaining causes of death. These residual categories ("Other Group 1" and "Other Group 2").Cause groups such as "Congenital malformations" and "Injuries" were expanded to the full GHE cause list (Annex Table A) for neonatal and under 5 deaths using cause distributions derived from VR data for countries with useable VR data (see Annex Table E) and from the GBD 2010 estimates for other countries (14).

5 Methods for specific causes with additional information

5.1 Tuberculosis

For countries with death registration data, tuberculosis mortality estimates were generally based on the most recently available vital registration data. For other countries, total tuberculosis deaths were derived from latest published WHO estimates (28), together with more detailed unpublished age distributions based on the VR data and notifications data.

5.2 HIV/AIDS and sexually transmitted diseases

For countries with death registration data, HIV/AIDS mortality estimates were generally based on the most recently available vital registration data except where there was evidence of misclassification of HIV/AIDS deaths. In such cases, a time series analysis of causes where there was likely misclassified HIV/AIDS deaths was carried out to identify and re-assign such deaths. For other countries, estimates were based on UNAIDS estimated HIV/AIDS mortality (29). It was assumed based on advice from UNAIDS that 1% of HIV deaths under age 5 occurred in the neonatal period.

5.3 Malaria

Countries outside the WHO African Region and low transmission countries in Africa[2].

Estimates of the number of cases were made by adjusting the number of reported malaria cases for completeness of reporting, the likelihood that cases are parasite-positive and the extent of health service use. The procedure, which is described in the *World Malaria Reports* and elsewhere (30-32), combines data reported by National Malaria Control Programs (reported cases, reporting completeness, likelihood that cases are parasite positive) with those obtained from nationally representative household surveys on health service use. If data from more than one household survey was available for a country, estimates of health service use for intervening years were imputed by linear regression. If only one household survey was available then health service use was assumed to remain constant over time; analysis summarized in the *World Malaria Report 2008* (30) indicated that the percentage of fever cases seeking treatment in public sector facilities varies little over time in countries with multiple surveys. Such a procedure results in an estimate with wide uncertainty intervals around the point estimate.

The number of deaths was estimated by multiplying the estimated number of *P. falciparum* malaria cases by a fixed case fatality rate for each country as described in the *World Malaria Reports (30, 32).* This method is used for all countries outside the African Region and for countries within the African Region where estimates of case incidence were derived from routine reporting systems and where malaria causes less than 5% of all deaths in children under 5 (*31*). A case fatality rate of 0·45% is applied to the estimated number of *P. falciparum* cases for countries in the African Region and a case fatality rate of 0·3% for *P. falciparum* cases in other Regions. In situations where the fraction of all deaths due to malaria is small, the use of a case fatality rate in conjunction with estimates of case incidence was considered to provide a better guide to the levels of malaria mortality than attempts to estimate the fraction of deaths due to malaria.

These estimates for malaria deaths 2000-2012 are consistent with those published in the latest Global Malaria Report (*32*).

[2] Botswana, Cabo Verde, Eritrea, Madagascar, Namibia, Swaziland, South Africa, and Zimbabwe

South Sudan and high transmission countries in the WHO African Region.

Child malaria deaths were estimated using a multinomial logistic regression model fitted to available verbal autopsy data sets; this model is described in more detail elsewhere (23). The estimated malaria mortality rate in children under 5 years for a country was used to determine malaria transmission intensity and the corresponding malaria-specific mortality rates in older age groups (30).

5.4 Whooping cough

Recognizing the limited data to support modelling of pertussis mortality, the World Health Organization's Department of Immunization Vaccines and Biologicals' Quantitative Immunization and Vaccines Related Research (QUIVER), recommended in 2009 that a revised pertussis model be developed to specifically address uncertainty in the model inputs and parameter values. Inputs to the current model are country- and year-specific estimates of population by single year of age and estimated pertussis immunization coverage (*33*). Age-, country-, and immunization history- specific estimates of the probability of initial infection, probability that an infected individual develops typical symptoms of a case of pertussis and the probability that a case of pertussis will die were estimated using structured expert judgment (*35-36)*. Annual deaths attributable to pertussis infection during the neonatal period (5% of estimated pertussis deaths 0-11 months of age), from age 1-11 months of age (estimated as 95% of deaths 1-11 months of age) and 12-59 months of age were estimated for each country for the years 2000 – 2012.

5.5 Measles

To estimate deaths attributable to measles, a new model of measles mortality developed by WHO Department of Immunization, Vaccines and Biologicals (IVB) was used to first estimate country-and-year-specific cases using surveillance data (*37-38*). The improved statistical model firstly estimates measles cases by country and year using surveillance data and making explicit projections about dynamic transitions over time as well as overall patterns in incidence.

The cases are then stratified by age classes based on a model fitted to data stratified by national GDP and vaccine coverage. The results are applied to age-specific case fatality ratios for each country (*39-41*) and then aggregated again to produce overall measles deaths. This method was published in the Lancet in 2012 (*25*). The estimates used here are from an update to those in (*25*) that take into account trends in case notifications and vaccine coverage up to and including the year 2012.

5.6 Schistosomiasis

For the last WHO update of burden of disease for year 2004 (1), the incidence and prevalence of cases of schistosomiasis infection were separately estimated by country for *S. mansoni*, *S. haematobium* and *S. japonicum* plus *S. mekongi.* The GBD 2004 estimated that schistosomiasis was responsible for around 41 000 deaths globally (excluding attributable cancer deaths) and 36 000 in sub-Saharan Africa, although others have argued that the figure should be much higher (42). Van der Werf et al (43), using limited data from Africa, estimated that schistosomiasis caused 210 000 deaths annually. For the GBD 2004 update, very limited available data was used to conservatively estimate annual case fatality rates for prevalent cases at 0.01% for *S. mansoni,* 0.02% for *S. haematobium,* and 0.03% for *S. japonicum* and *S. mekongi*. There were estimated to be 261 million prevalent cases of schistosomiasis infection in 2004.

The GBD 2010 study estimated that there 11,650 deaths due to schistosomias in 2010, of which 1,813 were in the Middle East and North Africa, and only 61 in sub-Saharan Africa in 2010. Divided by the numbers of prevalent cases estimated by the GBD 2010, the implied case fatality rates for the Middle

East and North Africa, and for Latin America are 0.01% and 0.02% respectively. In comparison, the implied African case fatality rate is almost 400 times smaller. Implied case fatality rates for non-African regions in the GBD 2010 were generally consistent with those previously estimated by WHO for the year 2004. Revised case fatality rates of 0.0075% for *S. mansoni,* 0.015% for *S. haematobium* were applied to the prevalence rates estimated by GBD 2010 (44) to revise the estimates of schistosomiasis deaths for GHE. This resulted in an estimate of 17,600 deaths in sub-Saharan Africa and 23,300 deaths globally in 2011.

5.7 Maternal causes of death

Country-specific estimates for maternal mortality were based on the most recent Interagency estimates for years 2000-2013 (15). For 62 Member States with relatively complete data from national death registration systems, these data were used directly for estimating and projecting maternal mortality ratios. For other Member States, a multilevel regression model was developed using available national-level data from surveys, censuses, surveillance systems and death registration. This regression model included national income per capita, the general fertility rate and the presence of a skilled attendant at birth (as a proportion of total births) as covariates to predict trends in maternal mortality.

Note that numbers of maternal deaths were adjusted upwards by a country-specific fraction, or by 50%, for countries with useable death registration data but without country-specific data on misclassification of maternal deaths, to correct for under-identification of maternal deaths. Note also that the maternal mortality estimates include those HIV deaths occurring in pregnant women or within 42 days of end of pregnancy which were considered to be indirect maternal deaths rather than incidental. These HIV maternal deaths were subtracted from total HIV deaths as estimated by UNAIDS.

5.8 Cancers

Cause-specific estimates for cancer deaths in 2012 were derived from Globocan 2012 (*45*). For countries without useable death registration data, site-specific deaths were projected back to year 2000 using trend estimates from the GBD 2010 (*9*).

Karposi sarcoma was excluded from the Globocan estimates as this is almost entirely a manifestation of HIV/AIDS, already included in the estimates for HIV/AIDS deaths. Deaths due to non-melanoma skin cancers were included in these estimates along with melanoma, unlike in Globocan 2008.

5.9 Alcohol use and drug use disorders

The injury codes for accidental poisoning by alcohol and by opioids are now used to code acute intoxication deaths from alcohol and acute overdose deaths by opioids. These deaths have been remapped to alcohol use disorders and drug use disorders respectively (see Annex Table A). WHO estimates of direct deaths associated with alcohol use disorders and total deaths attributable to alcohol consumption are under revision for a forthcoming report. The interim estimates included here for alcohol use disorders will be revised in the next revision to take these updates into account.

GBD 2010 estimates of deaths due to drug use disorders were revised to correct an extremely low implied case fatality rate for opioid dependent drug users in South Asia and for consistency with estimates of prevalence and mortality associated use of illicit opiate drugs reported by the UN Office on Drugs and Crime (UNODC) (46). UNODC estimated that there were around 17 million opiate users globally in 2010, with higher than average prevalence of opioid users in North America, Oceania, Eastern Europe and South East Europe. These estimates were quite similar to those of the IHME-GBD 2010, which estimated a global prevalence of 17.3 million for opioid dependence in 2010 (44). The IHME-GBD

2010 estimated a total of 77,615 deaths for drug use disorders in 2010, of which 43,000 were for opioid use disorders. The implied case fatality rate of opioid use was 0.25% globally, 0.23% in the Middle East and North Africa, and just under 0.1% in East and South East Asia. In contrast, the implied case fatality rate of 0.025% in South Asia was only 1/10th of the global average. Estimated opioid dependence deaths were conservatively revised upwards for South Asia to give an implied case fatality rate similar to that of the other Asian regions. The resulting GHE estimate of 91,900 deaths for all drug use disorders in 2011 is similar to the UNODC estimate of around 100,000 total direct drug use deaths in 2010 (with an additional 100,000 deaths from other causes, such as infectious diseases, also attributable to drug use disorders).

5.10 Epilepsy

The Million Death Study for India (*20-21*) recorded relatively high proportions of epilepsy deaths, resulting in an initial GHE estimate of 73,600 epilepsy deaths in India in 2010 compared to an estimated 21, 650 by the GBD 2010. GBD 2010 estimates of untreated idiopathic epilepsy prevalence were used to calculate implied regional case fatality rates (CFR) and the implied Indian CFR of 0.34 was substantially higher than those for South East Asia (0.09) or the Middle East and North Africa (0.05). Indian epilepsy deaths were adjusted downwards to give an implied case fatality rate of 0.17 (close to the global average), resulting in an estimated 35,480 epilepsy deaths for India in 2010.

5.11 Road injuries

For the second WHO *Global status report on road safety* (47), updated estimates of road injury deaths were prepared for 182 Member States for the year 2010. These estimates drew on death registration data, on reported road traffic deaths from official road traffic surveillance systems (collected in a WHO survey of Member States for the report), and on a revised regression model for countries without useable death registration data. The same methods were used to develop time series estimates of road injury deaths for years 2000-2012 for all Member States as described elsewhere (4).

5.12 Conflict and natural disasters

Estimated deaths for major natural disasters were obtained from the OFDA/CRED International Disaster Database (*48*). For country-years where death rates from these disasters exceeded 1 per 10,000 population, these deaths were added to the life table death rates for the relevant year. Age-sex distributions were based on a number of studies as described in an earlier Global Health Estimates Technical Paper (*49*).

Country-specific estimates of war and conflict deaths were updated for the entire period 1990-2012 using revised methods documented previously which draw on information on conflict intensity, time trends, and mortality obtained from a number of war mortality databases (*49*). The revised WHO country-specific estimates of war and conflict deaths for the period 1990-2012 make use of estimates of direct deaths from three datasets: *Battle-Related Deaths (version 5), Non-State* Conflict *Dataset (UCDP version 2.4),* and *One-sided Violence Dataset (UCDP version 1.4)* from 1989 to 2011 (*50-52*). Using these three datasets, instead of focusing solely on battle-related deaths, reduces the likelihood that overall direct conflict deaths are underestimated. However, it is likely that a degree of undercounting still occurs in the count-based datasets, and an adjustment factor obtained by Garfield and Blore (*53*) of 2.21 is applied to the annual battle death main estimates for state-state conflicts (*38*). No adjustments were applied to estimated conflict deaths (main estimates) for non-state conflict deaths (*51*), and one-sided violence (*52*).

For Syria, excess mortality in 2011 and 2012 due to the conflict was taken into account based on UN estimates of overall conflict deaths by month and age distribution of deaths (*54*). Additional information from epidemiological studies and surveys was also used for Iraq (*55-56*). Deaths due to landmines and unexploded ordinance were estimated separately by country (*57*).

The revised WHO estimates for conflict deaths were taken into account in preparing final all-cause mortality envelopes for Member States for years 1990-2012 as follows. For country-years where death rates from conflict or disasters exceeded 1 per 10,000 population, the estimated annual age-sex-specific conflict deaths were added to the life table death rates for the relevant year. In cases of extended conflicts where death rates fluctuated above and below 1 per 10,000, only the death rate in excess of 1 per 10,000 was added to relevant years.

6 Other causes of death for countries without useable data

Previous WHO comprehensive estimates of causes of death have relied on cause-of-death modelling and available data on cause of death distributions within each analysis subregion to estimate causes of death for countries whose death registration data did not meet the useability criteria described in Section 3.2 and where WHO cause-specific analyses were not available (*1-2*). The IHME developed covariate based estimation models for a large number of single causes as inputs to its overall estimation of numbers of deaths by country, cause, age and sex for years 1990-2010 in the GBD 2010 study (*7-9*). Results from these models are used as inputs to WHO Global Health Estimates for causes of death not addressed by WHO and UN Interagency estimation processes and where countries did not have useable death registration data, as described below.

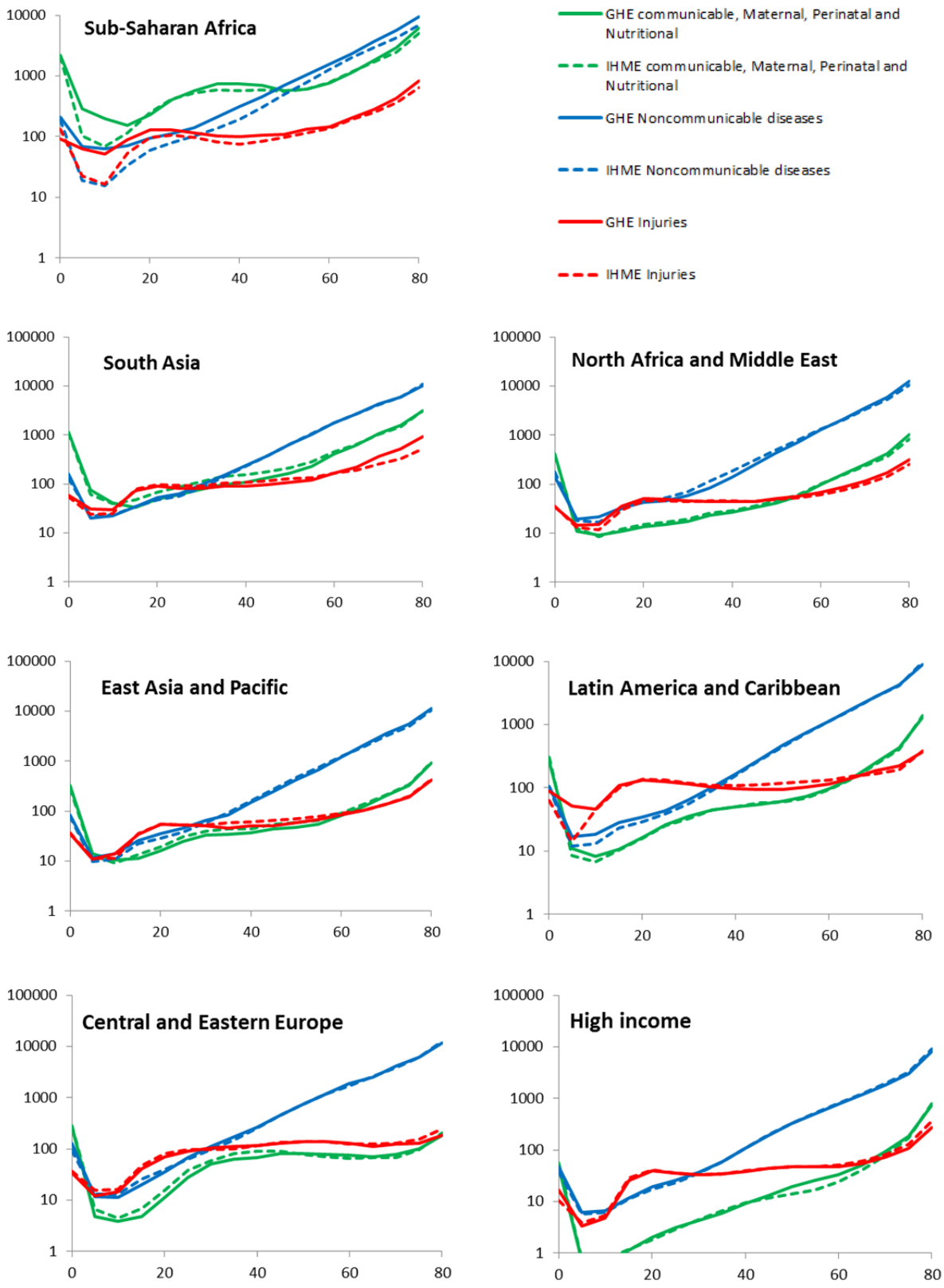
Six different modelling strategies were used by IHME for causes of death depending on the availability of data (14, webappendix). For all major causes of death except HIV/AIDS and measles, IHME used ensemble modelling to create a weighted average of many individual covariate-based models (ranging from hundreds to thousands in some cases) for each specific cause (14, 58). IHME cause of death estimation methods are thus complex and highly computer-intensive. The overall out-of-sample predictive validity of the ensemble is usually not much different to that of the top-ranked model, but uncertainty ranges are generally much wider and more plausible than for single models.

IHME results for priority causes such as HIV, TB, malaria, cancers, maternal mortality, child mortality differ to varying degrees from those of WHO and UN agency partners. In part, this reflects differences in modelling strategies, but also the inclusion by IHME of data from verbal autopsy (VA) studies which has been mapped to ICD categories using IHME-developed computer algorithms. WHO aims to work with IHME and expert groups to further improve data and methods, which requires that all input data and detailed analysis methods and results are made available. Figure 6.1 provides a comparison of major cause group death rates for the GBD 2010 and WHO GHE results for year 2010 for seven broad regional groupings.

To ensure that the results of all the single-cause models summed to the all-cause mortality estimate for each age-sex-country-year group, IHME applied a final step called CoDCorrect to rescale the cause-specific estimates. This was done using repeated random draws from the uncertainty distributions of each single cause and from the all-cause envelope, and proportionately rescaling each single cause estimate so they collectively summed to the envelope estimate. The overall effect is to “squeeze” or “expand” causes with wider uncertainty ranges more than those with narrower uncertainty ranges.

GBD 2010 results, post-CoDCorrect, were used as inputs to estimate cause fractions by country, age, sex and year for causes of death at ages five years and above for which death registration data and/or WHO and UN Interagency analyses (described in Section 5) were not available. For this set of causes, GBD 2010 country-level estimates for death rates at ages 5 and over for years 1990, 1995, 2000, 2005 and 2010 were interpolated to death rates for all years in the range 2000-2012 using cubic spline interpolation of log(death rates). Cause fraction distributions were then computed for the set of causes excluding WHO/Interagency cause-specific estimates. For countries where these cause fractions were used (see Annex table E), they were applied to the country-level residual mortality envelopes by age and sex after the WHO/Interagency cause-specific estimates were subtracted from the WHO all-cause envelopes.

Figure 6.1 *Comparison of GHE and IHME death rates per 100,000 population, major cause groups, 2010.*



7 Uncertainty of estimates

Country-level estimates of mortality for 2004 and 2008 previously released on the WHO website included guidance to users on the data sources and methods used for each country, in terms of four levels of evidence. Comprehensive uncertainty ranges have not yet been addressed for the GHE cause of death estimates although uncertainty ranges are available for many of the component analyses for specific causes (refer to the detailed documentation of sources in Sections 4 and 5). General guidance on the quality and uncertainty of these cause of death estimates for years 2000-2012 is provided in terms of the quality of data inputs and methods used. These are broadly summarized for WHO Member States in Annex Table E for general mortality and cause-of-death methods and also through the use of colour codes for levels of evidence underlying the country-level estimates available on the WHO website (4).

WHO's adoption of health estimates is affected by a number of factors, including a country consultation process for country-level health estimates, existing multi-agency and expert group collaborative mechanisms, and compliance with minimum standards around data transparency, data and methods sharing. More detailed information on quality of data sources and methods, as well as estimated uncertainty intervals, is provided in referenced sources for specific causes (Sections 4 and 5).

Although the GHE estimates for years 2000-2012 have large uncertainty ranges for some causes and some regions, they provide useful information on broad relativities of disease burden, on the relative importance of different causes of death, and on regional patterns and inequalities. The data gaps and limitations in high-mortality regions reinforces the need for caution when interpreting global comparative cause of death assessments and the need for increased investment in population health measurement systems. The use of verbal autopsy methods in sample registration systems, demographic surveillance systems and household surveys provides some information on causes of death in populations without well-functioning death registration systems, but there remain considerable challenges in the validation and interpretation of such data, and in the assessment of uncertainty associated with diagnoses of underlying cause of death.

Country health information systems, including vital registration, need to be strengthened as a matter of priority, in order to provide a more solid empirical basis for monitoring health situation and trends is essential. Such data are also crucial for Member States' monitoring of local trends in order to respond to the changing needs of their populations.

To improve monitoring of mortality, morbidity and risk factors the improving health information systems should focus on strengthening:

- Death registration through civil registration and vital statistics systems (CRVS), local health and demographic studies and other sources
- Cause of death data collection through vital registration and verbal autopsy in communities
- Regular household health surveys that include biological and clinical data collection
- Complete facility recording and reporting with regular quality control

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Annex Table A GHE cause categories and ICD-10 codes

Code	GHE cause name	ICD-10 code
1	**I. Communicable, maternal, neonatal and nutritional conditions**[a]	A00-B99, G00-G04, N70-N73, J00-J22, H65-H66, O00-O99, P00-P96, E00-E02, E40-E46, E50-E64, D50-D53, D64.9, U04
2	**A. Infectious and parasitic diseases**	A00-B99, G00, G03-G04, N70-N73
3	1. Tuberculosis	A15-A19, B90
4	2. Sexually transmitted diseases (STDs) excluding HIV	A50-A64, N70-N73
5	a. Syphilis	A50-A53
6	b. Chlamydia	A55-A56
7	c. Gonorrhoea	A54
8	d. Trichomoniasis	A59
9	e. Other STDs	A57-A58, A60-A64, N70-N73
10	3. HIV/AIDS	B20-B24
11	4. Diarrhoeal diseases[b]	A00, A01, A03, A04, A06-A09
12	5. Childhood-cluster diseases	A33-A37, B05
13	a. Whooping cough	A37
14	b. Diphtheria	A36
15	c. Measles	B05
16	d. Tetanus	A33-A35
17	6. Meningitis	A39, G00, G03
18	7. Encephalitis[b]	A83-A86, B94.1, G04
19	8. Hepatitis B	B16-B19 (minus B17.1, B18.2)
20	9. Hepatitis C	B17.1, B18.2
21	10. Parasitic and vector diseases	A30, A71, A82, A90-A91, B50-B57, B65, B73, B74.0-B74.2, P37.3-P37.4
22	a. Malaria	B50-B54, P37.3, P37.4
23	b. Trypanosomiasis	B56
24	c. Chagas disease	B57
25	d. Schistosomiasis	B65
26	e. Leishmaniasis	B55
27	f. Lymphatic filariasis	B74.0-B74.2
28	g. Onchocerciasis	B73
29	h. Leprosy	A30
30	i. Dengue	A90-A91
31	j. Trachoma	A71
32	k. Rabies	A82
33	11. Intestinal nematode infections	B76-B77, B79
34	a. Ascariasis	B77
35	b. Trichuriasis	B79
36	c. Hookworm disease	B76
37	12. Other infectious diseases	A02, A05, A20-A28, A31, A32, A38, A40-A49, A65-A70, A74-A79, A80-A81, A87-A89, A92-A99, B00-B04, B06-B15, B25-B49, B58-B60, B64, B66-B72, B74.3-B74.9, B75,B78, B80-B89, B91-B99 (minus B94.1)

Code	GHE cause name	ICD-10 code
38	**B. Respiratory infections** [b]	J00-J22, H65-H66,P23, U04
39	1. Lower respiratory infections	J09-J22, P23, U04
40	2. Upper respiratory infections	J00-J06
41	3. Otitis media	H65-H66
42	**C. Maternal conditions**	O00-O99
43	1. Maternal haemorrhage	O44-O46, O67, O72
44	2. Maternal sepsis	O85-O86
45	3. Hypertensive disorders of pregnancy	O10-O16
46	4. Obstructed labour	O64-O66
47	5. Abortion	O00-O07
48	6. Other maternal conditions	O20-O43, O47-O63, O68-O71, O73-O75, O87-O99
49	**D. Neonatal conditions**	P00-P96 (minus P23, P37.3, P37.4)
50	1. Preterm birth complications [b]	P05, P07, P22, P27-P28
51	2. Birth asphyxia and birth trauma [b]	P03, P10-P15, P20-P21, P24-P26, P29
52	3. Neonatal sepsis and infections	P35-P39 (minus P37.3, P37.4)
53	4. Other neonatal conditions	P00-P02, P04, P08, P50-P96
54	**E. Nutritional deficiencies**	E00-E02, E40-E46, E50-E64, D50-D53, D64.9
55	1. Protein-energy malnutrition	E40-E46
56	2. Iodine deficiency	E00-E02
47	3. Vitamin A deficiency	E50
58	4. Iron-deficiency anaemia	D50, D64.9
59	5. Other nutritional disorders	D51-D53, E51-E64
60	**II. Noncommunicable diseases** [a]	C00-C97, D00-D48, D55-D64 (minus D 64.9), D65-D89, E03-E07, E10-E16, E20-E34, E65-E88, F01-F99, G06-G98, H00-H61, H68-H93, I00-I99, J30-J98, K00-K92, N00-N64, N75-N98, L00-L98, M00-M99, Q00-Q99, X41-X42[b], X45[b]
61	**A. Malignant neoplasms**	C00-C97
62	1. Mouth and oropharynx cancers [d]	C00-C14
63	2. Oesophagus cancer [d]	C15
64	3. Stomach cancer [d]	C16
65	4. Colon and rectum cancers [d]	C18-C21
66	5. Liver cancer	C22
67	6. Pancreas cancer	C25
68	7. Trachea, bronchus and lung cancers	C33-C34
69	8. Melanoma and other skin cancers [d]	C43-C44
70	9. Breast cancer [d]	C50
71	10. Cervix uteri cancer [d]	C53
72	11. Corpus uteri cancer [d]	C54-C55
73	12. Ovary cancer	C56
74	13. Prostate cancer [d]	C61
75	14. Bladder cancer [d]	C67
76	15. Lymphomas and multiple myeloma [d]	C81-C90, C96
77	16. Leukaemia [d]	C91-C95
78	17. Other malignant neoplasms [d]	C17, C23, C24, C26-C32, C37-C41, C45-C49, C51, C52,C57-C60, C62-C66, C68-C80, C97

Code	GHE cause name	ICD-10 code
79	**B. Other neoplasms**	D00-D48
80	**C. Diabetes mellitus**	E10-E14
81	**D. Endocrine, blood, immune disorders**	D55-D64 (minus D64.9), D65-D89, E03-E07, E15-E34, E65-E88
82	**E. Mental and behavioural disorders**	F04-F99, X41-X42[c], X45[c]
83	1. Unipolar depressive disorders	F32-F33, F34.1
84	2. Bipolar affective disorder	F30-F31
85	3. Schizophrenia	F20-F29
86	4. Alcohol use disorders	F10, X45[c]
87	5. Drug use disorders	F11-F16, F18-F19, X41-X42[c]
88	6. Anxiety disorders	F40-F44
89	7. Eating disorders	F50
90	8. Pervasive developmental disorders	F84
91	9. Childhood behavioural disorders	F90-F92
92	10. Idiopathic intellectual disability	F70-F79
93	11. Other mental and behavioural disorders	F04-F09, F17, F34-F39 (minus F34.1), F45-F48, F51-F69, F80-F83, F88-F89, F93-F99
94	**F. Neurological conditions**	F01-F03, G06 -G98
95	1. Alzheimer's disease and other dementias	F01-F03, G30-G31
96	2. Parkinson disease	G20-G21
97	3. Epilepsy	G40-G41
98	4. Multiple sclerosis	G35
99	5. Migraine	G43
100	6. Non-migraine headache	G44
101	7. Other neurological conditions	G06-G12, G23-G25, G36-G37, G45-G98
102	**G. Sense organ diseases**	H00-H61, H68-H93
103	1. Glaucoma	H40
104	2. Cataracts	H25-H26
105	3. Refractive errors	H49-H52
106	4. Macular degeneration	H35.3
107	5. Other vision loss	H30-H35 (minus H35.3), H53-H54
108	6. Other hearing loss	H90-H91
109	7. Other sense organ disorders	H00-H21, H27, H43-H47, H55-H61, H68-H83, H92-H93
110	**H. Cardiovascular diseases**	I00-I99
111	1. Rheumatic heart disease	I01-I09
112	2. Hypertensive heart disease	I10-I15
113	3. Ischaemic heart disease[e]	I20-I25
114	4. Stroke	I60-I69
115	5. Cardiomyopathy, myocarditis, endocarditis	I30-I33, I38, I40, I42
116	6. Other cardiovascular diseases[e]	I00, I26-I28, I34-I37, I44-I51, I70-I99
117	**I. Respiratory diseases**	J30-J98
118	1. Chronic obstructive pulmonary disease	J40-J44
119	2. Asthma	J45-J46
120	3. Other respiratory diseases	J30-J39, J47-J98
121	**J. Digestive diseases**	K20-K92

Code	GHE cause name	ICD-10 code
122	1. Peptic ulcer disease	K25-K27
123	2. Cirrhosis of the liver	K70, K74
124	3. Appendicitis	K35-K37
125	4. Other digestive diseases	K20-K22, K28-K31, K38-K66, K71-K73, K75-K92
126	**K. Genitourinary diseases**	N00-N64, N75-N76, N80-N98
127	1. Kidney diseases	N00-N19
128	2. Hyperplasia of prostate	N40
129	3. Urolithiasis	N20-N23
130	4. Other genitourinary disorders	N25-N39, N41-N45, N47-N51
131	5. Infertility	N46, N97
132	6. Gynecological diseases	N60-N64, N75-N76, N80-N96, N98
133	**L. Skin diseases**	L00-L98
134	**M. Musculoskeletal diseases**	M00-M99
135	1. Rheumatoid arthritis	M05-M06
136	2. Osteoarthritis	M15-M19
137	3. Gout	M10
138	4. Back and neck pain	M45-M48, M50-M54
139	5. Other musculoskeletal disorders	M00, M02, M08, M11-M13, M20-M43, M60-M99
140	**N. Congenital anomalies**	Q00-Q99
141	1. Neural tube defects	Q00, Q05
142	2. Cleft lip and cleft palate	Q35-Q37
143	3. Down syndrome	Q90
144	4. Congenital heart anomalies	Q20-Q28
145	5. Other chromosomal anomalies	Q91-Q99
146	6. Other congenital anomalies	Q01-Q04, Q06-Q18, Q30-Q34, Q38-Q89
147	**O. Oral conditions**	K00-K14
148	1. Dental caries	K00-K04, K06-K14
149	2. Periodontal disease	K05
150	3. Edentulism	—
151	**III. Injuries**	V01-Y89 (minus X41-X42, X45)
152	**A. Unintentional injuries**[f]	V01-X40, X43-X44, X46-59, Y40-Y86, Y88, Y89
153	1. Road injury[g]	V01-V04, V06, V09-V80, V87, V89, V99
154	2. Poisonings	X40, X43-X44, X46-X49
155	3. Falls	W00-W19
156	4. Fire, heat and hot substances	X00-X19
157	5. Drownings	W65-W74
158	6. Exposure to forces of nature	X30-X39
159	7. Other unintentional injuries	Rest of V, W20-W64, W75-W99, X20-X29, X50-X59, Y40-Y86, Y88, Y89
160	**B. Intentional injuries**[f]	X60-Y09, Y35-Y36, Y870, Y871
161	1. Self-harm	X60-X84, Y870
162	2. Interpersonal violence	X85-Y09, Y871
163	3. Collective violence and legal intervention	Y35-Y36

—, not available

[a] Deaths coded to “Symptoms, signs and ill-defined conditions” (R00-R99) are distributed proportionately to all causes within Group I and Group II.

[b] For deaths under age 5, refer to classification in Annex Table B.

[c] As from 2006, deaths from causes F10-F19 with fourth character .0 (Acute intoxication) are coded to the category of accidental poisoning according to the updated ICD-10 instructions.

[d] Cancer deaths coded to ICD categories for malignant neoplasms of other and unspecified sites including those whose point of origin cannot be determined, and secondary and unspecified neoplasms (ICD-10 C76, C80, C97) were redistributed pro-rata across the footnoted malignant neoplasm categories within each age–sex group, so that the category “Other malignant neoplasms” includes only malignant neoplasms of other specified sites (Ref Mathers et al 2006 DCP chapter).

[e] Ischaemic heart disease deaths may be miscoded to a number of so-called cardiovascular “garbage” codes. These include heart failure, ventricular dysrhythmias, generalized atherosclerosis and ill-defined descriptions and complications of heart disease. Proportions of deaths coded to these causes were redistributed to ischaemic heart disease as described in (GPE discussion paper). Relevant ICD-10 codes are I47.2, I49.0, I46, I50, I51.4, I51.5, I51.6, I51.9 and I70.9.

[f] Injury deaths where the intent is not determined (Y10-Y34, Y872) are distributed proportionately to all causes below the group level for injuries.

[g] For countries with 3-digit ICD10 data, for “Road injury” use: V01-V04, V06, V09-V80, V87, V89 and V99. For countries with 4-digit ICD10 data, for “Road injury” use:

V01.1-V01.9, V02.1-V02.9, V03.1-V03.9, V04.1-V04.9, V06.1-V06.9, V09.2, V09.3, V10.3-V10.9, V11.3-V11.9, V12.3-V12.9, V13.3-V13.9, V14.3-V14.9, V15.4-V15.9, V16.4-V16.9, V17.4-V17.9, V18.4-V18.9, V19.4-V19.9, V20.3-V20.9, V21.3-V21.9, V22.3-V22.9, V23.3-V23.9, V24.3-V24.9, V25.3-V25.9, V26.3-V26.9, V27.3-V27.9, V28.3-V28.9, V29.4-V29.9, V30.4.V30.9, V31.4-V31.9, V32.4-V32.9, V33.4-V33.9, V34.4-V34.9, V35.4-V35.9, V36.4-V36.9, V37.4-V37.9, V38.4-V38.9, V39.4-V39.9, V40.4-V40.9, V41.4-V41.9, V42.4-V42.9, V43.4-V43.9, V44.4-V44.9, V45.4-V45.9, V46.4-V46.9, V47.4-V47.9, V48.4-V48.9, V49.4-V49.9, V50.4-V50.9, V51.4-V51.9, V52.4-V52.9, V53.4-V53.9, V54.4-V54.9, V55.4-V55.9, V56.4-V56.9, V57.4-V57.9, V58.4-V58.9, V59.4-V59.9, V60.4-V60.9, V61.4-V61.9, V62.4-V62.9, V63.4-V63.9, V64.4-V64.9, V65.4-V65.9, V66.4-V66.9, V67.4-V67.9, V68.4-V68.9, V69.4-V69.9, V70.4-V70.9, V71.4-V71.9, V72.4-V72.9, V73.4-V73.9, V74.4-V74.9, V75.4-V75.9, V76.4-V76.9, V77.4-V77.9, V78.4-V78.9, V79.4-V79.9, V80.3-V80.5, V81.1, V82.1, V82.8-V82.9, V83.0-V83.3, V84.0-V84.3, V85.0-V85.3, V86.0-V86.3, V87.0-V87.9, V89.2-V89.3, V89.9, V99 and Y850.

Annex Table B First-level categories for analysis of child causes of death

GBD cause name	ICD-10 code	ICD-9 code
All causes	A00-Y89	001-999
I. Communicable, maternal, perinatal and nutritional conditions[a]	A00-B99, D50-D53, D64.9, E00-E02, E40-E64, G00-G09, H65-H66, J00-J22, J85, N30, N34, N390, N70-N73, O00-P96, U04	001-139, 243, 260-269, 279.5-279.6, 280, 281, 285.9, 320-326, 381-382, 460-466, 480-487, 513, 614-616, 630-676, 760-779
HIV/AIDS	B20-B24	279.5-279.6, 042
Diarrhoeal diseases	A00-A09	001-009
Pertussis	A37	033
Tetanus	A33-A35	037, 771.3
Measles	B05	055
Meningitis/encephalitis	A20.3, A32.1, A39.1, G00–G09	036, 320, 322-326
Malaria	B50-B54, P37.3, P37.4	084
Acute respiratory infections	H65-H66, J00-J22, J85, P23, U04	460-466, 480-487, 381-382, 513, 770.0
Prematurity	P01.0, P01.1, P07, P22, P25-P28, P52, P61.2, P77	761.0-761.1, 765, 769, 770.2-770.9, 772.1, 774.2, 776.6, 777.5-777.6,
Birth asphyxia & birth trauma[b]	P01.7-P02.1, P02.4-P02.6, P03, P10-P15, P20-P21, P24, P50, P90-P91	761.7-762.1, 762.4-762.6, 763, 767-768, 770.1, 772.2, 779.0-779.2
Sepsis and other infectious conditions of the newborn	P35-P39 (exclude P37.3, P37.4)	771.0-771.2, 771.4-771.8
Other Group I	Remainder	Remainder
II. Noncommunicable diseases[a]	C00-C97, D00-D48, D55-D64 (exclude D64.9), D65-D89, E03-E34, E65-E88, F01-F99, G10-G98, H00-H61, H68-H93, I00-I99, J30-J84, J86-J98, K00-K92, L00-L98, M00-M99, N00-N28, N31-N32, N35-N64 (exclude N39.0), N75-N98, Q00-Q99	140- 242, 244-259, 270-279, 282-285, 286-319, 330-380, 383-459, 470-478, 490- 512, 514-611, 617- 629, 680- 759 (exclude 279.5-279.6, 285.9)
Congenital anomalies	Q00-Q99	740-759
Other Group II	Remainder	Remainder
III. Injuries	V01-Y89	E800-E999

[a] Deaths coded to "Symptoms, signs and ill-defined conditions" (780-799 in ICD-9 and R00-R99 in ICD-10) are distributed proportionately to all for neonatal deaths, but exclusively to Group I and Group II for the postneonatal deaths.
[b] Also referred to as "intrapartum-related complications"

Annex Table C Groupings of countries, areas and territories used for regional tabulations

C.1 WHO Regions and Member States*

WHO African Region

Algeria, Angola, Benin, Botswana, Burkina Faso, Burundi, Cabo Verde, Cameroon, Central African Republic, Chad, Comoros, Congo, Côte d'Ivoire, Democratic Republic of the Congo, Equatorial Guinea, Eritrea, Ethiopia, Gabon, Gambia, Ghana, Guinea, Guinea-Bissau, Kenya, Lesotho, Liberia, Madagascar, Malawi, Mali, Mauritania, Mauritius, Mozambique, Namibia, Niger, Nigeria, Rwanda, Sao Tome and Principe, Senegal, Seychelles, Sierra Leone, South Africa, Swaziland, Togo, Uganda, United Republic of Tanzania, Zambia, Zimbabwe

WHO Region of the Americas

Antigua and Barbuda, Argentina, Bahamas, Barbados, Belize, Bolivia (Plurinational State of), Brazil, Canada, Chile, Colombia, Costa Rica, Cuba, Dominica, Dominican Republic, Ecuador, El Salvador, Grenada, Guatemala, Guyana, Haiti, Honduras, Jamaica, Mexico, Nicaragua, Panama, Paraguay, Peru, Saint Kitts and Nevis, Saint Lucia, Saint Vincent and the Grenadines, Suriname, Trinidad and Tobago, United States of America, Uruguay, Venezuela (Bolivarian Republic of)

WHO South-East Asia Region

Bangladesh, Bhutan, Democratic People's Republic of Korea, India, Indonesia, Maldives, Myanmar, Nepal, Sri Lanka, Thailand, Timor-Leste

WHO European Region

Albania, Andorra, Armenia, Austria, Azerbaijan, Belarus, Belgium, Bosnia and Herzegovina, Bulgaria, Croatia, Cyprus, Czech Republic, Denmark, Estonia, Finland, France, Georgia, Germany, Greece, Hungary, Iceland, Ireland, Israel, Italy, Kazakhstan, Kyrgyzstan, Latvia, Lithuania, Luxembourg, Malta, Monaco, Montenegro, Netherlands, Norway, Poland, Portugal, Republic of Moldova, Romania, Russian Federation, San Marino, Serbia, Slovakia, Slovenia, Spain, Sweden, Switzerland, Tajikistan, the former Yugoslav Republic of Macedonia, Turkey, Turkmenistan, Ukraine, United Kingdom, Uzbekistan

WHO Eastern Mediterranean Region

Afghanistan, Bahrain, Djibouti, Egypt, Iran (Islamic Republic of), Iraq, Jordan, Kuwait, Lebanon, Libya, Morocco, Oman, Pakistan, Qatar, Saudi Arabia, Somalia, South Sudan**, Sudan, Syrian Arab Republic, Tunisia, United Arab Emirates, Yemen

WHO Western Pacific Region

Australia, Brunei Darussalam, Cambodia, China, Cook Islands, Fiji, Japan, Kiribati, Lao People's Democratic Republic, Malaysia, Marshall Islands, Micronesia (Federated States of), Mongolia, Nauru, New Zealand, Niue, Palau, Papua New Guinea, Philippines, Republic of Korea, Samoa, Singapore, Solomon Islands, Tonga, Tuvalu, Vanuatu, Viet Nam

*WHO regional groupings as of 2012, which corresponds to the most recent reference year for this revision of Global Health Estimates.

**South Sudan was reassigned to the WHO African Region in May 2013. As this revision of Global Health Estimates relate to time periods prior to this date, estimates for South Sudan are included in the figures given for the WHO Eastern Mediterranean Region.

C.2 Member States grouped by WHO Region and average income per capita*

High income

Andorra, Antigua and Barbuda, Australia, Austria, Bahamas, Bahrain, Barbados, Belgium, Brunei Darussalam, Canada, Chile, Croatia, Cyprus, Czech Republic, Denmark, Equatorial Guinea**, Estonia, Finland, France, Germany, Greece, Iceland, Ireland, Israel, Italy, Japan, Kuwait, Latvia, Lithuania, Luxembourg, Malta, Monaco, Netherlands, New Zealand, Norway, Oman, Poland, Portugal, Qatar, Republic of Korea, Russian Federation, Saint Kitts and Nevis, San Marino, Saudi Arabia, Singapore, Slovakia, Slovenia, Spain, Sweden, Switzerland, Trinidad and Tobago, United Arab Emirates, United Kingdom, United States of America, Uruguay

Low and middle income

WHO African Region

Algeria, Angola, Benin, Botswana, Burkina Faso, Burundi, Cabo Verde, Cameroon, Central African Republic, Chad, Comoros, Congo, Côte d'Ivoire, Democratic Republic of the Congo, Eritrea, Ethiopia, Gabon, Gambia, Ghana, Guinea, Guinea-Bissau, Kenya, Lesotho, Liberia, Madagascar, Malawi, Mali, Mauritania, Mauritius, Mozambique, Namibia, Niger, Nigeria, Rwanda, Sao Tome and Principe, Senegal, Seychelles, Sierra Leone, South Africa, Swaziland, Togo, Uganda, United Republic of Tanzania, Zambia, Zimbabwe

WHO Region of the Americas

Argentina, Belize, Bolivia (Plurinational State of), Brazil, Colombia, Costa Rica, Cuba, Dominica, Dominican Republic, Ecuador, El Salvador, Grenada Guatemala, Guyana, Haiti, Honduras, Jamaica, Mexico, Nicaragua, Panama, Paraguay, Peru, Saint Lucia, Saint Vincent and the Grenadines, Suriname, Venezuela (Bolivarian Republic of)

WHO South-East Asia Region

Bangladesh, Bhutan, Democratic People's Republic of Korea, India, Indonesia, Maldives, Myanmar, Nepal, Sri Lanka, Thailand, Timor-Leste

WHO European Region

Albania, Armenia, Azerbaijan, Belarus, Bosnia and Herzegovina, Bulgaria, Georgia, Hungary, Kazakhstan, Kyrgyzstan, Montenegro, Republic of Moldova, Romania, Serbia, Tajikistan, the former Yugoslav Republic of Macedonia, Turkey, Turkmenistan, Ukraine, Uzbekistan

WHO Eastern Mediterranean Region

Afghanistan, Djibouti, Egypt, Iran (Islamic Republic of), Iraq, Jordan, Lebanon, Libya, Morocco, Pakistan, Somalia, South Sudan*, Sudan, Syrian Arab Republic, Tunisia, Yemen

WHO Western Pacific Region

Cambodia, China, Cook Islands, Fiji, Kiribati, Lao People's Democratic Republic, Malaysia, Marshall Islands, Micronesia (Federated States of), Mongolia, Nauru, Niue, Palau, Papua New Guinea, Philippines, Samoa, Solomon Islands, Tonga, Tuvalu, Vanuatu, Viet Nam

* This regional grouping classifies WHO Member States (see notes on page 39) according to the World Bank analytical income of economies for fiscal year 2014, which is based on the 2012 Atlas gross national income per capita estimates (World Bank list of economies, July 2013).

** For the following World Health Statistics 2014 indicators, Equatorial Guinea was included in WHO African Region as its epidemiological profile suggested that was appropriate: life expectancy, healthy life expectancy, adult mortality rate, age-standardized mortality rates by cause, years of life lost, number of deaths and distribution of causes of death among children aged under 5 years.

C.3 World Bank income grouping*

Low income

Afghanistan, Bangladesh, Benin, Burkina Faso, Burundi, Cambodia, Central African Republic, Chad, Comoros, Democratic People's Republic of Korea, Democratic Republic of the Congo, Eritrea, Ethiopia, Gambia, Guinea, Guinea-Bissau, Haiti, Kenya, Kyrgyzstan, Liberia, Madagascar, Malawi, Mali, Mozambique, Myanmar, Nepal, Niger, Rwanda, Sierra Leone, Somalia, South Sudan, Tajikistan, Togo, Uganda, United Republic of Tanzania, Zimbabwe

Lower middle income

Armenia, Bhutan, Bolivia (Plurinational State of), Cabo Verde, Cameroon, Congo, Côte d'Ivoire, Djibouti, Egypt, El Salvador, Georgia, Ghana, Guatemala, Guyana, Honduras, India, Indonesia, Kiribati, Lao People's Democratic Republic, Lesotho, Mauritania, Micronesia (Federated States of), Mongolia, Morocco, Nicaragua, Nigeria, Pakistan, Papua New Guinea, Paraguay, Philippines, Republic of Moldova, Samoa, Sao Tome and Principe, Senegal, Solomon Islands, Sri Lanka, Sudan, Swaziland, Syrian Arab Republic, Timor-Leste, Ukraine, Uzbekistan, Vanuatu, Viet Nam, West Bank and Gaza Strip, Yemen, Zambia

Upper middle income

Albania, Algeria, Angola, Argentina, Azerbaijan, Belarus, Belize, Bosnia and Herzegovina, Botswana, Brazil, Bulgaria, China, Colombia, Cook Islands**, Costa Rica, Cuba, Dominica, Dominican Republic, Ecuador, Fiji, Gabon, Grenada, Iran (Islamic Republic of), Iraq, Jamaica, Jordan, Kazakhstan, Lebanon, Libya, Malaysia, Maldives, Marshall Islands, Mauritius, Mexico, Montenegro, Namibia, Nauru**, Niue**, Palau, Panama, Peru, Romania, Saint Lucia, Saint Vincent and the Grenadines, Serbia, Seychelles, South Africa, Suriname, Thailand, the former Yugoslav Republic of Macedonia, Tonga, Tunisia, Turkey, Turkmenistan, Tuvalu, Venezuela (Bolivarian Republic of)

High income

Andorra, Antigua and Barbuda, Australia, Austria, Bahamas, Bahrain, Barbados, Belgium, Brunei Darussalam, Canada, Chile, Croatia, Cyprus, Czech Republic, Denmark, Equatorial Guinea***, Estonia, Finland, France, Germany, Greece, Iceland, Ireland, Israel, Italy, Japan, Kuwait, Latvia, Lithuania, Luxembourg, Malta, Monaco, Netherlands, New Zealand, Norway, Oman, Poland, Portugal, Puerto Rico, Qatar, Republic of Korea, Russian Federation, Saint Kitts and Nevis, San Marino, Saudi Arabia, Singapore, Slovakia, Slovenia, Spain, Sweden, Switzerland, Taiwan, Trinidad and Tobago, United Arab Emirates, United Kingdom, United States of America, Uruguay

* This regional grouping classifies countries, areas and territories according to the World Bank analytical income of economies for fiscal year 2014, which is based on the 2012 Atlas gross national income per capita estimates (World Bank list of economies, July 2013).

** These countries have been classified into income groups using gross domestic product.

*** For the following World Health Statistics 2014 indicators, Equatorial Guinea was included in upper middle income countries as its epidemiological profile suggested that was appropriate: life expectancy, healthy life expectancy, adult mortality rate, age-standardized mortality rates by cause, years of life lost, number of deaths and distribution of causes of death among children aged under 5 years.

C.4 World Bank Regions

High income

Andorra, Antigua and Barbuda, Australia, Austria, Bahamas, Bahrain, Barbados, Belgium, Brunei Darussalam, Canada, Chile, Croatia, Cyprus, Czech Republic, Denmark, Equatorial Guinea, Estonia, Finland, France, Germany, Greece, Iceland, Ireland, Israel, Italy, Japan, Kuwait, Latvia, Lithuania, Luxembourg, Malta, Monaco, Netherlands, New Zealand, Norway, Oman, Poland, Portugal, Puerto Rico, Qatar, Republic of Korea, Russian Federation, Saint Kitts and Nevis, San Marino, Saudi Arabia, Singapore, Slovakia, Slovenia, Spain, Sweden, Switzerland, Taiwan, Trinidad and Tobago, United Arab Emirates, United Kingdom, United States of America, Uruguay

East Asia and Pacific

Cambodia, China, Cook Islands, Democratic People's Republic of Korea, Fiji, Indonesia, Kiribati, Lao People's Democratic Republic, Malaysia, Marshall Islands, Micronesia (Federated States of), Mongolia, Myanmar, Nauru, Niue, Palau, Papua New Guinea, Philippines, Samoa, Solomon Islands, Thailand, Timor-Leste, Tonga, Tuvalu, Vanuatu, Viet Nam

Europe and Central Asia

Albania, Armenia, Azerbaijan, Belarus, Bosnia and Herzegovina, Bulgaria, Georgia, Hungary, Kazakhstan, Kyrgyzstan, Montenegro, Republic of Moldova, Romania, Serbia, Tajikistan, the former Yugoslav Republic of Macedonia, Turkey, Turkmenistan, Ukraine, Uzbekistan

Latin America and Caribbean

Argentina, Belize, Bolivia (Plurinational State of), Brazil, Colombia, Costa Rica, Cuba, Dominica, Dominican Republic, Ecuador, El Salvador, Grenada, Guatemala, Guyana, Haiti, Honduras, Jamaica, Mexico, Nicaragua, Panama, Paraguay, Peru, Saint Lucia, Saint Vincent and the Grenadines, Suriname, Venezuela (Bolivarian Republic of)

Middle East and North Africa

Algeria, Djibouti, Egypt, Iran (Islamic Republic of), Iraq, Jordan, Lebanon, Libya, Morocco, Syrian Arab Republic, Tunisia, West Bank and Gaza Strip, Yemen

South Asia

Afghanistan, Bangladesh, Bhutan, India, Maldives, Nepal, Pakistan, Sri Lanka

Sub-Saharan Africa

Angola, Benin, Botswana, Burkina Faso, Burundi, Cabo Verde, Cameroon, Central African Republic, Chad, Comoros, Congo, Côte d'Ivoire, Democratic Republic of the Congo, Eritrea, Ethiopia, Gabon, Gambia, Ghana, Guinea, Guinea-Bissau, Kenya, Lesotho, Liberia, Madagascar, Malawi, Mali, Mauritania, Mauritius, Mozambique, Namibia, Niger, Nigeria, Rwanda, Sao Tome and Principe, Senegal, Seychelles, Sierra Leone, Somalia, South Africa, South Sudan, Sudan, Swaziland, Togo, Uganda, United Republic of Tanzania, Zambia, Zimbabwe

C.5 Millennium Development Goal (MDG) Regions

Developed region

Albania, Andorra, Australia, Austria, Belarus, Belgium, Bosnia and Herzegovina, Bulgaria, Canada, Croatia, Cyprus, Czech Republic, Denmark, Estonia, Finland, France, Germany, Greece, Hungary, Iceland, Ireland, Israel, Italy, Japan, Latvia, Lithuania, Luxembourg, Malta, Monaco, Montenegro, Netherlands, New Zealand, Norway, Poland, Portugal, Republic of Moldova, Romania, Russian Federation, San Marino, Serbia, Slovakia, Slovenia, Spain, Sweden, Switzerland, The former Yugoslav Republic of Macedonia, Ukraine, United Kingdom, United States of America

Developing regions

Caucasus and Central Asia

Armenia, Azerbaijan, Georgia, Kazakhstan, Kyrgyzstan, Tajikistan, Turkmenistan, Uzbekistan

Eastern Asia

China, Democratic People's Republic of Korea, Mongolia, Republic of Korea

Latin America and the Caribbean

Antigua and Barbuda, Argentina, Bahamas, Barbados, Belize, Bolivia (Plurinational State of), Brazil, Chile, Colombia, Costa Rica, Cuba, Dominica, Dominican Republic, Ecuador, El Salvador, Grenada, Guatemala, Guyana, Haiti, Honduras, Jamaica, Mexico, Nicaragua, Panama, Paraguay, Peru, Puerto Rico, Saint Kitts and Nevis, Saint Lucia, Saint Vincent and the Grenadines, Suriname, Trinidad and Tobago, Uruguay, Venezuela (Bolivarian Republic of)

Northern Africa

Algeria, Egypt, Libya, Morocco, Tunisia

Oceania

Cook Islands, Fiji, Kiribati, Marshall Islands, Micronesia (Federated States of), Nauru, Niue, Palau, Papua New Guinea, Samoa, Solomon Islands, Tonga, Tuvalu, Vanuatu

South-eastern Asia

Brunei Darussalam, Cambodia, Indonesia, Lao People's Democratic Republic, Malaysia, Myanmar, Philippines, Singapore, Thailand, Timor-Leste, Viet Nam

Southern Asia

Afghanistan, Bangladesh, Bhutan, India, Iran (Islamic Republic of), Maldives, Nepal, Pakistan, Sri Lanka

Sub-Saharan Africa

Angola, Benin, Botswana, Burkina Faso, Burundi, Cabo Verde, Cameroon, Central African Republic, Chad, Comoros, Congo, Côte d'Ivoire, Democratic Republic of the Congo, Djibouti, Equatorial Guinea, Eritrea, Ethiopia, Gabon, Gambia, Ghana, Guinea, Guinea-Bissau, Kenya, Lesotho, Liberia, Madagascar, Malawi, Mali, Mauritania, Mauritius, Mozambique, Namibia, Niger, Nigeria, Rwanda, Sao Tome and Principe, Senegal, Seychelles, Sierra Leone, Somalia, South Africa, South Sudan, Sudan, Swaziland, Togo, Uganda, United Republic of Tanzania, Zambia, Zimbabwe

Western Asia

Bahrain, Iraq, Jordan, Kuwait, Lebanon, Oman, Qatar, Saudi Arabia, Syrian Arab Republic, Turkey, United Arab Emirates, West Bank and Gaza Strip, Yemen

Annex Table D Mapping of India MDS categories to GHE causes.

MDS Cause	Million Death Study Cause Category	GHE causes	Comment
Communicable, maternal, neonatal and nutritional conditions			
1A01	Tuberculosis	3	
1B01	Syphilis	5	
1B02	Other sexually transmitted infections (excl. HIV/AIDS)	9	Other STDs estimated according to GBD 2010 cause fractions
1C01	HIV/AIDS	10	
1D01	Diarrhoeal diseases	11	
1E01	Tetanus	16	
1E02	Measles	15	
1E03	Other vaccine preventable diseases	13, 14	
1F01	Meningitis/encephalitis	17, 18	Apportioned to according to GBD 2010 cause fractions
1F02	Rabies	32	
1G01	Hepatitis	19, 20	Apportioned to according to GBD 2010 cause fractions
1H01	Malaria	22	WHO malaria mortality estimates used
1I01	Protozoal diseases	26	
1I02	Leprosy	29	
1I03	Arthropod-borne viral fevers	30	
1I04	Trachoma	31	
1I05	Helminthiases	34	
1J01	Acute respiratory infections	39-41	Apportioned to according to GBD 2010 cause fractions
1K01	Severe Systemic Infection	37	
1K02	Severe Localized Infection	37	Acute bacterial sepsis
1L01	Other infectious diseases	37	
1M01	Maternal haemorrhage	43	
1M02	Maternal sepsis	44	
1M03	Hypertensive disorders of pregnancy	45	
1M04	Obstructed labour	46	
1M05	Abortion	47	
1M06	Other maternal conditions	48	
1N01	Low birth weight/preterm	50	
1N02	Birth asphyxia and birth trauma	51	
1N03	Other perinatal conditions	52, 53	Apportioned using WHO-CHERG cause fractions
1O01	Protein-energy malnutrition	55	
1O02	Iron, vitamin deficiencies and nutritional anaemias	56-59	Apportioned to according to GBD 2010 cause fractions
1P01	Fever of unknown origin		Redistributed pro-rata across infectious disease categories
Noncommunicable diseases			
2A	Neoplasms	62-79	Replaced by WHO/IARC cancer estimates
2B01	Diabetes mellitus	80	

2C01	Endocrine and immune disorders	81	
2D01	Epilepsy	97	
2D02	Other neuropsychiatric disorders	83-93, 95, 96, 98-101	Apportioned to according to GBD 2010 cause fractions
2F01	Skin diseases	133	
2F02	Musculoskeletal disorders	135-139	Apportioned to according to GBD 2010 cause fractions
2F03	Sense organ disorders	103-109	Apportioned to according to GBD 2010 cause fractions
2F04	Oral conditions	150	
2G01	Rheumatic heart disease	111	
2G02	Ischaemic heart diseases	113	
2G03	Hypertensive heart diseases	112	
2G04	Cerebrovascular disease	114	
2G05	Heart failure		Redistributed pro-rata across cardiovascular cause categories excluding cerebrovascular disease
2G06	Other cardiovascular diseases	115, 116	Apportioned to according to GBD 2010 cause fractions
2H01	Asthma and chronic obstructive pulmonary disease	118, 119	Apportioned to according to GBD 2010 cause fractions
2H02	Other chronic respiratory diseases	120	
2J01	Gastro-oesophageal diseases	122	
2J02	Lliver and alcohol related diseases	86, 123, 125, 154	Apportioned to alcohol use disorders, liver cirrhosis, other gastrointestinal, and accidental poisoning according to GBD 2010 cause fractions
2J03	Other digestive diseases	124, 125	Apportioned to according to GBD 2010 cause fractions
2K01	Nephritis and nephrosis	127	
2K02	Other genitourinary system diseases	128-132	Apportioned to according to GBD 2010 cause fractions
2L01	Congenital anomalies	141-146	Apportioned to according to GBD 2010 cause fractions
Injuries			
3A01	Transport accidents	153, 159	Non-road transport injury estimated using GBD 2010 analysis
3A02	Poisonings	154	
3A03	Falls	155	
3A04	Fires	156	
3A05	Drownings	157	
3A06	Venomous snakes, animals and plants	159	
3A07	Other unintentional injuries	159	
3B01	Self-inflicted injuries (suicide)	161	
3B02	War, violence and other intentional injuries	162	
3C01	Undetermined Intent		Redistributed pro-rata across intentional & unintentional injury causes.
Symptoms, signs and Ill-defined conditions			
4A01	Senility		Redistributed pro-rata across non-injury cause categories.
4A02	Other Ill-defined and abnormal findings		Redistributed pro-rata across non-injury cause categories.
4A03	Unspecified deaths		Redistributed pro-rata across all cause categories.

Annex Table E Methods used for estimation of mortality levels and causes of death, by country, 2000-2012

Mortality method groups:

A: Life tables based on death rates computed from vital registration data.

B: Projection of life table parameters l_5 and l_{60} from adjusted vital registration data, smoothed with moving average, projected using modified logit system with latest available year's lx as standard; child mortality from the UN-IGME.

C: Life tables based on death rates computed from neighbouring regional vital registration data.

D: Life tables based on UNPD's World Population Prospects – the 2012 revision, and child mortality estimates from the UN-IGME.

E: Life tables based on UNPD's World Population Prospects – the 2012 revision, updated with the latest HIV/AIDS mortality from UNAIDS and child mortality estimates from the UN-IGME.

F: Life tables for high HIV countries modeled using Spectrum to ensure consistency of HIV and all-cause mortality estimates

Abbreviations

GBD 2010 Global Burden of Disease 2010 study estimates for cause fractions (9)

GBD 2010* GBD 2010 study estimates drawing on WHO death registration data (VR) for the country

VA Verbal autopsy

VR Vital (death) registration

Note (a) WHO and UN Interagency cause-specific estimates (see Section 5 above).

n.a. Useability not assessed

Country	All-cause mortality method	Under 5 child cause of death method	Cause of death methods for ages 5+	Latest available VR data	Average useability 2000+
Afghanistan	D	VA multicause models	GBD 2010 plus (a)		
Albania	B	VR multicause models	GBD 2010* plus (a)	2004	55%
Algeria	D	VA multicause models	GBD 2010 plus (a)		
Andorra	C	VR multicause models	GBD 2010 plus (a)		
Angola	F	VA multicause models	GBD 2010 plus (a)		
Antigua and Barbuda	B	VR data	GBD 2010* plus (a)	2009	n.a.
Argentina	B	VR data	GBD 2010* plus (a)	2010	79%
Armenia	B	VR multicause models	GBD 2010* plus (a)	2011	66%
Australia	A	VR data	VR data	2011	95%
Austria	A	VR data	VR data	2011	90%
Azerbaijan	B	VA multicause models	GBD 2010* plus (a)	2007	84%
Bahamas	F	VR data	GBD 2010* plus (a)	2008	n.a.

Country	All-cause mortality method	Under 5 child cause of death method	Cause of death methods for ages 5+	Latest available VR data	Average useability 2000+
Bahrain	D	VR data	GBD 2010* plus (a)	2009	n.a.
Bangladesh	D	VA multicause models	GBD 2010 plus (a)		
Barbados	B	VR data	GBD 2010* plus (a)	2008	n.a.
Belarus	A	VR multicause models	VR data	2009	88%
Belgium	A	VR data	VR data	2009	88%
Belize	F	VR data	VR data	2009	89%
Benin	E	VA multicause models	GBD 2010 plus (a)		
Bhutan	D	VA multicause models	GBD 2010 plus (a)		
Bolivia (Plurinational State of)	D	VA multicause models	GBD 2010 plus (a)		
Bosnia and Herzegovina	B	VR multicause models	GBD 2010 plus (a)		
Botswana	E	VA multicause models	GBD 2010 plus (a)		
Brazil	A	VR data	VR data	2010	76%
Brunei Darussalam	B	VR multicause models	GBD 2010* plus (a)	2011	n.a.
Bulgaria	A	VR data	GBD 2010* plus (a)	2011	79%
Burkina Faso	F	VA multicause models	GBD 2010 plus (a)		
Burundi	E	VA multicause models	GBD 2010 plus (a)		
Cabo Verde	D	VR data	GBD 2010 plus (a)		
Cambodia	D	VA multicause models	GBD 2010 plus (a)		
Cameroon	F	VA multicause models	GBD 2010 plus (a)		
Canada	B	VR multicause model (0-27d), VR data (1-59m)	VR data	2009	94%
Central African Republic	F	VA multicause models	GBD 2010 plus (a)		
Chad	F	VA multicause models	GBD 2010 plus (a)		
Chile	B	VR data	VR data	2009	94%
China	D	National VA model based on subnational Chinese studies only	GBD 2010 plus (a)		
Colombia	A	VR data	VR data	2009	89%
Comoros	D	VA multicause models	GBD 2010 plus (a)		
Congo	F	VA multicause models	GBD 2010 plus (a)		
Cook Islands	B	VR multicause models	GBD 2010 plus (a)		
Costa Rica	B	VR data	VR data	2011	87%
Côte d'Ivoire	F	VA multicause models	GBD 2010 plus (a)		
Croatia	A	VR data	VR data	2011	87%
Cuba	A	VR data	VR data	2010	90%
Cyprus	B	VR multicause models	VR data	2011	73%
Czech Republic	A	VR data	VR data	2011	88%
Democratic People's Republic of Korea	D	VA multicause models	GBD 2010 plus (a)		
Democratic Republic of the	F	VA multicause models	GBD 2010 plus (a)		

Country	All-cause mortality method	Under 5 child cause of death method	Cause of death methods for ages 5+	Latest available VR data	Average useability 2000+
Congo					
Denmark	B	VR data	VR data	2011	87%
Djibouti	F	VA multicause models	GBD 2010 plus (a)		
Dominica	B	VR data	GBD 2010* plus (a)	2010	n.a.
Dominican Republic	A	VA multicause models	GBD 2010* plus (a)	2010	48%
Ecuador	B	VR multicause models	GBD 2010* plus (a)	2010	59%
Egypt	D	VR multicause models	GBD 2010* plus (a)	2011	61%
El Salvador	B	VR multicause models	GBD 2010* plus (a)	2009	58%
Equatorial Guinea	F	VA multicause models	GBD 2010 plus (a)		
Eritrea	F	VA multicause models	GBD 2010 plus (a)		
Estonia	A	VR data	VR data	2012	94%
Ethiopia	F	VA multicause models	GBD 2010 plus (a)		
Fiji	D	VR multicause models	GBD 2010* plus (a)	2011	n.a.
Finland	A	VR data	VR data	2011	97%
France	A	VR data	VR data	2010	85%
Gabon	F	VA multicause models	GBD 2010 plus (a)		
Gambia	F	VA multicause models	GBD 2010 plus (a)		
Georgia	D	VR multicause models	GBD 2010* plus (a)	2010	53%
Germany	B	VR data	VR data	2011	87%
Ghana	F	VA multicause models	GBD 2010 plus (a)		
Greece	A	VR data	GBD 2010* plus (a)	2011	75%
Grenada	B	VR data	GBD 2010* plus (a)	2010	n.a.
Guatemala	D	VA multicause models	GBD 2010* plus (a)	2009	73%
Guinea	F	VA multicause models	GBD 2010 plus (a)		
Guinea-Bissau	E	VA multicause models	GBD 2010 plus (a)		
Guyana	B	VR data	GBD 2010* plus (a)	2009	58%
Haiti	E	VA multicause models	GBD 2010* plus (a)	2004	4%
Honduras	D	VR multicause models	GBD 2010 plus (a)		
Hungary	B	VR data	VR data	2011	94%
Iceland	A	VR data	VR data	2009	94%
India	D	State level	GBD 2010 plus (a)		
Indonesia	D	VA multicause models	GBD 2010 plus (a)		
Iran (Islamic Republic of)	D	VA multicause models	GBD 2010* plus (a)	2006	n.a.
Iraq	D	VA multicause models	GBD 2010* plus (a)	2008	n.a.
Ireland	B	VR data	VR data	2010	94%
Israel	A	VR data	VR data	2011	90%
Italy	B	VR data	VR data	2010	90%
Jamaica	F	VR multicause models	GBD 2010* plus (a)	2006	64%

Country	All-cause mortality method	Under 5 child cause of death method	Cause of death methods for ages 5+	Latest available VR data	Average useability 2000+
Japan	B	VR data	VR data	2011	89%
Jordan	D	VR multicause models	GBD 2010* plus (a)	2009	n.a.
Kazakhstan	B	VA multicause models	VR data	2010	83%
Kenya	F	VA multicause models	GBD 2010 plus (a)		
Kiribati	D	VA multicause models	GBD 2010* plus (a)	2001	n.a.
Kuwait	B	VR data	VR data	2011	87%
Kyrgyzstan	B	VA multicause models	VR data	2010	90%
Lao People's Democratic Republic	D	VA multicause models	GBD 2010 plus (a)		
Latvia	B	VR data	VR data	2010	92%
Lebanon	D	VR multicause models	GBD 2010 plus (a)		
Lesotho	F	VA multicause models	GBD 2010 plus (a)		
Liberia	F	VA multicause models	GBD 2010 plus (a)		
Libya	D	VR multicause models	GBD 2010 plus (a)		
Lithuania	A	VR data	VR data	2010	94%
Luxembourg	B	VR data	VR data	2011	85%
Madagascar	D	VA multicause models	GBD 2010 plus (a)		
Malawi	F	VA multicause models	GBD 2010 plus (a)		
Malaysia	B	VR multicause models	GBD 2010* plus (a)	2008	43%
Maldives	A	VR multicause models	GBD 2010* plus (a)	2011	49%
Mali	E	VA multicause models	GBD 2010 plus (a)		
Malta	A	VR data	VR data	2011	92%
Marshall Islands	D	VA multicause models	GBD 2010 plus (a)		
Mauritania	D	VA multicause models	GBD 2010 plus (a)		
Mauritius	B	VR data	VR data	2011	90%
Mexico	A	VR data	VR data	2010	95%
Micronesia (Federated States of)	D	VA multicause models	GBD 2010 plus (a)		
Monaco	C	VR multicause models	GBD 2010 plus (a)		
Mongolia	D	VA multicause models	GBD 2010 plus (a)		
Montenegro	B	VR data	GBD 2010* plus (a)	2009	70%
Morocco	D	VA multicause models	GBD 2010* plus (a)	2008	n.a.
Mozambique	F	VA multicause models	GBD 2010 plus (a)		
Myanmar	D	VA multicause models	GBD 2010 plus (a)		
Namibia	F	VA multicause models	GBD 2010 plus (a)		
Nauru	D	VA multicause models	GBD 2010 plus (a)		
Nepal	D	VA multicause models	GBD 2010 plus (a)		
Netherlands	A	VR data	VR data	2011	86%
New Zealand	B	VR data	VR data	2009	97%

Country	All-cause mortality method	Under 5 child cause of death method	Cause of death methods for ages 5+	Latest available VR data	Average useability 2000+
Nicaragua	B	VR multicause models	GBD 2010* plus (a)	2011	65%
Niger	D	VA multicause models	GBD 2010 plus (a)		
Nigeria	F	VA multicause models	GBD 2010 plus (a)		
Niue	D	VR multicause models	GBD 2010 plus (a)		
Norway	A	VR data	VR data	2012	89%
Oman	D	VR multicause models	GBD 2010* plus (a)	2010	n.a.
Pakistan	D	VA multicause models	GBD 2010 plus (a)		
Palau	D	VR multicause models	GBD 2010 plus (a)		
Panama	B	VR data	VR data	2009	80%
Papua New Guinea	D	VA multicause models	GBD 2010 plus (a)		
Paraguay	B	VR multicause models	GBD 2010* plus (a)	2010	n.a.
Peru	B	VR multicause models	GBD 2010* plus (a)	2010	61%
Philippines	B	VA multicause models	VR data	2008	83%
Poland	A	VR data	GBD 2010* plus (a)	2011	74%
Portugal	B	VR multicause model (0-27d), VR data (1-59m)	VR data	2011	82%
Qatar	B	VR multicause models	GBD 2010* plus (a)	2011	73%
Republic of Korea	A	VR data	VR data	2011	85%
Republic of Moldova	A	VR data	VR data	2012	89%
Romania	B	VR data	VR data	2011	92%
Russian Federation	B	VR multicause models	VR data	2010	95%
Rwanda	F	VA multicause models	GBD 2010 plus (a)		
Saint Kitts and Nevis	B	VR data	GBD 2010 plus (a)		
Saint Lucia	B	VR data	GBD 2010* plus (a)	2008	n.a.
Saint Vincent and the Grenadines	B	VR data	GBD 2010* plus (a)	2010	n.a.
Samoa	D	VR multicause models	GBD 2010 plus (a)		
San Marino	B	VR multicause models	GBD 2010 plus (a)		
Sao Tome and Principe	D	VA multicause models	GBD 2010 plus (a)		
Saudi Arabia	D	VR multicause models	GBD 2010* plus (a)	2009	n.a.
Senegal	D	VA multicause models	GBD 2010 plus (a)		
Serbia	B	VR data	VR data	2011	72%
Seychelles	B	VR multicause models	GBD 2010* plus (a)	2012	n.a.
Sierra Leone	E	VA multicause models	GBD 2010 plus (a)		
Singapore	A	VR data	VR data	2011	74%
Slovakia	B	VR data	VR data	2010	94%
Slovenia	B	VR data	VR data	2010	89%
Solomon Islands	D	VA multicause models	GBD 2010 plus (a)		
Somalia	D	VA multicause models	GBD 2010 plus (a)		

Country	All-cause mortality method	Under 5 child cause of death method	Cause of death methods for ages 5+	Latest available VR data	Average useability 2000+
South Africa	F	VR data (0-27d), VA multicause model (1-59m)	GBD 2010* plus (a)	2009	68%
South Sudan	F	VA multicause models	GBD 2010 plus (a)		
Spain	A	VR data	VR data	2011	89%
Sri Lanka	B	VR multicause models	GBD 2010* plus (a)	2006	55%
Sudan	D	VA multicause models	GBD 2010 plus (a)		
Suriname	B	VR data	VR data	2009	71%
Swaziland	E	VA multicause models	GBD 2010 plus (a)		
Sweden	A	VR data	VR data	2010	89%
Switzerland	B	VR data	VR data	2010	89%
Syrian Arab Republic	D	VR multicause models	GBD 2010 plus (a)		
Tajikistan	B	VA multicause models	GBD 2010* plus (a)	2005	56%
Thailand	F	VR multicause models	GBD 2010* plus (a)	2006	48%
The former Yugoslav Republic of Macedonia	B	VR data	VR data	2010	84%
Timor-Leste	D	VA multicause models	GBD 2010 plus (a)		
Togo	F	VA multicause models	GBD 2010 plus (a)		
Tonga	B	VR multicause models	GBD 2010 plus (a)		
Trinidad and Tobago	D	VR data	VR data	2008	95%
Tunisia	B	VR multicause models	GBD 2010 plus (a)		
Turkey	D	VR multicause models	GBD 2010* plus (a)	2011	n.a.
Turkmenistan	B	VA multicause models	GBD 2010* plus (a)	1998	n.a.
Tuvalu	D	VR multicause models	GBD 2010 plus (a)		
Uganda	F	VA multicause models	GBD 2010 plus (a)		
Ukraine	B	VR multicause models	VR data	2011	96%
United Arab Emirates	D	VR multicause models	GBD 2010 plus (a)		
United Kingdom	B	VR data	VR data	2010	93%
United Republic of Tanzania	F	VA multicause models	GBD 2010 plus (a)		
United States of America	B	VR data	VR data	2010	93%
Uruguay	B	VR data	VR data	2009	83%
Uzbekistan	B	VA multicause models	GBD 2010* plus (a)	2005	83%
Vanuatu	D	VR multicause models	GBD 2010 plus (a)		
Venezuela (Bolivarian Republic of)	B	VR data	VR data	2009	86%
Viet Nam	D	VR multicause models	GBD 2010 plus (a)		
Yemen	D	VA multicause models	GBD 2010 plus (a)		
Zambia	F	VA multicause models	GBD 2010 plus (a)		
Zimbabwe	F	VA multicause models	GBD 2010 plus (a)		