JAMA Pediatr. Author manuscript; available in PMC 2016 October 24.

Published in final edited form as:
JAMA Pediatr. 2016 March ; 170(3): 267–287. doi:10.1001/jamapediatrics.2015.4276.

Global and national burden of diseases and injuries among children and adolescents between 1990 and 2013: findings from the Global Burden of Disease 2013 Study

GBD 2013 Collaboration

Abstract

Importance—The current literature focuses on mortality among children younger than five years. Comparable information on non-fatal health outcomes among these children is scarce. Moreover, there has been little systematic data collection and reporting on both the fatal and non-fatal burden of diseases and injuries among older children and adolescents.

Objective—To determine levels and trends in the fatal and non-fatal burden of diseases and injuries among younger children (<5 years), older children (5-9 years) and adolescents (10-19 years) between 1990 and 2013 in 188 countries from the Global Burden of Disease (GBD) 2013 study.

Design—Data from vital registration, verbal autopsy, maternal and child death surveillance, and other sources covering 14,244 site-years (the number of years for which cause of death data were available for a particular geographic area such as a country or demographic surveillance site) from 1980 through 2013 were used to estimate cause-specific mortality. Data from 35,620 epidemiological sources (mainly covered from 1990 to 2013) were used to estimate the prevalence of the diseases and sequelae included in the GBD. Cause-specific mortality for most causes was estimated using the Cause of Death Ensemble model strategy. For some infectious diseases (e.g., HIV/AIDS, measles, hepatitis B) where the disease process is complex or the cause of death data were insufficient or unavailable, we used natural history models. For most non-fatal health outcomes, DisMod-MR 2.0, a Bayesian meta-regression tool was used to meta-analyze the epidemiological data to generate prevalence and incidence estimates.

Results—Of the 7.7 (95% uncertainty interval (UI): 7.4-8.1) million deaths among children and adolescents globally in 2013, 6.3 million occurred among younger children, 0.48 million among older children, and 0.97 million among adolescents. In 2013, lower respiratory infections were the leading cause of death among younger children (905,059 deaths, UI: 810,304 - 998,125), diarrheal diseases among older children (38,325 deaths, UI: 30,365 - 47,678), and road injuries among adolescents (115,186 deaths, UI: 105,185 - 124,870). Iron deficiency anemia was the leading cause of years lived with disability among children and adolescents affecting 619 (UI: 618 - 621) million prevalent cases in 2013. Large between-country variations exist in the trends in mortality from leading causes among children and adolescents. Developing countries with rapid declines in all-cause mortality between 1990 and 2013 also experienced large declines in mortality for most leading causes of death during the same period, whereas for countries with the slowest declines in all-cause mortality there was either a stagnant or an increasing trend in most of the leading causes of death. In 2013, Nigeria had about 4% of the world's children and adolescents but a 12% share of global lower respiratory infections deaths and a 38% share of global malaria

Europe PMC Funders Author Manuscripts

deaths. India had nearly 20% of the world's child and adolescent population but 33% of the world's neonatal encephalopathy deaths. Half of world's diarrheal deaths among children and adolescents occurred in just five countries: India, Democratic Republic of the Congo, Pakistan, Nigeria, and Ethiopia which together represented 30% of the world's pediatric population in 2013.

Conclusions and Relevance—Understanding the levels and trends, as well as geography, of the leading causes of death and disability among children and adolescents is critical to guide investment and inform policies. Monitoring these trends over time is also key to understanding where interventions are having an impact, and where more attention is needed. Proven interventions exist to prevent diarrheal and respiratory diseases, neonatal conditions, iron deficiency anemia, and road injuries, which are leading causes of unnecessary death and disability among children and adolescents. The findings presented here show that these and other available interventions are underutilized and point to where more attention is needed.

Introduction

The current literature focuses on mortality rates and time trends among children younger than five years. There is little comparable information on the fatal and non-fatal burden of diseases and injuries among older children and adolescents. Children and adolescents constitute about a third of the world's population and their health status is important for every country and society.

Global mortality rates among younger children (< 5 years old) have been declining since 1990 but striking variations in both the levels and trends exist across countries.1,2 For example, the number of under-five deaths per 1000 live births varied from 2.3 (95% uncertainty interval (UI): 1.8-2.9) in Singapore to 152.5 (95% UI: 130.6 to 177.4) in Guinea-Bissau in 2013.2 The annualized rates of change in mortality of younger children for 1990-2013 varied from -6.8% in Oman to 0.1% in Zimbabwe, and only 27 out of 138 developing countries are estimated to achieve the target of the Millennium Development Goal 4 of a two-thirds reduction of 1990 mortality levels by 2015 (equivalent to an annualized rate of change of -4.4%).2 Although between-country variations in mortality among younger children have been reported, information on non-fatal health outcomes among these children is scarce. Moreover, there has been little systematic data collection and reporting on the fatal and non-fatal burden of diseases and injuries among older children and adolescents. Knowing the current burden and trends of the leading causes of death and disability in these age groups is critically important to shed light on areas that need more attention. In this study, we identified levels and trends in the fatal and non-fatal burden of diseases and injuries among younger children (<5 years), older children (5-9 years) and adolescents (defined by the United Nations as those aged 10-19 years3) for 1990-2013 in 188 countries based on the results from the Global Burden of Disease 2013 study.

Methods and data sources

Detailed methods of the Global Burden of Disease (GBD) study have been published elsewhere1,4–6 and we provide only a brief description here. The study components relevant to the present paper are shown in eFigure 1.

Europe PMC Funders Author Manuscripts

Cause-specific mortality was estimated using a database of vital registration, verbal autopsy, maternal and child death surveillance, and other sources covering 14,244 site-years (the number of years for which cause of death data were available for a particular geographic area such as a country or demographic surveillance site) from 1980 to 2013.1 Of the 14,244 site-years, 5039 site years were from vital registration systems, 3860 from cancer registry, 1798 from sibling history, 1433 from police records, 1430 from surveillance, 538 from verbal autopsy, and 146 from other sources including surveys, census, hospital, and burial or mortuary. The quality and comparability of the cause of death data were assessed and enhanced through multiple steps which have been reported in detail previously.1 Sample key steps include developing more than 100 maps to convert causes of death observed in the raw data to the GBD 2013 cause list, and identifying deaths being assigned to ill-defined or intermediate rather than underlying causes of death, which were redistributed to more specific underlying causes.1,7 Moreover data that were reported in aggregated categories were split into estimates of age-sex-specific deaths using the observed global pattern of relative risks of death for a cause by age and sex and the local age-sex distribution of the population.7 Country-specific data sources and citations for each cause and data before and after redistribution are shown in the online data visualization of the cause of death database at http://vizhub.healthdata.org/cod/. For most causes, we used the Cause of Death Ensemble model (CODEm) strategy1,7–9 which has been widely used for generating global health estimates. The CODEm strategy evaluates a large number of potential models that apply different functional forms (mixed effects models and space-time Gaussian Process Regression models) to mortality rates or cause fractions with varying combinations of predictive covariates. An ensemble of models that performs best on out-of-sample predictive validity tests is selected for each cause of death. For some infectious diseases (e.g., HIV/AIDS, measles, hepatitis B) where the disease process is complex or the cause of death data were insufficient or unavailable, we used natural history models (i.e., models developed based on the natural history of diseases). For example, the natural history model for HIV/AIDS took into consideration the nature of HIV epidemics in particular countries, and HIV mortality rates among those on and those off antiretroviral therapy, which were not captured in the cause of death data.10 Years of life lost due to premature mortality (YLLs) were calculated by multiplying the number of deaths at each age by a standard life expectancy at that age.1,7

The prevalence of diseases and their disabling consequences, called sequelae in the GBD, were estimated using an epidemiological database compiling data from systematic reviews on prevalence, incidence, remission, mortality risk and severity distributions of the diseases and injuries included in the GBD. There were 35,620 data sources (mainly covered from 1990 to 2013) that include studies published in the scientific literature, nationally-representative household surveys, antenatal clinic surveillance data, disease notifications, disease registries, hospital admissions data, outpatient visit data, population-based cancer registries, and other administrative data. Household surveys including the Demographic and Health surveys, Multiple Indicator Cluster Surveys, Living Standards Measurement Studies, Reproductive Health Surveys, and other national health surveys included in the Global Health Data Exchange were systematically screened for relevant data. For some diseases (e.g. measles and pertussis), case notifications reported to the World Health Organization up

to 2013 were used as input data. A full list of citations for sources organized by country are available in the appendix of a previous GBD paper (pp 97–653).5 Epidemiological data for most causes were meta-analyzed with DisMod-MR 2.0,5 a Bayesian meta-regression tool, which adjusts for variations in study methods between data sources and enforces consistency between data for different parameters, such as incidence and prevalence. The tool evaluates all the data through a geographical cascade of four levels (global, super-region, region, and country). At first, all data in the world are evaluated to estimate the fixed effects on age, sex, study-level and country-level covariates and the random effects for countries, regions and super-regions (we grouped regions into seven super-regions for analytical purposes11). The outputs of the global level are then used as prior information for the next, super-region level of the cascade. After fitting the model to each super-region's data, the results are fed as priors to the region-specific fits and finally, region fits are used as a prior when modelling a country's results for a particular time period. For countries and time periods for which little or no data are available, the estimation is facilitated by country characteristics and random effects on super-region, region and country. For this purpose, a database of country covariates for 93 topic areas and 242 variants was created, using data from household surveys, censuses, official reports, administrative data, and systematic reviews.1,5 The sources and imputation methods used to generate time series for the covariates have been reported previously.1 DisMod-MR 2.0 also allows the user to add strong prior knowledge on the age pattern and/or epidemiological parameters including incidence, remission and excess mortality rate. For example, major depressive disorder cannot be detected at very young ages, and we set a prior of zero incidence in children younger than 4 years. The assumptions and priors by individual condition have been reported in the appendix of a previous GBD paper (pp 654–684).5 Years lived with disability (YLDs) were computed by multiplying the prevalence of each sequela by a disability weight.5 Since we applied disability weights to prevalence in calculating YLD, the most prevalent cause of disability (defined as any departure from full health) is not necessarily the leading cause of YLD. For instance, mild vision impairment and caries are very common but cause relatively little disability.

Disability weights for a set of 235 health states were estimated by pair-wise comparison methods presenting pairs of lay health state descriptions to respondents in surveys conducted among the general population in nine countries and an open web-based survey.12 Each of the 2337 sequelae defined for 301 diseases and injuries mapped to one or a combination of the 235 health states. Sequelae are the direct consequences of disease or injury.11 Sequelae that are common across different diseases or injuries are called health states.11 For example, severe anemia due to malaria is a sequela that shares the health state of severe anemia with a number of other diseases such as hookworm disease and maternal hemorrhage. Disability-adjusted life-years (DALYs) were computed as the sum of YLLs and YLDs for each country, age, sex and year. A full list of causes of death and disability and the corresponding ICD codes have been reported in previous GBD papers.1,5

The GBD classifies countries into developed (Australasia, North America, all of Europe, Brunei, Japan, Singapore and South Korea) and developing (all other countries) rather than using the World Bank income classification of low, middle and high income countries. As the income status of a country may change over time, it makes reporting on time series for country groupings with a varying composition more difficult. Although we realize that the

inclusion of some countries in either developed or developing is controversial, we have opted to use the GBD classification in this paper as it illustrates important differences in the levels and trends of mortality and DALY rates between the two sets of countries.

Results

Global mortality and leading causes of death in 2013

In 2013, there were 7.7 (95% UI: 7.4-8.1) million deaths among children and adolescents globally, of which 6.28 million occurred among younger children, 0.48 million among older children, and 0.97 million among adolescents (Table 1a & b, eTable 1-4).

Among all children and adolescents, the leading causes of death were predominantly those common in younger children as shown in Figures 1a and b and Figure 2, because of the large share of deaths in children younger than five years. The leading causes of death among younger children globally in 2013 were lower respiratory infections (905,059 deaths, UI: 810,304 - 998,125), preterm birth complications (742,381 deaths, UI: 591,348 - 910,767), neonatal encephalopathy following birth trauma and asphyxia (643,765 deaths, UI: 515,010 - 760,486), malaria (586,844 deaths, UI: 451,969 - 756,864), and diarrheal diseases (519,666 deaths, UI: 438,795 - 593,675) (Table 1b, eTable 1, Figure 1b). These five causes accounted for 3.4 million deaths or 54% of all deaths among children younger than five years. Five other causes accounted for an additional 24% of deaths: congenital anomalies (495,319 deaths, UI: 424,788 - 590,319), neonatal sepsis (366,041 deaths, UI: 233,155 - 510,770), other neonatal disorders (276,231 deaths, UI: 219,603 - 350,681), protein-energy malnutrition (225,906 deaths, UI: 168,497 - 280,129) and meningitis (141,952 deaths, UI: 105,060 - 182,518) (Table 1b, eTable 1). The leading cause of death among younger children in each country in 2013 is shown in a map (eFigure 2). Lower respiratory infections, malaria, and diarrhea were the prevailing leading causes of death in sub-Saharan African countries. Lower respiratory infections were also the leading cause for some countries in Asia. Neonatal encephalopathy was the most common cause of death in some South Asian countries. Preterm birth complications and congenital anomalies were the leading causes of death among countries in North America, Australasia, Europe, East Asia, and most countries in Latin America and the Caribbean.

Among older children, the most common cause of death in 2013 was diarrheal diseases (38,325 deaths, UI: 30,365 - 47,678), followed by lower respiratory infections (37,431deaths, UI: 30,713 - 44,837), road injuries (36,577 deaths, UI: 31,097 - 41,896), intestinal infectious diseases (mainly typhoid and paratyphoid) (36,110 deaths, UI: 20,561 - 57,277), and malaria (35,212 deaths, UI: 26,187 - 46,691) (eTable 2, eFigure 3). These five causes accounted for 181 thousand deaths or 39% of deaths among 5-9 year old children. Five other causes accounted for an additional 23% of deaths: drowning (31,500 deaths, UI: 25,452 - 42,630), HIV/AIDS (28,211 deaths, UI: 26,407 - 30,307), hemoglobinopathies (20,229 deaths, UI: 6,077 - 42,394), congenital anomalies (17,508 deaths, UI: 14,677 - 20,722), and meningitis 13,577 deaths, UI: 10,777 - 16,863) (eTable 2). Country-specific leading causes of death among children aged 5-9 years are shown in eFigure 4. For countries in North America, Latin America and Caribbean, and Australasia, road injuries were the leading cause of death while drowning was the most common cause of death in most

countries in Eastern Europe, East Asia and South East Asia. Intestinal infectious diseases and lower respiratory infections were the leading causes for countries in South Asia while diarrheal diseases, HIV/AIDS and malaria were the leading causes for countries in sub-Saharan Africa.

Among adolescents, the leading cause of death in 2013 was road injuries (115,186 deaths, UI: 105,185 - 124,870), followed by HIV/AIDS (75,564 deaths, UI: 69,254 - 82,629), self-harm (59,114 deaths, UI: 47,914 - 70,864), drowning (51,013 deaths, UI: 43,533 - 68,179), and intestinal infectious diseases (44,171 deaths, UI: 24,318 - 72,643) (eTable 3, eFigure 5). These five leading causes accounted for 34% of all deaths in this age group. Another five causes contributed an additional 17% of all deaths: interpersonal violence (38,300 deaths, UI: 27,452 - 45,009), lower respiratory infections (36,190 deaths, UI: 31,124 - 42,361), diarrhea (32,616 deaths, UI: 26,725 - 38,766), malaria (30,764 deaths, UI: 25,003 - 38,940), and tuberculosis (29,257 deaths, UI: 23,880 - 34,091) (eTable 3). Country-specific leading causes of death among adolescents in 2013 are shown in eFigure 6. Injury related deaths were the leading causes in most countries except for those in sub-Saharan Africa where HIV/AIDS was the dominant leading cause of death. Self-harm was the most common cause of death for some parts of Asia and Eastern Europe.

Contributions to global child and adolescent deaths according to population proportion

Table 1a shows the number of deaths and age-standardized mortality rates for the 10 leading causes among children and adolescents at the global level and in the 50 countries with the largest child and adolescent populations. In 2013, there were 2.5 billion children and adolescents in the world, and the 50 countries represented 73% of this population (eTable 5). In 2013, Nigeria had about 4% of the world's children and adolescents (eTable 5) but a 12% share of global lower respiratory infections deaths and a 38% share of global malaria deaths (Table 1a). India had nearly 20% of the world's child and adolescent population but 33% of the world's neonatal encephalopathy deaths. Half of world's diarrheal deaths among children and adolescents occurred in just five countries: India, Democratic Republic of the Congo, Pakistan, Nigeria, and Ethiopia which together represented 30% of the world's pediatric population in 2013 (Table 1a, eTable 5).

Mortality time trends

The global decline in mortality between 1990 and 2013 was faster among younger (annual percent change (APC), -3.0%) and older children (APC, -2.9%) than adolescents (APC, -1.6%) (eTables 6-8). The corresponding APC figures in developing countries were -3.1, -3.0, and -1.7% and those in developed countries were -3.5, -3.9, and -2.5% respectively (eTables 6-8).

Among children younger than five years, countries in which all-cause mortality declined rapidly experienced these large declines in most of the leading causes of death (eTable 6). For example, Oman, China and Maldives, the three countries with fastest declining under-five mortality rates, showed an annual reduction of 5.6% or greater in mortality from at least 6 of the 10 leading causes of death (eTable 6). Countries with the slowest declines (Vanuatu, Fiji, Swaziland, Lesotho, and Zimbabwe) showed either a stagnant or an increasing trend in

Europe PMC Funders Author Manuscripts

most of the 10 leading causes (eTable 6). Similarly, among older children and adolescents, countries with a rapid decline in all-cause mortality experienced greater declines for most of the leading causes of death in these age groups (eTables 7-9).

Global YLDs and prevalence of the leading causes of disability

In 2013, disability caused 135.6 million YLDs among children and adolescents, of which 26.4 million affected children younger than five years, 29.6 million affected older children, and 79.6 million affected adolescents (data not shown in table).

Leading causes of YLD largely overlapped among the three age groups. Iron deficiency anemia was the most common cause of YLD in both younger and older children and adolescents in 2013 (Table 2, eTable 10-13). The 50 countries with the largest child and adolescent population contributed to 86% of global iron deficiency anemia cases in this population (Table 2). India contributed the largest number of cases (147.9 million), followed by China (75.7 million) and Nigeria (24.7 million). The prevalence of iron-deficiency anemic children and adolescents was highest in Afghanistan (41%), followed by Yemen (39.8%) and Senegal (38.5%) (Table 2, eTable 13).

Skin diseases were the second leading cause of YLD among children and adolescents in 2013 (Table 2). Younger and older children were most commonly affected by viral skin diseases and dermatitis, whereas adolescents were mainly affected by acne vulgaris(data not shown in table) . Depressive disorders were the third most common cause of YLD among children and adolescents, with the prevalence in adolescents being 4 times as high as that in older children (2.8% versus 0.7%) (Table 2, eTable 11 & 12).

Among other leading causes of YLD among children and adolescents, conduct disorder, anxiety disorders, low back and neck pain, and migraine mainly affected older children and adolescents, whereas sense organ diseases and hemoglobinopathies affected all three age groups (Table 2, eTable 10-12). Among sense organ diseases, uncorrected refractive error and hearing loss were the most frequently occurring causes in all three age groups (data not shown in table). The country-year-age-sex specific distributions of YLDs for each cause and their sub-categories are viewable in an interactive online visualization tool at http://vizhub.healthdata.org/gbd-compare.

DALYs among children and adolescents

Figure 3 shows DALY rates for leading causes among males and females aged 0-19 years at the global level and in the 50 countries with the largest child and adolescent populations. Age-group specific leading causes of DALYs are shown in eFigures 7-9. The rankings of leading causes of deaths and DALYs are similar if the percent contribution to the disease burden by mortality is high, which is especially the case for the main conditions affecting younger children (Figure 1b and eFigure7). Sex differences were small in younger children but larger in some of the causes among adolescents. For instance, transport injuries, drowning and interpersonal violence among adolescent boys were much higher than among adolescent girls (eFigure 9). The most striking sex differences were observed in Venezuela, Colombia and Brazil for interpersonal violence (eFigure 9). Maternal disorders were

common causes of DALYs among adolescent girls in sub-Saharan African and South Asian countries (eFigure 9).

Time trends in DALYs

Among all children and adolescents, the leading causes of DALYs were dominated by those common in children younger than five years (Figure 4a & b), who had the greatest share of deaths. Lower respiratory infections remained the leading cause of DALYs among children younger than five years in both 1990 and 2013, but the number and rate of DALYs declined over the 23 years by 58% and 59% respectively (Figure 4b). Preterm birth complications and neonatal encephalopathy rose in rank (from 3rd and 4th to 2nd and 3rd respectively) because of their relatively slower rates of decline than diarrhea, which dropped from 2nd to 5th, with a 67% decrease in DALY rates (Figure 4b). The rate for measles also notably declined (from 8th to 14th), with an 84% decrease in DALY rates between 1990 and 2013 (Figure 4b).

Among older children and adolescents, iron deficiency anemia remained the leading cause of DALYs in both 1990 and 2013, with a modest decrease in the number and rate of DALYs over the 23 years (eFigure 10 & 11). The rank of HIV/AIDS increased from 101 to 6 among adolescents, 78 to 10 among older children, and 33 to 17 among younger children between 1990 and 2013, with a statistically significant increase in both DALY counts and rates (Figure 4b, eFigure 10 & 11). Full details of the results by age, sex, geography, and time period can be viewed in the online interactive visualization tool (http://vizhub.healthdata.org/gbd-compare).

Discussion

This is the first of a series of annual updates to identify levels and trends in the fatal and non-fatal burden of diseases and injuries among children and adolescents at the country-level. Of the 7.7 million deaths among children and adolescents globally in 2013, about 80% occurred among younger children. Of the 135.6 million YLDs among children and adolescents in 2013, about 60% of the YLDs were contributed by adolescents. Leading causes of death among children and adolescents in 2013 fell into four main categories: neonatal, congenital, infectious diseases and injuries. Developing and developed countries had both similarities and differences in the leading causes of death. In both sets of countries, preterm birth complications and congenital anomalies were common causes of death among children younger than five years, whereas injuries were major killers of adolescents. Infectious diseases including lower respiratory infections, neonatal sepsis, malaria, diarrheal diseases, HIV/AIDS, typhoid and tuberculosis remained major challenges in developing nations. In several countries, vaccine-preventable diseases such as measles and pertussis were still among the 10 leading causes of death, indicating a need to strengthen immunization programs in those countries. Leading causes of YLD largely overlapped among the three age groups, with iron deficiency anemia and skin diseases being the first and second common causes of YLD among children and adolescents.

Trends from the leading causes of death in younger children varied widely across countries. Countries with greater declines in all-cause child mortality tended to have a rapid decline in mortality rates for most of the main causes of death, suggesting that general improvements

Europe PMC Funders Author Manuscripts

in health services and public health interventions for a wide range of health problems (e.g., improved management of childhood illnesses, immunization, mass distribution of insecticide-treated bed nets, and improved access to prenatal, obstetric and postnatal care) rather than single disease programs determine success. The declines in poverty levels and improvements in living conditions over time might have also contributed to the declines in mortality. Countries with slowly declining or stagnant trends in all-cause under-five mortality generally showed similar trends in mortality rates for the leading causes. Most of these deaths, especially in developing countries, could be prevented by a concerted response from health systems and public health interventions.

The typical leading causes of death in younger children such as lower respiratory infections and diarrhea were also common causes of death for older children in many developing countries, indicating that interventions targeting the former should extend to cover the latter. Mortality and DALY rates for lower respiratory infections and diarrhea declined over the past 23 years, but they were still among the top five causes for both younger and older children in 2013. In fact, lower respiratory infections were the first leading cause of death among younger children, whereas diarrhea was the most common cause of death among older children. These deaths are largely avoidable through case identification and proper management and prevention of risk factors. Unsafe water, sanitation and hand washing practices are largely responsible for diarrheal deaths, whereas household air pollution and ambient air pollution are important risk factors for deaths from lower respiratory infections in both younger and older children, with undernutrition being an additional key risk factor for these two diseases among younger children.13 Proven interventions14–16 exist to reduce exposures to these risk factors but uptake is insufficient.

The decline in all-cause mortality rates among adolescents between 1990 and 2013 was slower than that among younger and older children. Road injuries were the leading cause of death among adolescents globally, with a stagnant or increasing trend in most developing countries. Many countries inadequately implement proven road safety practices (e.g. safety measures for road users and vehicles, road infrastructure and post-crash care)17. With increasing motorization, these trends are likely to worsen unless decisive action is taken.

Self-harm was the second most common cause of injury-related death among adolescents. While the most common suicidal methods differ across geography, restricting access to common lethal means has proven to be effective in reducing suicide rates.18,19 For example, pesticide ingestion is a commonly used method of suicide among young people in developing countries.20 Prohibition of toxic pesticides in Sri Lanka and South Korea has been shown to reduce both the overall and method specific suicide rates.21,22 National suicide prevention strategies can play a role in preventing suicide but such strategies are lacking in many countries worldwide.19 Mental and substance use disorders contributed to two-thirds of all suicide DALYs in the world, indicating the importance of early detection and effective management of these disorders as part of suicide prevention strategies.23

Drowning was among the 10 leading causes of death among older children and adolescents and the 14th leading cause of death among younger children in 2013. Lack of barriers to water sites and absence of close supervision are key risk factors for drowing among younger

children in both developing and developed countries.24,25 Older children and adolescents usually drown during non-recreational or daily activities in developing countries, but during recreational activities in developed countries.26 Risk of death from drowning is especially high in rural areas in developing countries, where unfenced water sources are close to the homes, without any emergency medical care facilities or capacity to perform resuscitation for the drowning child.24,26 In developed countries, failure to wear life jackets during boating activities and alchol use among adolescents during water related recreation are among the risk factors for drowning.25,26

In addition to injuries, infectious diseases were important causes of death among adolescents in developing countries, especially HIV/AIDS, lower respiratory infections, intestinal infectious diseases, diarrhea, malaria, and tuberculosis. The mortality rates for all these diseases except HIV/AIDS are decreasing. Deaths from HIV/AIDS among adolescents are concentrated in sub-Saharan Africa and have been increasing since 1990. This trend differs from that in all age groups, where it increased after 1990, peaked around 2005 and then declined steadily after antiretroviral treatment became more widely available.10 Low rates of HIV testing, an important step toward HIV treatment, and poor access to antiretroviral treatment among adolescents,27 might explain some of the increases in HIV/AIDS mortality in this age group. Although much emphasis has been placed on prevention of HIV infections among adolescents, little attention has been given to the care of those who were infected during infancy.28 High rates of children orphaned by HIV/AIDS, the necessity of guardian consent to undergo HIV testing, and the lack of clear policies and guidance regarding consent and HIV testing among minors are among the barriers to HIV testing and care for older children and adolescents.28,29

Leading causes of disability among all children and adolescents were dominated by causes common in adolescents because of a larger share of YLDs by this age group. Iron deficiency anemia, the largest cause of disability, however, is common in both younger and older children and adolescents. The high demand of nutritients for growth, blood loss during menstruation in adolescent girls, and hookworm infections (especially in developing countries) put children and adolescents at risk for this deficiency. Although iron supplementation is effective, challenges exist in terms of distribution, cost and compliance. 30 Other cost-effective interventions exist, including food fortification and biofortification of crops, with the latter being a way of reaching rural populations with limited access to marketed fortified foods.30,31

Compared to changes in the causes of mortality which are generally showing decreasing rates in all age groups,1 there are smaller changes, if at all, in the prevalence of many causes of disability (data not shown). The slow decline in disabling conditions is not specific to children and adolescents but a more common feature across the age span.5 Major depressive disorder, conduct disorder and anxiety disorders were major causes of disability among older children and adolescents in 2013. Whereas identification and treatment of these disorders are important, prevention of modifiable risk factors such as child abuse and neglect, bullying and intimate partner violence, should also be a priority.32 Other common causes of disability such as low back and neck pain, migraine, and skin disorders were also showing little change. Musculoskeletal disorders have drawn more attention since the GBD

2010, but there is still limited policy discussion on the approaches to deal with and/or prevent the leading causes of low back and neck pain.5,33,34 Migraine and other headache disorders generally attract low health-care priority despite the disability attributed to them.35

Limitations

The general limitations of the GBD study also apply to this report. These limitations have been discussed widely and in detail in the published GBD 2013 papers and we summarized the relevant limitations here.1,2,5,6,10 First, there were variations in the instrument used for collection of verbal autopsy data, which might reduce the between-country comparability of cause of death data. Moreover, the quality of the medical certification of causes of death (e.g. diagnostic accuracy), might have also influenced our estimates. Second, although redistribution of ill-defined or intermediate causes to specific underlying causes improved the comparability of cause of death data, it could yield results different from official statistics of countries. This could happen because the redistribution used global or regional algorithms, which did not pick up variations across countries in terms of certification practices or the timing of implementation of coding rules. We plan to use more country-specific redistribution algorithms in future rounds of the GBD. Third, the fact that the sum of cause-specific mortality estimates must equal all-cause mortality for a particular country, age, sex, and year, is a strength of the GBD approach, but it also has a limitation. Causes of death with very wide UIs (e.g. hemoglobinopathies) tend to be adjusted downwards relative to causes with narrower UIs. Fourth, in general, the epidemiological data coverage for the period 2006-2013 was relatively lower than the period 1998-2005 although there were variations by disease. For example, the percentages of countries that have epidemiological data on low back and neck pain for the period 1998-2005 and 2006-2013 were 41.5% and 13.3% respectively. The lower coverage for the latter might be explained by the lag in data collection, analyses and publications.5 For some diseases such as tuberculosis, the data coverage is higher for the recent years (91.5% for the period 1998-2005 versus 98.4% for 2006-2013). A systematic quantification of the geographical and temporal coverage of the input epidemiological data by cause has been reported in detail previously.5 Making estimates for every country over time is challenging especially for those with little or no data. We had to make use of sophisticated modeling techniques to borrow strength across geography and covariates to help predict for countries and years with sparse data. The lack of data for a particular geography is reflected by wider uncertainty intervals. Finally, for some causes of disability, long term consequences in later years of life are not reflected in this paper. For example, long term impairments due to preterm birth complications, neonatal encephalopathy and Down’s syndrome after age 19 were not counted in the DALY rankings since we focused only on the burden of disease experienced by those aged 0-19 years.

Conclusions

Understanding the levels and trends, as well as geography, of the leading causes of death and disability among children and adolescents is critical to guide investment and inform policies. Monitoring these trends over time is also key to understanding where interventions are having an impact, and where more attention is needed. The vast majority of deaths in children and adolescents are preventable. Proven interventions exist to prevent diarrheal and

Europe PMC Funders Author Manuscripts

respiratory diseases, neonatal conditions, iron deficiency anemia, and road injuries, which result in some of the highest burdens of unnecessary death and disability among children and adolescents. The findings presented here show that these and other available interventions are underutilized and point to where more attention is needed. The findings point out that proven health interventions could save millions of lives. Despite the general decline in mortality, the speed of the decline could still be ‘faster’.

Supplementary Material

Refer to Web version on PubMed Central for supplementary material.

Footnotes

Corresponding author: Theo Vos, MSc, PhD, Professor of Global Health, Institute for Health Metrics and Evaluation, University of Washington, 2301 5th Ave. Suite 600 Seattle, WA 98121, Phone 206-897 2856, tvos@uw.edu

Author Contributions: Dr Kyu and Prof Vos had full access to all the data in the study and take responsibility for the integrity of the data and the accuracy of the data analysis.

Study concept and design: Kyu, Brown, Forouzanfar, Higashi, Kassebaum, Crump, Leung, Lyons, Malekzadeh, Mashal, Schwebel, Zaki, Naghavi, Murray, Vos.

Acquisition, analysis, or interpretation of data: Kyu, Pinho, Wagner, Bertozzi-Villa, Charlson, Coffeng, Dandona, Erskine, Ferrari, Fitzmaurice, Fleming, Forouzanfar, Graetz, Guinovart, Haagsma, Higashi, Kassebaum, Larson, Lim, Mokdad, Moradi-Lakeh, Odell, Roth, Serina, Stanaway, Misganaw, Whiteford, Wolock, Wulf Hanson, Abd-Allah, Abera, Abu-Raddad, AlBuhairan, Amare, Antonio, Artaman, Barker-Collo, Barrero, Benjet, Bensenor, Bhutta, Bikbov, Brazinova, Campos-Nonato, Castañeda-Orjuela, Catalá-López, Chowdhury, Cooper, Crump, Dandona, Degenhardt, Dellavalle, Dharmaratne, Faraon, Feigin, Fürst, Geleijnse, Gessner, Gibney, Goto, Gunnell, Hankey, Hay, Hornberger, Hosgood, Hu, Jacobsen, Jayaraman, Jeemon, Jonas, Karch, Kim, Kim, Kokubo, Kuate Defo, Kumar, Larsson, Leasher, Li, Lipshultz, Lopez, Lotufo, Lyons, Majdan, Malekzadeh, Mason-Jones, Melaku, Memish, Mendoza, Miller, Mock, Murray, Nolte, Oh, Olusanya, Ortblad, Park, Paternina Caicedo, Patten, Patton, Pereira, Perico, Piel, Polinder, Popova, Pourmalek, Quistberg, Remuzzi, Rojas-Rueda, Rothenbacher, Rothstein, Sanabria, Santos, Schwebel, Sepanlou, Shiri, Shiue, Sliwa, Sreeramareddy, Stein, Steiner, Stovner, Sykes, Tabb, Terkawi, Thomson, Thorne-Lyman, Towbin, Ukwaja, Vasankari, Venketasubramanian, Vlassov, Vollset, Weiderpass, Weintraub, Werdecker, Wilkinson, Woldeyohannes, Wolfe, Yano, Yip, Yoon, Younis, Yu, Zaki, Naghavi, Murray, Vos.

Drafting of the manuscript: Kyu, Pinho, Wagner, Forouzanfar, Odell, Woldeyohannes, Zaki, Naghavi, Vos.

Critical revision of the manuscript for important intellectual content: Kyu, Pinho, Brown, Bertozzi-Villa, Charlson, Coffeng, Dandona, Erskine, Ferrari, Fitzmaurice, Fleming, Graetz, Guinovart, Haagsma, Higashi, Kassebaum, Larson, Lim, Mokdad, Moradi-Lakeh, Roth, Serina, Stanaway, Misganaw, Whiteford, Wolock, Wulf Hanson, Abd-Allah, Abera, AlBuhairan, Amare, Antonio, Artaman, Barker-Collo, Barrero, Benjet, Bensenor, Bhutta, Bikbov, Brazinova, Campos-Nonato, Castañeda-Orjuela, Catalá-López, Chowdhury, Cooper, Crump, Dandona, Degenhardt, Dellavalle, Dharmaratne, Faraon, Feigin, Fürst, Geleijnse, Gessner, Gibney, Goto, Gunnell, Hankey, Hay, Hornberger, Hosgood, Hu, Jacobsen, Jayaraman, Jeemon, Jonas, Karch, Kim, Kim, Kokubo, Kuate Defo, Kumar, Larsson, Leasher, Leung, Li, Lipshultz, Lopez, Lotufo, Lunevicius, Lyons, Majdan, Malekzadeh, Mashal, Mason-Jones, Melaku, Memish, Mendoza, Miller, Mock, Murray, Nolte, Oh, Olusanya, Ortblad, Park, Paternina Caicedo, Patten, Patton, Pereira, Perico, Piel, Polinder, Popova, Pourmalek, Quistberg, Remuzzi, Rodriguez, Rojas-Rueda, Rothenbacher, Rothstein, Sanabria, Santos, Schwebel, Sepanlou, Shaheen, Shiri, Shiue, Skirbekk, Sliwa,

Europe PMC Funders Author Manuscripts

Europe PMC Funders Author Manuscripts

Sreeramareddy, Stein, Steiner, Stovner, Sykes, Tabb, Terkawi, Thomson, Thorne-Lyman, Towbin, Ukwaja, Vasankari, Venketasubramanian, Vlassov, Vollset, Weiderpass, Weintraub, Werdecker, Wilkinson, Woldeyohannes, Wolfe, Yano, Yip, Yonemoto, Yoon, Younis, Yu, Zaki, Naghavi, Murray, Vos.

Statistical analysis: Kyu, Pinho, Bertozzi-Villa, Charlson, Coffeng, Erskine, Ferrari, Fitzmaurice, Fleming, Forouzanfar, Graetz, Guinovart, Haagsma, Higashi, Kassebaum, Lim, Moradi-Lakeh, Odell, Roth, Serina, Stanaway, Whiteford, Wolock, Wulf Hanson, Kim, Kuate Defo, Ortblad, Sreeramareddy, Sykes, Thomson, Yip, Zaki, Naghavi, Murray, Vos.

Obtaining funding: Mokdad, Hosgood, Memish.

Administrative, technical, or material support: Kyu, Pinho, Wagner, Brown, Dandona, Forouzanfar, Higashi, Mokdad, Misganaw, Abd-Allah, Bensenor, Castañeda-Orjuela, Catalá-López, Cooper, Dandona, Degenhardt, Faraon, Gibney, Karch, Kucuk Bicer, Kumar, Larsson, Mashal, Olusanya, Paternina Caicedo, Pereira, Quistberg, Sliwa, Stein, Terkawi, Thorne-Lyman, Ukwaja, Vasankari, Zaki, Murray, Vos.

Study supervision: Kyu, Brown, Coffeng, Kassebaum, Mokdad, Cooper, Crump, Karch, Kokubo, Kucuk Bicer, Lipshultz, Wilkinson, Naghavi, Murray, Vos.

Additional Contributions: Brent Christofferson, Rachel Fortunati, William Heisel, Kate Muller, Kevin O'Rourke, Amanda Pain, Kelsey Pierce, Logan Sanders, and Caitlyn Steiner contributed to the production of the manuscript. Katharine Looker provided HSV-2 seroprevalence data which inform the work. We would also like to thank all contributors to the Global Burden of Disease Study 2013.

Conflict of Interest Disclosures: Dr. Kassebaum reports personal fees and non-financial support from Vifor Pharmaceuticals, Axon Communications LLC and Merck & Co outside the submitted work. KPG was awarded the NHMRC-Gustav Nossal Postgraduate Award sponsored by CSL; this award is peer reviewed and CSL had no part in selecting the awardee. Prof. Lotufo reports honoraria (modest) from Abbvie for one lecture. Walter Mendoza is program analyst at the UNFPA country office in Peru, which not necessarily endorses the study. Prof. Santos reports receiving a grant from São Paulo Research Foundation/FAPESP (Brazilian governmental research agency) for research purposes. In the past 3 years, Dr. Stein has received research grants and/or consultancy honoraria from AMBRF, Biocodex, Cipla, Lundbeck, National Responsible Gambling Foundation, Novartis, Servier, and Sun. No other conflicts are reported.

Acknowledgments

Funding/Support: The Institute for Health Metrics and Evaluation received funding from the Bill and Melinda Gates Foundation. Christina Fitzmaurice was supported by National Institutes of Health grant 5T32HL007093-40. Joseph Murray is supported by the Wellcome Trust [089963/Z/09/Z].

Role of the Funder/Sponsor: The funding institutions had no role in study design and conduct of the study; collection, management, analysis, and interpretation of the data; preparation, review, or approval of the manuscript; and decision to submit the manuscript for publication.

The Global Burden of Disease Pediatrics Collaboration

Hmwe H Kyu, MBBS, MPH, PhD; Christine Pinho, BA; Joseph A Wagner, BS; Jonathan C Brown, BA, MAIS; Amelia Bertozzi-Villa, BA; Fiona J Charlson, MPH; Luc Edgar Coffeng, MD, PhD; Lalit Dandona, MPH, MD; Holly E Erskine, BPsySc (Hons); Alize J Ferrari, BPsySc (Hons), PhD; Christina Fitzmaurice, MD, MPH; Thomas D Fleming, BS; Mohammad H Forouzanfar, MD; Nicholas Graetz, BS; Caterina Guinovart, MD, PhD; Juanita Haagsma, MSc, PhD; Hideki Higashi, PhD; Nicholas J Kassebaum, MD; Heidi J Larson, MA, PhD; Stephen S Lim, BA, BSc (Hons), PhD; Ali H Mokdad, PhD; Maziar Moradi-Lakeh, MD, MPH; Shaun V Odell, MD; Gregory A Roth, MD, MPH; Peter T

Europe PMC Funders Author Manuscripts

Serina, MPH; Jeffrey D Stanaway, PhD; Awoke Misganaw, PhD; Harvey A Whiteford, MBBS, PhD; Timothy M Wolock, BA; Sarah Wulf Hanson, BS, MPH; Foad Abd-Allah, MD; Semaw Ferede Abera, BSc, MSc; Laith J Abu-Raddad, PhD; Fadia S AlBuhairan, MD; Azmeraw T Amare, MSc, MPH, MPHM; Carl Abelardo T Antonio, MPH, MD; Al Artaman, PhD, MD, MHA; Suzanne L Barker-Collo, PhD; Lope H Barrero, BE, MSc, ScD; Corina Benjet, PhD; Isabela M Bensenor, MD, PhD; Zulfiqar A Bhutta, MBBS, DCH, MRCP, FCPS, FRCP, PhD, FRCPCH; Boris Bikbov, PhD, MD; Alexandra Brazinova, MD, PhD, MPH; Ismael Campos-Nonato, MSc, PhD, MD; Carlos A Castañeda-Orjuela, MSc, MD; Ferrán Catalá-López, PhD, MPH; Rajiv Chowdhury, MD, PhD; Cyrus Cooper, FMedSci, MD; John A Crump, MB ChB, MD, DTM&H; Rakhi Dandona, PhD; Louisa Degenhardt, BA (Hons), PhD, MPsychology (Clinical); Robert P Dellavalle, MD, PhD, MSPH; Samath D Dharmaratne, MBBS, MSc, MD; Emerito Jose A Faraon, BSPH, MD, MBA; Valery L Feigin, MD, PhD; Thomas Fürst, MA, PhD; Johanna M Geleijnse, PhD; Bradford D Gessner, MD, MPH; Katherine B Gibney, MPH, MBBS, BMedSci, FRACP, FAFPHM; Atsushi Goto, MD, PhD, MPH; David Gunnell, MB ChB, PhD, DSc; Graeme J Hankey, MD, FRACP, FRCP, FRCPE, FAHA, MBBS; Roderick J Hay, MA, DM, FRCP, FRCPath; John C Hornberger, MD, MS, FACP; H Dean Hosgood, MPH, PhD; Guoqing Hu, PhD; Kathryn H Jacobsen, BS, MPH, PhD; Sudha P Jayaraman, MD, MSc; Panniyammakal Jeemon, PhD, MPH; Jost B Jonas, MD; André Karch, MD, MSc; Daniel Kim, MD, DrPH; Sungroul Kim, MS, PhD; Yoshihiro Kokubo, PhD, MD, FAHA, FACC, FESC, FESO; Barthelemy Kuate Defo, BS, MS, MPH, PhD, DEA; Burcu Kucuk Bicer, PhD, MD; G. Anil Kumar, PhD; Anders Larsson, MD, PhD; Janet L Leasher, MPH, OD; Ricky Leung, PhD; Yongmei Li, BA, MPH, PhD; Steven E Lipshultz, MD; Alan D Lopez, MS, PhD; Paulo A Lotufo, MD, DrPH; Raimundas Lunevicius, PhD, DSc, MD; Ronan Anthony Lyons, MD; Marek Majdan, PhD; Reza Malekzadeh, MD; Taufiq Mashal, MD, PhD; Amanda J Mason-Jones, PhD, MPH, MSc, BA (Hons); Yohannes Adama Melaku, BSc, MPH; Ziad A Memish, MD, FRCPC, FACP; Walter Mendoza, MD; Ted R Miller, PhD; Charles N Mock, MD, PhD; Joseph Murray, BA, MPhil, PhD; Sandra Nolte, BA, PhD; In-Hwan Oh, MPH, PhD, MD; Bolajoko Olubukunola Olusanya, MBBS, FMCPaed, FRCPCH, PhD; Katrina F Ortblad, MPH; Eun-Kee Park, MS, PhD; Angel J Paternina Caicedo, MD, MSc; Scott B Patten, MD, PhD; George C Patton, MD, MBBS; David M Pereira, MS, PhD; Norberto Perico, MD; Frédéric Bernard Piel, PhD; Suzanne Polinder, PhD; Svetlana Popova, MD, PhD, MPH; Farshad Pourmalek, MPH, PhD, MD; D. Alex Quistberg, MPH, PhD; Giuseppe Remuzzi, MD; Alina Rodriguez, PhD; David Rojas-Rueda, MPH, PhD, MD; Dietrich Rothenbacher, MD, MPH; David H Rothstein, MD, MS; Juan Sanabria, MD, MSc, FRCSC, FACS, FAASLD; Itamar S Santos, PhD, MD; David C Schwebel, PhD; Sadaf G Sepanlou, MPH, PhD, MD; Amira Shaheen, PhD; Rahman Shiri, MPH, PhD, MD; Ivy Shiue, BA, MS, PhD, PGCE; Vegard Skirbekk, PhD, MD; Karen Sliwa, MD, PhD; Chandrashekhar T Sreeramareddy, MBBS, MD, MSc; Dan J Stein, PhD, MD; Timothy J Steiner, MB, BS, PhD; Lars Jacob Stovner, PhD; Bryan L Sykes, MA, PhD; Karen M Tabb, PhD, MSW; Abdullah Sulieman Terkawi, MD; Alan J Thomson, BSc, MSc, PhD, DLSHTM; Andrew L Thorne-Lyman, ScD, MHS, BA; Jeffrey Allen Towbin, BS, MS, MD; Kingsley Nnanna Ukwaja, MD; Tommi Tommi Vasankari, MD, PhD; Narayanaswamy Venketasubramanian, MBBS, MMed, MSc, DLHTM, MHlthSc, FRCP; Vasiliy Victorovich Vlassov, MD; Stein Emil Vollset, MD, DrPH; Elisabete Weiderpass, MD, MSc, PhD; Robert G Weintraub, MB,

Europe PMC Funders Author Manuscripts

BS (Hons); Andrea Werdecker, Dipl.oec.troph.; James D Wilkinson, MD, MPH; Solomon Meseret Woldeyohannes, BSc, MPH; Charles D A Wolfe, MB BS, MRCOG, MD, MFPH, FFPH, FRCOG; Yuichiro Yano, PhD, MD; Paul Yip, PhD; Naohiro Yonemoto, MPH; Seok-Jun Yoon, MD, PhD; Mustafa Z Younis, Dr.PH, MA, MBA; Chuanhua Yu, PhD; Maysaa El Sayed Zaki, MD; Mohsen Naghavi, PhD; Christopher J L Murray, DPhil; Theo Vos, PhD, MSc.

Affiliations of The Global Burden of Disease Pediatrics Collaboration

Institute for Health Metrics and Evaluation, University of Washington, Seattle (Kyu, Pinho, Wagner, Brown, Bertozzi-Villa, Charlson, Coffeng, Dandona, Erskine, Ferrari, Fitzmaurice, Fleming, Forouzanfar, Graetz, Guinovart, Haagsma, Higashi, Kassebaum, Larson, Lim, Mokdad, Moradi-Lakeh, Roth, Serina, Stanaway, Misganaw, Whiteford, Wolock, Wulf Hanson, Naghavi, Murray, Vos); University of Washington Medical Center, Seattle (Odell); Seattle Children's Hospital, Seattle (Odell); Intermountain Healthcare, Salt Lake City (Odell); School of Public Health, University of Queensland, Brisbane, Australia (Charlson, Erskine, Ferrari, Whiteford); Department of Public Health, Erasmus MC, University Medical Center Rotterdam, Rotterdam, Netherlands (Coffeng, Polinder, Haagsma); Public Health Foundation of India, New Delhi, India (Dandona, Dandona, Kumar); School of Public Health, Queensland Centre for Mental Health Research, Brisbane, Australia (Erskine); Queensland Centre for Mental Health Research, Brisbane, Australia (Ferrari, Whiteford); Division of Hematology, Department of Medicine, University of Washington, Seattle (Fitzmaurice); Fred Hutchinson Cancer Research Center, Seattle (Fitzmaurice); Department of Anesthesiology & Pain Medicine, Seattle Children’s Hospital, Seattle (Kassebaum); Department of Infectious Disease Epidemiology, London School of Hygiene and Tropical Medicine, London, United Kingdom (Larson); Department of Community Medicine, Iran University of Medical Sciences, Tehran, Iran (Moradi-Lakeh); Department of Nuerology, Cairo-University, Cairo, Egypt (Abd-Allah); School of Public Health, College of Health Sciences, Mekelle University, Mekelle, Ethiopia (Abera, Melaku); Kilte Awlaelo-Health and Demographic Surveillance Site, Mekelle, Ethiopia (Abera); Infectious Disease Epidemiology Group, Weill Cornell Medical College in Qatar, Doha, Qatar (Abu-Raddad); King Abdullah Specialized Children’s Hospital, King Saud bin Abdulaziz University for Health Sciences, Riyadh, Saudi Arabia (AlBuhairan); King Abdullah International Medical Research Center, Riyadh, Saudi Arabia (AlBuhairan); Department of Epidemiology, University of Groningen, Groningen, Netherlands (Amare); College of Medicine and Health Sciences, Bahir Dar University, Bahir Dar, Ethiopia (Amare); Discipline of Psychiatry, School of Medicine, University of Adelaide, Adelaide, Australia (Amare); Department of Health Policy and Administration, College of Public Health, University of the Philippines Manila, Manila, Philippines (Antonio); Consultant, Windsor, Canada (Artaman); School of Psychology, University of Auckland, Auckland, New Zealand (Barker-Collo); Department of Industrial Engineering, School of Engineering, Pontificia Universidad Javeriana, Bogota, Colombia (Barrero); National Institute of Psychiatry Ramon de la Fuente, Mexico City, Mexico (Benjet); University of São Paulo, São Paulo, Brazil (Bensenor, Lotufo); Medical Center, Aga Khan University, Karachi, Pakistan (Bhutta); The Hospital for Sick Children, Toronto, Canada (Bhutta); A.I.Evdokimov Moscow State University of Medicine and

Dentistry, Moscow, Russia (Bikbov); Academician V.I.Shumakov Federal Research Center of Transplantology and Artificial Organs, Moscow, Russia (Bikbov); Faculty of Health Sciences and Social Work, Trnava University, Trnava, Slovakia (Brazinova, Majdan); International Neurotrama Research Organization, Vienna, Austria (Brazinova); National Institute of Public Health, Cuernavaca, Mexico (Campos-Nonato); School of Public Health, Harvard University, Boston (Campos-Nonato); Instituto Nacional de Salud, Colombian National Health Observatory, Bogota, Colombia (Castañeda-Orjuela); Epidemiology and Public Health Evaluation Group, Public Health Department, Universidades Nacional de Colombia, Bogota, Colombia (Castañeda-Orjuela); Division of Pharmacoepidemiology and Pharmacovigilance, Spanish Medicines and Healthcare Products Agency (AEMPS), Ministry of Health, Madrid, Spain (Catalá-López); Department of Medicine, University of Valencia, INCLIVA/CIBERSAM, Valencia, Spain (Catalá-López); Department of Public Health and Primary Care, University of Cambridge, Cambridge, United Kingdom (Chowdhury); MRC Lifecourse Epidemiology Unit, University of Southampton, Southampton, United Kingdom (Cooper); NIHR Biomedical Research Centre, University of Southampton and University Hospital Southampton NHS Foundation Trust, Southampton, United Kingdom (Cooper); NIHR Musculoskeletal Biomedical Research Centre, University of Oxford, Oxford, United Kingdom (Cooper); Centre for International Health, Dunedin School of Medicine, University of Otago, Dunedin, New Zealand (Crump); National Drug and Alcohol Research Centre, University of New South Wales, Sydney, Australia (Degenhardt); University of Colorado School of Medicine and the Colorado School of Public Health, Aurora (Dellavalle); Department of Community Medicine, Faculty of Medicine, University of Peradeniya, Peradeniya, Sri Lanka (Dharmaratne); College of Public Health, University of the Philippines Manila, Manila, Philippines (Faraon); Department of Health, Manila, Philippines (Faraon); National Institute for Stroke and Applied Neurosciences, Auckland University of Technology, Auckland, New Zealand (Feigin); Department of Infectious Disease Epidemiology, Imperial College London, London, United Kingdom (Fürst); Division of Human Nutrition, Wageningen University, Wageningen, Netherlands (Geleijnse); Agence de Medecine Preventive, Paris, France (Gessner); Department of Epidemiology and Preventive Medicine, Monash University, Melbourne, Australia (Gibney); Melbourne Health, Parkville, Australia (Gibney); Department of Public Health, Tokyo Women's Medical University, Tokyo, Japan (Goto); School of Social and Community Medicine, University of Bristol, Bristol, United Kingdom (Gunnell); School of Medicine and Pharmacology, The University of Western Australia, Perth, Australia (Hankey); Harry Perkins Institute of Medical Research, Nedlands, Australia (Hankey); Western Australian Neuroscience Research Institute, Nedlands, Australia (Hankey); International Foundation for Dermatology, London, United Kingdom (Hay); King's College London, London, United Kingdom (Hay); Cedar Associates, Menlo Park (Hornberger); Stanford University, Stanford (Hornberger); Albert Einstein College of Medicine, Bronx (Hosgood); Department of Epidemiology and Health Statistics, School of Public Health, Central South University, Changsha, China (Hu); George Mason University, Fairfax (Jacobsen); Department of Surgery, Virginia Commonwealth University, Richmond (Jayaraman); Centre for Chronic Disease Control, New Delhi, India (Jeemon); Centre for Control of Chronic Conditions, Public Health Foundation of India, New Delhi, India (Jeemon); Department of Ophthalmology, Medical Faculty Mannheim, Ruprecht-Karls-

University Heidelberg, Mannheim, Germany (Jonas); Epidemiological and Statistical Methods Research Group, Helmholtz Centre for Infection Research, Braunschweig, Germany (Karch); Hannover-Braunschweig Site, German Center for Infection Research (DZIF), Braunschweig, Germany (Karch); Department of Health Sciences, Northeastern University, Boston (Kim); Soonchunhyang University, Seoul, South Korea (Kim); Department of Preventive Cardiology, National Cerebral and Cardiovascular Center, Suita, Japan (Kokubo); Department of Social and Preventive Medicine, School of Public Health, University of Montreal, Montreal, Canada (Kuate Defo); Department of Demography, Public Health Research Institute, University of Montreal, Montreal, Canada (Kuate Defo); Institute of Public Health, Hacettepe University, Ankara, Turkey (Kucuk Bicer); Department of Medical Sciences, Uppsala University, Uppsala, Sweden (Larsson); Nova Southeastern University College of Optometry, Fort Lauderdale (Leasher); SUNY Albany, Rensselaer (Leung); Genentech, Hillsboro (Li); School of Medicine, Wayne State University, Miami (Lipshultz, Wilkinson); Children's Hospital of Michigan, Detroit (Lipshultz, Wilkinson); University of Melbourne, Melbourne, Australia (Lopez, Patton, Weintraub); Aintree University Hospitals NHS Foundation Trust, Liverpool, United Kingdom (Lunevicius); School of Medicine, University of Liverpool, Liverpool, United Kingdom (Lunevicius); Farr Institute, Swansea University, Swansea, United Kingdom (Lyons); Digestive Diseases Research Institute, Tehran University of Medical Sciences, Tehran, Iran (Malekzadeh, Sepanlou); Ministry of Public Health, Kabul, Afghanistan (Mashal); Department of Health Sciences, University of York, York, United Kingdom (Mason-Jones); School of Public Health, Mekelle University, Mekelle, Ethiopia (Melaku); School of Medicine, The University of Adelaide, Adelaide, Australia (Melaku); Saudi Ministry of Health, Riyadh, Saudi Arabia (Memish); College of Medicine, Alfaisal University, Riyadh, Saudi Arabia (Memish); United Nations Population Fund, Lima, Peru (Mendoza); Pacific Institute for Research & Evaluation, Calverton (Miller); Curtin University Centre for Population Health, Perth, Australia (Miller); University of Washington, Seattle (Mock); Department of Psychiatry, University of Cambridge, Cambridge, United Kingdom (Murray); Department of Psychosomatic Medicine, Center for Internal Medicine and Dermatology, Charité Universitätsmedizin, Berlin, Germany (Nolte); Population Health Strategic Research Centre, School of Health and Social Development, Deakin University, Melbourne, Australia (Nolte); Department of Preventive Medicine, School of Medicine, Kyung Hee University, Seoul, South Korea (Oh); Center for Healthy Start Initiative, Ikoyi, Nigeria (Olusanya); Harvard T.H. Chan School of Public Health, Harvard University, Boston (Ortblad); Department of Medical Humanities and Social Medicine, College of Medicine, Kosin University, Busan, South Korea (Park); Universidad de Cartagena, Cartagena, Colombia (Paternina Caicedo); Department of Community Health Sciences, University of Calgary, Calgary, Canada (Patten); REQUIMTE/LAQV, Laboratório de Farmacognosia, Departamento de Química, Faculdade de Farmácia, Universidade do Porto, Porto, Portugal (Pereira); IRCCS - Mario Negri Institute for Pharmacological Research, Bergamo, Italy (Perico); Department of Zoology, University of Oxford, Oxford, United Kingdom (Piel); Centre for Addiction and Mental Health, University of Toronto, Toronto, Canada (Popova); School of Population and Public Health, University of British Columbia, Vancouver, Canada (Pourmalek); Harborview Injury Prevention and Research Center, University of Washington, Seattle (Quistberg); Department of Pediatrics, University of Washington, Seattle (Quistberg); Centro Anna Maria

Europe PMC Funders Author Manuscripts

Astori, IRCCS Mario Negri Institute for Pharmacological Research, Bergamo, Italy (Remuzzi); Azienda Ospedaliera Papa Giovanni XXIII, Bergamo, Italy (Remuzzi); Imperial College London, London, United Kingdom (Rodriguez); Mid Sweden University, Stersund, Sweden (Rodriguez); Centre for Research in Environmental Epidemiology (CREAL), ISGlobal, Barcelona, Spain (Rojas-Rueda); Institute of Epidemiology and Medical Biometry, Ulm University, Ulm, Germany (Rothenbacher); Department of Pediatric Surgery, Women & Children's Hospital of Buffalo, Buffalo (Rothstein); Department of Surgery, University at Buffalo, State University of New York, Buffalo (Rothstein); Case Western Reserve University, Cleveland (Sanabria); RFU Chicago Medical School, Cancer Treatment Centers of America, North Chicago (Sanabria); Internal Medicine Department, University of São Paulo, São Paulo, Brazil (Santos); University of Alabama at Birmingham, Birmingham (Schwebel); Department of Public Health, An-Najah University, Nablus, Palestine (Shaheen); Finnish Institute of Occupational Health, Helsinki, Finland (Shiri); School of Health Sciences, University of Tampere, Tampere, Finland (Shiri); Health and Life Sciences, Northumbria University, Newcastle upon Tyne, United Kingdom (Shiue); Alzheimer's Scotland Dementia Research Centre, University of Edinburgh, Edinburgh, United Kingdom (Shiue); Norwegian Institute of Public Health, Oslo, Norway (Skirbekk, Vollset); Columbia University, New York (Skirbekk); Faculty of Health Sciences, Hatter Institute for Cardiovascular Research in Africa, University of Cape Town, Cape Town, South Africa (Sliwa); Department of Community Medicine, International Medical University, Kuala Lumpur, Malaysia (Sreeramareddy); Department of Psychiatry, University of Cape Town, Cape Town, South Africa (Stein); South African Medical Research Council Unit on Anxiety & Stress Disorders, Cape Town, South Africa (Stein); Department of Neuroscience, Norwegian University of Science and Technology, Trondheim, Norway (Steiner, Stovner); Division of Brain Sciences, Imperial College London, London, United Kingdom (Steiner); Norwegian Advisory Unit on Headache, St. Olavs Hospital, Trondheim, Norway (Stovner); University of California, Irvine, Irvine (Sykes); School of Social Work, University of Illinois at Urbana-Champaign, Champaign (Tabb); Department of Anesthesiology, University of Virginia, Charlottesville (Terkawi); Outcomes Research Consortium, Cleveland Clinic, Cleveland (Terkawi); Department of Anesthesiology, King Fahad Medical City, Riyadh, Saudi Arabia (Terkawi); Adaptive Knowledge Management, Victoria, Canada (Thomson); Department of Nutrition, TH Chan School of Public Health, Harvard University, Boston (Thorne-Lyman); WorldFish, Penang, Malaysia (Thorne-Lyman); Le Bonheur Children's Hospital, Memphis (Towbin); University of Tennessee Health Science Center, Memphis (Towbin); St. Jude Children's Research Hospital, Memphis (Towbin); Department of Internal Medicine, Federal Teaching Hospital, Abakaliki, Nigeria (Ukwaja); UKK Institute for Health Promotion Research, Tampere, Finland (Vasankari); Neuroscience Centre, Raffles Hospital, Singapore, Singapore (Venketasubramanian); National Research University Higher School of Economics, Moscow, Russia (Vlassov); Department of Global Public Health and Primary Care, University of Bergen, Bergen, Norway (Vollset); Department of Medical Epidemiology and Biostatistics, Karolinska Institute, Stockholm, Sweden (Weiderpass); Department of Research, Cancer Registry of Norway, Oslo, Norway (Weiderpass); Department of Community Medicine, Faculty of Health Sciences, University of Tromsø, The Arctic University of Norway, Tromsø, Norway (Weiderpass); Genetic Epidemiology Group, Folkhälsan Research Center, Helsinki, Finland (Weiderpass); Royal Children's

Hospital, Melbourne, Australia (Weintraub); Murdoch Children's Research Institute, Melbourne, Australia (Weintraub); Competence Center Mortality-Follow-Up of the German National Cohort, Federal Institute for Population Research, Wiesbaden, Germany (Werdecker); Department of Epidemiology and Biostatistics, Institute of Public Health, University of Gondar, Gondar, Ethiopia (Woldeyohannes); Division of Health and Social Care Research, King's College London, London, United Kingdom (Wolfe); National Institute for Health Research Comprehensive Biomedical Research Centre, Guy's & St. Thomas' NHS Foundation Trust and King's College London, London, United Kingdom (Wolfe); Department of Preventive Medicine, Northwestern University, Chicago (Yano); Social Work and Social Administration Department, The University of Hong Kong, Hong Kong, China (Yip); National Center of Neurology and Psychiatry, Kodaira, Japan (Yonemoto); Department of Preventive Medicine, College of Medicine, Korea University, Seoul, South Korea (Yoon); Jackson State University, Jackson (Younis); Department of Epidemiology and Biostatistics, School of Public Health, Wuhan University, Wuhan, China (Yu); Global Health Institute, Wuhan University, Wuhan, China (Yu); Mansoura Faculty of Medicine, Mansoura, Egypt (Zaki)

References

1. Naghavi M, Wang H, Lozano R, et al. Global, regional, and national age–sex specific all-cause and cause-specific mortality for 240 causes of death, 1990–2013: a systematic analysis for the Global Burden of Disease Study 2013. Lancet. 2015; 385(9963):117–171. [PubMed: 25530442]
2. Wang H, Liddell CA, Coates MM, et al. Global, regional, and national levels of neonatal, infant, and under-5 mortality during 1990–2013: a systematic analysis for the Global Burden of Disease Study 2013. Lancet. 2014; 384(9947):957–979. [PubMed: 24797572]
3. United Nations Children's Fund (UNICEF). [Accessed May 28, 2015] The State of the World's Children 2011. Adolescence: An age of opportunity. 2011. http://www.unicef.org/sowc2011/pdfs/SOWC-2011-Main-Report_EN_02092011.pdf
4. Murray CJL, Ezzati M, Flaxman AD, et al. GBD 2010: design, definitions, and metrics. The Lancet. 2013; 380(9859):2063–2066.
5. Vos T, Barber RM, Bell B, et al. Global, regional, and national incidence, prevalence, and YLDs for 301 acute and chronic diseases and injuries for 188 countries, 1990-2013: a systematic analysis for the Global Burden of Disease Study 2013. Lancet. 2015; doi: 10.1016/S0140-6736(15)60692-4
6. GBD DALYs and HALE Collaborators. Global, regional, and national DALYs for 306 diseases and injuries and healthy life expectancy for 188 countries, 1990-2013: quantifying the epidemiological transition. Lancet. (in press).
7. Lozano R, Naghavi M, Foreman K, et al. Global and regional mortality from 235 causes of death for 20 age groups in 1990 and 2010: a systematic analysis for the Global Burden of Disease Study 2010. Lancet. 380(9859):2095–2128.
8. Foreman, KJ.; Lozano, R.; Lopez, AD.; Murray, CJL. Modeling causes of death: an integrated approach using CODEm. University of Washington; 2011.
9. Ortblad KF, Lozano R, Murray CJL. The burden of HIV: insights from the Global Burden of Disease Study 2010. AIDS (London, England). 2013; 27(13):2003.
10. Murray CJ, Ortblad KF, Guinovart C, et al. Global, regional, and national incidence and mortality for HIV, tuberculosis, and malaria during 1990– 2013: a systematic analysis for the Global Burden of Disease Study 2013. Lancet. 2014; 384(9947):1005–1070. [PubMed: 25059949]
11. Murray CJL, Ezzati M, Flaxman AD, et al. GBD 2010: design, definitions, and metrics. Lancet. 2013; 380(9859):2063–2066.
12. Salomon JA, Haagsma JA, Davis A, et al. Disability weights for the Global Burden of Disease 2013 study. Lancet Global Health. (in press).

Europe PMC Funders Author Manuscripts

13. GBD 2013 Risk Factors Collaborators. Global, regional and national comparative risk assessment of 79 behavioural, environmental/occupational and metabolic risks or clusters of risks in 188 countries 1990-2013: a systematic analysis for the GBD 2013. Lancet. 2015 (in press).
14. World Health Organization. Interventions to reduce indoor air pollution. http://www.who.int/indoorair/interventions/en/.
15. Smith LC, Haddad L. Reducing Child Undernutrition: Past Drivers and Priorities for the Post-MDG Era. World Development. 2015; 68:180–204.
16. World Health Organization. International Programme on Chemical Safety. Air pollution. http://www.who.int/ipcs/assessment/public_health/air_pollution/en/.
17. World Health Organization. [Accessed June 1, 2015] Global status report on road safety 2013. http://www.who.int/violence_injury_prevention/road_safety_status/2013/en/.
18. Mann JJ, Apter A, Bertolote J, et al. Suicide prevention strategies: a systematic review. JAMA. 2005; 294(16):2064–2074. [PubMed: 16249421]
19. World Health Organization. Preventing suicide: a global imperative. 2014. http://www.who.int/mental_health/suicide-prevention/world_report_2014/en/.
20. Gunnell D, Eddleston M, Phillips MR, Konradsen F. The global distribution of fatal pesticide self-poisoning: systematic review. BMC Public Health. 2007; 7(1):357. [PubMed: 18154668]
21. Gunnell D, Fernando R, Hewagama M, Priyangika WDD, Konradsen F, Eddleston M. The impact of pesticide regulations on suicide in Sri Lanka. Int J Epidemiol. 2007; 36(6):1235–1242. [December 1, 2007] [PubMed: 17726039]
22. Myung W, Lee G-H, Won H-H, et al. Paraquat prohibition and change in the suicide rate and methods in South Korea. PLoS One. 2015; 10(6):e0128980. [PubMed: 26035175]
23. Ferrari AJ, Norman RE, Freedman G, et al. The burden attributable to mental and substance use disorders as risk factors for suicide: findings from the Global Burden of Disease Study 2010. PLoS One. 2014; 9(4):e91936. [PubMed: 24694747]
24. World Health Organization. [Accessed August 14, 2015] Global report on drowning: preventing a leading killer. 2014. http://www.who.int/violence_injury_prevention/publications/drowning_global_report/Final_report_full_web.pdf.
25. Centers for Disease Control and Prevention. [Accessed August 14, 2015] Unintentional Drowning: Get the Facts. 2014. http://www.cdc.gov/HomeandRecreationalSafety/Water-Safety/waterinjuries-factsheet.html.
26. Linnan, M.; Rahman, A.; Scarr, J., et al. Child drowning: evidence for a newly recognized cause of child mortality in low and middle income countries in Asia. Florence: UNICEF Office of Research; 2012.
27. Idele P, Gillespie A, Porth T, et al. Epidemiology of HIV and AIDS among adolescents: current status, inequities, and data gaps. Journal of Acquired Immune Deficiency Syndromes. 2014; 66:S144–S153. [PubMed: 24918590]
28. Ferrand R, Lowe S, Whande B, et al. Survey of children accessing HIV services in a high prevalence setting: time for adolescents to count? Bull World Health Organ. 2010; 88(6):428–434. [PubMed: 20539856]
29. Kranzer K, Meghji J, Bandason T, et al. Barriers to provider-initiated testing and counselling for children in a high HIV prevalence setting: a mixed methods study. PLoS Med. 2014 May. 11(5):e1001649. [PubMed: 24866209]
30. Ramsay LC, Charles CV. Review of Iron Supplementation and Fortification. 2015
31. Bouis, H.; Low, J.; McEwan, M.; Tanumihardjo, S. [Accessed August 14, 2015] Biofortification: evidence and lessons learned linking agriculture and nutrition. 2013. http://www.fao.org/fileadmin/user_upload/agn/pdf/Biofortification_paper.pdf
32. Erskine H, Moffitt T, Copeland W, et al. A heavy burden on young minds: the global burden of mental and substance use disorders in children and youth. Psychol Med. 2015; 45(07):1551–1563. [PubMed: 25534496]
33. Vos T, Flaxman AD, Naghavi M, et al. Years lived with disability (YLDs) for 1160 sequelae of 289 diseases and injuries 1990–2010: a systematic analysis for the Global Burden of Disease Study 2010. Lancet. 2013; 380(9859):2163–2196.

34. Hoy D, Geere J-A, Davatchi F, Meggitt B, Barrero LH. A time for action: Opportunities for preventing the growing burden and disability from musculoskeletal conditions in low- and middle-income countries. Best Practice & Research Clinical Rheumatology. 2014; 28(3):377–393. [PubMed: 25481422]

35. World Health Organization. [Accessed July 30, 2015] Atlas of headache disorders and resources in the world 2011. http://www.who.int/mental_health/management/atlas_headache_disorders/en/

Europe PMC Funders Author Manuscripts

- In this study, we identified the fatal and non-fatal burden of diseases and injuries among younger children (<5 years), older children (5-9 years) and adolescents (10-19 years) for 1990-2013 in 188 countries.
- Of the 7.7 million deaths among children and adolescents globally in 2013, 80% occurred among younger children. Of the 135.6 million years lived with disability among children and adolescents in the same year, 60% were contributed by adolescents.
- In 2013, lower respiratory infections were the leading cause of death among younger children (905,059 deaths), diarrheal diseases among older children (38,325 deaths), and road injuries among adolescents (115,186 deaths). Iron deficiency anemia was the leading cause of years lived with disability among children and adolescents affecting 619 million prevalent cases in 2013.
- There is large variation in the distribution of deaths and disease burden between countries. For instance, in 2013, Nigeria had about 4% of the world's children and adolescents but a 12% share of global lower respiratory infections deaths and a 38% share of global malaria deaths. Also, half of world's diarrheal deaths among children and adolescents occurred in just five countries: India, Democratic Republic of the Congo, Pakistan, Nigeria, and Ethiopia which together represented 30% of the world's pediatric population in 2013.
- Detailed information on causes of death and non-fatal health outcomes in children and adolescents by age, sex, and country over time is an essential input into policy decision making on resource allocation to disease prevention and treatment programs.

Europe PMC Funders Author Manuscripts

Europe PMC Funders Author Manuscripts

Location	Lower Respiratory Infections	Preterm Birth Complications	Malaria	Neonatal Encephalopathy	Diarrheal Diseases	Congenital Anomalies	Neonatal Sepsis	Other Neonatal	Protein-Energy Malnutrition	Road Injuries	Meningitis	HIV/AIDS	Drowning	Hemoglobinopathies	Intestinal infectious	STDs	Measles	Tuberculosis	Whooping Cough	Self-Harm	Mechanical Forces	Fire & Heat	Foreign Body	Interpersonal Violence	Other Neoplasms
Global	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25
Developing	1	2	3	4	5	6	7	8	9	10	11	12	14	13	15	16	17	18	19	22	20	21	23	24	25
Afghanistan	1	2	20	7	4	3	18	5	19	8	6	98	9	21	17	46	13	14	12	35	24	25	44	16	38
Algeria	7	1	89	3	8	2	4	6	13	5	11	97	12	20	9	21	16	44	57	46	39	26	49	42	19
Angola	1	6	3	7	2	4	12	9	5	11	8	10	15	14	22	13	33	17	23	36	24	18	19	34	30
Argentina	4	2	132	8	17	1	5	6	19	3	16	51	11	25	54	33	129	46	40	9	15	23	7	10	13
Bangladesh	3	2	104	1	13	6	5	8	10	14	17	88	4	24	7	9	27	49	28	11	31	54	33	22	16
Brazil	7	2	85	6	10	1	5	8	14	4	13	51	9	31	15	19	124	50	62	12	26	33	11	3	17
Cameroon	2	4	1	5	3	6	7	13	8	11	10	9	16	15	18	12	14	24	19	47	26	22	20	37	34
China	6	2	102	4	22	1	14	9	34	3	15	45	5	29	42	47	87	43	62	12	7	30	19	18	11
Colombia	4	3	63	6	8	1	9	10	11	5	15	64	7	41	17	23	132	47	57	14	20	28	12	2	16
Cote d'Ivoire	1	3	2	5	4	7	6	11	8	12	10	9	15	14	16	18	13	20	19	45	22	24	28	74	33
Democratic Republic of the Congo	2	5	3	7	1	6	10	11	4	17	9	13	12	8	21	14	18	15	25	35	22	19	37	30	36
Egypt	2	3	110	15	4	1	12	7	36	6	27	83	11	14	9	73	45	62	54	31	34	44	52	37	20
Ethiopia	1	3	5	4	2	9	6	12	11	15	14	10	18	27	17	13	8	16	7	32	23	20	38	21	26
Ghana	2	4	1	6	9	7	3	12	5	13	10	11	17	8	15	18	14	21	44	46	22	27	26	36	37
India	3	2	13	1	4	7	5	6	15	12	26	37	9	36	8	14	33	10	28	11	25	17	20	39	22
Indonesia	1	3	38	2	5	4	10	9	16	7	11	36	6	22	12	17	8	15	13	46	45	27	21	50	43
Iran	5	1	85	6	9	2	15	4	43	3	17	119	7	20	8	48	23	52	62	12	16	10	18	25	33
Iraq	3	1	-	8	5	2	4	6	39	7	10	64	12	25	13	71	30	41	11	36	21	20	56	9	15
Kenya	1	4	6	5	2	7	8	12	9	16	10	3	17	18	14	13	11	15	19	37	24	20	36	26	21
Madagascar	1	3	8	11	2	9	7	10	5	16	12	18	20	22	17	4	6	21	29	39	30	28	47	41	27
Malaysia	4	3	88	8	22	1	9	5	66	2	14	45	6	21	7	26	17	47	51	16	31	39	11	15	13
Mexico	3	2	131	6	8	1	5	9	13	4	26	71	11	39	16	33	130	52	61	14	24	35	10	7	17
Morocco	5	1	110	2	14	3	4	10	32	6	12	75	7	34	9	8	23	31	68	21	20	30	50	37	18
Mozambique	3	8	1	6	5	9	4	10	11	14	12	2	20	22	17	7	15	16	18	41	27	19	36	26	24
Myanmar	1	2	5	3	7	4	6	9	32	11	14	30	8	21	10	13	12	23	19	35	28	18	31	29	25
Nepal	1	3	27	2	5	7	4	6	14	13	15	50	11	33	9	8	46	16	29	12	34	17	40	30	19
Niger	3	5	1	7	2	8	9	10	4	14	6	22	16	12	18	11	20	17	19	65	24	23	31	52	32
Nigeria	2	4	1	5	6	9	8	13	7	10	12	11	16	3	20	14	15	17	23	93	22	19	28	50	37
Pakistan	1	4	36	2	3	7	5	9	14	10	6	72	11	24	8	17	15	13	25	49	35	22	12	20	31
Peru	1	3	103	4	8	2	5	13	9	7	17	68	11	36	14	10	132	28	27	23	21	31	6	18	20
Philippines	1	2	72	4	7	3	6	8	14	12	11	41	10	34	5	32	9	20	23	30	52	47	21	18	26
Saudi Arabia	9	2	72	5	13	1	4	8	43	3	30	34	6	14	7	41	66	42	47	20	15	18	39	28	24
South Africa	3	5	63	6	2	7	8	4	9	10	14	1	16	37	18	13	28	12	17	20	19	24	21	11	25
Sudan	4	1	5	8	3	2	15	6	34	9	11	19	20	18	12	10	14	31	42	39	23	27	45	28	37
Tanzania	1	10	2	7	3	5	8	11	9	16	12	6	18	19	17	4	13	15	36	49	24	21	35	25	22
Thailand	5	3	59	6	18	2	7	12	86	1	15	44	4	30	11	32	38	55	70	9	19	42	25	8	16
Turkey	4	2	128	6	18	1	7	3	45	5	25	74	16	20	8	37	17	48	50	10	14	36	24	21	27
Uganda	2	3	1	4	5	9	7	12	8	13	10	6	17	20	16	11	15	14	19	120	18	22	29	24	27
Uzbekistan	1	4	-	2	8	3	16	6	72	7	15	82	5	28	48	44	122	36	86	10	9	13	20	26	22
Venezuela	5	3	88	7	8	1	6	16	13	4	19	61	12	31	17	9	132	49	36	10	18	32	11	2	15
Vietnam	1	2	45	6	14	3	7	11	82	5	15	56	4	18	9	19	8	36	34	26	17	43	13	24	16
Yemen	4	1	5	8	3	2	16	6	39	7	9	55	13	21	12	14	15	22	11	41	27	17	50	29	40
Developed	7	2	130	6	26	1	13	4	49	3	20	51	9	36	34	40	102	56	67	5	17	19	16	10	11
France	16	3	-	5	22	1	11	6	67	2	23	61	13	37	29	46	96	65	56	7	19	25	15	17	8
Germany	14	2	-	5	29	1	15	8	78	3	21	88	13	34	45	39	69	87	75	4	19	25	18	17	7
Italy	13	2	-	5	38	1	12	4	71	3	25	46	14	24	17	22	120	68	72	11	19	32	15	20	6
Japan	6	4	-	11	31	1	15	8	55	3	27	116	7	23	28	29	97	63	62	2	19	21	12	14	5
Russia	3	5	-	8	23	1	13	2	35	4	15	36	6	54	33	50	121	40	67	7	22	12	11	10	19
South Korea	11	3	128	9	38	1	12	5	77	2	31	97	6	28	29	30	107	34	69	4	20	23	16	15	8
United Kingdom	6	1	-	5	21	2	15	12	77	3	16	104	20	35	28	49	116	69	57	11	17	25	18	23	7
United States	13	2	-	8	29	1	14	5	64	3	23	55	9	33	41	43	127	84	60	7	10	17	21	6	11

Figure 1a. Top 25 Global Causes of Death for the Largest 50 Countries by Child and Adolescent Population, Both Sexes, Ages 0 to 19, 2013

Footnote (Figure 1a): Colors correspond to the ranking of the leading causes of death, with dark red as the most common cause and dark green as the least common cause for the location indicated. The numbers inside each box indicate the ranking.

Europe PMC Funders Author Manuscripts

Location	Lower Respiratory Infections	Preterm Birth Complications	Neonatal Encephalopathy	Malaria	Diarrheal Diseases	Congenital Anomalies	Neonatal Sepsis	Other Neonatal	Protein-Energy Malnutrition	Meningitis	STDs	Hemoglobinopathies	Measles	Drowning	Road Injuries	HIV/AIDS	Intestinal Infectious	Whooping Cough	Foreign Body	Tuberculosis	Mechanical Forces	Other Infectious	Fire & Heat	Iron Deficiency Anemia	Tetanus
Global	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25
Developing	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	22	21	25	23	24
Afghanistan	1	2	7	21	4	3	13	5	16	6	35	18	10	9	14	75	20	8	34	17	26	24	22	19	12
Algeria	6	1	3	84	8	2	4	5	9	11	15	24	12	21	7	80	13	46	45	47	39	41	22	31	58
Angola	1	6	7	3	2	4	10	8	5	9	11	14	28	16	15	12	24	20	19	18	23	22	17	13	49
Argentina	4	2	6	91	9	1	3	5	13	11	19	17	88	12	10	46	48	25	7	45	33	35	18	54	76
Bangladesh	3	2	1	79	11	6	4	7	10	14	8	19	16	5	25	64	9	15	18	52	23	24	37	34	60
Brazil	5	1	4	65	7	2	3	6	9	10	12	32	80	13	11	59	15	45	8	49	31	27	25	34	64
Cameroon	2	4	5	1	3	6	7	11	8	9	10	15	13	17	14	12	19	18	20	27	25	24	22	16	41
China	4	2	3	83	15	1	9	7	24	13	36	25	68	5	8	39	38	47	12	53	6	44	27	51	43
Colombia	3	2	4	60	5	1	6	7	8	12	17	39	91	10	11	72	18	46	9	50	27	32	23	43	61
Cote d'Ivoire	1	3	5	2	4	7	6	10	8	9	16	12	11	18	13	17	20	14	24	21	25	26	22	15	19
Democratic Republic of the Congo	1	5	7	3	2	6	8	9	4	10	12	11	15	13	20	18	22	23	26	16	25	19	17	14	44
Egypt	2	3	12	87	4	1	8	5	21	22	52	13	29	14	10	64	11	43	44	71	45	18	40	35	57
Ethiopia	1	3	4	6	2	9	5	10	11	13	12	23	8	19	18	14	17	7	30	15	22	25	21	16	20
Ghana	3	4	6	1	9	7	2	10	5	11	17	8	12	16	13	18	15	34	22	31	23	37	28	14	21
India	3	2	1	21	6	7	4	5	10	22	9	33	24	15	29	48	8	19	12	13	25	11	27	28	14
Indonesia	1	3	2	45	5	4	7	6	15	9	13	23	8	11	14	26	12	10	16	38	43	24	22	36	25
Iran	4	1	5	67	7	2	13	3	31	15	42	19	16	8	6	89	11	50	14	51	17	32	10	40	65
Iraq	3	1	7	-	5	2	4	6	31	9	61	26	27	14	10	57	19	8	49	36	32	28	18	41	77
Kenya	1	3	4	7	2	6	5	12	8	9	13	18	11	19	17	10	14	16	30	15	24	25	20	21	29
Madagascar	1	3	11	10	2	9	6	8	5	12	4	22	7	20	21	18	17	19	38	25	28	14	24	13	33
Malaysia	4	2	5	69	15	1	6	3	53	10	14	21	9	12	11	47	8	27	7	46	39	22	33	58	70
Mexico	3	2	5	91	7	1	4	6	9	19	22	41	90	14	10	69	13	51	8	55	35	36	32	39	75
Morocco	5	1	2	86	11	3	4	7	22	10	6	32	18	9	8	67	13	57	48	34	21	36	27	28	60
Mozambique	3	7	5	1	6	10	4	9	11	12	8	22	13	24	16	2	19	15	31	18	25	26	17	20	21
Myanmar	1	2	3	10	6	4	5	7	21	11	9	24	8	12	33	39	13	14	23	52	34	26	18	31	48
Nepal	1	3	2	27	5	7	4	6	10	13	8	26	34	11	25	50	12	15	23	18	28	17	16	40	14
Niger	3	5	6	1	2	7	9	10	4	8	11	12	18	15	19	29	21	16	27	17	22	23	20	14	13
Nigeria	2	4	5	1	7	9	6	11	8	12	13	3	15	16	10	14	23	21	25	18	22	27	17	19	50
Pakistan	2	4	1	44	3	7	5	8	11	6	14	26	12	13	16	54	9	17	10	19	30	22	23	39	27
Peru	1	2	4	81	7	3	5	11	9	13	10	30	92	14	8	73	18	17	6	41	28	29	26	33	62
Philippines	2	1	4	69	7	3	5	6	13	11	21	34	8	12	20	35	9	15	14	27	46	41	37	25	39
Saudi Arabia	9	2	4	64	11	1	3	5	32	19	24	14	55	7	6	26	8	29	33	52	15	47	16	41	53
South Africa	2	4	5	54	1	7	8	3	9	12	10	33	23	18	15	6	19	13	16	14	24	22	21	48	72
Sudan	4	1	7	5	3	2	12	6	23	10	9	17	11	32	13	25	15	30	38	35	33	28	24	27	47
Tanzania	1	8	6	2	4	5	7	10	9	11	3	19	12	17	18	13	16	33	31	14	23	25	21	20	29
Thailand	3	2	4	56	10	1	5	7	63	11	12	22	19	6	9	41	8	50	13	66	36	16	33	55	59
Turkey	5	2	4	88	10	1	6	3	33	12	22	20	11	32	9	49	7	39	14	45	35	38	30	53	68
Uganda	2	3	4	1	5	8	6	12	7	10	9	20	13	19	14	11	17	16	23	15	18	22	21	29	25
Uzbekistan	1	4	2	-	7	3	8	5	52	12	32	19	83	6	15	74	36	66	14	47	9	18	10	31	82
Venezuela	3	2	5	68	6	1	4	10	9	12	7	27	92	13	11	71	15	19	8	53	23	33	24	54	72
Vietnam	2	1	5	45	13	3	6	8	63	12	15	21	7	4	14	46	9	22	10	59	24	30	32	70	48
Yemen	4	1	7	5	3	2	13	6	26	8	11	23	14	15	10	45	17	9	42	29	34	27	18	19	16
Developed	6	2	4	90	18	1	7	3	40	13	26	31	67	10	8	47	30	50	9	55	12	23	15	59	75
France	13	2	4	-	14	1	6	5	50	15	36	32	64	12	8	55	24	44	9	57	21	23	20	59	70
Germany	10	2	3	-	23	1	7	5	60	14	28	27	42	13	11	62	37	59	12	72	19	24	20	52	69
Italy	8	2	4	-	22	1	5	3	53	17	13	24	82	21	11	57	16	52	10	60	19	25	29	40	66
Japan	4	2	6	-	21	1	8	3	47	20	17	23	59	9	11	84	27	51	7	56	13	24	22	64	66
Russia	4	3	5	-	13	1	8	2	28	10	34	45	82	9	12	29	30	51	7	37	19	46	11	41	78
South Korea	8	2	4	87	26	1	7	3	60	24	21	28	65	11	6	82	27	55	9	38	15	30	23	64	57
United Kingdom	5	1	4	-	12	2	7	6	59	10	31	34	77	20	14	78	26	45	13	60	15	17	18	62	74
United States	9	1	5	-	22	2	6	4	55	18	32	28	86	10	7	56	39	46	12	66	8	19	14	60	75

Figure 1b. Top 25 Global Causes of Death for the Largest 50 Countries by Child and Adolescent Population, Under 5, Both Sexes, 2013

Footnote (Figure 1b): Colors correspond to the ranking of the leading causes of death, with dark red as the most common cause and dark green as the least common cause for the location indicated. The numbers inside each box indicate the ranking.

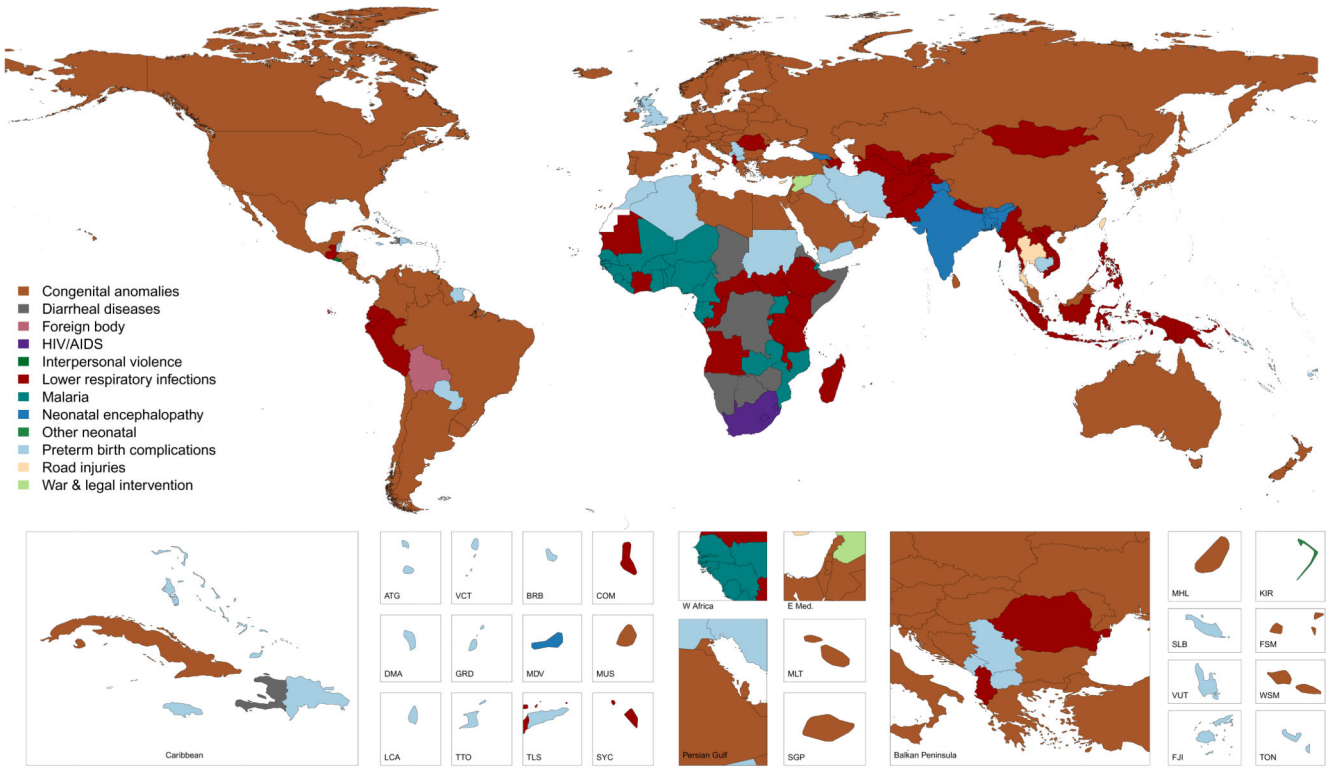

Figure 2. Top cause of death by country for ages 0 to 19, both sexes, 2013

Footnote (Figure 2): “Foreign Body” refers to “foreign body in lung and pulmonary aspiration”. “Neonatal Encephalopathy” refers to “neonatal encephalopathy following birth trauma and asphyxia”.

Europe PMC Funders Author Manuscripts

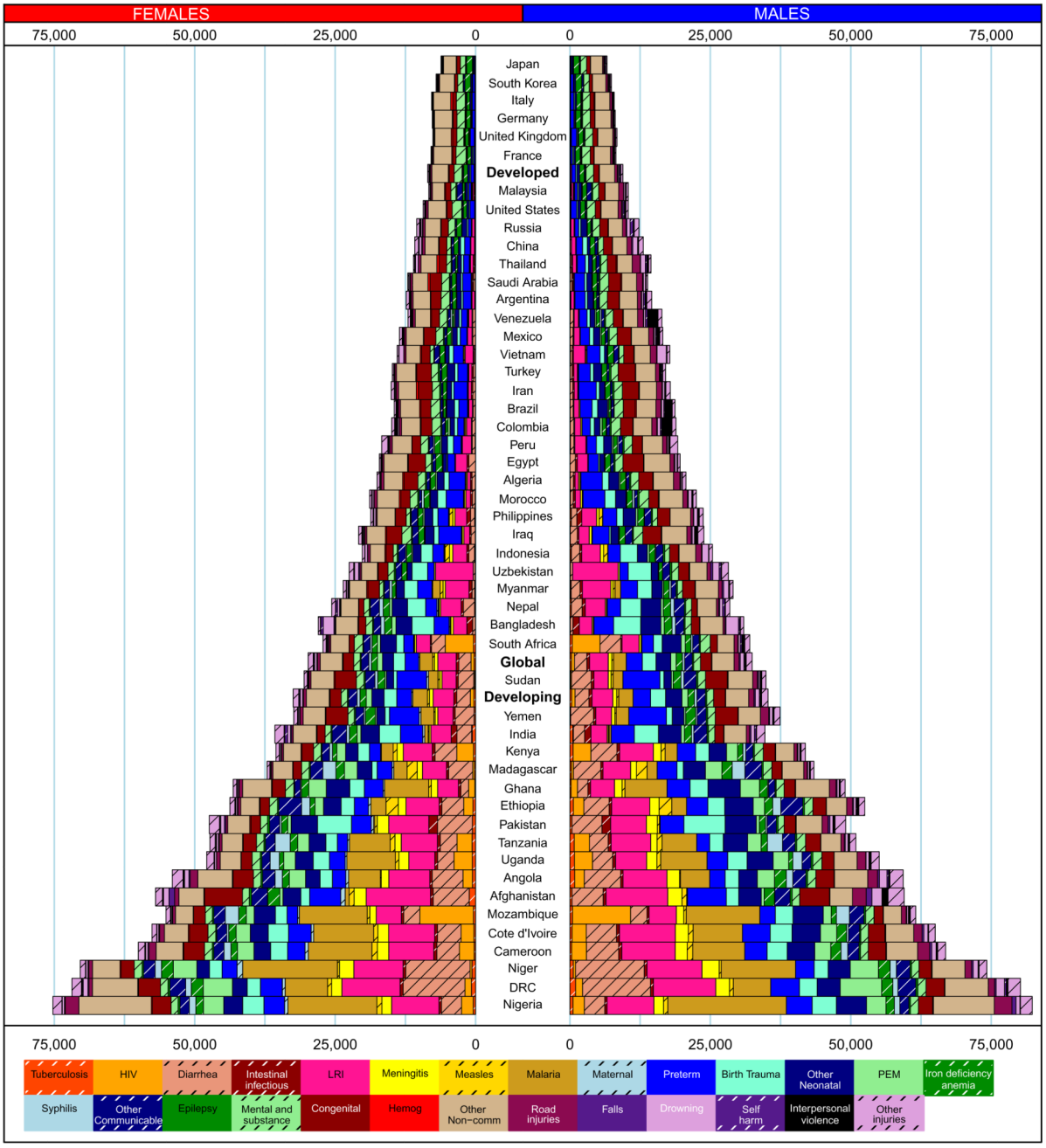

Figure 3. Age-standardized DALY rate (per 100,000), ages 0 to 19, 2013

Europe PMC Funders Author Manuscripts

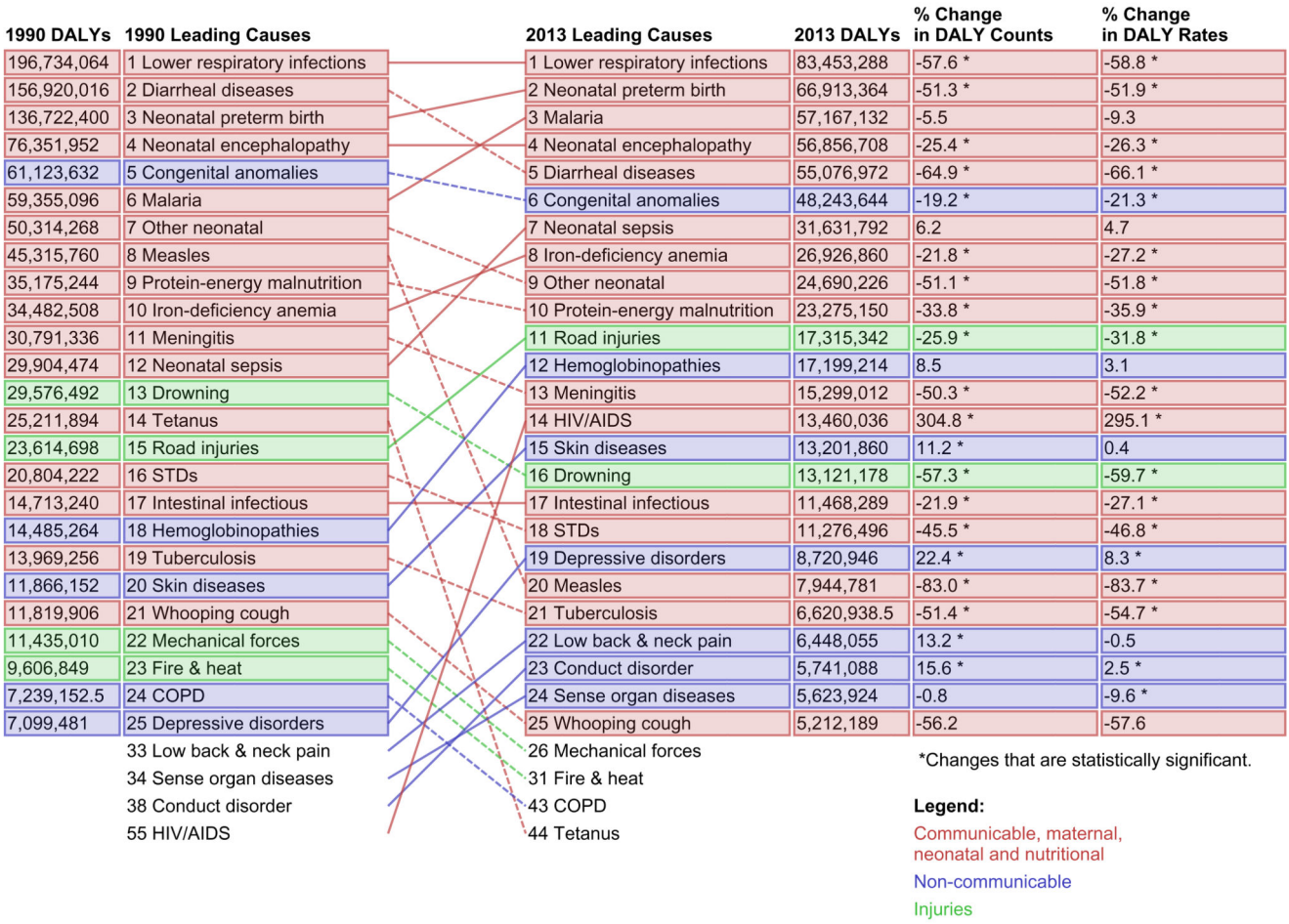

Figure 4a. Top 25 global causes of DALYs, ages 0 to 19, both sexes, 1990 and 2013

Footnote 1 (Figure 4a): Causes connecting with lines show changes in ranks between 1990 and 2013. The second column on the right-hand side shows the mean DALY counts. The third and fourth columns on the right-hand side show the median percent changes (calculated at the 1000 draw level) in the number and rates of global DALYs.

Footnote 2 (Figure 4a): *Changes that are statistically significant.

Europe PMC Funders Author Manuscripts

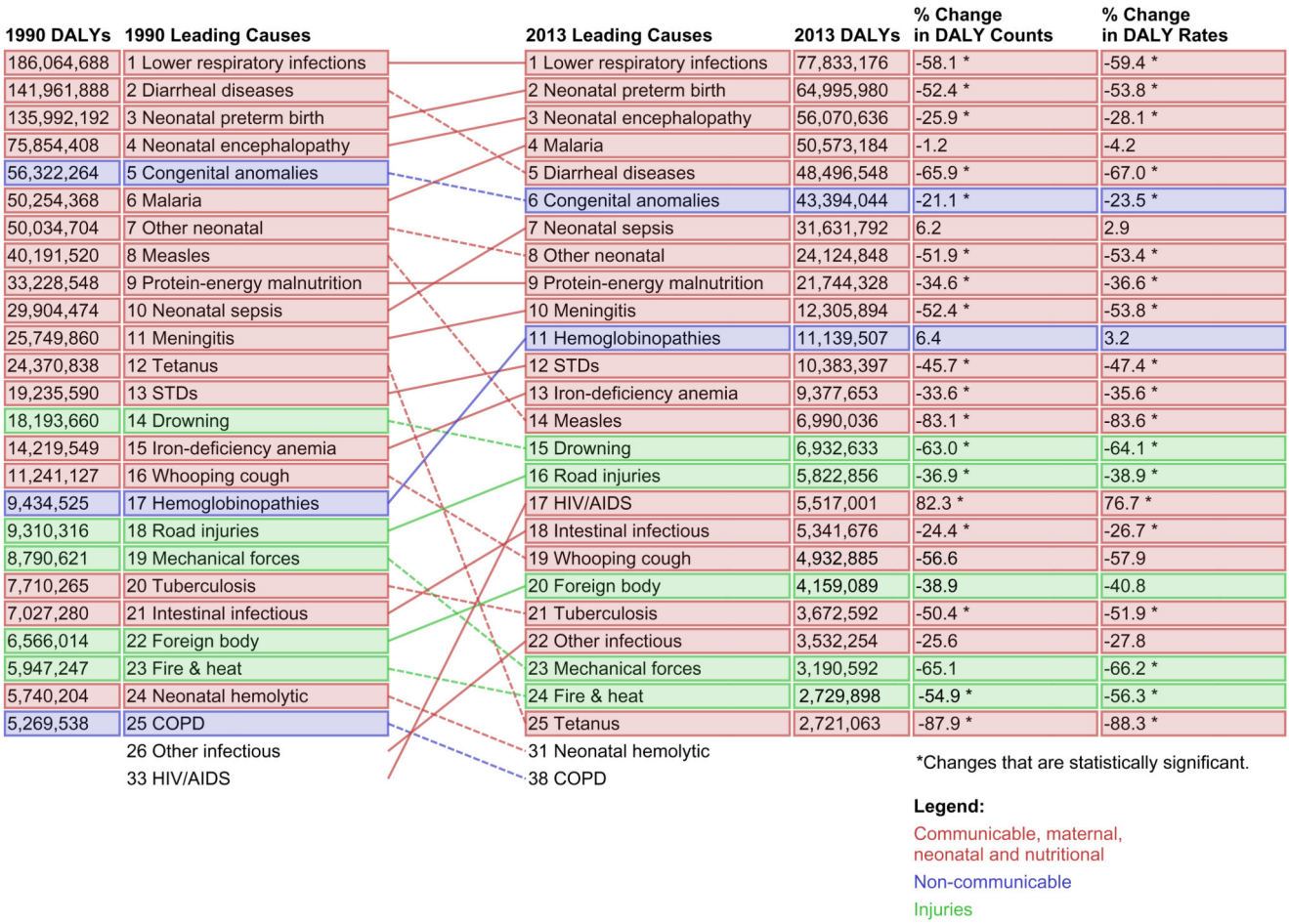

Figure 4b. Top 25 global causes of DALYs, under 5, both sexes, 1990 and 2013

Footnote 1 (Figure 4b): Causes connecting with lines show changes in ranks between 1990 and 2013. The second column on the right-hand side shows the mean DALY counts. The third and fourth columns on the right-hand side show the median percent changes (calculated at the 1000 draw level) in the number and rates of global DALYs.

Footnote 2 (Figure 4b): *Changes that are statistically significant.

Europe PMC Funders Author Manuscripts

Europe PMC Funders Author Manuscripts

Table 1a

Number of Deaths and Age-standardized Rates (per 100,000) for the Top 10 Global Causes of Death in the Largest 50 Countries by Child and Adolescent Population, Ages 0 to 19, Both Sexes, 2013

Location	All Cause	Lower Respiratory Infections	Preterm Birth Complications	Malaria	Neonatal Encephalopathy	Diarrheal Diseases	Congenital Anomalies	Neonatal Sepsis	Other Neonatal	Protein-Energy Malnutrition	Road Injuries
Global	7,722,750 (307.4)	978,680 (38.9)	742,381 (29.3)	652,820 (26.1)	643,765 (25.4)	590,607 (23.5)	533,165 (21.1)	366,041 (14.4)	276,231 (10.9)	245,899 (9.8)	220,064 (8.9)
Developing	7,586,066 (339.6)	972,977 (43.4)	726,053 (32.0)	652,820 (29.3)	637,629 (28.1)	589,834 (26.4)	508,095 (22.6)	363,566 (16.1)	268,355 (11.9)	245,744 (11.0)	205,864 (9.4)
Developed	136,684 (48.3)	5,703 (2.0)	16,328 (6.0)	0 (0.0)	6,136 (2.3)	772 (0.3)	25,070 (9.1)	2,476 (0.9)	7,876 (2.9)	156 (0.1)	14,200 (4.7)
Afghanistan	115,094 (622.9)	24,525 (131.4)	13,420 (71.1)	905 (5.0)	4,098 (21.7)	12,344 (66.2)	13,050 (69.7)	1,010 (5.4)	6,295 (33.4)	934 (5.0)	3,624 (20.9)
Algeria	27,429 (166.2)	1,178 (7.2)	6,617 (38.0)	3 (0.0)	1,945 (11.2)	673 (4.0)	4,746 (27.7)	1,671 (9.6)	1,180 (6.8)	364 (2.2)	1,535 (10.5)
Angola	95,184 (603.1)	14,534 (88.9)	4,991 (28.9)	9,632 (60.2)	4,577 (26.6)	10,733 (66.9)	6,578 (39.5)	2,563 (14.9)	3,071 (17.8)	5,510 (34.1)	2,605 (19.5)
Argentina	13,944 (106.2)	799 (6.1)	2,245 (17.6)	0 (0.0)	483 (3.8)	167 (1.3)	2,714 (21.1)	658 (5.2)	523 (4.1)	141 (1.1)	914 (6.6)
Bangladesh	162,876 (277.1)	15,631 (27.2)	19,077 (33.4)	10 (0.0)	28,412 (49.7)	2,200 (3.7)	8,703 (15.0)	13,856 (24.3)	6,537 (11.5)	3,275 (5.6)	1,950 (3.0)
Brazil	80,486 (135.6)	5,163 (9.0)	11,257 (20.5)	19 (0.0)	5,364 (9.8)	2,028 (3.6)	11,897 (21.3)	5,730 (10.4)	3,790 (6.9)	1,020 (1.8)	5,808 (8.6)
Cameroon	95,403 (683.9)	14,765 (102.9)	6,130 (40.8)	16,138 (116.4)	5,709 (38.0)	7,651 (54.2)	5,650 (38.9)	5,079 (33.8)	1,605 (10.7)	4,682 (33.5)	2,638 (21.8)
China	336,465 (97.8)	27,874 (8.1)	37,467 (11.0)	33 (0.0)	29,759 (8.7)	2,845 (0.8)	55,076 (16.1)	3,675 (1.1)	9,229 (2.7)	1,211 (0.4)	30,332 (8.6)
Colombia	24,375 (141.1)	1,951 (11.5)	2,341 (14.1)	19 (0.1)	1,166 (7.0)	820 (4.8)	3,807 (22.6)	778 (4.7)	767 (4.6)	713 (4.2)	1,433 (8.0)
Cote d'Ivoire	81,205 (653.3)	13,633 (106.5)	6,858 (51.0)	13,385 (109.4)	5,778 (42.9)	6,635 (52.8)	4,591 (35.4)	4,614 (34.4)	1,616 (12.1)	3,809 (30.9)	1,569 (14.8)
Democratic Republic of the Congo	387,210 (822.7)	61,499 (126.1)	26,984 (51.7)	37,453 (79.8)	16,564 (31.8)	62,988 (132.7)	20,396 (41.1)	9,836 (18.9)	9,710 (18.7)	34,389 (72.4)	4,246 (10.9)
Egypt	53,993 (157.5)	7,977 (22.9)	5,787 (16.6)	3 (0.0)	581 (1.7)	3,390 (9.7)	13,272 (38.2)	1,042 (3.0)	1,545 (4.4)	185 (0.5)	2,144 (6.5)
Ethiopia	273,571 (503.9)	40,963 (74.5)	20,328 (36.0)	16,642 (30.8)	17,243 (30.5)	25,585 (47.2)	12,461 (22.5)	16,090 (28.6)	10,072 (17.9)	10,482 (19.4)	4,933 (9.7)
France	4,789 (31.9)	70 (0.5)	335 (2.3)	0 (0.0)	318 (2.2)	38 (0.3)	831 (5.6)	111 (0.8)	288 (2.0)	2 (0.0)	589 (3.8)
Germany	4,187 (30.0)	63 (0.4)	658 (5.1)	0 (0.0)	202 (1.6)	17 (0.1)	858 (6.5)	60 (0.5)	133 (1.0)	1 (0.0)	456 (2.9)
Ghana	66,581 (479.5)	6,628 (47.1)	6,086 (42.0)	11,890 (85.8)	4,806 (33.1)	2,433 (17.4)	3,422 (24.1)	6,561 (45.3)	1,521 (10.5)	5,239 (37.6)	1,464 (11.5)
India	1,640,176 (348.8)	178,266 (38.2)	211,108 (45.4)	25,652 (5.4)	212,686 (45.7)	109,366 (23.3)	76,898 (16.5)	94,299 (20.3)	91,118 (19.6)	24,163 (5.2)	27,072 (5.6)
Indonesia	192,905 (218.4)	29,910 (34.2)	19,396 (22.6)	555 (0.6)	25,303 (29.5)	11,377 (12.8)	13,789 (15.8)	7,381 (8.6)	7,646 (8.9)	1,817 (2.0)	9,081 (9.8)
Iran	34,199 (130.8)	1,850 (7.0)	8,148 (30.5)	6 (0.0)	1,357 (5.1)	679 (2.6)	7,950 (30.0)	327 (1.2)	2,101 (7.9)	75 (0.3)	2,219 (8.9)
Iraq	36,974 (200.0)	3,172 (16.9)	7,416 (38.6)	0 (0.0)	1,063 (5.5)	1,682 (8.9)	6,431 (33.9)	1,727 (9.0)	1,310 (6.8)	141 (0.8)	1,204 (7.0)
Italy	3,440 (31.2)	54 (0.5)	537 (5.2)	0 (0.0)	183 (1.8)	9 (0.1)	668 (6.3)	70 (0.7)	209 (2.0)	2 (0.0)	468 (3.8)
Japan	5,498 (25.9)	253 (1.2)	292 (1.5)	0 (0.0)	131 (0.7)	31 (0.2)	1,249 (6.2)	91 (0.5)	200 (1.0)	5 (0.0)	461 (2.0)
Kenya	105,250 (393.6)	18,068 (65.4)	8,380 (29.7)	6,416 (23.8)	7,065 (25.0)	13,011 (47.8)	6,396 (23.0)	6,363 (22.5)	2,110 (7.5)	5,393 (19.8)	1,280 (5.3)
Madagascar	54,762 (402.5)	7,544 (54.4)	5,011 (34.7)	2,693 (20.6)	1,655 (11.5)	7,075 (51.8)	2,497 (17.7)	2,823 (19.6)	2,479 (17.2)	3,803 (28.2)	660 (5.6)

Europe PMC Funders Author Manuscripts

Location	All Cause	Lower Respiratory Infections	Preterm Birth Complications	Malaria	Neonatal Encephalopathy	Diarrheal Diseases	Congenital Anomalies	Neonatal Sepsis	Other Neonatal	Protein-Energy Malnutrition	Road Injuries
Malaysia	6,067 (58.8)	345 (3.4)	401 (4.2)	2 (0.0)	214 (2.2)	49 (0.5)	1,038 (10.7)	211 (2.2)	244 (2.5)	4 (0.0)	849 (7.5)
Mexico	54,288 (124.4)	4,624 (10.9)	6,280 (15.2)	0 (0.0)	2,850 (6.9)	1,588 (3.7)	10,674 (25.3)	2,975 (7.2)	1,449 (3.5)	1,003 (2.3)	3,735 (7.9)
Morocco	23,976 (180.9)	1,364 (10.3)	5,299 (38.7)	2 (0.0)	2,590 (18.9)	364 (2.7)	2,451 (18.3)	1,789 (13.1)	495 (3.6)	108 (0.8)	1,051 (8.4)
Mozambique	105,323 (624.1)	9,586 (54.9)	4,704 (25.8)	24,578 (145.3)	5,458 (29.9)	5,474 (32.1)	3,596 (20.3)	5,937 (32.6)	3,513 (19.3)	2,706 (15.9)	1,227 (8.6)
Myanmar	44,632 (258.9)	9,227 (54.5)	5,175 (30.9)	2,243 (12.4)	4,685 (28.0)	1,882 (11.0)	3,927 (23.1)	1,980 (11.8)	1,047 (6.2)	170 (1.0)	1,026 (5.4)
Nepal	28,664 (255.5)	4,598 (42.2)	2,536 (23.9)	148 (1.2)	4,123 (38.8)	2,269 (20.2)	1,126 (10.2)	2,349 (22.1)	1,354 (12.7)	416 (3.7)	425 (3.3)
Niger	109,268 (788.9)	15,722 (109.7)	5,545 (34.6)	24,007 (173.7)	4,375 (27.4)	18,851 (136.0)	3,808 (25.8)	3,507 (21.8)	2,081 (13.1)	7,241 (52.8)	1,217 (11.5)
Nigeria	997,325 (856.7)	118,643 (98.6)	61,669 (47.6)	246,283 (213.1)	60,479 (46.7)	47,410 (40.4)	40,960 (33.3)	45,349 (35.1)	18,926 (14.7)	45,785 (39.8)	34,466 (34.2)
Pakistan	416,805 (505.1)	64,527 (78.5)	36,320 (43.6)	1,461 (1.8)	64,388 (77.2)	52,326 (63.9)	17,408 (21.1)	34,161 (41.2)	12,441 (14.9)	4,297 (5.3)	7,434 (9.0)
Peru	16,931 (150.6)	2,399 (21.4)	1,879 (17.1)	2 (0.0)	1,463 (13.3)	382 (3.4)	1,974 (17.8)	1,276 (11.6)	243 (2.2)	323 (2.9)	856 (7.4)
Philippines	86,334 (196.7)	12,350 (28.1)	10,566 (24.0)	51 (0.1)	5,117 (11.6)	3,745 (8.5)	10,053 (22.9)	4,078 (9.3)	3,378 (7.7)	1,225 (2.8)	1,898 (4.4)
Russia	24,697 (83.4)	1,904 (6.2)	1,837 (5.9)	0 (0.0)	993 (3.2)	208 (0.7)	4,508 (14.6)	473 (1.5)	2,326 (7.5)	68 (0.2)	1,852 (6.7)
Saudi Arabia	9,198 (89.0)	200 (1.9)	1,906 (18.4)	2 (0.0)	397 (3.8)	92 (0.9)	2,402 (22.9)	715 (6.9)	208 (2.0)	14 (0.1)	992 (10.0)
South Africa	58,342 (288.2)	6,613 (32.6)	4,371 (21.7)	35 (0.2)	3,251 (16.1)	6,908 (34.0)	2,312 (11.4)	1,772 (8.8)	5,112 (25.3)	1,390 (6.8)	1,274 (6.3)
South Korea	3,210 (31.9)	77 (0.8)	371 (4.3)	0 (0.0)	90 (1.0)	9 (0.1)	439 (4.9)	74 (0.9)	145 (1.7)	1 (0.0)	410 (3.5)
Sudan	70,379 (316.1)	6,750 (30.0)	15,800 (67.9)	4,202 (19.0)	1,628 (7.0)	7,607 (33.5)	10,076 (44.0)	643 (2.8)	2,559 (11.0)	261 (1.2)	1,512 (7.7)
Tanzania	167,958 (517.4)	26,533 (79.1)	8,086 (23.1)	24,870 (76.2)	8,948 (25.5)	11,371 (35.0)	9,743 (28.6)	8,409 (24.0)	6,085 (17.4)	8,386 (25.4)	1,910 (6.6)
Thailand	15,783 (104.2)	1,029 (7.2)	1,669 (13.2)	14 (0.1)	666 (5.3)	156 (1.1)	2,023 (15.4)	579 (4.6)	297 (2.4)	4 (0.0)	2,338 (12.9)
Turkey	30,251 (125.7)	1,638 (6.8)	4,785 (20.7)	0 (0.0)	1,345 (5.8)	290 (1.2)	7,402 (31.6)	1,214 (5.2)	2,185 (9.4)	65 (0.3)	1,637 (6.3)
Uganda	147,277 (545.7)	16,561 (59.9)	10,838 (36.8)	25,022 (93.1)	10,733 (36.4)	9,608 (35.1)	6,433 (22.7)	8,604 (29.2)	4,409 (15.0)	7,606 (27.8)	3,136 (13.7)
United Kingdom	5,498 (37.6)	194 (1.3)	1,164 (8.2)	0 (0.0)	243 (1.7)	55 (0.4)	1,082 (7.5)	77 (0.5)	114 (0.8)	2 (0.0)	390 (2.5)
United States	45,241 (55.4)	846 (1.0)	6,822 (8.8)	0 (0.0)	1,650 (2.1)	174 (0.2)	7,007 (8.9)	806 (1.0)	2,399 (3.1)	19 (0.0)	5,872 (6.8)
Uzbekistan	27,850 (244.5)	9,908 (87.2)	1,673 (14.7)	0 (0.0)	4,454 (39.2)	396 (3.5)	2,248 (19.8)	298 (2.6)	955 (8.4)	6 (0.1)	675 (5.9)
Venezuela	13,132 (116.4)	876 (7.8)	1,418 (12.9)	4 (0.0)	566 (5.1)	494 (4.4)	1,859 (16.7)	733 (6.6)	192 (1.7)	235 (2.1)	1,096 (9.5)
Vietnam	36,163 (132.1)	5,591 (20.8)	5,522 (21.1)	73 (0.3)	2,270 (8.7)	279 (1.0)	4,862 (18.2)	1,053 (4.0)	515 (2.0)	9 (0.0)	3,063 (10.0)
Yemen	46,038 (342.3)	4,377 (32.5)	9,343 (67.7)	3,554 (26.9)	1,391 (10.1)	5,500 (40.7)	6,191 (45.4)	345 (2.5)	2,237 (16.2)	153 (1.1)	1,650 (12.9)

Europe PMC Funders Author Manuscripts

Table 1b

Number of Deaths and Rates (per 100,000) for the Top 10 Global Causes of Death in the Largest 50 Countries by Child and Adolescent Population, Under 5, Both Sexes, 2013

Location	All Cause	Lower Respiratory Infections	Neonatal Preterm Birth	Neonatal Encephalopathy	Malaria	Diarrheal Diseases	Congenital Anomalies	Neonatal Sepsis	Other Neonatal	Protein-Energy Malnutrition	Meningitis
Global	6,279,920 (951.5)	905,059 (137.1)	742,381 (112.5)	643,765 (97.5)	586,844 (88.9)	519,666 (78.7)	495,319 (75.1)	366,041 (55.5)	276,231 (41.9)	225,906 (34.2)	141,952 (21.5)
Developing	6,193,574 (1,055.7)	900,384 (153.5)	726,053 (123.8)	637,629 (108.7)	586,844 (100.0)	518,963 (88.5)	472,671 (80.6)	363,566 (62.0)	268,355 (45.7)	225,796 (38.5)	140,814 (24.0)
Developed	86,346 (117.8)	4,675 (6.4)	16,328 (22.3)	6,136 (8.4)	0 (0.0)	703 (1.0)	22,648 (30.9)	2,476 (3.4)	7,876 (10.7)	110 (0.2)	1,138 (1.6)
Afghanistan	94,721 (1,919.6)	22,657 (459.2)	13,420 (272.0)	4,098 (83.1)	436 (8.8)	11,916 (241.5)	12,203 (247.3)	1,010 (20.5)	6,295 (127.6)	761 (15.4)	4,721 (95.7)
Algeria	22,942 (514.7)	976 (21.9)	6,617 (148.4)	1,945 (43.6)	1 (0.0)	634 (14.2)	4,558 (102.2)	1,671 (37.5)	1,180 (26.5)	340 (7.6)	331 (7.4)
Angola	83,369 (1,950.1)	13,668 (319.7)	4,991 (116.7)	4,577 (107.1)	8,987 (210.2)	9,722 (227.4)	6,307 (147.5)	2,563 (59.9)	3,071 (71.8)	5,229 (122.3)	2,659 (62.2)
Argentina	9,828 (287.0)	644 (18.8)	2,245 (65.6)	483 (14.1)	0 (0.0)	155 (4.5)	2,545 (74.3)	658 (19.2)	523 (15.3)	120 (3.5)	143 (4.2)
Bangladesh	128,228 (843.5)	14,800 (97.3)	19,077 (125.5)	28,412 (186.9)	4 (0.0)	1,718 (11.3)	7,457 (49.1)	13,856 (91.1)	6,537 (43.0)	2,806 (18.5)	1,257 (8.3)
Brazil	54,076 (362.0)	4,255 (28.5)	11,257 (75.4)	5,364 (35.9)	9 (0.1)	1,919 (12.8)	11,246 (75.3)	5,730 (38.4)	3,790 (25.4)	919 (6.2)	816 (5.5)
Cameroon	82,515 (2,234.5)	13,981 (378.6)	6,130 (166.0)	5,709 (154.6)	14,638 (396.4)	7,160 (193.9)	5,411 (146.5)	5,079 (137.5)	1,605 (43.5)	4,376 (118.5)	2,675 (72.4)
China	239,013 (265.1)	26,095 (28.9)	37,467 (41.5)	29,759 (33.0)	11 (0.0)	2,626 (2.9)	50,853 (56.4)	3,675 (4.1)	9,229 (10.2)	1,088 (1.2)	2,789 (3.1)
Colombia	16,332 (362.7)	1,739 (38.6)	2,341 (52.0)	1,166 (25.9)	11 (0.2)	781 (17.3)	3,595 (79.8)	778 (17.3)	767 (17.0)	655 (14.5)	314 (7.0)
Cote d'Ivoire	70,182 (2,162.0)	12,977 (399.8)	6,858 (211.3)	5,778 (178.0)	12,022 (370.4)	6,199 (191.0)	4,394 (135.4)	4,614 (142.1)	1,616 (49.8)	3,527 (108.6)	2,402 (74.0)
Democratic Republic of the Congo	340,416 (2,736.6)	58,309 (468.7)	26,984 (216.9)	16,564 (133.2)	34,629 (278.4)	57,183 (459.7)	19,520 (156.9)	9,836 (79.1)	9,710 (78.1)	32,916 (264.6)	8,985 (72.2)
Egypt	41,267 (447.6)	7,371 (79.9)	5,787 (62.8)	581 (6.3)	1 (0.0)	3,273 (35.5)	12,306 (133.5)	1,042 (11.3)	1,545 (16.8)	173 (1.9)	164 (1.8)
Ethiopia	229,333 (1,615.1)	38,427 (270.6)	20,328 (143.2)	17,243 (121.4)	15,276 (107.6)	22,209 (156.4)	11,763 (82.8)	16,090 (113.3)	10,072 (70.9)	9,603 (67.6)	7,397 (52.1)
France	2,967 (75.3)	50 (1.3)	335 (8.5)	318 (8.1)	0 (0.0)	34 (0.9)	744 (18.9)	111 (2.8)	288 (7.3)	1 (0.0)	31 (0.8)
Germany	2,539 (73.1)	38 (1.1)	658 (18.9)	202 (5.8)	0 (0.0)	12 (0.4)	743 (21.4)	60 (1.7)	133 (3.8)	1 (0.0)	24 (0.7)
Ghana	56,588 (1,537.9)	6,090 (165.5)	6,086 (165.4)	4,806 (130.6)	10,737 (291.8)	2,245 (61.0)	3,219 (87.5)	6,561 (178.3)	1,521 (41.3)	4,888 (132.8)	1,284 (34.9)
India	1,249,673 (1,022.1)	154,884 (126.7)	211,108 (172.7)	212,686 (174.0)	9,453 (7.7)	80,225 (65.6)	69,283 (56.7)	94,299 (77.1)	91,118 (74.5)	19,483 (15.9)	8,659 (7.1)
Indonesia	148,807 (639.9)	28,186 (121.2)	19,396 (83.4)	25,303 (108.8)	129 (0.6)	8,700 (37.4)	12,240 (52.6)	7,381 (31.7)	7,646 (32.9)	1,424 (6.1)	4,968 (21.4)
Iran	27,378 (390.5)	1,645 (23.5)	8,148 (116.2)	1,357 (19.4)	4 (0.1)	647 (9.2)	7,462 (106.4)	327 (4.7)	2,101 (30.0)	70 (1.0)	208 (3.0)
Iraq	29,942 (607.8)	2,900 (58.9)	7,416 (150.5)	1,063 (21.6)	0 (0.0)	1,599 (32.5)	6,018 (122.2)	1,727 (35.1)	1,310 (26.6)	127 (2.6)	673 (13.7)
Italy	2,060 (73.2)	37 (1.3)	537 (19.1)	183 (6.5)	0 (0.0)	8 (0.3)	591 (21.0)	70 (2.5)	209 (7.4)	1 (0.0)	14 (0.5)
Japan	3,158 (58.5)	168 (3.1)	292 (5.4)	131 (2.4)	0 (0.0)	27 (0.5)	1,137 (21.1)	91 (1.7)	200 (3.7)	3 (0.1)	29 (0.5)
Kenya	89,504 (1,244.0)	17,324 (240.8)	8,380 (116.5)	7,065 (98.2)	5,743 (79.8)	11,925 (165.7)	6,146 (85.4)	6,363 (88.4)	2,110 (29.3)	5,062 (70.4)	3,160 (43.9)
Madagascar	45,736 (1,278.3)	6,885 (192.4)	5,011 (140.1)	1,655 (46.3)	1,767 (49.4)	6,345 (177.3)	2,352 (65.8)	2,823 (78.9)	2,479 (69.3)	3,367 (94.1)	1,169 (32.7)

Europe PMC Funders Author Manuscripts

Location	All Cause	Lower Respiratory Infections	Neonatal Preterm Birth	Neonatal Encephalopathy	Malaria	Diarrheal Diseases	Congenital Anomalies	Neonatal Sepsis	Other Neonatal	Protein-Energy Malnutrition	Meningitis
Malaysia	3,349 (133.8)	218 (8.7)	401 (16.0)	214 (8.5)	1 (0.0)	39 (1.5)	951 (38.0)	211 (8.4)	244 (9.8)	3 (0.1)	72 (2.9)
Mexico	38,097 (336.9)	4,249 (37.6)	6,280 (55.5)	2,850 (25.2)	0 (0.0)	1,419 (12.6)	9,837 (87.0)	2,975 (26.3)	1,449 (12.8)	832 (7.4)	247 (2.2)
Morocco	19,441 (567.5)	1,211 (35.3)	5,299 (154.7)	2,590 (75.6)	0 (0.0)	325 (9.5)	2,316 (67.6)	1,789 (52.2)	495 (14.5)	100 (2.9)	326 (9.5)
Mozambique	87,913 (1,940.5)	9,010 (198.9)	4,704 (103.8)	5,458 (120.5)	21,497 (474.5)	4,870 (107.5)	3,431 (75.7)	5,937 (131.0)	3,513 (77.5)	2,480 (54.7)	2,008 (44.3)
Myanmar	34,098 (760.9)	8,691 (193.9)	5,175 (115.5)	4,685 (104.6)	721 (16.1)	1,611 (36.0)	3,459 (77.2)	1,980 (44.2)	1,047 (23.4)	157 (3.5)	560 (12.5)
Nepal	22,241 (754.6)	4,384 (148.7)	2,536 (86.0)	4,123 (139.9)	63 (2.1)	1,897 (64.4)	972 (33.0)	2,349 (79.7)	1,354 (45.9)	323 (11.0)	206 (7.0)
Niger	97,824 (2,669.4)	14,845 (405.1)	5,545 (151.3)	4,375 (119.4)	22,819 (622.7)	17,426 (475.5)	3,579 (97.7)	3,507 (95.7)	2,081 (56.8)	6,799 (185.5)	3,560 (97.2)
Nigeria	892,598 (2,930.4)	113,255 (371.8)	61,669 (202.5)	60,479 (198.6)	235,483 (773.1)	44,743 (146.9)	39,396 (129.3)	45,349 (148.9)	18,926 (62.1)	43,299 (142.2)	18,872 (62.0)
Pakistan	348,496 (1,619.4)	61,669 (286.6)	36,320 (168.8)	64,388 (299.2)	367 (1.7)	48,321 (224.5)	15,729 (73.1)	34,161 (158.7)	12,441 (57.8)	3,367 (15.6)	17,091 (79.4)
Peru	13,209 (446.9)	2,041 (69.1)	1,879 (63.6)	1,463 (49.5)	1 (0.0)	349 (11.8)	1,864 (63.1)	1,276 (43.2)	243 (8.2)	281 (9.5)	149 (5.0)
Philippines	65,074 (564.6)	10,432 (90.5)	10,566 (91.7)	5,117 (44.4)	16 (0.1)	3,287 (28.5)	9,014 (78.2)	4,078 (35.4)	3,378 (29.3)	1,002 (8.7)	1,438 (12.5)
Russia	16,255 (196.2)	1,656 (20.0)	1,837 (22.2)	993 (12.0)	0 (0.0)	203 (2.4)	4,119 (49.7)	473 (5.7)	2,326 (28.1)	47 (0.6)	353 (4.3)
Saudi Arabia	6,775 (241.3)	121 (4.3)	1,906 (67.9)	397 (14.2)	1 (0.0)	81 (2.9)	2,194 (78.1)	715 (25.5)	208 (7.4)	10 (0.4)	17 (0.6)
South Africa	40,647 (758.0)	6,061 (113.0)	4,371 (81.5)	3,251 (60.6)	21 (0.4)	6,510 (121.4)	2,201 (41.0)	1,772 (33.0)	5,112 (95.3)	1,352 (25.2)	574 (10.7)
South Korea	1,764 (76.0)	55 (2.4)	371 (16.0)	90 (3.9)	0 (0.0)	7 (0.3)	397 (17.1)	74 (3.2)	145 (6.2)	0 (0.0)	10 (0.4)
Sudan	59,503 (993.6)	6,046 (101.0)	15,800 (263.8)	1,628 (27.2)	3,446 (57.5)	7,173 (119.8)	9,553 (159.5)	643 (10.7)	2,559 (42.7)	237 (4.0)	1,007 (16.8)
Tanzania	145,246 (1,680.0)	25,290 (292.5)	8,086 (93.5)	8,948 (103.5)	22,604 (261.5)	9,951 (115.1)	9,411 (108.9)	8,409 (97.3)	6,085 (70.4)	7,967 (92.1)	3,593 (41.6)
Thailand	7,675 (213.8)	680 (18.9)	1,669 (46.5)	666 (18.5)	5 (0.1)	113 (3.1)	1,823 (50.8)	579 (16.1)	297 (8.3)	2 (0.1)	83 (2.3)
Turkey	22,002 (350.5)	1,273 (20.3)	4,785 (76.2)	1,345 (21.4)	0 (0.0)	253 (4.0)	7,014 (111.7)	1,214 (19.3)	2,185 (34.8)	43 (0.7)	210 (3.3)
Uganda	127,340 (1,773.3)	15,339 (213.6)	10,838 (150.9)	10,733 (149.5)	22,449 (312.6)	8,776 (122.2)	6,153 (85.7)	8,604 (119.8)	4,409 (61.4)	7,176 (99.9)	4,906 (68.3)
United Kingdom	3,785 (98.9)	158 (4.1)	1,164 (30.4)	243 (6.3)	0 (0.0)	50 (1.3)	969 (25.3)	77 (2.0)	114 (3.0)	1 (0.0)	56 (1.5)
United States	28,013 (133.1)	627 (3.0)	6,822 (32.4)	1,650 (7.8)	0 (0.0)	150 (0.7)	6,350 (30.2)	806 (3.8)	2,399 (11.4)	14 (0.1)	238 (1.1)
Uzbekistan	22,318 (742.7)	9,217 (306.8)	1,673 (55.7)	4,454 (148.2)	0 (0.0)	376 (12.5)	2,121 (70.6)	298 (9.9)	955 (31.8)	4 (0.1)	214 (7.1)
Venezuela	7,973 (268.9)	763 (25.7)	1,418 (47.8)	566 (19.1)	2 (0.1)	465 (15.7)	1,675 (56.5)	733 (24.7)	192 (6.5)	210 (7.1)	117 (4.0)
Vietnam	26,628 (370.8)	5,321 (74.1)	5,522 (76.9)	2,270 (31.6)	23 (0.3)	222 (3.1)	4,411 (61.4)	1,053 (14.7)	515 (7.2)	6 (0.1)	230 (3.2)
Yemen	38,030 (1,083.1)	3,879 (110.5)	9,343 (266.1)	1,391 (39.6)	2,645 (75.3)	5,177 (147.4)	5,883 (167.5)	345 (9.8)	2,237 (63.7)	138 (3.9)	708 (20.2)

Europe PMC Funders Author Manuscripts

Table 2

Number of Prevalent Cases and Age-standardized Rates (%) for the Largest 50 Countries by Child and Adolescent Population, Ages 0 to 19, Both Sexes, 2013 for the Top 10 Global Causes of YLDs in Children and Adolescents

Location	Iron Deficiency Anemia	Skin Diseases	Depressive Disorders	Low Back and Neck Pain	Conduct Disorder	Sense Organ Diseases	Diarrheal Diseases	Anxiety Disorders	Migraine	Hemoglobinopathies
Global	619,605,056 (25.1)	660,642,176 (26.8)	38,112,752 (1.5)	55,550,072 (2.2)	47,630,912 (1.9)	171,179,648 (6.9)	32,115,848 (1.3)	54,400,176 (2.2)	135,462,464 (5.5)	686,931,456 (27.8)
Developing	559,020,288 (25.6)	579,689,344 (26.7)	32,712,120 (1.5)	44,444,064 (2.0)	41,606,516 (1.9)	155,748,528 (7.2)	31,785,562 (1.4)	44,414,392 (2.1)	118,650,488 (5.5)	639,235,968 (29.3)
Developed	60,592,520 (21.3)	80,951,928 (27.5)	5,400,086 (1.8)	11,102,756 (3.7)	6,024,180 (2.0)	15,434,175 (5.4)	332,252 (0.1)	9,983,493 (3.4)	16,811,666 (5.7)	47,716,020 (16.6)
Afghanistan	7,332,846 (41.0)	4,238,545 (24.9)	63,781 (0.4)	315,433 (1.9)	440,995 (2.6)	1,239,438 (6.9)	376,116 (2.0)	450,584 (2.7)	772,277 (4.6)	4,566,996 (25.5)
Algeria	3,441,017 (24.1)	3,470,004 (25.8)	201,336 (1.5)	236,100 (1.8)	334,774 (2.6)	930,226 (6.6)	261,559 (1.6)	351,731 (2.7)	591,396 (4.5)	2,388,454 (16.8)
Angola	2,713,103 (21.3)	3,875,611 (32.4)	269,830 (2.5)	190,895 (1.8)	226,593 (2.1)	1,270,567 (10.3)	333,494 (2.2)	155,545 (1.5)	488,563 (4.4)	5,490,424 (43.2)
Argentina	2,160,695 (16.2)	3,761,645 (27.3)	227,945 (1.6)	339,210 (2.4)	278,913 (2.0)	691,635 (5.1)	3,179 (0.0)	603,244 (4.4)	275,705 (2.0)	2,012,420 (15.0)
Bangladesh	20,854,394 (33.4)	16,710,643 (25.5)	1,233,841 (1.9)	2,151,134 (3.2)	1,209,422 (1.8)	3,802,958 (6.0)	646,328 (1.1)	2,042,371 (3.1)	5,743,748 (8.7)	17,882,126 (28.4)
Brazil	7,029,418 (11.1)	19,921,510 (28.8)	1,259,185 (1.8)	2,443,170 (3.4)	1,634,301 (2.3)	6,052,039 (9.2)	581,602 (1.0)	3,586,669 (5.1)	2,995,137 (4.3)	16,326,374 (25.0)
Cameroon	2,827,804 (22.6)	2,398,197 (21.3)	190,652 (1.8)	209,882 (2.0)	227,608 (2.1)	1,032,729 (8.8)	250,795 (1.9)	227,137 (2.1)	541,121 (4.9)	4,793,160 (39.9)
China	75,771,496 (22.6)	96,197,600 (27.4)	2,265,622 (0.6)	7,576,406 (2.1)	5,283,304 (1.5)	19,313,980 (5.7)	2,186,853 (0.6)	3,939,810 (1.1)	6,980,461 (2.0)	66,767,232 (19.5)
Colombia	2,612,874 (14.8)	3,317,298 (18.4)	361,618 (2.0)	410,055 (2.2)	418,405 (2.3)	1,382,299 (7.7)	213,754 (1.2)	745,607 (4.1)	606,699 (3.3)	4,254,938 (23.9)
Cote d'Ivoire	2,869,279 (26.2)	2,764,364 (27.2)	181,328 (1.9)	167,405 (1.7)	204,280 (2.1)	1,008,279 (9.7)	233,121 (2.0)	203,593 (2.1)	482,507 (4.9)	5,860,560 (55.1)
Democratic Republic of the Congo	12,028,243 (30.4)	11,787,841 (32.5)	810,434 (2.4)	541,768 (1.7)	699,967 (2.1)	4,720,162 (12.8)	981,748 (2.2)	483,213 (1.5)	1,481,869 (4.4)	18,834,114 (49.3)
Egypt	9,012,794 (27.1)	7,656,056 (23.8)	370,386 (1.2)	1,190,205 (3.7)	825,220 (2.6)	2,364,621 (7.2)	510,698 (1.5)	749,422 (2.3)	1,505,614 (4.7)	10,056,616 (30.4)
Ethiopia	11,906,531 (22.7)	18,870,550 (37.1)	1,458,751 (3.0)	703,566 (1.5)	1,027,051 (2.1)	4,496,158 (8.9)	767,576 (1.4)	1,225,066 (2.5)	1,132,576 (2.3)	14,459,131 (28.3)
France	3,162,781 (20.6)	5,085,942 (32.5)	302,551 (1.9)	624,919 (4.0)	391,268 (2.5)	853,257 (5.5)	6,555 (0.0)	833,962 (5.3)	995,247 (6.3)	2,131,999 (13.8)
Germany	3,159,099 (22.0)	4,599,480 (29.7)	223,628 (1.4)	1,010,594 (6.3)	390,249 (2.5)	869,605 (5.9)	6,245 (0.0)	707,790 (4.5)	897,465 (5.7)	2,352,558 (16.1)
Ghana	3,279,134 (25.3)	2,446,959 (20.2)	269,538 (2.3)	173,416 (1.5)	248,948 (2.1)	1,073,870 (8.6)	135,822 (1.0)	245,960 (2.1)	579,341 (4.8)	5,862,193 (46.3)
India	147,866,688 (30.8)	144,154,592 (29.3)	7,943,998 (1.6)	9,226,282 (1.9)	9,112,211 (1.8)	32,171,082 (6.7)	10,306,493 (2.2)	9,776,147 (2.0)	45,574,424 (9.2)	165,971,520 (34.4)
Indonesia	23,082,472 (24.7)	19,602,020 (20.9)	604,057 (0.7)	1,232,236 (1.3)	1,418,120 (1.5)	7,193,820 (7.7)	1,007,852 (1.1)	993,326 (1.1)	4,704,706 (5.0)	25,875,604 (27.7)
Iran	5,400,623 (22.1)	5,761,539 (23.8)	425,132 (1.7)	660,969 (2.7)	610,969 (2.6)	1,510,187 (6.2)	430,757 (1.7)	642,066 (2.7)	1,193,648 (4.9)	6,171,506 (25.2)
Iraq	4,657,270 (26.9)	3,741,314 (22.9)	238,071 (1.5)	294,504 (1.9)	478,578 (2.9)	1,133,282 (6.6)	270,184 (1.5)	919,248 (5.6)	786,549 (4.9)	5,514,278 (32.2)
Italy	2,208,197 (19.3)	3,802,988 (31.9)	172,715 (1.4)	550,715 (4.5)	297,079 (2.5)	800,834 (6.9)	5,442 (0.0)	455,132 (3.8)	1,253,207 (10.5)	2,877,173 (25.0)
Japan	5,947,348 (27.2)	5,647,052 (24.5)	292,760 (1.2)	592,367 (2.5)	476,060 (2.0)	831,355 (3.8)	9,719 (0.0)	381,128 (1.6)	1,011,451 (4.3)	1,959,192 (8.8)
Kenya	4,945,485 (19.6)	6,308,646 (28.5)	685,965 (3.3)	350,701 (1.7)	439,564 (2.1)	2,096,825 (9.2)	340,966 (1.3)	319,931 (1.5)	702,950 (3.3)	10,051,371 (42.9)
Madagascar	3,398,545 (27.1)	2,534,052 (21.5)	361,294 (3.2)	160,125 (1.4)	238,143 (2.1)	1,221,466 (10.2)	179,199 (1.3)	179,241 (1.6)	280,226 (2.4)	4,636,076 (37.9)

Europe PMC Funders Author Manuscripts

Location	Iron Deficiency Anemia	Skin Diseases	Depressive Disorders	Low Back and Neck Pain	Conduct Disorder	Sense Organ Diseases	Diarrheal Diseases	Anxiety Disorders	Migraine	Hemoglobinopathies
Malaysia	1,658,848 (16.2)	2,250,309 (20.4)	81,936 (0.7)	149,345 (1.3)	166,296 (1.5)	575,626 (5.4)	21,918 (0.2)	285,860 (2.5)	383,955 (3.4)	2,533,710 (24.0)
Mexico	8,608,476 (18.5)	9,144,078 (19.1)	1,029,133 (2.1)	888,059 (1.8)	1,116,740 (2.3)	3,292,484 (7.0)	497,630 (1.1)	1,160,518 (2.4)	1,674,620 (3.4)	6,700,752 (14.4)
Morocco	3,020,575 (24.8)	3,683,524 (29.9)	169,903 (1.4)	340,260 (2.7)	314,774 (2.6)	891,072 (7.3)	202,905 (1.6)	326,990 (2.7)	527,746 (4.2)	3,517,012 (28.7)
Mozambique	3,569,652 (23.4)	2,923,215 (21.4)	376,918 (2.9)	166,509 (1.4)	269,505 (2.1)	1,319,990 (9.4)	195,956 (1.2)	200,002 (1.6)	371,252 (2.9)	4,984,920 (34.3)
Myanmar	3,749,215 (21.0)	3,763,255 (20.3)	123,529 (0.6)	229,676 (1.2)	281,221 (1.5)	1,579,330 (8.7)	105,457 (0.6)	204,372 (1.1)	911,798 (4.8)	6,276,282 (34.7)
Nepal	3,896,646 (31.0)	3,042,602 (23.2)	135,016 (1.0)	421,234 (3.2)	242,823 (1.8)	693,879 (5.4)	179,090 (1.5)	286,757 (2.2)	1,148,806 (8.6)	1,912,174 (15.0)
Niger	3,522,047 (30.9)	2,410,055 (25.6)	170,336 (2.0)	111,350 (1.4)	188,449 (2.1)	999,215 (9.8)	322,986 (2.5)	186,776 (2.1)	448,099 (4.9)	4,482,896 (41.9)
Nigeria	24,720,332 (24.9)	25,323,874 (29.4)	1,481,373 (1.8)	2,477,954 (3.1)	1,745,272 (2.1)	6,919,968 (7.6)	1,300,393 (1.2)	1,690,025 (2.0)	4,178,561 (4.9)	53,729,512 (56.8)
Pakistan	22,113,446 (27.1)	25,429,536 (30.8)	1,214,347 (1.5)	1,469,120 (1.8)	1,511,480 (1.8)	5,118,624 (6.3)	1,594,437 (2.0)	1,765,968 (2.1)	6,745,028 (8.2)	16,630,634 (20.3)
Peru	2,627,255 (22.8)	2,322,444 (19.6)	242,315 (2.0)	223,803 (1.9)	276,890 (2.3)	919,818 (7.9)	191,123 (1.7)	359,244 (3.0)	915,026 (7.7)	1,480,244 (12.7)
Philippines	11,150,432 (25.4)	9,307,344 (21.3)	275,411 (0.6)	1,026,651 (2.4)	659,048 (1.5)	3,972,324 (9.1)	381,269 (0.9)	463,169 (1.1)	2,098,499 (4.8)	8,347,250 (19.1)
Russia	6,090,342 (21.2)	4,833,236 (17.8)	523,996 (2.0)	636,408 (2.4)	547,980 (2.1)	1,796,431 (6.4)	90,226 (0.3)	494,719 (1.9)	1,971,138 (7.4)	3,447,237 (12.2)
Saudi Arabia	2,286,151 (21.5)	3,204,233 (32.4)	192,765 (1.9)	264,819 (2.7)	263,068 (2.6)	758,576 (7.3)	170,280 (1.6)	258,739 (2.6)	483,857 (4.9)	4,540,608 (43.4)
South Africa	5,159,018 (25.5)	5,397,856 (26.7)	348,786 (1.7)	408,048 (2.0)	415,093 (2.1)	1,726,566 (8.5)	241,299 (1.2)	672,602 (3.3)	890,644 (4.4)	2,835,948 (14.0)
South Korea	2,875,140 (28.0)	2,955,092 (24.9)	122,304 (0.9)	498,049 (3.8)	247,234 (2.1)	446,216 (4.2)	4,425 (0.0)	255,656 (2.1)	974,364 (7.9)	843,204 (7.9)
Sudan	6,138,748 (30.6)	4,588,169 (24.5)	223,781 (1.2)	473,051 (2.6)	473,888 (2.6)	1,502,186 (7.6)	412,693 (1.9)	490,279 (2.7)	902,967 (4.9)	4,400,068 (22.1)
Tanzania	6,867,952 (23.8)	7,587,108 (30.1)	751,729 (3.2)	320,849 (1.4)	499,204 (2.1)	2,059,415 (7.8)	430,098 (1.4)	370,869 (1.6)	653,218 (2.7)	9,701,801 (35.6)
Thailand	2,218,648 (13.7)	3,950,348 (22.3)	125,973 (0.7)	176,500 (0.9)	271,934 (1.5)	1,121,922 (6.7)	84,203 (0.6)	195,711 (1.1)	1,419,518 (7.8)	5,687,484 (34.2)
Turkey	6,251,246 (24.6)	8,073,130 (30.5)	387,904 (1.5)	873,888 (3.3)	680,494 (2.6)	1,503,149 (5.9)	407,041 (1.7)	734,689 (2.8)	1,997,641 (7.5)	5,650,598 (22.1)
Uganda	3,970,910 (16.1)	4,647,124 (22.2)	622,216 (3.2)	308,970 (1.6)	410,578 (2.1)	1,886,161 (8.7)	475,153 (1.8)	313,328 (1.6)	602,755 (3.1)	8,473,717 (37.8)
United Kingdom	2,966,546 (20.3)	5,018,414 (33.1)	181,497 (1.2)	648,266 (4.2)	376,388 (2.5)	819,044 (5.5)	6,741 (0.0)	390,157 (2.6)	924,021 (6.1)	2,619,553 (17.7)
United States	15,992,132 (19.3)	26,350,414 (30.7)	2,050,206 (2.4)	3,241,876 (3.7)	1,375,879 (1.6)	4,037,732 (4.8)	33,152 (0.0)	3,987,614 (4.6)	2,809,268 (3.2)	18,102,976 (21.6)
Uzbekistan	2,272,136 (20.4)	1,762,122 (15.4)	203,936 (1.7)	198,432 (1.7)	235,947 (2.1)	736,265 (6.5)	57,520 (0.5)	230,302 (2.0)	878,042 (7.7)	1,637,579 (14.5)
Venezuela	1,438,655 (12.6)	2,340,201 (20.4)	224,245 (1.9)	221,679 (1.9)	265,702 (2.3)	796,519 (7.0)	115,015 (1.0)	275,549 (2.4)	446,818 (3.9)	2,337,759 (20.5)
Vietnam	7,160,936 (25.5)	6,063,204 (20.7)	235,859 (0.8)	509,638 (1.7)	442,505 (1.5)	1,831,238 (6.4)	348,806 (1.3)	219,648 (0.7)	1,477,531 (4.9)	6,972,515 (24.4)
Yemen	5,108,383 (39.8)	3,214,463 (25.4)	49,653 (0.4)	190,046 (1.5)	338,034 (2.7)	869,423 (6.8)	216,751 (1.6)	335,131 (2.7)	600,865 (4.8)	3,989,276 (31.1)