

## RAPID HEALTH TRANSITIONS: GBD 2010 RESULTS

In most countries in South Asia, years of healthy life lost due to premature death and disability, or DALYs, from non-communicable diseases are increasing, while DALYs from communicable, newborn, nutritional, and maternal causes are decreasing. To help decision-makers establish health service priorities within countries with limited resources, in this section we will explore changes in disease burden around the globe, in South Asia, and in specific countries. In the next section, we will compare how well countries are performing in health relative to other countries in South Asia using a metric called age-standardized rates.

In terms of disease burden at the global level, GBD 2010 found that the leading causes of DALYs have evolved dramatically over the past 20 years. Figure 1 shows the changes in the global leading causes of DALYs from 1990 to 2010. Communicable, newborn, maternal, and nutritional causes are shown in red, non-communicable diseases appear in blue, and injuries are shown in green. Dotted lines indicate causes that fell in rank during this period, while solid lines signal causes that rose in rank.

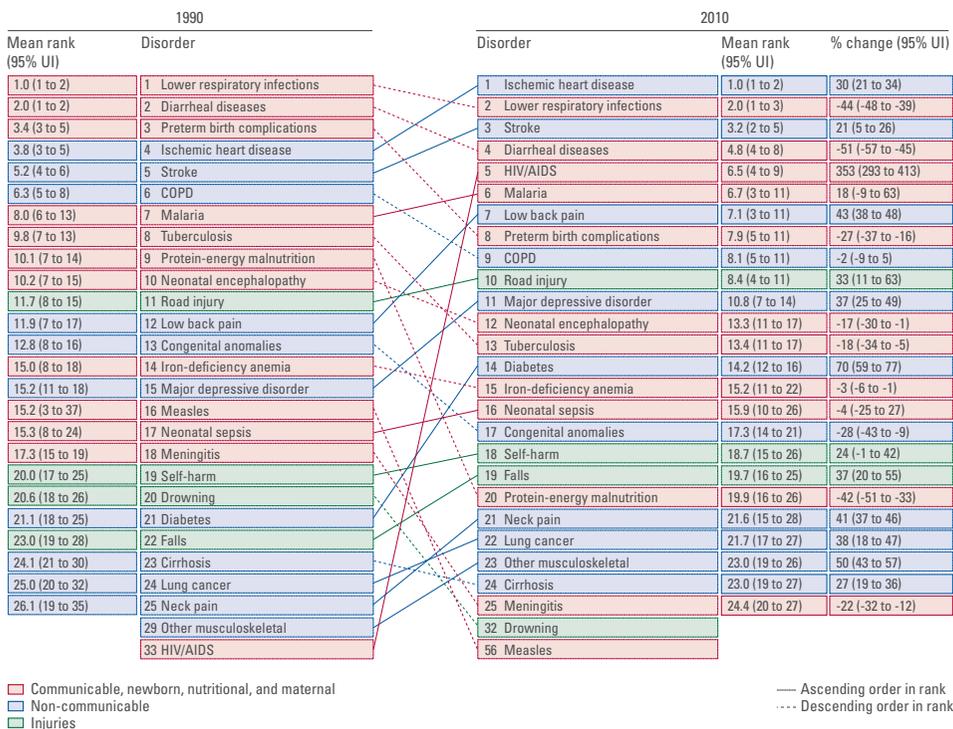
Causes associated with ill health and death in adults, such as ischemic heart disease, stroke, and low back pain, increased in rank between 1990 and 2010, while causes that primarily affect children, such as lower respiratory infections, diarrhea, preterm birth complications, and protein-energy malnutrition, decreased in rank. Unlike most of the leading communicable causes, HIV/AIDS and malaria increased by 353% and 18%, respectively. Since 2005, however, premature mortality and disability from these two causes have begun to decline. Four main trends have driven changes in the leading causes of DALYs globally: aging populations, increases in non-communicable diseases, shifts toward disabling causes and away from fatal causes, and changes in risk factors.

To provide a closer look at the epidemiological changes occurring at the regional level, Figure 2 shows how the leading causes of premature death and disability have changed over time in South Asia. Figures showing changes in the leading causes of DALYs by country can be found in the Annex of this report. The region shares three of the top five causes of health loss globally for 2010, with lower respiratory infections, diarrheal diseases, and ischemic heart disease ranking as the first, third, and fourth highest disease burdens, respectively. The disease burdens in the Maldives and Sri Lanka more closely resembled those of high-income countries, such that more non-communicable causes like ischemic heart disease, major depressive disorder, and stroke were among the leading five causes of premature death and disability. At the same time, each country had a fairly distinct leading disease

burden in 2010: for example, self-harm was the second-greatest health burden in Sri Lanka, and iron-deficiency anemia was the third-largest driver of health loss in the Maldives.

Most communicable, newborn, maternal, and nutritional causes of DALYs dropped in rank in South Asia, and most non-communicable causes rose in rank, both of which mirror global trends. At the same time, certain communicable diseases were much more prominent causes of premature death and disability globally than in South Asia, as well as vice versa. HIV/AIDS and malaria ranked as the fifth- and sixth-largest contributors, respectively, to disease burdens worldwide in 2010 but ranked as 17th and 45th, respectively, in South Asia. Globally, the relative malaria burden has increased since 1990 (from seventh to sixth), whereas health loss from

**Figure 1: Global disability-adjusted life year ranks, top 25 causes, and percentage change, 1990-2010**



*Note: Solid lines indicate a cause that has moved up in rank or stayed the same. Broken lines indicate a cause that has moved down in rank. The causes of DALYs are color coded, with blue for non-communicable diseases, green for injuries, and red for communicable, newborn, nutritional, and maternal causes of DALYs. COPD: Chronic obstructive pulmonary disease. To view an interactive version of this figure, visit IHME's website: <http://ihmeuw.org/gbdarrowdiagram>.*

malaria has dramatically plummeted in South Asia, ranking 19th in 1990 and dropping by 66% 20 years later. On the other hand, preterm birth complications ranked second in South Asia but ranked eighth globally in 2010. Increasing health loss from injuries between 1990 and 2010 was documented both globally and for South Asia, but disease burdens from road injury, self-harm, and falls rose much higher in South Asia than they did globally.

Overall, communicable, newborn, maternal, and nutritional health burdens declined similarly globally and in South Asia between 1990 and 2010. Globally, DALYs caused by diarrheal diseases, preterm birth complications, and lower respiratory infections fell by 51%, 27%, and 44%, respectively. For the same conditions in South Asia, declines of 55%, 31%, and 44% were recorded. Similarly, nearly all non-communicable

**Figure 2: Disability-adjusted life year ranks, top 25 causes, and percentage change in South Asia, 1990-2010**

1990		2010		
Mean rank (95% UI)	Disorder	Disorder	Mean rank (95% UI)	% change (95% UI)
1.0 (1 to 2)	1 Diarrheal diseases	1 Lower respiratory infections	1.7 (1 to 3)	-44 (-50 to -35)
2.0 (1 to 2)	2 Lower respiratory infections	2 Preterm birth complications	2.3 (1 to 5)	-31 (-47 to -12)
3.0 (3 to 4)	3 Preterm birth complications	3 Diarrheal diseases	2.6 (1 to 5)	-55 (-63 to -45)
5.5 (4 to 8)	4 Tuberculosis	4 Ischemic heart disease	4.3 (3 to 6)	73 (47 to 92)
5.9 (4 to 9)	5 COPD	5 COPD	4.4 (2 to 6)	16 (3 to 32)
6.8 (4 to 10)	6 Protein-energy malnutrition	6 Neonatal encephalopathy	7.4 (6 to 11)	-12 (-36 to 31)
7.0 (4 to 12)	7 Neonatal sepsis	7 Tuberculosis	8.2 (6 to 13)	-25 (-45 to -7)
7.2 (4 to 10)	8 Neonatal encephalopathy	8 Neonatal sepsis	8.8 (3 to 15)	-21 (-48 to 24)
9.5 (5 to 12)	9 Iron-deficiency anemia	9 Iron-deficiency anemia	9.2 (6 to 14)	-3 (-5 to -2)
10.1 (8 to 12)	10 Ischemic heart disease	10 Road injury	9.7 (6 to 14)	58 (26 to 138)
13.2 (3 to 36)	11 Measles	11 Low back pain	10.6 (6 to 15)	63 (48 to 81)
13.5 (11 to 17)	12 Meningitis	12 Stroke	11.8 (9 to 14)	54 (28 to 73)
13.8 (9 to 22)	13 Tetanus	13 Self-harm	12.5 (8 to 19)	134 (18 to 208)
14.2 (11 to 18)	14 Congenital anomalies	14 Major depressive disorder	13.1 (8 to 17)	58 (16 to 111)
15.5 (12 to 20)	15 Road injury	15 Congenital anomalies	15.4 (12 to 19)	-1 (-27 to 32)
16.9 (12 to 22)	16 Maternal disorders	16 Diabetes	16.7 (14 to 20)	104 (72 to 126)
17.2 (12 to 24)	17 Low back pain	17 HIV/AIDS	18.6 (15 to 24)	4,753 (642 to 9,020)
17.2 (14 to 20)	18 Stroke	18 Protein-energy malnutrition	19.2 (14 to 24)	-62 (-71 to -52)
19.2 (12 to 26)	19 Malaria	19 Fire	20.0 (14 to 30)	18 (-26 to 80)
20.0 (13 to 27)	20 Major depressive disorder	20 Falls	20.5 (16 to 26)	60 (19 to 99)
20.7 (17 to 25)	21 Drowning	21 Meningitis	21.3 (17 to 25)	-31 (-43 to -14)
22.5 (19 to 27)	22 Fire	22 Cirrhosis	21.6 (17 to 28)	73 (25 to 109)
23.1 (19 to 27)	23 Encephalitis	23 Migraine	24.4 (18 to 32)	61 (38 to 87)
24.5 (18 to 28)	24 Self-harm	24 Drowning	24.5 (18 to 29)	-19 (-33 to 15)
25.0 (16 to 33)	25 Asthma	25 Asthma	25.1 (17 to 31)	1 (-15 to 25)
	26 Falls	28 Maternal disorders		
	28 Diabetes	29 Encephalitis		
	31 Cirrhosis	32 Measles		
	32 Migraine	45 Malaria		
	122 HIV/AIDS	56 Tetanus		

■ Communicable, newborn, nutritional, and maternal  
■ Non-communicable  
■ Injuries

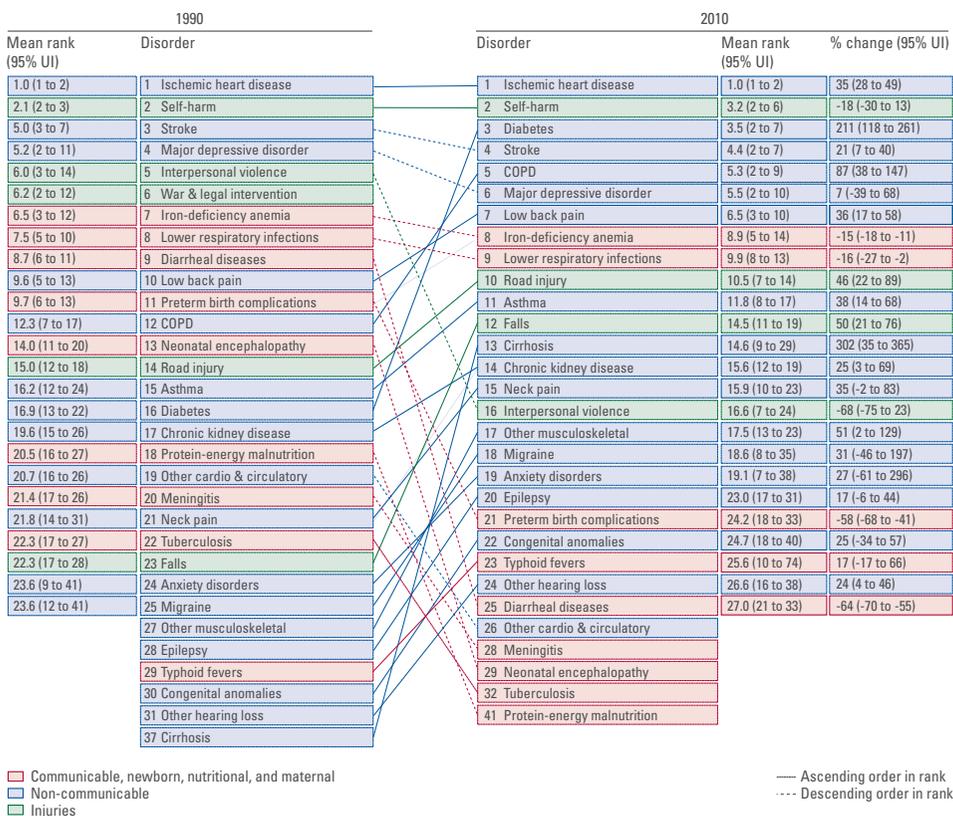
— Ascending order in rank  
 - - - Descending order in rank

*Note: Solid lines indicate a cause that has moved up in rank or stayed the same. Broken lines indicate a cause that has moved down in rank. The causes of DALYs are color coded, with blue for non-communicable diseases, green for injuries, and red for communicable, newborn, nutritional, and maternal causes.*

diseases increased globally and in South Asia from 1990 to 2010. Between 1990 and 2010, ischemic heart disease increased by 73% and moved from 10th to fourth place in South Asia. While the global ranking for ischemic heart disease rose from fourth to first between 1990 and 2010, its relative burden increased at a much slower rate (30%) than it did in South Asia. Diabetes rose 70% worldwide, from 21st in 1990 to 14th in 2010. In South Asia, however, the health loss due to diabetes escalated much faster, from 28th in 1990 to 16th in 2010, representing a 104% increase over the 20-year period.

Figure 3 shows changes in the leading causes of premature death and disability in Sri Lanka, which differs from both global and regional trends in many ways. Unlike DALY trends found worldwide and in South Asia, non-communicable diseases have

**Figure 3: Disability-adjusted life year ranks, top 25 causes, and percentage change in Sri Lanka, 1990-2010**



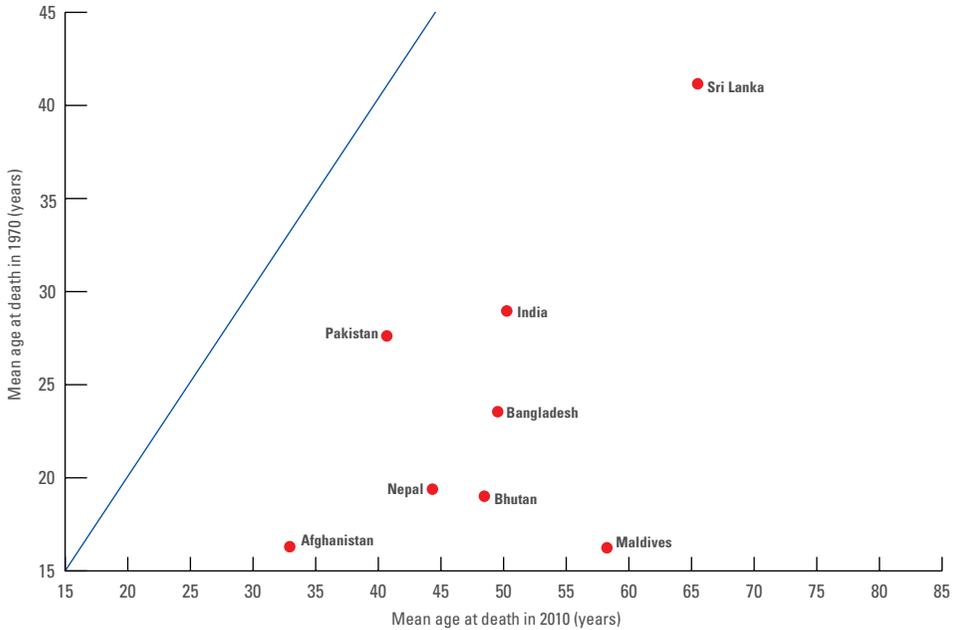
*Note: Solid lines indicate a cause that has moved up in rank or stayed the same. Broken lines indicate a cause that has moved down in rank. The causes of DALYs are color coded, with blue for non-communicable diseases, green for injuries, and red for communicable, newborn, nutritional, and maternal causes. To view an interactive version of this figure, visit IHME's website: <http://ihmeuw.org/gbdarrowdiagram>.*

been dominant causes of death in Sri Lanka over the last 20 years, which suggests that Sri Lanka is in a more advanced phase of epidemiologic transition than most of the South Asia region. Epidemiological transition is defined by a progression towards non-communicable diseases replacing communicable, newborn, maternal, and nutritional causes as the leading drivers of disease burden. The relative burdens of these non-communicable diseases have increased substantially from 1990 to 2010 (e.g., a 35% increase in DALYs from ischemic heart disease, the leading cause of health loss in both 1990 and 2010). Like the rest of the South Asia region, Sri Lanka saw substantial reductions in health loss from diarrheal diseases and preterm birth complications between 1990 and 2010 ranking ninth and 11th, respectively, in 1990 and 25th and 21st, respectively, in 2010. In contrast, diarrheal diseases and preterm birth complications both have steadfastly remained among the top three causes in South Asia over the last two decades. The health burdens associated with interpersonal violence and war in Sri Lanka dramatically dropped from 1990 to 2010, reflecting the end of a 26-year-long conflict that began in 1983.

## **MOST OF THE WORLD'S POPULATION IS LIVING LONGER AND DYING AT LOWER RATES**

In much of the world, GBD 2010 found that people are living to older ages than ever before, and the entire population is getting older. Since 1970, the average age of death has increased 20 years globally. Dramatic changes have occurred during this period in Asia, Latin America, and the Middle East, where the average age of death increased by 30 years or more. Sub-Saharan Africa, however, has not made nearly as much progress as other developing regions, and people in this part of the world tend to die at much younger ages than in any other region. Progress in sub-Saharan Africa has in particular been held back by the HIV/AIDS epidemic, maternal deaths, and child mortality caused by infectious diseases and malnutrition, but some of these trends have begun to change in the past decade.

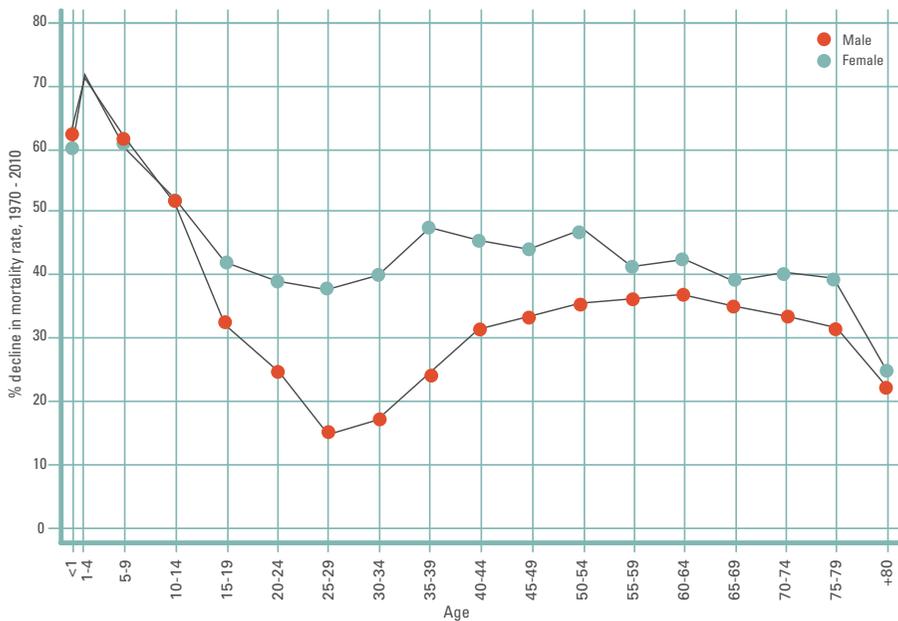
South Asia made much progress in increasing its average age at death between 1970 and 2010 (Figure 4), achieving an average gain of about 25 years in each country. However, substantial variation existed within the region: the Maldives showed the greatest gain (about 42 years), and the more conflict-ravaged countries of Afghanistan and Pakistan showed the least at about 17 and 13 years, respectively. The rest of the countries in South Asia posted gains between 21 years (India) and just under 30 years (Bhutan) between 1970 and 2010.

**Figure 4: Average age of death for countries in South Asia, 1970 compared with 2010**

*Note: Countries falling on the right side of the 45-degree-angle line had a greater average age of death in 2010 than in 1970.*

Yet another way to understand changes in global demographic trends is to explore reductions in mortality rates by sex and age group. Figure 5 shows how global death rates declined in all age groups between 1970 and 2010. These changes have been most dramatic among males and females aged 0 to 9 years, whose death rates have dropped over 60% since 1970. Among age groups 15 and older, the decrease in female death rates since 1970 has been greater than the drop in male death rates. The gap in progress between men and women was largest between the ages of 15 to 54, most likely due to the persistence of higher mortality from injuries, as well as alcohol and tobacco use, among men.

Figure 6 showcases the same age-specific mortality trends in South Asia from 1970 to 2010. Similar to global trends, the largest improvements in mortality rates was seen among both males and females between the ages of 0 and 9, with death rates declining over 60% since 1970. The most pronounced decreases were among children aged 1 to 4 years old, posting a decline of over 80% since 1970. Akin to the gender divide seen at the global level, beyond the age of 15, female death rates improved far more than male death rates in South Asia. The greatest absolute difference was seen between the ages of 25 to 39.

**Figure 5: Global decline in age-specific mortality rate, 1970-2010**

Note: Higher values indicate greater declines in mortality; lower values indicate smaller declines in mortality.

**Figure 6: Decline in age-specific mortality rate in South Asia, 1970-2010**

Note: Higher values indicate greater declines in mortality; lower values indicate smaller declines in mortality.

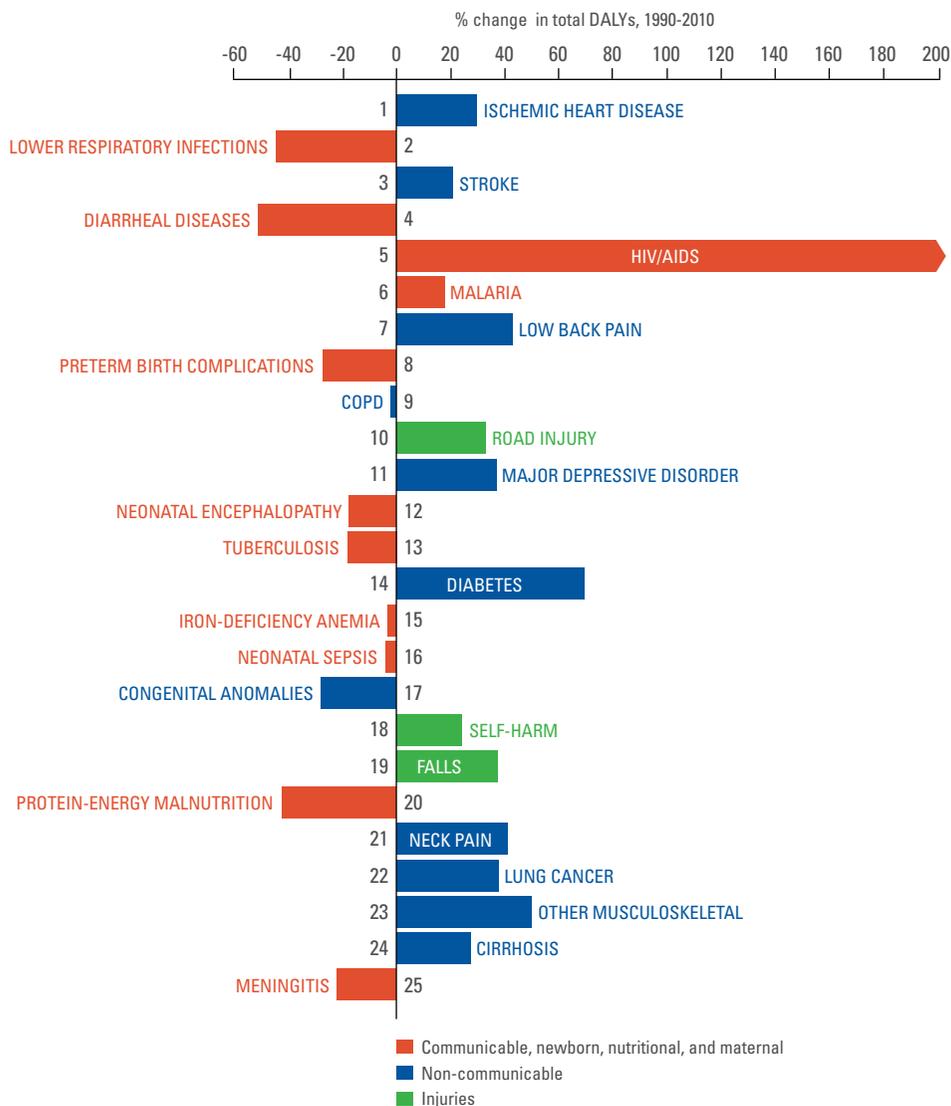
## LEADING CAUSES OF DEATH ARE SHIFTING TO NON-COMMUNICABLE DISEASES

In part because many people are living longer lives and the population is growing older, the leading causes of death have changed. Worldwide, the number of people dying from non-communicable diseases, such as ischemic heart disease and diabetes, has grown 30% since 1990. To a lesser extent, overall population growth also contributed to this increase in deaths from non-communicable diseases.

The rise in the total number of deaths from non-communicable diseases has increased the number of healthy years lost, or DALYs, from these conditions. Figure 7 shows global changes in the 25 leading causes of DALYs between 1990 and 2010 ordered from highest- to lowest-ranking cause from top to bottom. Figure 7 shows that among non-communicable diseases, diabetes and low back pain and other musculoskeletal disorders increased the most between 1990 and 2010.

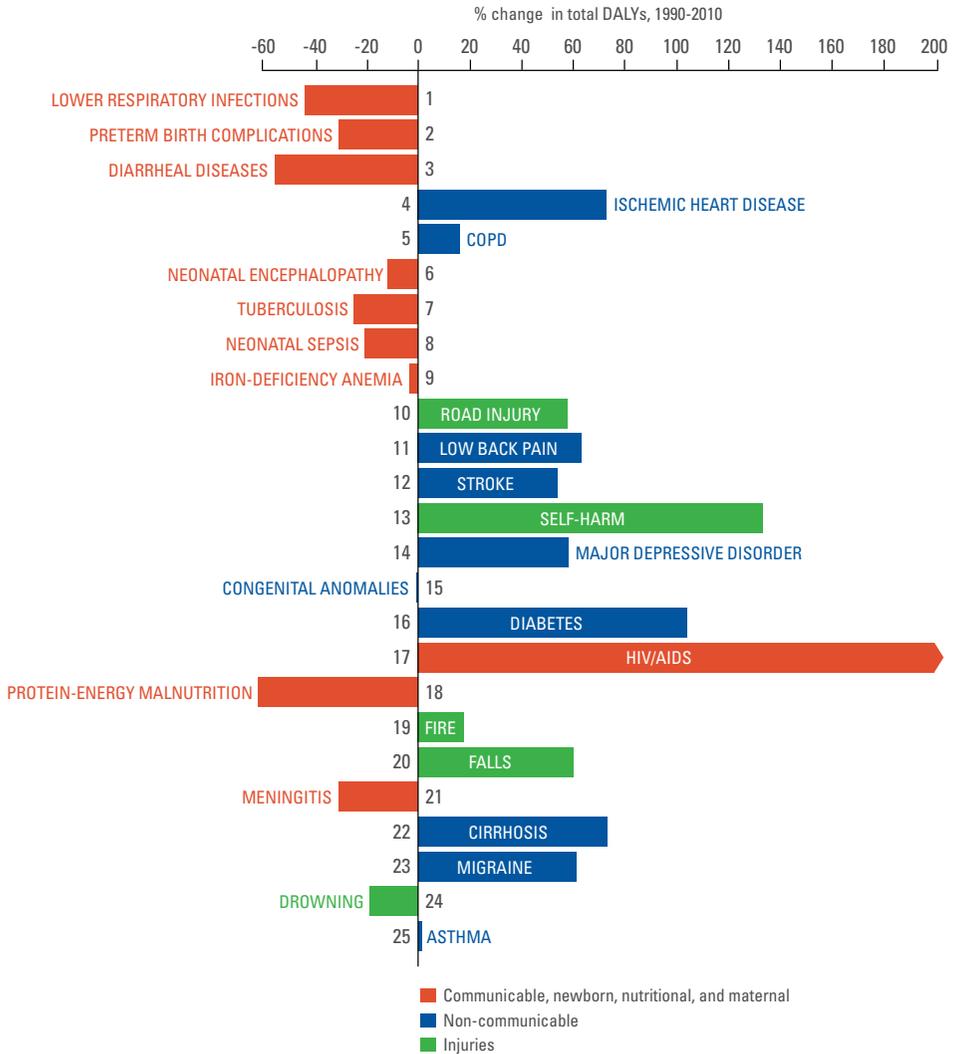
Changes in the 25 leading causes of DALYs in South Asia, from 1990 to 2010, are depicted in Figure 8. In the region, substantial progress has been made for many communicable and childhood conditions, as highlighted by the drastic declines in protein-energy malnutrition (62%), diarrhea (55%), and lower respiratory infections (44%). Nonetheless, HIV/AIDS skyrocketed by 4,753%, which demonstrates that improvements in communicable diseases are not always uniform. After the growing relative HIV/AIDS burden in South Asia, self-harm, diabetes, cirrhosis, and ischemic heart disease were the next four drivers of increased health loss in 2010, compared with 1990 (with increases of 134%, 104%, 73%, and 73%, respectively).

In many countries around the world, non-communicable diseases account for the majority of DALYs. Figure 9 shows the percentage of healthy years lost from this disease group by country in 2010. In most countries outside sub-Saharan Africa, non-communicable diseases caused 50% or more of all DALYs. In Australia, Japan, and richer countries in Western Europe and North America, the percentage was greater than 80%. In South Asia, Afghanistan documented the lowest DALY burden from non-communicable diseases (38%). The Maldives and Sri Lanka posted much higher relative burdens from non-communicable diseases: 70% and 69% of all DALYs, respectively. India, a country where 45% of DALYs are caused by non-communicable diseases, epitomizes the definition of “double burden of disease,” where communicable causes of premature death and disability co-exist alongside growing burdens from non-communicable causes.

**Figure 7: Global shifts in leading causes of DALYs, 1990-2010**

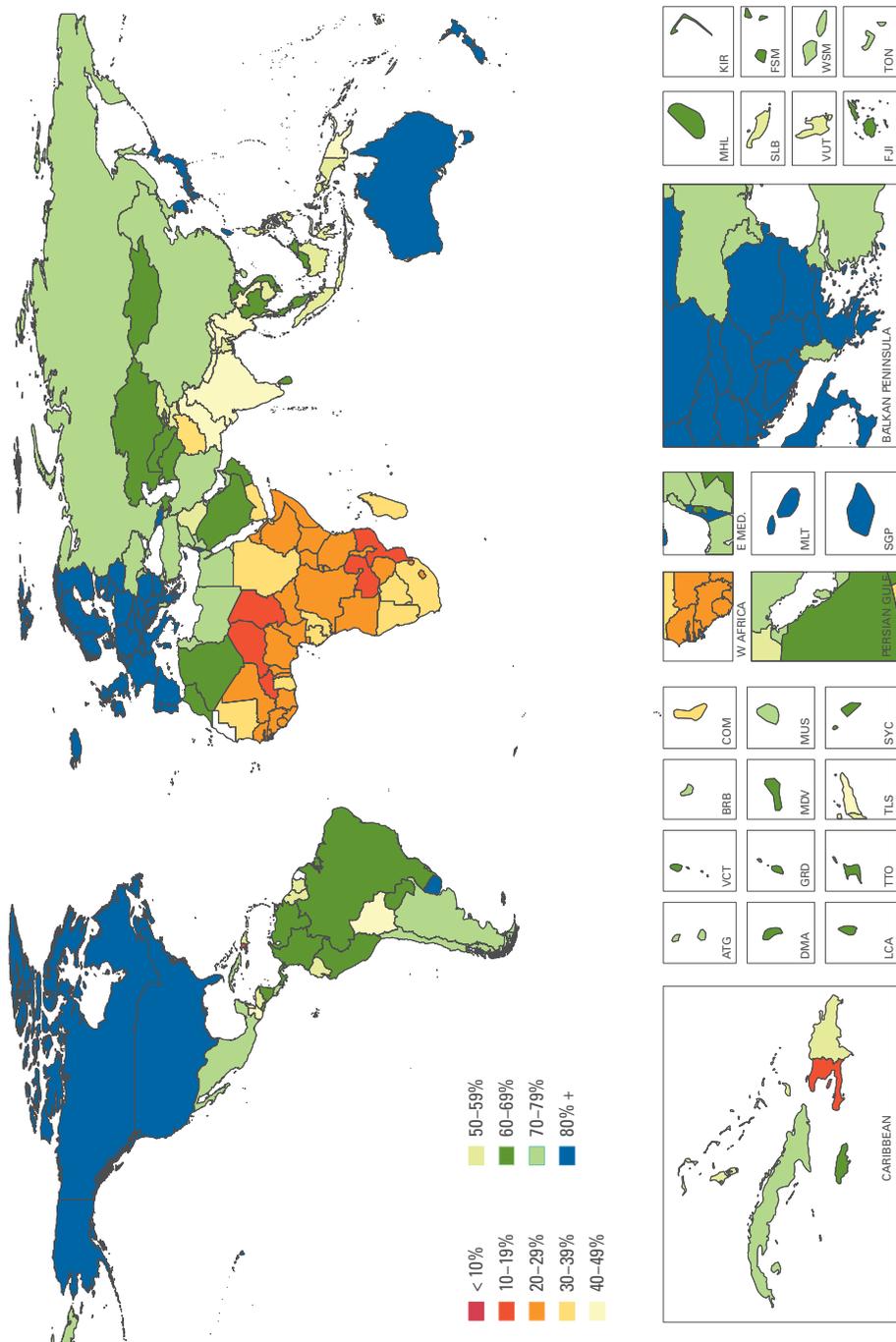
*Note: The leading 25 causes of DALYs are ranked from top to bottom in order of the number of DALYs they contributed in 2010. Bars to the right of the vertical line show the percent by which DALYs have increased since 1990. Bars on the left show the percent by which DALYs have decreased. Pointed arrows indicate causes that have increased by a greater amount than shown on the x-axis.*

**Figure 8: Shifts in leading causes of DALYs in South Asia, 1990-2010**



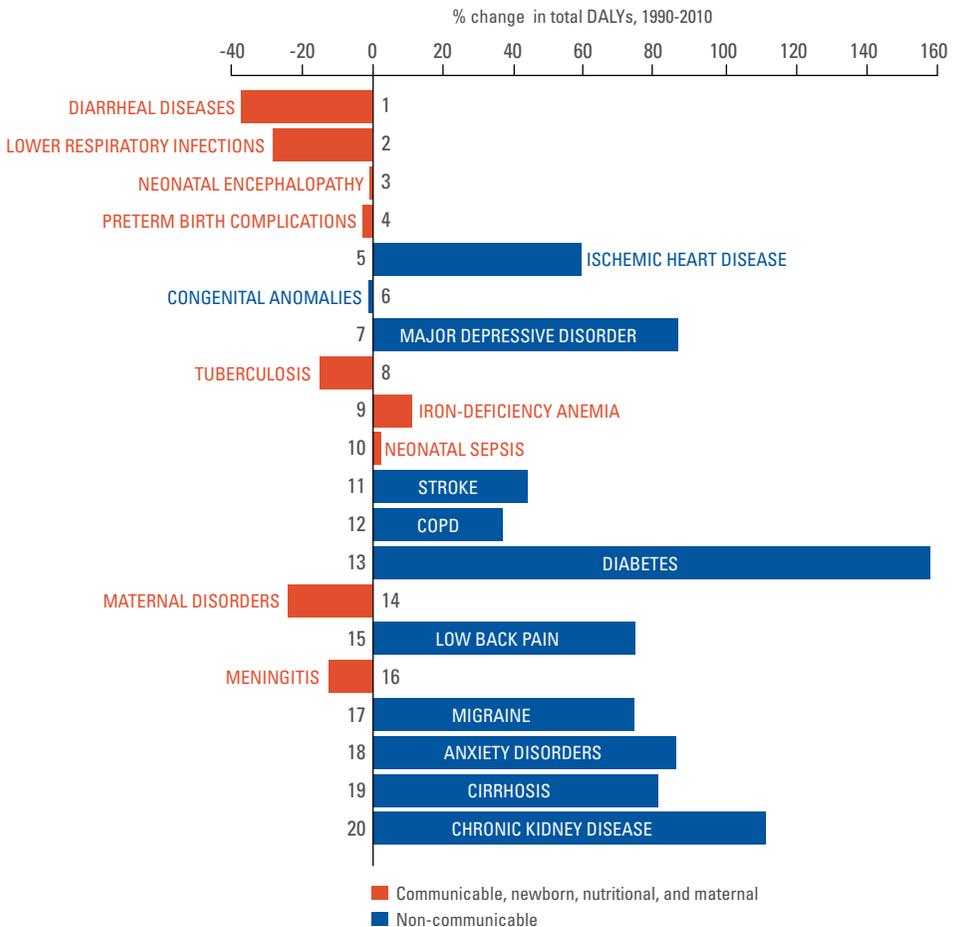
*Note: The leading 25 causes of DALYs are ranked from top to bottom in order of the number of DALYs they contributed in 2010. Bars to the right of the vertical line show the percent by which DALYs have increased since 1990. Bars on the left show the percent by which DALYs have decreased. Pointed arrows indicate causes that have increased by a greater amount than shown on the x-axis.*

Figure 9: Percent of global DALYs due to non-communicable diseases, 2010



An in-depth look at the country-level data reveals the specific diseases that are driving overall shifts from communicable to non-communicable diseases. As an example, Figure 10 displays the changes in the top 20 causes of DALYs in Pakistani females between 1990 and 2010. The causes are organized by ranking from top to bottom. Most non-communicable diseases rose over time, while the majority of communicable, newborn, nutritional, and maternal conditions fell during this period. Among communicable, nutritional, newborn, and maternal conditions, diarrheal diseases and lower respiratory infections experienced the most dramatic declines, falling by 37% and 28%, respectively. Among the top 20 causes in 2010, diabetes increased the most (159%), followed by chronic kidney disease (112%) and depression (87%).

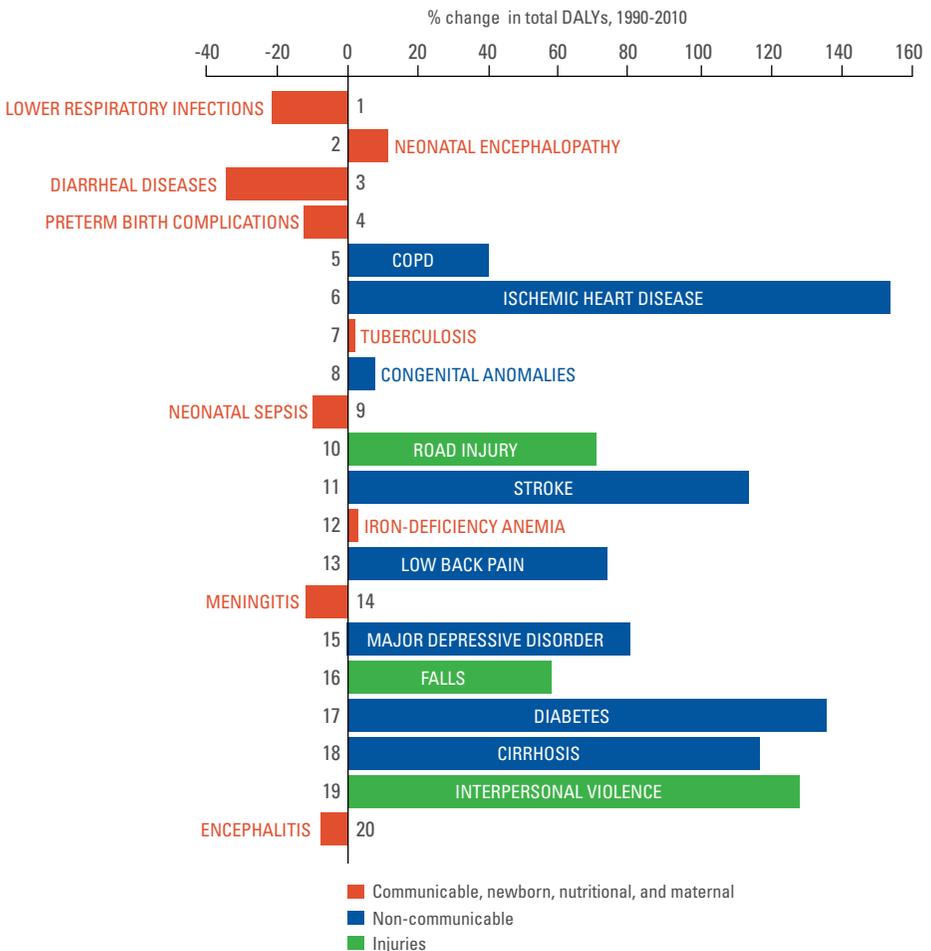
**Figure 10: Shifts in leading causes of DALYs for females, Pakistan, 1990-2010**



*Note: The leading 20 causes of DALYs are ranked from top to bottom in order of the number of DALYs they contributed in 2010. Bars to the right of the vertical line show the percent by which DALYs have increased since 1990. Bars on the left show the percent by which DALYs have decreased.*

Figure 11 shows declines in DALYs among Pakistani males from communicable, nutritional, and newborn conditions coupled with increases in non-communicable diseases between 1990 and 2010. The greatest improvements were seen for diarrheal diseases and lower respiratory infections, with declines of 35% and 22%, respectively, from 1990 to 2010. Out of all the non-communicable diseases shown in this figure, ischemic heart disease increased the most over the period (155%). Diabetes increased by 136%, cirrhosis by 118%, and stroke by 114%. In addition to displaying the rising prominence of non-communicable diseases, this figure shows that injuries are important causes of healthy life lost in males in Pakistan. DALYs caused by road injuries increased by 71%, falls by 58%, and interpersonal violence by 129%.

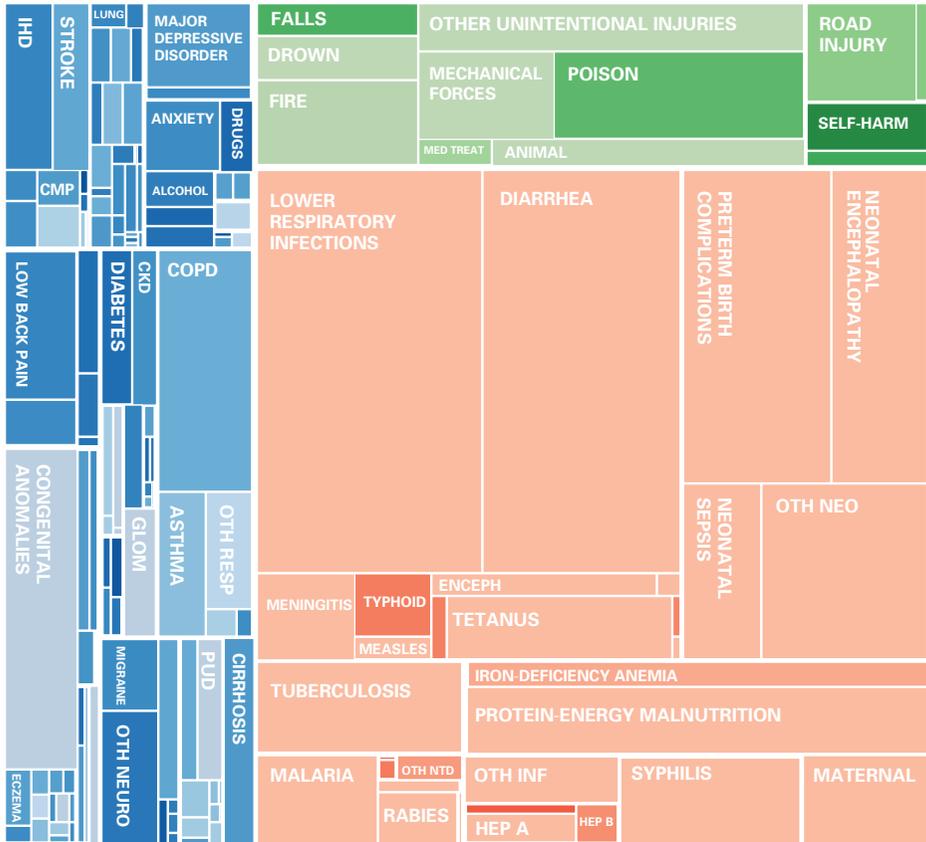
**Figure 11: Shifts in leading causes of DALYs for males, Pakistan, 1990-2010**



*Note: The leading 20 causes of DALYs are ranked from top to bottom in order of the number of DALYs they contributed in 2010. Bars to the right of the vertical line show the percent by which DALYs have increased since 1990. Bars on the left show the percent by which DALYs have decreased.*

Another visualization tool, GBD Compare, displays proportional changes in disease patterns over time using a treemap diagram, which is essentially a square pie chart. Causes of DALYs are shown in boxes. The size of each box represents the percentage of total DALYs due to a specific cause. Figures 12a and 12b show how DALYs changed in Bhutan between 1990 and 2010. In 1990, non-communicable diseases accounted for 27% of DALYs in both sexes, while communicable, nutritional, maternal, and newborn causes accounted for 58%. By 2010, these two groups of causes

**Figure 12a: Causes of DALYs, both sexes, all ages, Bhutan, 1990**



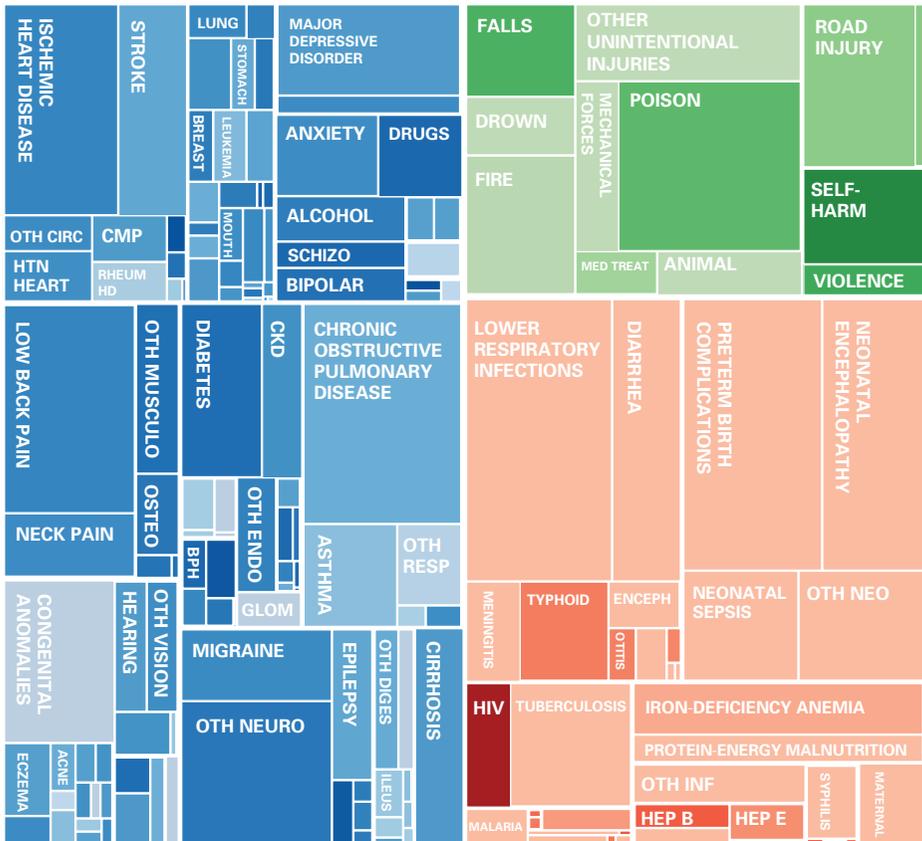
Annual % change, 2005 to 2010, DALYs per 100,000



*Note: The size of each box in this square pie chart represents the percentage of total DALYs caused by a particular disease or injury. To view an interactive version of this figure, visit IHME's website: <http://ihmeuw.org/gbdcompare>.*

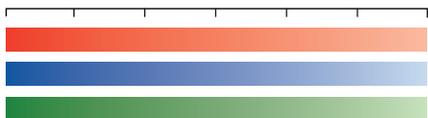
represented 50% and 33% of total disease burden, respectively. This near reversal of disease burden types exemplifies the progress made against communicable conditions in Bhutan over the last two decades, but it also highlights the upcoming challenges posed by more chronic diseases. Premature death and disability from many communicable, nutritional, maternal, and newborn causes decreased during this period. The greatest declines were documented for measles (100%), tetanus (93%), and whooping cough (92%). DALYs from many non-communicable causes

**Figure 12b: Causes of DALYs, both sexes, all ages, Bhutan, 2010**



Annual % change, 2005 to 2010, DALYs per 100,000

3% 2% 1% 0% -1% -2% -3%



Communicable, newborn, nutritional, and maternal  
Non-communicable  
Injuries

*Note: The size of each box in this square pie chart represents the percentage of total DALYs caused by a particular disease or injury. To view an interactive version of this figure, visit IHME's website: <http://ihmeuw.org/gbdcompare>.*

rose considerably from 1990 to 2010. Large escalations occurred in causes of burden such as ischemic heart disease (76%), diabetes (74%), low back pain (50%), and neck pain (50%).

In 2010, chronic obstructive pulmonary disease (COPD), a term used to describe emphysema and other chronic respiratory diseases, caused nearly 11,300 DALYs, the largest number from any non-communicable cause in Bhutan. In addition to non-communicable disease burden, health loss from injuries such as self-harm increased by 22%, while DALYs from poisonings declined by 13%.

## DISABILITY INCREASES IN MIDDLE- AND HIGH-INCOME COUNTRIES

Most countries in the world have succeeded in reducing deaths early in life. To a growing extent, longer lives are redefining “old age” in many countries, and people in all age groups are dying at lower rates than in the past. Simply living longer does not mean that people are healthier. Little progress has been made in reducing the prevalence of disability, so people are living to an older age but experiencing more ill health. Many people suffer from different forms of disability throughout their lives, such as mental and behavioral health problems starting in their teens and musculoskeletal disorders beginning in middle age. These findings have far-reaching implications for health systems.

Healthy years lost, or DALYs, are calculated by adding together years lived with disability (YLDs) and years of life lost (YLLs, also known as years lost to premature death). Between 1990 and 2010, YLDs increased as a percentage of total DALYs in all areas of the world except Eastern Europe, southern sub-Saharan Africa, and the Caribbean. This disability transition has been most dramatic in parts of Latin America, the Middle East, North Africa, and many areas in Asia. The percentage of burden from YLDs also increased in sub-Saharan Africa with the exception of the southern part of the region.

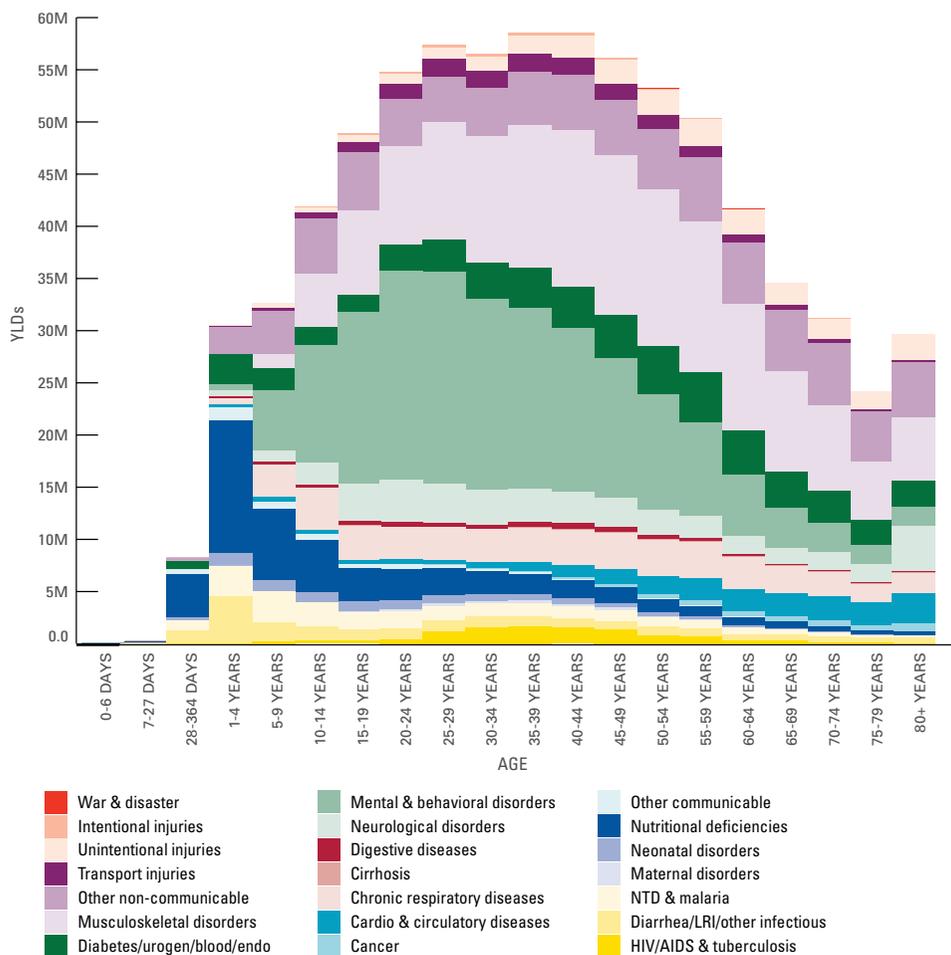
Figure 13 tells a more detailed story about the different conditions that cause disability globally. It is important to keep in mind that these estimates reflect both how many individuals suffer from a particular condition and the severity of that condition. Mental and behavioral disorders, such as depression, anxiety, and drug use, were the primary drivers of disability worldwide and caused over 40 million YLDs in 20- to 29-year-olds. Musculoskeletal conditions, which include low back pain and neck pain, accounted for the next-largest number of YLDs. People aged 45 to 54 were most impacted by these conditions, as musculoskeletal disorders caused over 30 million YLDs in this age group.

Figure 14 also shows trends in disability by age group in 2010, but for the South Asia region. Similar to what is seen worldwide, the predominant sources of disability between the ages of 0 to 9 years were nutritional deficiencies, and between the ages of 10 and 44 years, mental and behavioral disorders predominated. Beyond the

age of 45, musculoskeletal disorders and other non-communicable diseases (largely sense organ diseases) became the largest drivers of disability in South Asia.

Another way to view the world's health challenges is by comparing how different conditions rank. Figure 15 ranks the leading causes of disability globally and in each of the six World Bank regions in 2010, using color coding and numbering to indicate how high a condition ranks in a region. Low back pain caused the most disability in East Asia and Pacific, Europe and Central Asia, and in the Middle East and North Africa and ranks second in South Asia and Latin America and the Caribbean. This

**Figure 13: Global disability patterns by broad cause group and age, 2010**

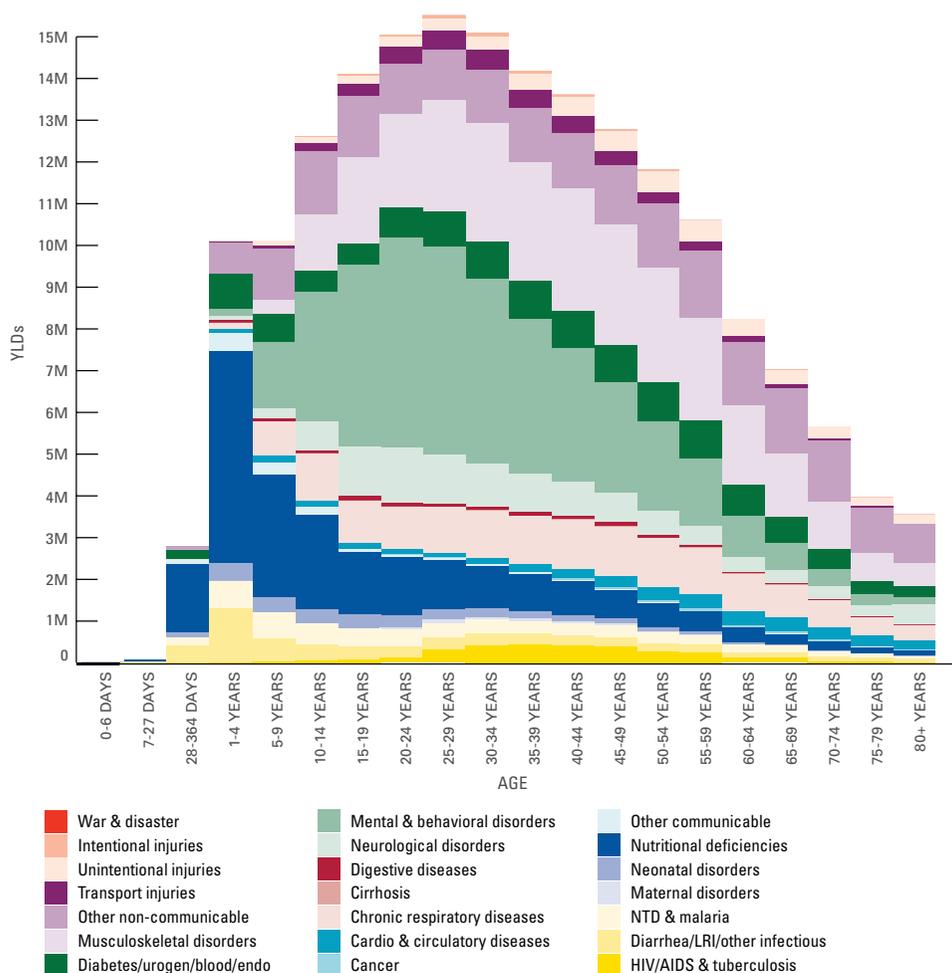


*Note: The size of the colored portion in each bar represents the number of YLDs attributable to each cause for a given age group. The height of each bar shows total YLDs for a given age group in 2010. The causes are aggregated. For example, musculoskeletal disorders include low back pain and neck pain. To view an interactive version of this figure, visit IHME's website: <http://ihmeuw.org/gbdcausepattern>.*

condition can inhibit people's ability to perform different types of work both inside and outside the home and impair their mobility. In addition to low back pain, neck pain and other musculoskeletal disorders ranked in the top 10 causes of disability in most regions. Another musculoskeletal disorder, osteoarthritis, ranked among the top 20 causes of disability in every region.

Depression was a major cause of disability across regions and was one of the top three causes of disability in every region. This disorder can cause fatigue, decreased ability to work or attend school, and suicide. Other types of mental disorder caused

**Figure 14: Disability patterns by broad cause group and age in South Asia, 2010**

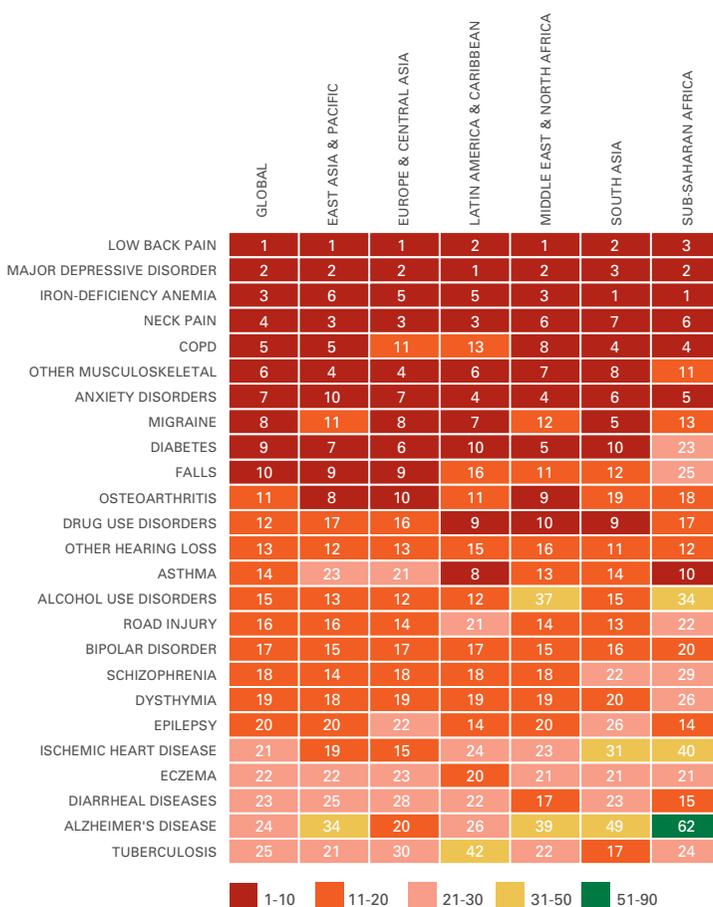


*Note: The size of the colored portion in each bar represents the number of YLDs attributable to each cause for a given age group. The height of each bar shows total YLDs for a given age group in 2010. The causes are aggregated. For example, musculoskeletal disorders include low back pain and neck pain.*

considerable disability around the world. Anxiety was one of the top 10 causes of disability across all regions, and bipolar disorder appeared among the top 20 causes of disability in all regions.

While mental and musculoskeletal disorders ranked high among causes of disability across regions, Figure 15 also reveals substantial regional variation among other causes. Iron-deficiency anemia was the leading cause of disability in sub-Saharan Africa and South Asia but was less important as a cause of disability in the other regions. The substantial burden in these two regions contributed to iron-deficiency anemia's ranking as the third leading cause of disability at the global level. Iron-deficiency anemia can lead to fatigue and lowered ability to fight infection and may decrease cognitive ability.

**Figure 15: Rankings of leading causes of disability by region, 2010**



*Note: In this figure, shading is used to indicate the ranking of each cause of disability in a particular region.*

COPD was among the top five causes of disability in East Asia and Pacific, South Asia, and sub-Saharan Africa and was the eighth leading cause of disability in the Middle East and North Africa. COPD ranked lower in Europe and Central Asia (11th) and Latin America and the Caribbean (13th).

The leading causes of disability in South Asia during this period were similar to the leading causes globally. Nine of the top 10 causes globally appeared in the top 10 causes in South Asia (albeit with different relative burden ranks). Drug use disorders ranked ninth among the top 10 causes of disability in South Asia, while these disorders ranked 12th globally. Migraine ranked higher across South Asian countries (fifth) than globally (eighth). Greater heterogeneity is revealed when individual countries within the South Asia region are examined. In Bangladesh, osteoarthritis was the 10th highest contributor to health loss, whereas the condition ranked lower both globally (11th) and within the South Asia region (19th). Unlike any of the other countries in its region, Afghanistan posted tuberculosis as its fifth highest cause of disability, whereas this disease ranked much lower globally (25th) and in other countries in the region. In Bhutan, tuberculosis was the 10th leading cause of disability, the 12th in Nepal, 16th in Pakistan, 19th in India, 20th in Bangladesh, 31st in the Maldives, and 36th in Sri Lanka. As the largest country in South Asia, India largely drives regional trends; however, when the country's top 25 causes of disability are compared with those worldwide, lymphatic filariasis was on India's list (25th) but failed to make the global top 50 (53rd) in 2010. Country-level disability rankings can be viewed on IHME's website: <http://ihmeuw.org/gbdheatmap>.

Using GBD tools to identify leading causes of disability can help guide health system planning and medical education. Decision-makers can use GBD's findings to ensure that health care systems are designed to address the primary drivers of disability in a cost effective way.

## THE GLOBAL RISK FACTOR TRANSITION

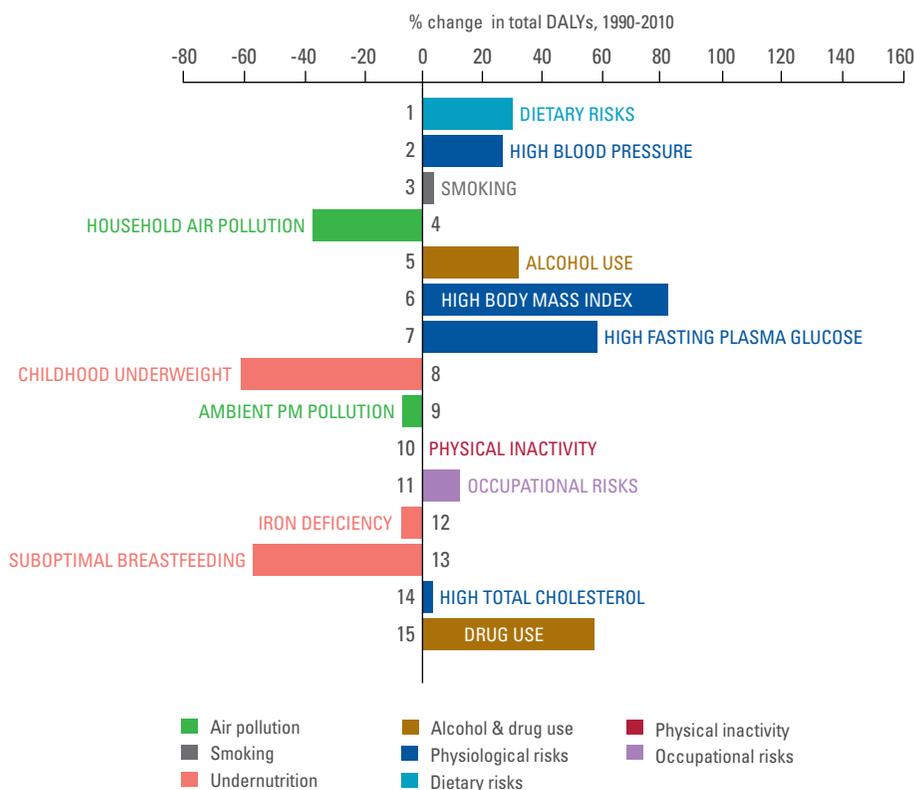
Data on potentially modifiable causes of health loss, or risk factors, can help policymakers and donors prioritize prevention strategies to achieve maximum health gains. GBD tools estimate the number of deaths, premature deaths, YLDs, and DALYs attributable to 67 risk factors worldwide. This study benefited from the availability of new data, such as epidemiologic evidence about the health impacts of different risk factors; population, nutrition, health, and medical examination surveys; and high-resolution satellite data on air pollution.

Figure 16 shows changes in the 15 leading global risk factors for premature death and disability, or DALYs, between 1990 and 2010. Over this period, many risk factors that primarily cause communicable diseases in children declined. Examples of these risk factors are childhood underweight and suboptimal breastfeeding, which dropped by 61% and 57% from 1990 to 2010, respectively. Childhood underweight is commonly used to measure malnutrition and was formerly the leading risk factor for DALYs in 1990, but it ranked eighth in 2010. DALYs attributable to household air pollution, which contributes to lower respiratory tract infections in children, dropped

by 37% between 1990 and 2010. Unlike other risk factors that primarily cause DALYs from communicable diseases, progress in reducing DALYs from iron deficiency was much lower, declining by just 7% between 1990 and 2010. Slow progress in reducing iron deficiency helps explain why iron-deficiency anemia ranked as the third leading cause of disability globally.

As most risk factors for communicable diseases in children have declined, many risks associated with non-communicable diseases have grown. As the leading global risk factor for DALYs in 2010, dietary risks increased 30% between 1990 and 2010. Dietary risks include components such as high sodium intake and lack of fruit, nuts and seeds, and whole grain intake. GBD found the diseases linked to dietary risks and physical inactivity are primarily cardiovascular diseases as well as cancer and diabetes. While many public health messages about diet have stressed the importance of eating less saturated fat, GBD 2010's findings indicate that these messages should emphasize a broader range of dietary components.

**Figure 16: Global shifts in rankings of DALYs for top 15 risk factors, 1990-2010**



*Note: The leading 15 risk factors are ranked from top to bottom in order of the number of DALYs they contributed in 2010. Bars to the right of the vertical line show the percent by which DALYs attributable to different risk factors increased since 1990. Bars to the left show the percent by which DALYs attributable to different risk factors decreased. Attributable DALYs were not quantified for physical inactivity for 1990.*

GBD 2010 used the most recent data available on the effects of different dietary risk factors. It is important to note that these data are constantly evolving as new studies on diet are conducted. Compared with data on the negative health impacts of tobacco smoking, which have been well understood for decades, the scientific evidence surrounding dietary risk factors is much newer. Future updates of GBD will incorporate new data on risk factors as they emerge.

The second leading global risk factor, high blood pressure, increased by 27% as a cause of DALYs between 1990 and 2010. High blood pressure is a major risk factor for cardiovascular and circulatory diseases. DALYs attributable to another risk factor for non-communicable diseases, tobacco smoking, increased slightly, by 3%, between 1990 and 2010. Smoking increases the risk of chronic respiratory diseases, cardiovascular and circulatory diseases, and cancer. DALYs attributable to another substance, alcohol use increased 32% during this period. Alcohol use contributes to cardiovascular and circulatory diseases, cirrhosis, and cancer. In addition to being a contributor to non-communicable diseases, alcohol increases the risk of injuries.

High body mass index (BMI) was another major contributor to DALYs in 2010 and was the sixth leading risk factor. High BMI is typically used as an indicator of overweight and obesity. It increased by a dramatic 82% over the period 1990 to 2010. High BMI is a leading risk factor for cardiovascular and circulatory diseases as well as diabetes. It is striking that high BMI was a more important cause of poor health worldwide than childhood underweight in 2010, whereas childhood underweight was a much more prominent risk factor than high BMI in 1990.

Based on trends in South Asia, Figure 17 shows changes in the 15 leading regional risk factors for DALYs between 1990 and 2010. Akin to worldwide trends, substantial improvements in childhood underweight, suboptimal breastfeeding, and iron deficiency were documented in South Asia from 1990 to 2010. As risk factors for DALYs, high fasting plasma glucose and high BMI escalated much faster in South Asia than globally, increasing by more than 100% each.

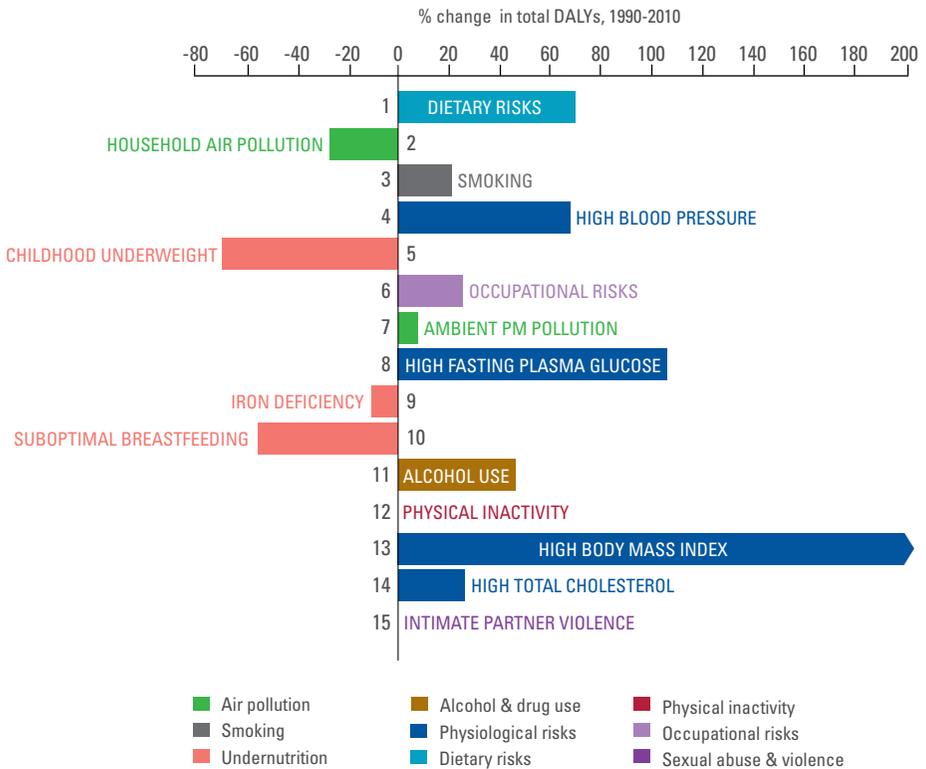
Global and regional rankings of risk factors mask important differences across countries. Figure 18 shows the leading risk factors for DALYs in the countries in the South Asia region in 2010.

Dietary risks ranked as the leading risk factor in four countries (Bhutan, India, the Maldives, and Sri Lanka) and was the third-largest risk factor in the remaining countries (Afghanistan, Bangladesh, Nepal, and Pakistan). Smoking was the third-largest risk factor contributing to DALYs regionally and was among the top three risk factors for Bangladesh, India, and Nepal. Household air pollution was ranked among the top three risk factors for all countries except the Maldives, which is the only country in the South Asia region with high BMI as a top-five risk factor. As seen in Figure 18, the Maldives featured a composition of risk factors that contributed to the country's correspondingly higher disease burdens from non-communicable diseases, mirroring global trends. The lower-income countries in South Asia, like Nepal

and Pakistan, reported more ill health from household air pollution and childhood underweight; these trends are more akin to risk factor patterns found in sub-Saharan Africa than in the rest of South Asia.

In addition to allowing users to explore how different risk factors rank across countries, decision-makers can use GBD visualization tools to understand how many DALYs could potentially be averted by addressing different risk factors. Figure 19 shows the number of DALYs attributable to household air pollution that contributed to different diseases in India. The percentage of DALYs that could be averted by reducing this risk factor is shown in dark shading.

**Figure 17: Shifts in rankings of DALYs for top 15 risk factors in South Asia, 1990-2010**



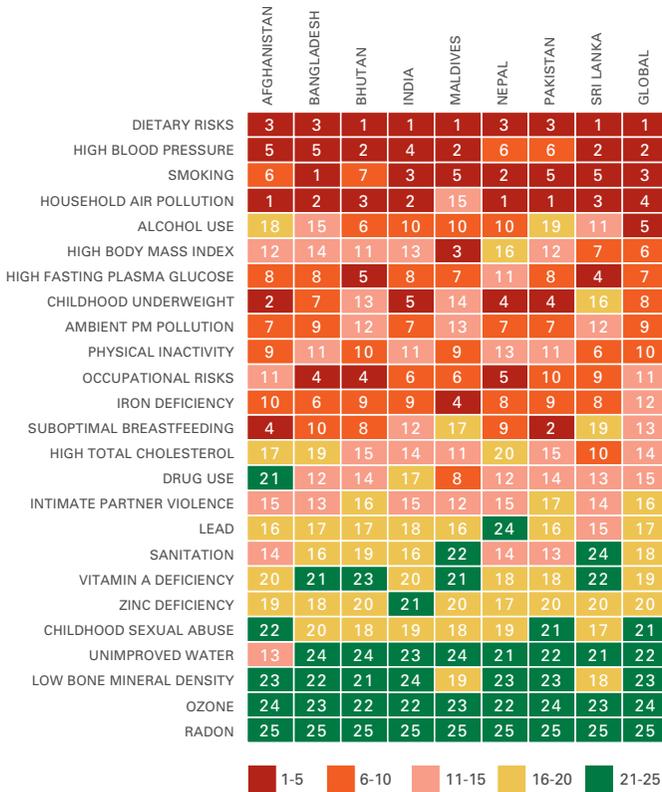
*Note: The top 15 risk factors are ranked from top to bottom in order of the number of DALYs they contributed in 2010. Bars to the right of the vertical line show the percent by which DALYs attributable to different risk factors increased since 1990. Bars on the left show the percent by which DALYs attributable to different risk factors decreased. Attributable DALYs were not quantified for physical inactivity and intimate partner violence for 1990.*

Household air pollution results from burning solid fuels. Figure 19 depicts how reducing this exposure is likely to substantially reduce DALYs from ischemic heart disease, lower respiratory infections, and COPD, as indicated by the portions of these causes that are shaded in dark blue or dark red. Reduction of household air pollution could also reduce DALYs from cataracts and stroke in India.

Figure 20 shows how, in Nepal, many DALYs could be averted by reducing occupational risks, which include toxins (e.g., carcinogens, asthmagens, particulate matter), noise, and physical injury associated with occupation-based exposures.

In Nepal, over 50% of low back pain was attributable to occupational risks, as highlighted by the dark-blue portion of the box. Of the non-communicable conditions associated with occupational risk in Nepal, hearing loss, COPD, asthma, and lung

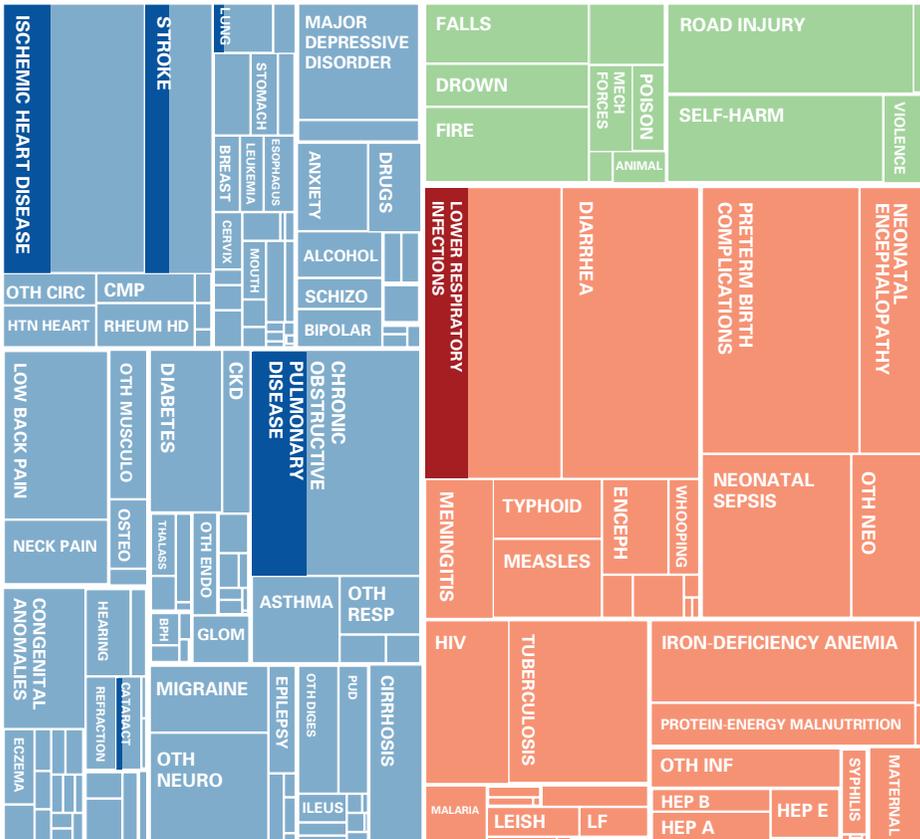
**Figure 18: Rankings of DALYs attributable to leading risk factors, South Asia, 2010**



Note: In this figure, shading is used to indicate the ranking of each risk factor in a particular country or region. To view an interactive version of this figure, visit IHME's website: <http://ihmeuw.org/gbdheatmap>.

cancer rounded out the top five, with occupational risk attributions of 32%, 18%, 15%, and 8%, respectively. Considerable health loss from injuries was attributable to occupational exposures in Nepal, as designated by the dark-green portions of the boxes representing injury subcategories. Of the top injuries associated with employment, 16% of injuries due to mechanical forces, 15% of poisonings, 12% of total road injuries, 11% of animal-contact-based injuries, and 9% of drowning were attributable to heightened occupational risks in the country.

**Figure 19: DALYs attributable to household air pollution, both sexes, all ages, India, 2010**



DALYs attributable to risk factor

- Communicable, newborn, nutritional, and maternal
- Non-communicable
- Injuries

DALYs not attributable to risk factor

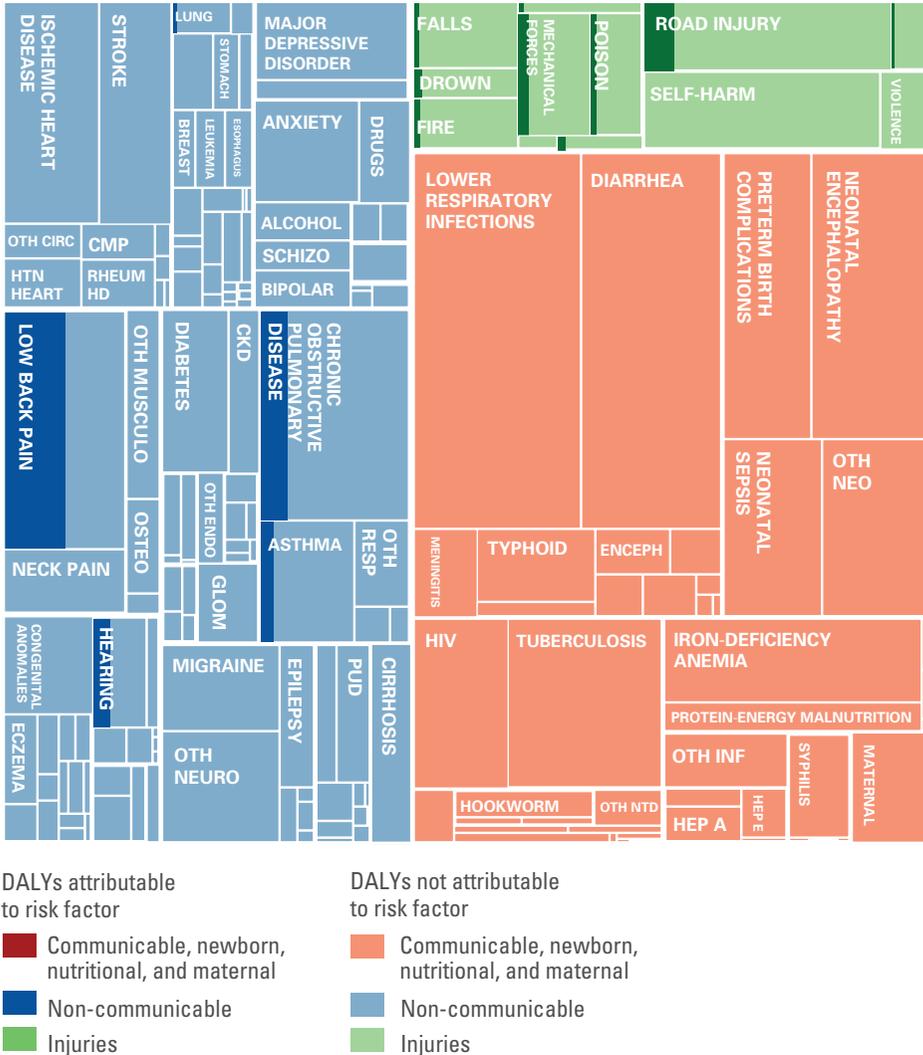
- Communicable, newborn, nutritional, and maternal
- Non-communicable
- Injuries

*Note: The size of each box represents the percentage of total DALYs caused by a particular disease or injury, and the proportion of each cause attributable to the risk factor is shaded. To view an interactive version of this figure, visit IHME's website: <http://ihmeuw.org/gbdcompare>.*

Figure 21 shows the number of DALYs attributable to suboptimal breastfeeding for children aged 1 to 11 months in Afghanistan. This is the fourth highest risk factor for health loss in Afghanistan.

Figure 21 can be used to determine the number of years of healthy life that could potentially be gained by ensuring that all Afghan children in this age group are adequately breastfed. Adequate breastfeeding is defined as exclusive breastfeeding of

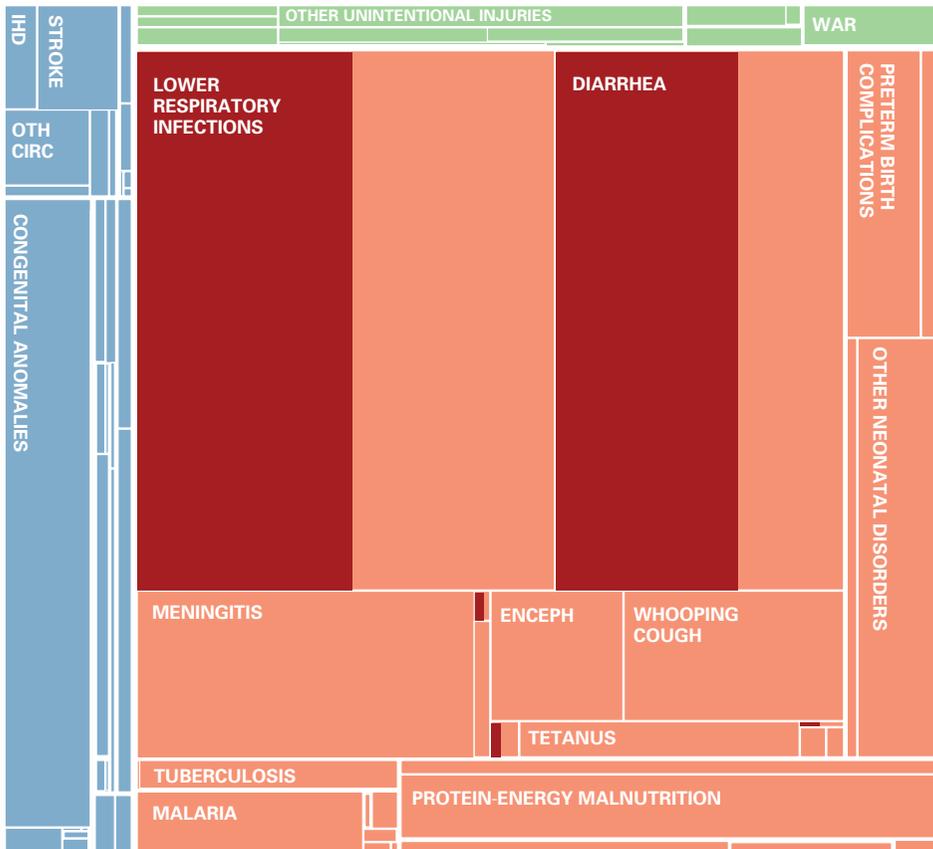
**Figure 20: DALYs attributable to occupational risks, both sexes, all ages, Nepal, 2010**



*Note: The size of each box represents the percentage of total DALYs caused by a particular disease or injury, and the proportion of each cause attributable to the risk factor is shaded. To view an interactive version of this figure, visit IHME's website: <http://ihmeuw.org/gbdcompare>.*

children for the first six months of life and continued breastfeeding after 6 months of age until age 2. Over 63% of the DALYs attributable to diarrhea could potentially be prevented in this age group, as indicated by the dark shading in the box representing this cause. Adequate breastfeeding would also greatly reduce illness from lower respiratory infections among these children (i.e., over 50% of DALYs).

**Figure 21: DALYs attributable to suboptimal breastfeeding, both sexes, ages 1-11 months, Afghanistan, 2010**



DALYs attributable to risk factor

- Communicable, newborn, nutritional, and maternal
- Non-communicable
- Injuries

DALYs not attributable to risk factor

- Communicable, newborn, nutritional, and maternal
- Non-communicable
- Injuries

*Note: The size of each box represents the percentage of total DALYs caused by a particular disease or injury, and the proportion of each cause attributable to the risk factor is shaded. To view an interactive version of this figure, visit IHME's website: <http://ihmeuw.org/gbdcompare>.*