

# 6

## Burden of disease

### Introduction

The global burden of disease (GBD) is a comprehensive assessment of mortality and disability from specific diseases, injuries and risk factors. A scientific, evidence-based approach to health issues that objectively quantifies the burden of disease, disability-adjusted life years (DALYs) is a comprehensive measurement of health gaps which combines premature mortality in populations along with the extent and severity of morbidity.

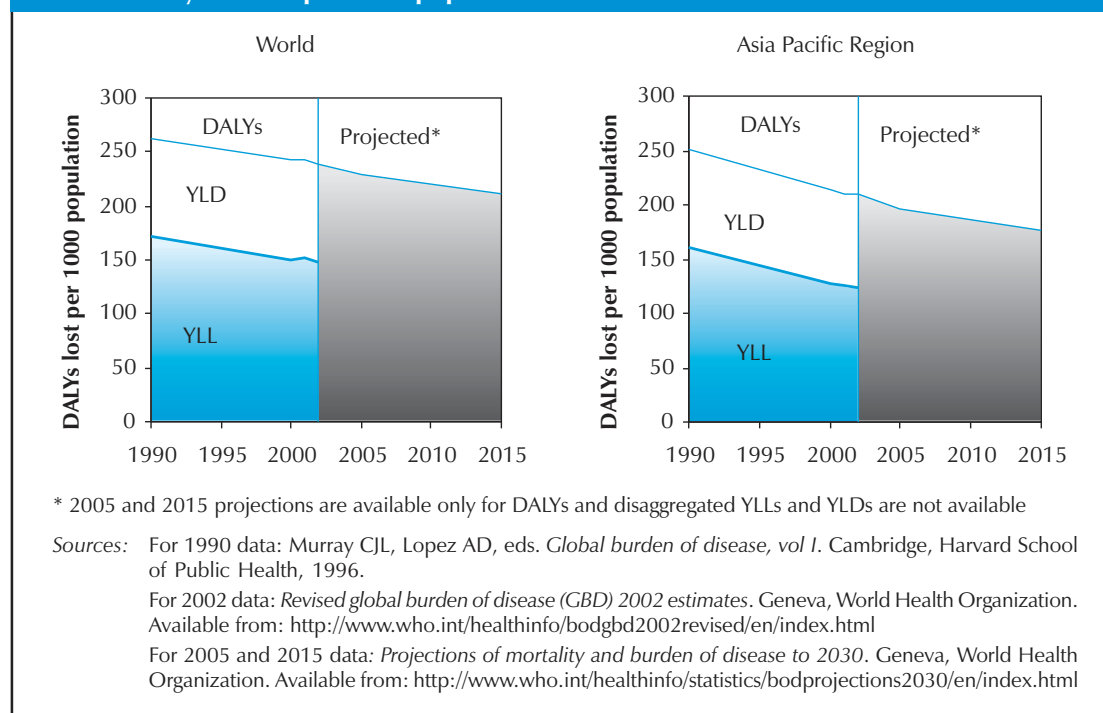
Disability-adjusted life years for a disease is years of life lost (YLL) due to premature death, plus years lost to disability (YLD), thus DALYs represent both mortality and morbidity. One DALY is one lost year of “healthy” life, and the burden of disease is a measurement of the gap between current health status and an ideal situation, in which everyone lives to old age free of disease and disability.<sup>1</sup>

Measurement of DALYs considers mortality with age at death, incidence of various types of adverse health conditions with age at onset, prevalence of morbidities with severity, duration and sequelae, and remission rates. These have been obtained for over 130 causes. The use of DALYs is a large step towards standardization and comparability of the burden of disease.

Any death earlier than the highest expectation of life is considered premature, and contributes to YLL. Similarly, the period of various disabilities during the entire life is equated to the loss of years of healthy life. In addition, years lost from the most productive and active periods of life are valued more than loss during childhood or old age, and future years lost are discounted for equivalence to the current year. A practical guide for carrying out such studies is available in WHO’s *National burden of disease manual*.<sup>2</sup>

If everyone were to live in full health throughout their maximum potential lifespan, the loss of DALYs would be zero. In 2002, the world average of all DALYs was 239 per 1000 population, of which 148 (62%) are YLL due to premature mortality, and the remaining 91 (38%) are YLD. The decline in global DALYs since 1990 has been less than 1% per annum, even when adjusted for population growth (Figure 6.1).

**Figure 6.1** Trend in years of life lost, years lost to disability and disability-adjusted life years lost per 1000 population



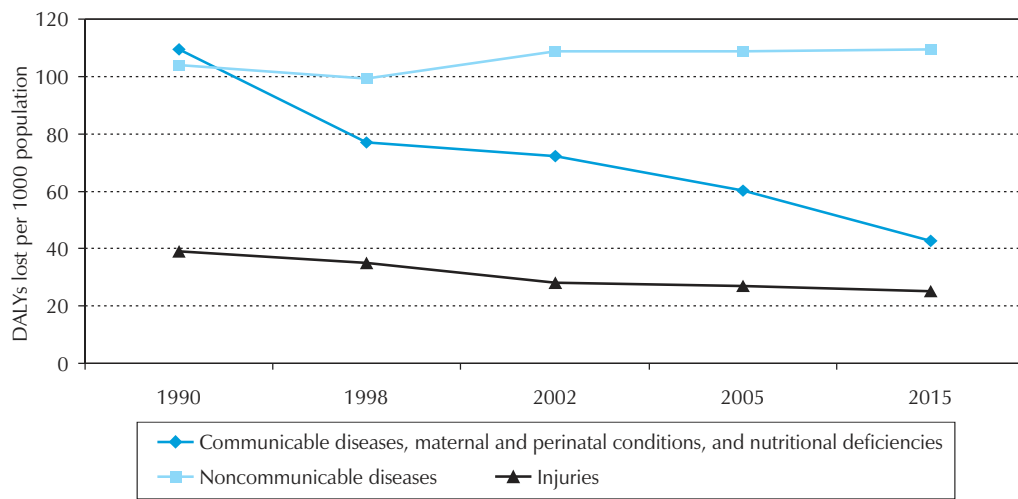
According to classification of condition, in 1990, DALYs were slightly higher for communicable, maternal and perinatal conditions, and nutritional deficiencies, compared to noncommunicable conditions. Since then, there has been a slight decrease, which is projected to continue until 2015, while DALYs for noncommunicable diseases continue to rise (Figure 6.2).

Globally, the share of DALYs lost to noncommunicable diseases has increased from 40.9% in 1990 to 46.8% in 2002 and is projected to rise at nearly the same rate until 2015. The share of nutritional deficiencies for this measure of health gap has dropped from 3.7% to 2.3% for the same period, and is projected to decline faster in the next decade (Table 6.1).

## Disability-adjusted life years lost in the Asia Pacific Region

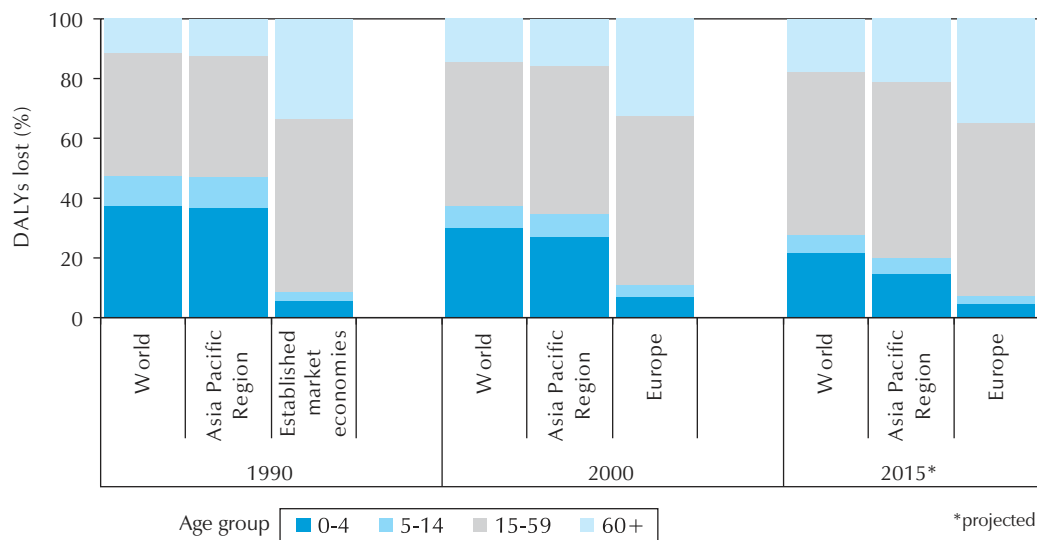
Compared to the developed countries of Europe, under-five mortality and morbidity is very high in the Asia Pacific Region, but the gap is projected to narrow by 2015 (Figure 6.3). The contribution of under-five mortality and morbidity in the Region to total DALYs was 37% in 1990, but had dropped to 27% by 2002. Since the total of all age groups is 100%, the contribution of those aged 60 and above has correspondingly increased. All DALYs lost indicate poor health, but the increased share among older ages implies that some causes of mortality and morbidity have shifted from younger to older age groups, at least for countries with well-developed economies.

**Figure 6.2 Trends in disability-adjusted life years lost (per 1000 population) due to the major group of conditions in the Asia Pacific Region, 1990–2015**



Sources: 1990: Murray CJL, Lopez AD, eds. *Global burden of disease, vol 1*. Cambridge, Harvard School of Public Health, 1996. Annex Tables 9c, 9d and 9e.  
 1998: *The world health report 1999: making a difference*. Geneva, World Health Organization, 1999. Annex Table 3.  
 2002: *Revised global burden of disease (GBD) 2002 estimates*. Geneva, World Health Organization. Available from: <http://www.who.int/healthinfo/bodgbd2002revised/en/index.html>  
 2005 and 2015: *Projections of mortality and burden of disease to 2030*. Geneva, World Health Organization. Available from: <http://www.who.int/healthinfo/statistics/bodprojections2030/en/index.html>

**Figure 6.3 Comparative trend of disability-adjusted life years lost by age group worldwide, in the Asia Pacific Region and Europe**



Sources: For 1990 data: Murray CJL, Lopez AD, eds. *Global burden of disease, vol 1*. Cambridge, Harvard School of Public Health, 1996.  
 For 2000 data: *Global burden of disease (GBD) 2000*. Geneva, World Health Organization. Available from: <http://www.who.int/healthinfo/bodgbd2000v3/en/index.html>  
 For 2015 data: *Projections of mortality and burden of disease to 2030*. Geneva, World Health Organization. Available from: <http://www.who.int/healthinfo/statistics/bodprojections2030/en/index.html>

Table 6.1 Disability-adjusted life years lost worldwide by major groups of causes, 1990–2015

Year →	1990		1998		2002		Projected 2005		Projected 2015	
Population (thousands) →	5 267 000		5 884 576		6 224 985		6 441 919		7 103 297	
Cause ↓	Per 1000 pop.	%	Per 1000 pop.	%	Per 1000 pop.	%	Per 1000 pop.	%	Per 1000 pop.	%
<b>Total DALYs lost</b>	<b>261.9</b>	<b>100</b>	<b>234.9</b>	<b>100</b>	<b>239.4</b>	<b>100</b>	<b>228.3</b>	<b>100</b>	<b>210.2</b>	<b>100.0</b>
<b>I. Communicable, maternal, perinatal and nutritional conditions</b>	<b>115.0</b>	<b>43.9</b>	<b>96.1</b>	<b>40.9</b>	<b>98.0</b>	<b>41.0</b>	<b>88.8</b>	<b>38.6</b>	<b>75.0</b>	<b>34.6</b>
A Infectious and parasitic diseases	60.0	22.9	55.1	23.4	56.3	23.5	50.5	22.2	45.2	21.5
B Respiratory infections	22.2	8.5	14.5	6.2	15.2	6.3	13.5	5.9	9.5	4.5
C Maternal conditions	5.7	2.2	5.5	2.3	5.4	2.3	4.6	2.0	3.1	1.5
D Perinatal conditions	17.5	6.7	13.7	5.8	15.6	6.5	14.4	6.3	11.4	5.4
E Nutritional deficiencies	9.7	3.7	7.4	3.2	5.5	2.3	4.9	2.1	3.4	1.6
<b>II Noncommunicable diseases</b>	<b>107.2</b>	<b>40.9</b>	<b>100.8</b>	<b>42.9</b>	<b>112.1</b>	<b>46.8</b>	<b>111.7</b>	<b>49.0</b>	<b>110.2</b>	<b>52.5</b>
A Malignant neoplasms	13.4	5.1	13.7	5.8	12.1	5.1	12.3	5.4	12.7	6.0
B Other neoplasms	...	...	0.7	0.3	0.3	0.1	0.3	0.1	0.3	0.1
C Diabetes mellitus	2.1	0.8	2.0	0.8	2.6	1.1	2.8	1.2	3.7	1.7
D Endocrine disorders	1.2	0.4	1.0	0.4	1.3	0.5	1.2	0.5	1.0	0.5
E Neuropsychiatric conditions	27.5	10.5	27.1	11.5	31	13	30.8	13.5	30.0	14.3
F Sense organ diseases	2.0	0.8	2.1	0.9	11.1	4.7	11.4	5.0	12.1	5.8
G Cardiovascular diseases	25.3	9.7	24.3	10.3	23.8	9.9	23.8	10.4	22.6	10.7
H Respiratory diseases	11.5	4.4	10.5	4.5	8.9	3.7	9.0	4.0	9.4	4.5
I Digestive diseases	9.0	3.4	7.0	3.0	7.5	3.1	7.1	3.1	6.0	2.9

Year →	1990		1998		2002		Projected 2005		Projected 2015	
Population (thousands) →	5 267 000		5 884 576		6 224 985		6 441 919		7 103 297	
Cause ↓	Per 1000 pop.	%	Per 1000 pop.	%	Per 1000 pop.	%	Per 1000 pop.	% cent	Per 1000 pop.	%
J Genitourinary diseases	2.9	1.1	2.6	1.1	2.4	1	2.4	1.0	2.3	1.1
K Skin diseases	0.0	0.0	0.3	0.1	0.6	0.3	0.6	0.3	0.6	0.3
L Musculoskeletal diseases	3.6	1.4	3.6	1.6	4.8	2	4.9	2.1	4.9	2.3
M Congenital anomalies	6.3	2.4	4.8	2.0	4.4	1.8	4.1	1.8	3.3	1.6
N Oral conditions	1.4	0.5	1.4	0.6	1.2	0.5	1.2	0.5	1.2	0.6
<b>III. Injuries</b>	<b>39.6</b>	<b>15.1</b>	<b>37.7</b>	<b>16.0</b>	<b>29.2</b>	<b>12.2</b>	<b>28.8</b>	<b>12.6</b>	<b>27.4</b>	<b>13.0</b>
A Unintentional injuries	28.9	11.0	26.5	11.3	21.4	8.9	20.8	9.1	19.5	9.3
B Intentional injuries	10.7	4.1	11.1	4.7	7.9	3.3	7.8	3.4	7.9	3.7

... Data not available

Sources: For 1990 data: Murray CJL, Lopez AD, eds. *Global burden of disease, vol I*. Cambridge, Harvard School of Public Health, 1996.

For 1998 data: *The world health report 1999: making a difference*. Geneva, World Health Organization, 1999.

For 2002 data: *Revised global burden of disease (GBD) 2002 estimates*. Geneva, World Health Organization. Available from: <http://www.who.int/healthinfo/bodgbd2002revised/en/index.html>

For 2005 and 2015 data: *Projections of mortality and burden of disease to 2030*. Geneva, World Health Organization. Available from: <http://www.who.int/healthinfo/statistics/bodprojections2030/en/index.html>

In 2002, the contribution of the Asia Pacific Region to total DALYs lost worldwide was 46%. Both morbidity and mortality are declining more rapidly in the Region than elsewhere, but DALYs for noncommunicable diseases are higher than communicable diseases, a trend reversed for the rest of the world (Table 6.2).

**Table 6.2 Worldwide premature death and disability by conditions compared to the Asia Pacific Region, 2002**

Cause	World			Asia Pacific		
	YLL	YLD	DALYs	YLL	YLD	DALYs
<b>All causes</b>	<b>100%</b>	<b>100%</b>	<b>100%</b>	<b>100%</b>	<b>100%</b>	<b>100%</b>
<b>I. Communicable, maternal, perinatal and nutritional conditions</b>	<b>53.63</b>	<b>20.36</b>	<b>40.96</b>	<b>45.48</b>	<b>19.01</b>	<b>34.56</b>
A. Infectious and parasitic diseases	32.23	9.34	23.51	22.26	7.79	16.29
B. Respiratory infections	9.59	1.08	6.35	9.47	1.13	6.03
C. Maternal conditions	1.63	3.27	2.26	1.39	3.14	2.11
D. Perinatal conditions	8.91	2.67	6.53	11.20	2.82	7.74
E. Nutritional deficiencies	1.27	4.00	2.31	1.16	4.12	2.38
<b>II. Noncommunicable diseases</b>	<b>33.33</b>	<b>68.77</b>	<b>46.83</b>	<b>39.36</b>	<b>70.14</b>	<b>52.06</b>
A. Malignant neoplasms	7.76	0.69	5.07	9.19	0.44	5.58
B. Other neoplasms	0.19	0.00	0.12	0.16	0.00	0.10
C. Diabetes mellitus	0.93	1.34	1.09	1.04	1.35	1.17
D. Endocrine disorders	0.41	0.73	0.53	0.44	0.28	0.37
E. Neuropsychiatric conditions	1.43	31.72	12.97	1.24	31.48	13.72
F. Sense organ diseases	0.00	12.22	4.66	0.01	14.30	5.91
G. Cardiovascular diseases	13.66	3.91	9.94	15.59	4.23	10.90
H. Respiratory diseases	3.07	4.73	3.7	4.45	4.59	4.51
I. Digestive diseases	2.90	3.47	3.12	3.71	3.25	3.52
J. Genitourinary diseases	1.00	1.06	1.02	1.24	0.98	1.13
K. Skin diseases	0.08	0.54	0.25	0.06	0.53	0.25
L. Musculoskeletal diseases	0.12	5.11	2.02	0.13	5.49	2.34
M. Congenital anomalies	1.76	1.96	1.84	2.11	1.98	2.05
N. Oral conditions	0.00	1.29	0.49	0.00	1.25	0.52
<b>III. Injuries</b>	<b>13.04</b>	<b>10.86</b>	<b>12.21</b>	<b>15.16</b>	<b>10.85</b>	<b>13.38</b>
A. Unintentional injuries	8.89	9.00	8.93	10.76	9.73	10.33
B. Intentional injuries	4.15	1.86	3.28	4.40	1.13	3.05

Source: *Revised global burden of disease (GBD) 2002 estimates*. Geneva, World Health Organization. Available from: <http://www.who.int/healthinfo/bodgbd2002revised/en/index.html>

Note that in Table 6.2, the major contributors to YLD are diseases with a low case-fatality rate and a chronic course; for example, neuropsychiatric conditions (31% of YLD) and sense organ diseases (14% of YLD). These conditions are gradually being noticed because of the considerable burden of the disease brought about by their chronicity and, therefore, higher cost of treatment, impact on social

relationships and loss of economic opportunities for those afflicted. Despite recent advances in neuroscience, much remains to be understood about these conditions, and greater attention and resources are needed to address the burden they create.

In 1990, average DALYs lost in the Region was 253 per 1000 population, but dropped 17% to 209 per 1000 by 2002 (Table 6.3), with communicable, maternal, perinatal and nutritional conditions steadily declining. Among specific conditions in this group, the greatest decline was in nutritional deficiencies, and the smallest in perinatal conditions.

Table 6.4 presents the country-specific DALYs (percentage and per 1000 population) of the major groups of conditions. For communicable, maternal, perinatal and nutritional conditions, low-resource countries such as Cambodia, the Lao People's Democratic Republic and Timor-Leste have the highest percentage of DALYs. By contrast, high-resource countries such as Australia, Japan, New Zealand and Singapore have the highest percentage of DALYs due to noncommunicable diseases. China has the highest for injuries (15%), while Mongolia, Sri Lanka, India, Thailand, Indonesia, Viet Nam and Bangladesh closely follow each other. Of all conditions, the Lao People's Democratic Republic has the highest DALYs per 1000 (403.1), followed by Cambodia (384.5) and Nepal (303.5).

## The hidden burden of disease

Although DALYs were developed to measure disease burden, a hidden burden exists for each morbidity condition, and some of this hidden burden is currently unquantifiable.

Costs borne by families is one example of a hidden disease burden, particularly in countries lacking specialized health services. The economic cost to industry through higher health coverage of employees is another that is yet to be studied in detail.

A group of conditions with an obvious yet hidden burden are neuropsychiatric conditions, because the burden has not been quantified in DALYs. These disorders are responsible for 13% of DALYs worldwide and 14% in the Asia Pacific Region. In the midst of this increasing burden, recognition of mental disorders as a major health problem remains low, or nonexistent, in many national health programmes.

Evidence suggests that the poor and marginalized in developing countries are at greater risk and females are most greatly affected by mental disorders. Between 10% to 30% of women in developing countries suffer from depression during pregnancy and childbirth. This impacts child care and health. The negative health implications for children of depressed mothers can be substantial and they may suffer serious somatic effects as well.<sup>3,4</sup>

Although the precise mechanisms involving the interaction of social and biological factors that lead to mental disorders are unclear, there is ample evidence to banish the scepticism in developing countries that little can be done for many mental disorders, particularly depression. Primary prevention through education and economic empowerment, and secondary prevention by training medical-care providers to recognize and treat common mental diseases, should be explored.

Suicide, although classified under the category of injuries is related to this, and is now a leading cause of death among young women of reproductive age in China and India. Complications arising from unsuccessful suicide attempts, from wrist drop to wrist slashing, or injuries from ingesting corrosive materials, leave not only physical but also psychological scars.

**Table 6.3** Trend in disability-adjusted life years lost per 1000 population in the Asia Pacific Region

Cause ↓	1990	1998	2002	2005+	2015+
<b>Population (thousands) →</b>	<b>2 667 000.0</b>	<b>3 136 209.0</b>	<b>3 308 368.9</b>	<b>3 419 785.4</b>	<b>3 705 468.0</b>
<b>Total DALYs lost (per 1000 pop.) →</b>	<b>252.6</b>	<b>211.0</b>	<b>209.0</b>	<b>196.3</b>	<b>177.2</b>
<b>I. Communicable, maternal, perinatal and nutritional conditions</b>	<b>109.5</b>	<b>76.9</b>	<b>72.2</b>	<b>60.3</b>	<b>42.8</b>
A. Infectious and parasitic diseases	50.7	36.9	34.0	28.4	23.0
B. Respiratory infections	19.6	13.9	12.6	10.1	5.6
C. Maternal conditions	8.1	4.7	4.4	3.5	1.8
D. Perinatal conditions	17.7	13.0	16.2	14.2	9.9
E. Nutritional deficiencies	11.1	8.3	5.0	4.2	2.6
<b>II. Noncommunicable diseases</b>	<b>104.0</b>	<b>99.1</b>	<b>108.8</b>	<b>108.9</b>	<b>109.4</b>
A. Malignant neoplasms	12.8	13.9	11.7	12.1	13.3
B. Other neoplasms	0.0	0.5	0.2	0.2	0.2
C. Diabetes mellitus	1.7	1.5	2.4	2.6	3.2
D. Endocrine disorders	0.4	0.4	0.8	0.7	0.6
E. Neuropsychiatric conditions	25.8	25.7	28.7	28.5	28.0
F. Sense organ diseases	2.5	2.6	12.3	12.6	13.5
G. Cardiovascular diseases	24.1	23.1	22.8	22.8	22.4
H. Respiratory diseases	13.0	12.9	9.4	9.8	10.8
I. Digestive diseases	9.3	7.0	7.4	6.8	5.6
J. Genitourinary diseases	2.4	2.1	2.4	2.3	2.2
K. Skin diseases	0.0	0.2	0.5	0.5	0.5
L. Musculoskeletal diseases	2.6	2.9	4.9	4.9	5.1
M. Congenital anomalies	7.0	5.0	4.3	3.8	3.0
N. Oral conditions	1.3	1.3	1.1	1.1	1.2
<b>III. Injuries</b>	<b>39.1</b>	<b>35.1</b>	<b>28.0</b>	<b>27.1</b>	<b>25.0</b>
A. Unintentional injuries	32.3	17.3	21.6	20.8	19.0
B. Intentional injuries	6.8	6.5	6.4	6.3	6.1

**+ Projected**

Sources: 1990: Murray CJL, Lopez AD, eds. *Global burden of disease, vol I*. Cambridge, Harvard School of Public Health, 1996. Annex Tables 9c, 9d and 9e

1998: *The world health report 1999: making a difference*. Geneva, World Health Organization, 1999. Annex Table 3

2002: *Revised global burden of disease (GBD) 2002 estimates*. Geneva, World Health Organization. Available from: <http://www.who.int/healthinfo/bodgbd2002revised/en/index.html>

2005 and 2015: *Projections of mortality and burden of disease to 2030*. Geneva, World Health Organization. Available from: <http://www.who.int/healthinfo/statistics/bodprojections2030/en/index.html>



**Table 6.4 Disability-adjusted life years by major disease conditions in selected Asia Pacific Region countries, 2002**

Country and area	DALYs lost (%)			DALYs lost per 1000 population			
	Group I conditions*	Noncommu-nicable diseases	Injuries	Group I conditions*	Noncommu-nicable diseases	Injuries	All causes
1 Australia	5.1	85.1	9.8	5.6	93.8	10.8	110.2
2 Bangladesh	47.1	40.7	12.2	121.1	104.6	31.4	257.1
3 Bhutan	51.7	36.8	11.5	152.1	108.2	33.8	294.1
4 Brunei Darussalam	15.6	73.3	11.1	20.0	94.3	14.3	128.6
5 Cambodia	62.4	30.8	6.8	239.8	118.5	26.3	384.5
6 China	18.5	66.4	15.0	28.5	102.2	23.1	153.8
7 Cook Islands	33.3	66.7	0.0	55.6	111.1	0.0	166.7
8 DPR Korea	33.4	57.8	8.8	71.2	123.2	18.7	213.0
9 Fiji	26.4	66.3	7.4	51.7	130.0	14.4	196.1
10 India	45.3	41.4	13.3	129.6	118.2	37.9	285.8
11 Indonesia	31.0	56.0	13.1	66.2	119.6	27.9	213.6
12 Japan	5.6	84.3	10.1	5.9	87.9	10.5	104.3
13 Kiribati	33.3	62.5	4.2	92.0	172.4	11.5	275.9
14 Lao People's Democratic Republic	60.4	27.9	11.7	243.4	112.5	47.2	403.1
15 Malaysia	19.9	69.6	10.5	29.0	101.8	15.4	146.3
16 Maldives	41.7	48.3	8.3	80.9	93.9	16.2	190.9
17 Marshall Islands	23.1	61.5	7.7	57.7	153.8	19.2	230.8
18 Micronesia, Federated States of	31.8	59.1	9.1	64.8	120.4	18.5	203.7
19 Mongolia	29.3	57.1	13.8	66.4	129.3	31.3	227.0
20 Myanmar	49.8	38.9	11.3	148.0	115.8	33.6	297.3
21 Nauru	33.3	66.7	0.0	76.9	153.8	0.0	230.8
22 Nepal	51.9	36.8	11.3	157.5	111.6	34.4	303.5
23 New Zealand	4.9	85.4	9.7	5.7	100.4	11.4	117.5
24 Palau	25.0	50.0	0.0	50.0	100.0	0.0	150.0
25 Papua New Guinea	54.0	35.9	10.1	155.4	103.5	29.0	287.9
26 Philippines	33.0	57.6	9.4	63.0	109.9	17.9	190.8
27 Republic of Korea	11.0	76.1	0.3	14.8	102.3	0.4	117.5
28 Samoa	27.6	65.5	6.9	45.5	108.0	11.4	164.8
29 Singapore	10.4	83.5	6.1	11.0	88.2	6.5	105.7
30 Solomon Islands	40.4	54.1	6.4	95.0	127.4	15.1	237.6
31 Sri Lanka	15.3	71.3	13.4	28.4	131.9	24.7	185.1
32 Thailand	29.8	56.9	13.3	61.1	116.7	27.2	205.1
33 Timor-Leste	63.4	25.5	11.1	131.3	52.8	23.0	207.0
34 Tonga	25.0	68.8	6.3	38.8	106.8	9.7	155.3
35 Tuvalu	33.3	66.7	0.0	100.0	200.0	0.0	300.0
36 Vanuatu	31.6	60.5	7.9	58.0	111.1	14.5	183.6
37 Viet Nam	32.2	54.9	12.9	53.6	91.4	21.4	166.4

\* Communicable diseases, maternal and perinatal conditions, and nutritional deficiencies

Source: Data calculated from: *Death and DALY estimates for 2002 by cause for WHO Member States*. Geneva, World Health Organization. Available from: <http://www.who.int/healthinfo/statistics/bodgbdeathdalyestimates.xls>

Other psychosocial effects include anxiety and depression over impending death; fear of disability; chronic pain, and loss of ability to perform activities related to daily living, for example, those resulting from chronic diseases such as stroke, diabetes or cancer. For communicable diseases, mental illnesses and many other chronic illnesses that are stigmatized, shame and guilt are common. The SARS epidemic generated feelings of extreme vulnerability, uncertainty and threat to life during its initial outbreak phase. Over time, when the infection was being brought under control, depression and avoidance were evident among hospital workers in Taiwan.<sup>5</sup> Beyond the impact on individual health there was also an impact on families, occupations and on the national economy, all this attributed to hidden burdens of the epidemic.

## Morbidity

Morbidity is the occurrence of ill-health and the effects of disease on a population. It is measured in various ways, often by the probability that a randomly selected individual in a population, at some time and place, will become seriously ill. Incidence and prevalence are both measures of morbidity, as is disability. Various chronic diseases bring about physical, sensory and cognitive impairments.

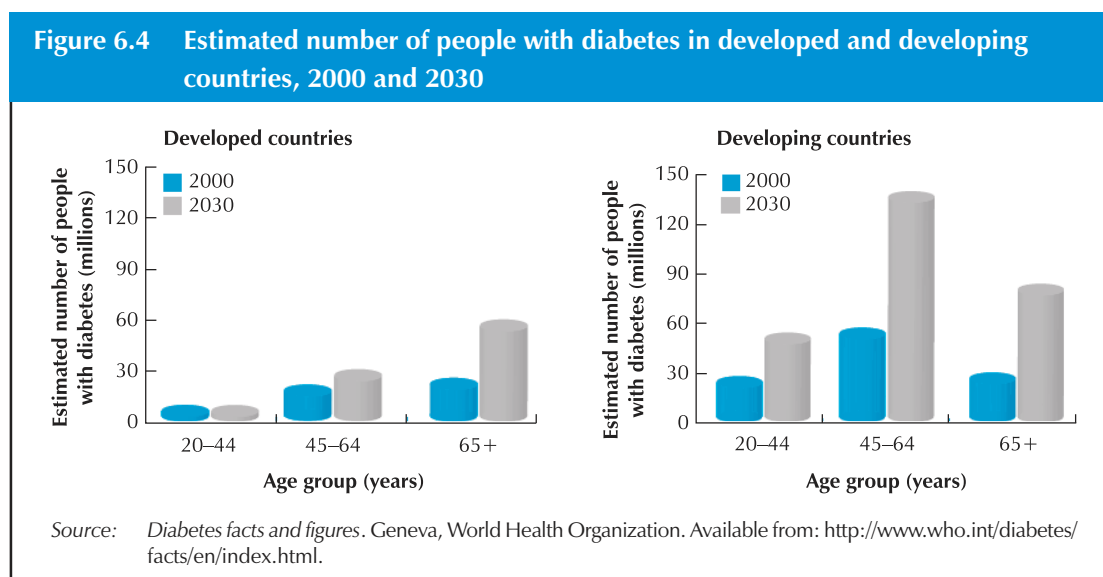
Morbidity data is difficult to collate across countries because of varying sources and dates, different approaches to diagnostic nomenclature, and the use of vague and nonspecific diagnoses. Available sources range from hospital reports, community surveys, routine surveillance and monitoring, and research. There are also varying health information system capabilities across countries, with some reflecting obviously poor data collection methods and others with more systematic health information systems.

Recent available data generated by these varied sources from countries in the Asia Pacific Region include respiratory tract infections, childbirth-related conditions, diarrhoea, viral infections (including influenza), various skin diseases, other respiratory conditions, and injuries and accidents (including poisoning) as leading causes of morbidity.<sup>6,7</sup> Other causes of morbidity include various disorders of the cardiovascular system, parasitic infections, neoplasms and diabetes. Tuberculosis remains a major health challenge in some countries such as Cambodia, Indonesia, Nepal, the Philippines and Timor-Leste.<sup>8,9</sup> Malaria is the leading cause of morbidity in the Lao People's Democratic Republic, Myanmar, Solomon Islands and Vanuatu,<sup>10</sup> and in Indonesia it is anaemia.

Although available data gleaned from different sources show predominantly infectious diseases as leading causes of morbidity, particularly among the young, there is a growing concern over the increasing incidence of noncommunicable disease conditions such as cardiovascular disease and diabetes. Neuropsychiatric disorders, particularly depression, continue to be a public health challenge. Epidemiological transition is believed to partly play a role in the changing morbidity landscape.

The concept of epidemiologic transition is related to demographic transition (ageing populations) and nutrition transition, both part of a more broadly defined health transition. As life expectancy increases with demographic transition, cardiovascular disease is increasing rapidly in some developing countries. In India, cardiovascular disease cases were estimated to be 38 million in 2005, and may rise to 64 million by 2015. This is partly due to a growing and ageing population as well as an increasing prevalence of lifestyle-related risk factors.<sup>11</sup> The current estimate of more than 180 million people worldwide with diabetes is likely to more than double by 2030.<sup>12</sup> Since the 1980s, Japanese disease patterns have shifted to lifestyle-related diseases such as cancer, heart disease, cerebrovascular disease and diabetes.<sup>13</sup>

Figure 6.4 shows the estimated number of people with diabetes in both developed and developing countries. The rate of increase in diabetes cases appears to be higher in developing countries in comparison with developed countries.



Neuropsychiatric disorders, on the other hand, have gained much attention. Although the prevalence of neuropsychiatric disorders varies widely, from 4.3% in Shanghai, China, to 26.4% in the United States of America, serious disorders are associated with substantial disability.<sup>14</sup> Four of the ten leading causes of YLD are due to neuropsychiatric disorders, such as depression, alcohol-use disorders, schizophrenia and bipolar disorder.<sup>15</sup>

In general, the epidemiologic transition is from a high occurrence of communicable diseases to noncommunicable diseases. Some countries, such as the Philippines, defy this expected pattern, with most of the leading causes of morbidity still being communicable diseases like diarrhoea, bronchitis, pneumonia, influenza, tuberculosis, malaria, chicken pox and measles. The situation is similar in Samoa, where there is persistent high morbidity due to communicable diseases, although obesity, diabetes and cardiovascular diseases are becoming more prevalent. Pregnancy-related disorders in Thailand are now overshadowed by intestinal diseases.

It is also important to note that morbidity from emerging and re-emerging infectious diseases has threatened public health safety. Among these are HIV/AIDS, SARS, avian flu, and tuberculosis, which has been difficult to control because of growing resistance to conventional therapies.

## Maternal morbidity

Improving maternal health is one of the eight Millennium Development Goals. Conditions related to childbirth (pregnancy, delivery and obstetric complications) are among the five leading causes of morbidity. Maternal health also impacts child health, with depression following childbirth associated with poor child growth in developing countries. An association between psychological morbidity during pregnancy and low birth weight (<2.5 kg) was established in a cohort study in India. In this study, it was concluded that maternal psychological morbidity has an adverse impact on fetal growth.<sup>16</sup>

In a systematic review done to identify the main causes of maternal mortality and morbidity, the maternal conditions most frequently reported in studies were hypertensive disorders in pregnancy, stillbirth, pre-term delivery, induced abortion and haemorrhage.<sup>17</sup>

A useful indicator for measuring maternal morbidity is YLD. Table 6.7 shows the YLD due to maternal conditions in different countries, classified according to mortality strata. Overall, YLD for maternal conditions in Stratum D (high child and high adult mortality) countries is 10 times that of Stratum A (very low child and very low adult mortality) countries. Improving maternal health, particularly delivery, in many developing countries remains a challenge, despite the realization that maternal health is at the core of efforts to reduce poverty and inequality.

**Table 6.7** Years lost due to disability for maternal conditions in females aged 15–44 in the Region (by mortality strata), 2002

Cause	Years lost due to disability			
	Stratum A	Stratum B	Stratum D	Region
Maternal haemorrhage	0.00	0.02	0.50	0.20
Maternal sepsis	0.48	2.26	4.48	3.02
Hypertensive disorders	0.00	0.00	0.00	0.00
Obstructed labour	0.05	0.53	2.59	1.28
Abortion	0.00	0.17	2.70	1.12
Others	1.53	4.12	8.94	5.83
Total maternal conditions	2.06	7.10	19.21	11.45

Note: There is no stratum C country in this Region

A. Very low child and very low adult mortality countries: Australia, Brunei Darussalam, Japan, New Zealand, Singapore

B. Low child and low adult mortality countries: Cambodia, China, Cook Islands, Fiji, Indonesia, Kiribati, the Republic of Korea, the Lao People's Democratic Republic, Malaysia, the Marshall Islands, the Federated States of Micronesia, Mongolia, Nauru, Niue, Palau, Papua New Guinea, the Philippines, Samoa, Solomon Islands, Sri Lanka, Thailand, Tonga, Tuvalu, Vanuatu, Viet Nam

C. Low child and high adult mortality countries: None

D. High child and high adult mortality countries: Bangladesh, Bhutan, India, Maldives, Myanmar, Nepal, Timor-Leste, the Democratic People's Republic of Korea

E. High child and very high adult mortality countries: None

Source: Calculations based on: *Revised global burden of disease (GBD) 2002 estimates*. Geneva, World Health Organization. Available from: <http://www.who.int/healthinfo/bodgbd2002revised/en/index.html>

One of only a few available indicators for measuring maternal health at the population level is the percentage of women who have anaemia. Low birth weight and child and maternal mortality are possible outcomes of anaemia in pregnant women. The other direct adverse sequelae of iron deficiency anaemia are reduced work productivity among affected women and the possibility of mental retardation in affected children.<sup>18</sup>

Often asymptomatic, anaemia goes unnoticed and is widely prevalent among pregnant women. While it is practically absent (2% or less) in Guam, Hong Kong (China), Palau and Tokelau, it is disturbingly high (50% or more) in Cambodia, French Polynesia, India and the Federated States of Micronesia. At 44%, it is also a concern in the Philippines (Table 6.8). A maternal micronutrient

<b>Country/area</b>	<b>Percentage</b>	<b>Year</b>
French Polynesia	66.6	2002
Cambodia	57.1	2005
Micronesia, Federated States of	51.0	2000
India	49.7	1998-99
Philippines	43.9	2003
American Samoa	32.0	2002
New Zealand	27.0	1998
Fiji	17.8	1998
Mongolia	12.1	2006
Marshall Islands	8.0	1999
Vanuatu	7.0	2003
Australia	6.2	2005
Northern Mariana Islands	4.6	2000
Hong Kong (China)	1.8	2006
Guam	1.2	2001
Palau	1.2	1998
Tokelau	0.0	1999

*Sources:* *Country health information profiles 2007*. Manila, WHO Regional Office for the Western Pacific, 2007. For India: *National Family Health Survey (NFHS-2) 1998-89*. Mumbai, International Institute for Population Sciences.

supplementation trial in rural Nepal found low serum iron concentrations in 40% of pregnant women and anaemia in 33%.<sup>19</sup>

Short height, age over 35, high parity, closely-spaced births and poor obstetric history are risk factors for poor pregnancy outcomes. Medical risk factors for adverse pregnancy outcomes are toxemia and pre-eclampsia.<sup>20</sup> Although height, age and parity are useful indicators for identifying high-risk pregnancies, these are not modifiable. Augmenting maternal nutrition and hygiene are viable strategies for prevention of obstetric complications.

A very important component of maternal health is proper nutrition, as this determines fetal nutrition. Nutritional deficiencies in antenatal women can cause structural and functional changes *in utero* that may permanently increase susceptibility of the child to chronic diseases.<sup>21</sup> The role of micronutrients is important and a critical need in developing countries is meeting the requirements of calories and iron. This is not only limited to pregnant or women of child-bearing age. Considering the wide benefits of maternal nutrition, innovative approaches are needed. A more extensive discussion of maternal health is found in Chapter 9.

## Undernutrition in children

The leading causes of morbidity, such as respiratory tract infections and diarrhoea, mostly affect children. Such morbidity arises from a large number of interrelated factors. Maternal condition has previously been cited as associated with child health. Child nutrition is another interrelated factor.

Undernutrition is an important cause of morbidity. Although overweight is gaining importance in developing countries, international commitments must continue undeterred to alleviate the major problem of undernutrition. Undernutrition compromises the body's defence from infections, and protein and energy malnutrition in children inhibits growth, increases risk of morbidity, affects development, and reduces subsequent school performance and labour productivity.<sup>22</sup> Severe undernutrition during infancy may contribute to lasting intellectual deficits.<sup>23</sup> Improved nutrition is not merely a public health imperative but a social responsibility. Table 6.9 shows the malnutrition situation in some selected countries in the Region. Undernutrition among children aged five and under, for both weight for age and weight for height, is high in Bangladesh. According to gender, the percentage of undernutrition is higher among males. Undernutrition is more prevalent in rural than urban areas.

Aside from undernutrition, the other nutrition-related problems, particularly among children, are iodine deficiency anaemia, vitamin A deficiency and obesity.

**Table 6.9** Percentage of children (0 to 5 years) underweight for age and height in selected Asia Pacific Region countries

Country	Year	Weight for age (<-2SD)				Weight for height (<-2SD)			
		Male	Female	Urban	Rural	Male	Female	Urban	Rural
Bangladesh	2004	42.8	42.7	37.7	43.9	15.7	13.5	13.9	14.8
China	2002	7.2	6.4	3.1	8.0	3.3	2.7	2.4	3.2
Cambodia	2006	29.8	27.1	27.7	28.5	8.3	8.3	9.2	8.2
Indonesia	2004	20.7	18.7	16.9	21.9	15.3	13.5	13.1	15.4
DPR Korea	2002	19.2	16.2	16.8	18.5	9.3	8.1	8.7	8.8
Maldives	2001	25.5	26.0	...	...	14.3	12.2	...	...
Mongolia	2004	5.3	4.2	3.0	5.8	0.6	0.7	1.4	0.2
Myanmar	2003	31.1	28.2	24.7	31	11.5	9.8	9.3	11
Nepal	2006	37.7	39.8	23.2	40.9	13.0	12.4	7.5	13.4
Singapore	2000	3.6	2.9	...	...	3.8	3.3	...	...
Sri Lanka†	2000	22.0	23.8	...	...	16.5	14.3	...	...
Timor-Leste	2002	43.0	38.1	33.2	42.9	15.9	11.4	11.1	14.5
Viet Nam	2000	26.6	26.7	16.2	29.1	7.1	5.1	7.2	5.9

† Age 3 months to 5 years

... Data not available

Source: WHO global database on child growth and malnutrition. Geneva, World Health Organization. Available from: <http://www.who.int/nutgrowthdb/database/countries/en/index.html/p-child.pdf>

While poverty is frequently a contributing factor to undernutrition, the lack of proper nutritional knowledge complicates the problem. People may not know which available food resource is most nutritious. A basic problem is the deficiency of protein and energy, and this is compounded by deficiencies in micronutrients. A prudent low-cost diet which is wholesome with adequate calorie and micronutrient requirements can be determined. Development of proper food and eating habits is also essential, but such prescriptions must be specific to local conditions, such as what foods are available and are culturally acceptable.

## Injuries

Injuries and accidents, including poisoning, are leading causes of mortality (discussed in Chapter 5) as well as morbidity.

Although injury is the fifth leading cause of death in both urban and rural China, nonfatal injuries are far greater: estimated to be at least 50 million annually, leaving 2.25 million suffering disability of

**Table 6.10 Years lost due to disability from unintentional and intentional injuries (by mortality strata), 2002**

Type of injury	Years lost due to disability			
	Stratum A	Stratum B	Stratum D	Region
<b>Unintentional injuries</b>	<b>2.67</b>	<b>6.01</b>	<b>12.51</b>	<b>8.39</b>
Road traffic accidents	0.43	1.36	1.83	1.50
Poisonings	0.03	0.02	0.02	0.02
Falls	0.79	1.64	2.60	1.97
Fire	0.05	0.17	1.18	0.56
Drownings	0.01	0.01	0.01	0.01
Other unintentional injuries	1.37	2.80	6.87	4.33
<b>Intentional injuries</b>	<b>0.34</b>	<b>0.82</b>	<b>1.26</b>	<b>0.97</b>
Self-inflicted injuries	0.25	0.23	0.59	0.37
Violence	0.08	0.45	0.54	0.47
War	0.01	0.13	0.12	0.12
Other intentional injuries	0.00	0.01	0.01	0.01

- A. Very low child and very low adult mortality countries: Australia, Brunei Darussalam, Japan, New Zealand, Singapore
- B. Low child and low adult mortality countries: Cambodia, China, Cook Islands, Fiji, Indonesia, Kiribati, the Republic of Korea, the Lao People's Democratic Republic, Malaysia, the Marshall Islands, the Federated States of Micronesia, Mongolia, Nauru, Niue, Palau, Papua New Guinea, the Philippines, Samoa, Solomon Islands, Sri Lanka, Thailand, Tonga, Tuvalu, Vanuatu, Viet Nam
- C. Low child and high adult mortality countries: None
- D. High child and high adult mortality countries: Bangladesh, Bhutan, India, the Democratic People's Republic of Korea, Maldives, Myanmar, Nepal, Timor-Leste
- E. High child and very high adult mortality countries: None

Source: Calculations based on: *Revised global burden of disease (GBD) 2002 estimates*. Geneva, World Health Organization. Available from: <http://www.who.int/healthinfo/bodgbd2002revised/en/index.html>

varying degrees.<sup>24</sup> In India, there has been a steep rise in trauma deaths in rural areas over the previous two decades, with five injured for every trauma death.<sup>25</sup>

When measuring the burden of injuries in YLL and YLD, the type of injury plays a large role. Unintentional injuries account for 13.2 YLL and 8.4 YLD per 1000 population. Figures are higher in high child and adult mortality countries (Stratum D) compared to other country categories. Among the identified types of unintentional injuries, falls contribute the most to the YLD. For intentional injuries, self-inflicted injuries are a close second to violence in terms of YLD (Table 6.10). Self-inflicted injuries are related to mental health issues, often called unsuccessful suicide attempts. Aside from the economic cost of self-inflicted injuries from direct health services, there is an unquantifiable psychosocial impact on the individual and the family, not to mention disability arising from sustained injuries in some cases.

## Managing morbidity

Theoretically, mortality can only be delayed while morbidity can be eliminated. Sickness is assumed to be an integral part of life but it can be prevented with appropriate measures, treated with effective therapies, and complications prevented.

In less-resourced regions, major contributors to loss of healthy life are childhood and maternal underweight, unsafe sex, unsafe water, sanitation and hygiene, indoor smoke from solid fuels, and various micronutrient deficiencies.<sup>26</sup> High blood pressure, high cholesterol and tobacco are the major risk factors in low mortality countries, while unsafe sex is also a major risk factor in high mortality countries. Except for tobacco use, differences between males and females are minor.

The role of community awareness in health improvement does not always attract the appreciation it deserves. HIV/AIDS has affected large sections of the population in many countries because of lack of awareness about how it is spread and its consequences. Communicable diseases can become epidemics because of ignorance of the benefits of hygiene, clean water sources and immunizations. With increasing longevity, lifestyle diseases and their prevention are getting more attention. Health awareness should figure prominently in policy-making at every level.

Poor nourishment in childhood adversely affects health in adult life through a set of interlocking processes. Much of childhood undernutrition arises from nutritionally deprived mothers. Just as immunization programmes reduce inequality in childhood mortality, maternal nutrition can reduce inequalities in other aspects of health.

Clean water is absolutely essential for healthy living but its importance is not fully realized. Fresh water resources are scarce and uneven, and threatened by all types of contamination. Unsafe water, sanitation and hygiene are major contributors to high morbidity in high mortality countries (segment D) but that does not sufficiently capture the misery inflicted on the deprived segments of society.

Awareness, nutrition, vaccines and safe water are simple strategies but they present stiff implementation challenges, and it has been difficult to bring effective interventions to the needy. Accelerated efforts may produce results if the capability of health systems to carry out interventions is enhanced and other sectors become involved. Building national ownership and the capacity to implement programmes are crucial for this purpose.



Countries must develop criteria to identify priorities and allocate resources accordingly. Large investments poured into diagnostic and curative services meet the market needs generated by the well-off in developing countries but may not be cost-effective in the long run. Various public health strategies (e.g. awareness, nutrition, vaccines and safe water) also compete for resources, raising the relevance of the prioritization issue. For maximum health gains, thorough analysis of the costs and benefits of various interventions should be carried out, based on the best evidence, with morbidity and mortality assessment guiding resource allocation and evidence-based policy.

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