

Indicator name Disability-adjusted-life year (DALY)				
Disease	Annual global burden attributable to water, sanitation and hygiene		Percent of total burden attributable to environmental factors	Environmental pathways
	Deaths (thousands)	DALY ^a (thousands)		
Diarrhoea	1,523	52,460	94	Water supply, sanitation, hygiene
Malnutrition	863	35,579	50	Water supply, sanitation, hygiene, water resources management
Malaria	526	19,241	42	Water resources management
Lymphatic filariasis	0	3,784	66	Water supply, sanitation
Intestinal nematodes	12	2,948	100	Sanitation
Trachoma	0	2,320	100	Water supply, hygiene, flies
Schistosomiasis	15	1,698	100	Water supply, sanitation, water resources management
Japanese encephalitis	13	671	95	Water resources management
Dengue	18	586	95	Water supply, sanitation

Source: Adapted from Prüss-Üstün and Corvalán 2006; Prüss-Üstün et al. 2008.

Prepared by	WHO
Example	WWDR3, Chapter 6, Table 6.3 WWDR2, Chapter 6, Table 6.3
Rationale	The Disability-Adjusted-Life Year (DALY) is a summary measure of population health, integrating mortality with morbidity and disability information in a single unit. DALYs show the relative importance of health problems and can be combined with data on costs and effectiveness of interventions to establish which public health interventions would be most cost effective. The DALY is the measure of choice to monitor the burden of disease in relation to improvements in water supply and sanitation.
Position in DPSIR chain	Impact
Definition of indicator	One DALY represents the loss of one healthy year of life. For each disease DALYs are calculated as the sum of years lost due to premature mortality and the years of productive life lost due to disability for incident cases of the ill-health condition in question.
Underlying definitions and concepts	DALY estimates depend on availability of data of sufficient quality and on assigning a certain class of severity of disability to each disease, which is based upon expert opinion.
Specification of determinants needed	The DALY is an indicator of the time lived with a disability and the time lost due to premature mortality. To measure the time lived with a disability in a manner that can be meaningfully compared with the time lost due to premature mortality, there is a need for the following data: (1) age and gender specific information on the incidence of disease, (2) the proportion of disease incidence leading to a disabling outcome, (3) the average age of disability onset, the duration of disability, and (4) the distribution of disability across the six classes of disability severity. In most cases this data is unavailable and researchers are forced to rely on estimates, many of which are uncertain.
Computation	The duration of time lost due to premature mortality is calculated using standard expected years of life lost with model life-tables. The reduction in physical capacity due to morbidity is measured using disability weights. The value of time lived at different ages has been calculated using an exponential function which reflects the dependence of the young and the elderly on the adults. Because incidence data are rarely available directly, the Global Burden of Disease study uses a mathematical model to convert prevalence data to incidence data.

Units of measurements	The DALY
Data sources, availability and quality	WHO Global Burden of Disease database: http://www.who.int/evidence/bod (Accessed 02 March 2009); annexes of the annual World Health Report. Cause of death patterns by age and gender are needed to calculate the years of life lost to premature death. Worldwide, only about 30-35 percent of all deaths are captured by vital registration. For the remainder, cause of death structure as a function of the level of mortality can provide broad cause-of-death groups. Such methods are generally unreliable for more specific causes.
Scale of application	Global, by age, sex, and 14 epidemiological regions.
Geographical coverage	Global
Interpretation	There are uncertainties in estimates of disease incidence, duration, severity, and disability weighting.
Linkage with other indicators	None reported.
Alternative methods and definitions	It has been stated that the value choices in the DALY on disability weighting, age-weighting and discounting, tend to underestimate the disease burden attributed to young populations and communicable diseases.
Related indicator sets	None reported
Sources of further information	World Bank. 1993. <i>The World Development Report 1993: Investing in Health</i> . Washington DC. Murray, C.J.L.; Lopez, A.D. (eds). 1996. <i>The Global Burden of Disease</i> . Boston, MA: Harvard University Press, 990p.
Other institutions involved	WHO