

# Chapter 2.3

## Disease Burden: Generating Evidence, Guiding Policy

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# Learning objectives

To understand the basic concept of disease burden and its potential in identifying and understanding health issues in a disaster. In particular:

- The strength of the burden of the disease concept.
- How to quantify the burden of disease from mortality to disability.
- The content of a case study using the burden of disease concept.

# Introduction

**Comprehensive** and **comparable** evidence of mortality and disability is important for prioritizing policy planning and interventions for Health EDRM. **Burden of disease** is a methodological framework that quantifies and compares population health using **DALYs**.

- The framework allows comparisons of the differences between health losses due to mortality and disability, and those due to different diseases or injuries.
- It is a powerful tool that can be used to generate evidence, guide policy and invest strategically on disaster risk management.

# DALYs

## **DALY (Disability-adjusted life year)**

- Used to measure mortality and disability.
- Combines time lost due to premature death from a disease or injury and time lived with disability into a single measure.
- Considers the severity of disability associated with different states of poor health.
- Useful for determining which diseases and injuries contribute to health loss in a population.
- Helps identify key health problems and prioritize health policy concerns.



# Disasters as a cause of death and disability

Disasters are a major cause of mortality and disability. Risks and harmful consequences of health emergencies are exacerbated by factors such as:

- Rapid and unplanned urbanization.
- Climate change.
- Widespread poverty and insecurity.
- Social inequity.
- Political instability.
- Economic stagnation.



# Managing disaster risk



To reduce the impact of disasters in terms of economic losses and burden of diseases, it is important to invest in disaster risk management which can help conserve resources and protect development progress.

Examples of global commitments to disaster risk management include the **Sendai Framework of 2015**, the **Sustainable Development Goals (SDGs)** and the **Paris Agreement**.



# Quantifying the burden of disease from mortality and disability (1)

DALYs measure the difference between the **actual situation** and an **ideal situation** (where everyone is in perfect health and lives to the standard life expectancy).

In a hazard context, DALYs include direct injuries, death and indirect health effects, as well as the impacts of hazards on deteriorating health resources and social capital. One DALY represents a **one-year loss** of 'healthy' life due to disease or injury.



## Quantifying the burden of disease from mortality and disability (2)

$$\text{DALY} = \text{YLL} + \text{YLD}$$

**YLL** = Years of Life Lost

**YLD** = Years Lived with Disability

For a specific cause of disease or injury:

**DALYs** are calculated as the sum of **YLL** due to premature death from that cause and the **YLD** for people living in states of less than perfect health due to a specific cause.



## Quantifying the burden of disease from mortality and disability (3)

$$YLL = N \times L$$

**YLL** = Years of Life Lost is the number of deaths multiplied by the standard life expectancy at the age at which death occurs

**N** = Number of deaths

**L** = Standard life expectancy (in years)

Standard life expectancy is calculated using a standard life table, which is a key component of the **burden of disease** concept. It corresponds to the ideal life span for an individual in perfect health but is not necessarily the actual life table of the population of interest.

## Quantifying the burden of disease from mortality and disability: prevalence-based approach

The two methods of calculating YLD are the prevalence-based approach (existing cases) and the incidence-based approach (new cases).

### Prevalence:

$$YLD = P \times DW$$

**P** = Number of prevalent cases

**DW** = Disability weight

This weight factor is based on subjective measures.

# Quantifying the burden of disease from mortality and disability: incidence-based approach

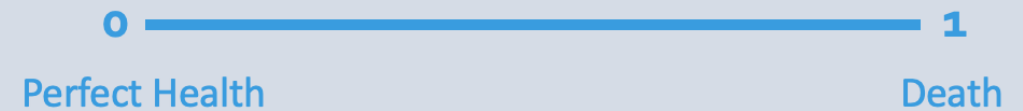
## Incidence:

$$YLD = I \times DW \times L$$

**I** = Number of incident cases

**DW** = Disability weight

**L** = Average duration of the case of remission or death (in years)



This weight factor reflects the severity of the disease or injury on a scale from 0 (perfect health) to 1 (dead).

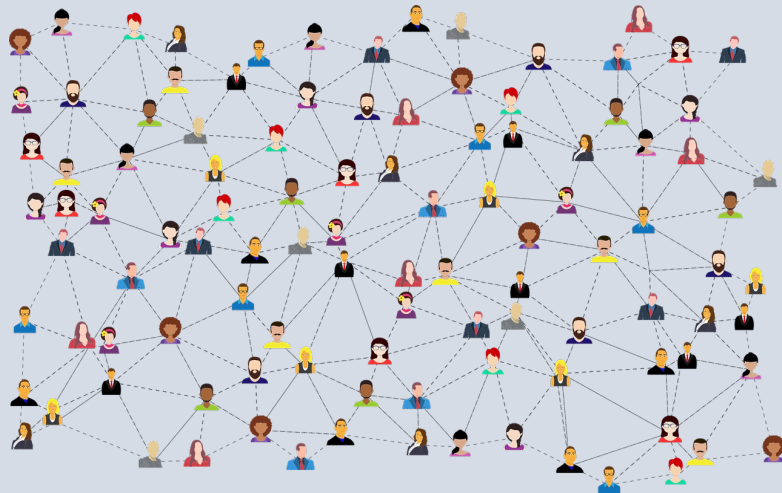
# Use of DALYs in Health EDRM



DALYs are valuable for disaster research and policy priorities. They can be used to calculate the impact of disasters and emergencies in different socioeconomic groups and geographic areas.

Health EDRM can benefit from DALYs by using them to support policies aimed at improving resilience and reducing disparity in damage.

# GBD 2017 reporting: a snapshot (1)



The **Global Burden of Disease (GBD)** is produced by a global network of more than 3600 collaborators from universities, research institutions and governments; primarily from low- and middle-income countries.

## GBD 2017 reporting: a snapshot (2)

### **GBD 2019**

- The most recent GBD study covered 204 countries and territories.
- DALYs and other health metrics for each year from 1990 to 2019 were calculated.
- Data are disaggregated by age, gender, location and year.
- 359 diseases or injuries were assessed.

## GBD 2017 reporting: a snapshot (3)

The GBD synthesizes various data sources to estimate burden of disease, with country vital registration data used as the primary data source for mortality due to hazards.

### Other relevant databases include:

- **Centre for Research on the Epidemiology of Disasters' International Disaster Database (EM-DAT)**: source of mortality data due to exposure of forces of nature, fire, heat, and hot substances.
- **Uppsala Conflict Data Program (UCDP)**: source for data on conflict and terrorism.





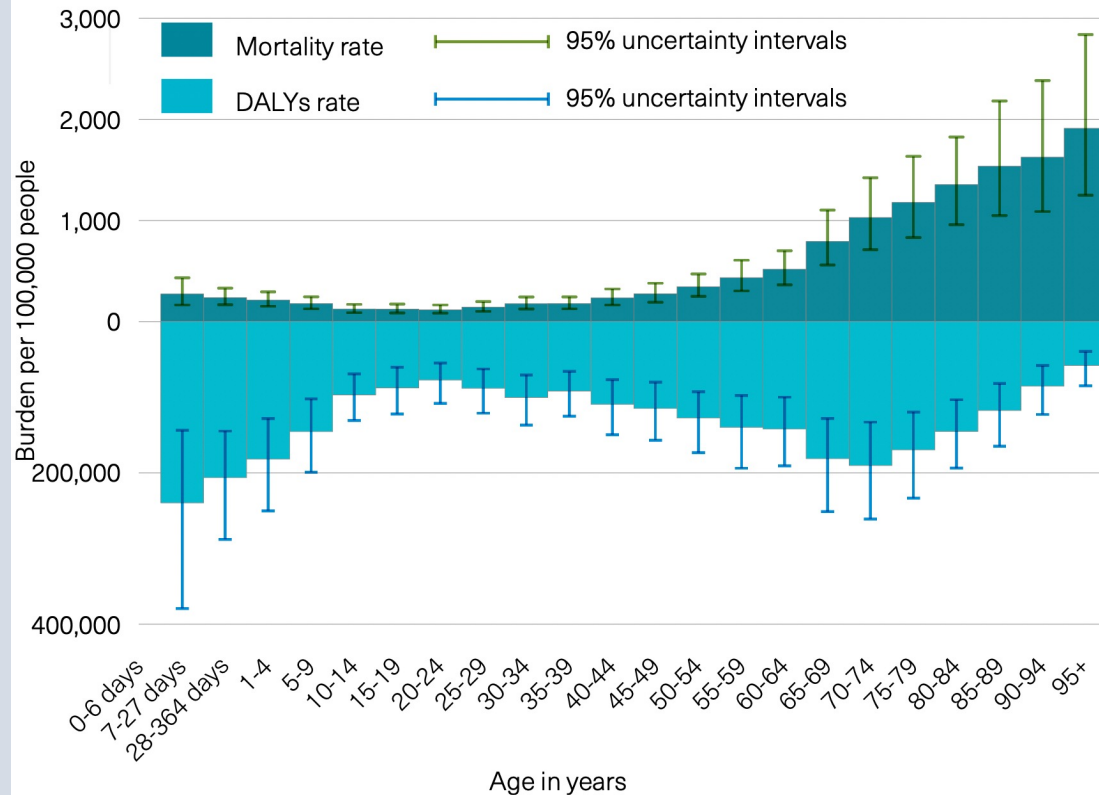
## **Case study 1:** *DALYs produce a different picture of health impact of a disaster (1)*



In March 2011, the magnitude 9.0 Great East Japan Earthquake and subsequent tsunami killed more than 16,000 people.

Miyagi, the coastal prefecture in the path of the tsunami, had the greatest number of fatalities (accounting for 60% of total deaths due to the tsunami).

# Case study 1: DALYs produce a different picture of health impact of a disaster (2)



This figure shows the age-specific mortality rate (per 100,000) due to exposure to forces of nature in 2011 in Miyagi Prefecture.

- The highest mortality rate was observed among people above 90 years of age, at 1913 (with 95% uncertainty intervals of 1249 to 2840 per 100 000 people).
- This is 5 to 10 times higher than among people under 50 years of age.

## **Case study 1:** *DALYs produce a different picture of health impact of a disaster (3)*

- However, when using DALYs instead of mortality rates, the highest burden of the disaster was observed in children under 5 years of age, followed by older groups.
- This demonstrates that DALYs produce a different picture of the burden of a disaster than mortality rates, which is why it is important to use and interpret the burden of disease concept in Health EDRM.

# Conclusions

- It is important to gather evidence on mortality and disability to understand how populations are affected by disasters and emergencies.
- The burden of disease concept is globally recognized as a framework to quantify and compare population health, using the DALY as a summary measure of both mortality and disability. It can:
  - Compare data from mortality and disability rates.
  - Compare and contrast health impacts of different events across countries and regions.
- Over time, this provides a foundation for assessing programmes and policies, and for planning and analyzing research.

# Key messages

- A key foundation for prioritizing policy planning and interventions in Health EDRM is comprehensive and comparable evidence on mortality and disability.
- A burden of disease approach quantifies and compares health loss due to mortality and disability for different diseases and injuries.
- The DALY is a summary measure of population health that integrates mortality and disability.
- DALYs allow comparisons between different health hazards and offers the ability to assess the impact of disaster risk reduction (DRR) strategies.

## Further readings (1)

Haagsma JA, Polinder S, Cassini A, Colzani E, Havelaar AH. Review of disability weight studies: comparison of methodological choices and values. *Population Health Metrics*. 2014 Dec;12(1):1-4.

This review article provides an overview of studies that developed disability weights and compares methodological design choices.

Murray CJ. Quantifying the burden of disease: the technical basis for disability-adjusted life years. *Bulletin of the World Health Organization*. 1994; 72(3): 429-45.

This article provides the technical basis for the disability-adjusted life year (DALY).

## Further readings (2)

Murray CJ, Lopez AD. The global burden of disease: a comprehensive assessment of mortality and disability from diseases, injuries and risk factors in 1990 and projected to 2020. Cambridge: Harvard University Press. 1996.

This booklet summarises *The Global Burden of Disease: A Comprehensive Assessment of Mortality and Disability from Diseases, Injuries, and Risk Factors in 1990 and projected to 2020*.



# References

**This chapter:** Nomura S., Ishizuka A. Disease burden: Generating Evidence, Guiding policy.

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**Quantifying the burden of disease: the technical basis for disability-adjusted life years.** Bulletin of the World Health Organization 1994; 72(3): 429-45.

**Incidence-based versus prevalence-based approaches on measuring disability adjusted life years for injury.** Journal of Korean Medical Science 2019; 34 (Suppl 1): e69.

**Global, regional, and national incidence, prevalence, and years lived with disability for 354 diseases and injuries for 195 countries and territories, 1990-2017: a systematic analysis for the Global Burden of Disease Study 2017.** Lancet. 2018; 392(10159): 1789-858.

**The Great Hanshin-Awaji Earthquake and the problems with emergency medical care.** Renal Failure. 1997; 19(5): 633-45.

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