Chapter 4.7

Evaluating Economic Impacts in Health Emergency and Disaster Risk Management

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Learning objectives

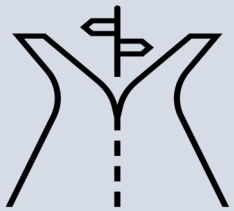
The learning objectives of this chapter are to:

- Understand how economic evaluations and economic impact studies can support decision-making in health emergency and disaster risk management (Health EDRM).
- Know the methods available to researchers conducting these studies.
- Be aware of research limitations, including evidence gaps and methodological challenges.

Economic evaluations and economic impact studies

Economic evaluations and economic impact studies can help justify the size of overall spending and support specific resource allocation decisions in Health EDRM.

1. **Economic impact studies** quantify the costs (resource use) or consequences (effects) involved in events or actions.



2. **Economic evaluations** explicitly compare the costs and consequences of a programme or policy with an alternative course of action.

Why conduct economic evaluations and economic impact studies?

This type of research is used to

- Explain the implications of an event or health issue.
- Describe potential risk management actions (in terms of financial and non-financial resources).
- Help justify spending and supports resource allocation decisions.

Macroeconomic impacts (1)

Health emergencies and disasters lead to economic impacts on households, health systems and economies as a whole.

Illness or injury can create healthcare costs and income losses that put stress on families and households. For example:

- Spending on health services or medicines, which limit money available for other household costs or create financial debt.
- An inability to work, due to illness or caring for others who are sick, can lower household income and add to financial distress.

Example

Response to Super Typhoon Yolanda (Philippines, 2013), included national insurance agency (PhilHealth) guaranteeing hospital services to all seeking access, regardless insurance coverage. Prevented further typhoon-related hardship due to additional costs.

Macroeconomic impacts (2)

- Damage and disruption can restrict healthcare services and, at the same time, create increased demand due to direct and indirect health impacts.
- This can mean that illness and injury are not treated, leading to worse health outcomes and higher long-term health-related costs.

Example

Hurricane Katrina (USA, 2005) was estimated to cause disruption to diabetes patients' access to healthcare services and supplies leading to US$504 million in additional healthcare costs over the lifetimes of affected individuals.

Macroeconomic impacts (3)

Disasters and emergencies also create macroeconomic impacts. For example:

- Government institutions are stressed by responses to challenging public priorities.
- Private organizations lose potential revenues from the goods and services they produce, and the supplies of labour and other inputs needed to produce them.

Example

Extreme heat in South-East Asian countries may restrict feasible annual working hours by 15% to 20% by 2030.

Key concepts involved in conducting economic evaluations

Three elements of economic evaluations:

1. **Target Population**
2. **Economic Outcomes (Perspectives)**
3. **Comparison Methods**

Target population (1)

Economic evaluations focus on a specific group of individuals, known as the target population, which is often defined by the interventions they receive or their geographic / socioeconomic / demographic characteristics.

- Researchers should also consider whether they define this population based on whether a health emergency or disaster directly or indirectly affected the people in the population.

Target population (2)

Directly affected

- People who have suffered injury, illness or other health effects; who were evacuated, displaced or relocated or have suffered direct damage to their livelihoods, economic, physical, social, cultural and environmental assets.
- Examples of direct health effects include immediate illness due to an infectious disease or injuries such as wounding, blunt force trauma, and burns.

Indirectly affected

- People who, over time, have suffered consequences other than or in addition to direct effects. These may be due to disruption or changes in economy, critical infrastructure, basic services, commerce or work, and include social, health and psychological consequences.
- Examples of indirect health effects include post-emergency sanitation issues leading to infectious disease outbreaks and disrupted access to healthcare services leading to untreated health issues.

Perspective (1)

Researchers use a variety of measures to estimate costs and consequences, two ways these measures can be grouped is via using a "payer perspective", or a "societal perspective".

- The choice as to which economic outcomes should be included in a study is influenced by the amount of time and effort required to conduct the study, which depends on analysis requirements and the intended audience for the results of the study.
- The choice of perspective for a study is often discussed in terms of the range of costs considered, but can also account for consequences considered.

Perspective (2)

Payer perspective focuses on costs and consequences linked to the use of (and payment for) health care. The main payers are usually government agencies or health insurers. However, in many settings, patients and family members will incur costs associated with accessing or receiving health care.

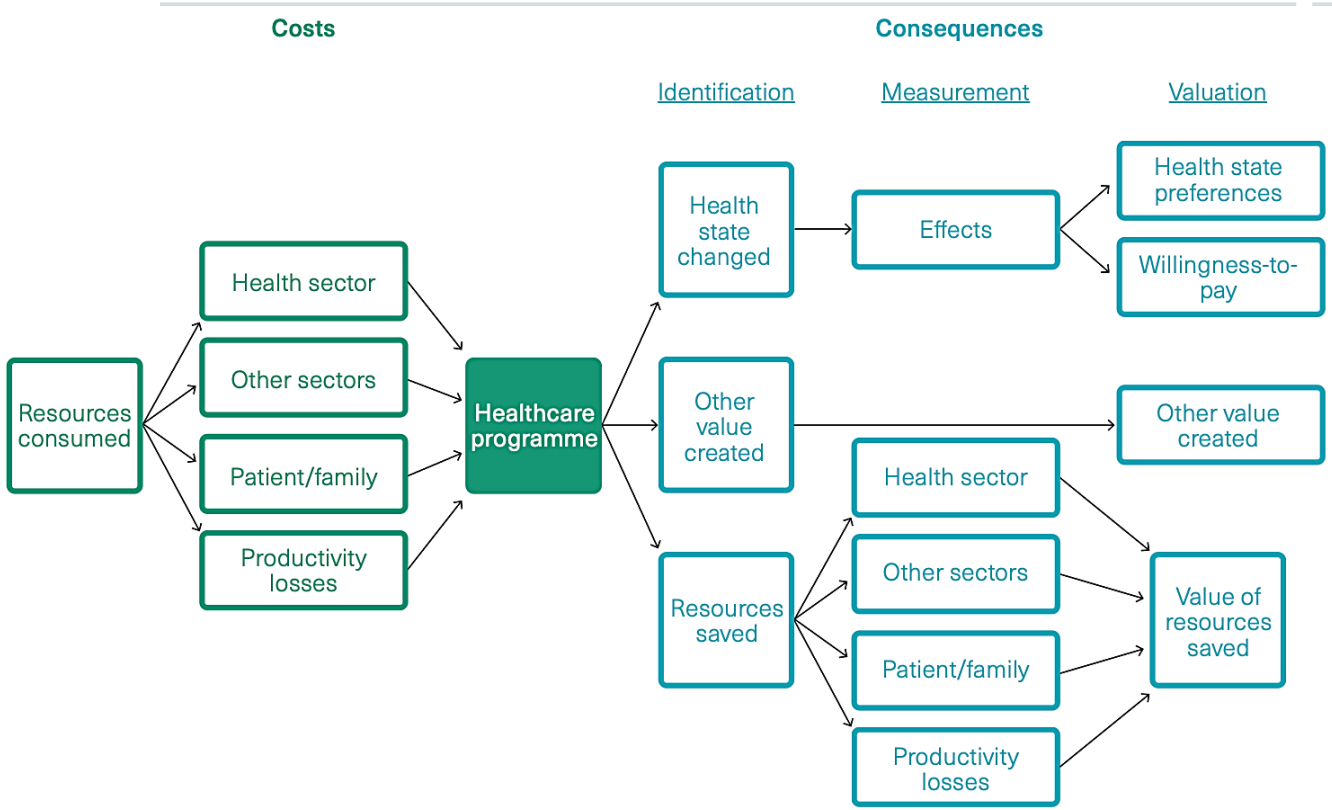
- Medical costs and consequences may involve payments for access to care, medical supply costs, salaries for health workers and expected future healthcare costs related to changes in health outcomes.
- Non-medical costs and consequences may involve spending on transport, accommodation, and food by individuals receiving care and informal nursing care provided by their families.

Perspective (3)

Societal perspective focuses on the costs and consequences, including but not limited to those measured in a payer perspective, which can be linked to health outcomes and healthcare use. Societal costs and consequences include broader societal concerns – such as employment, labour productivity, and consumption of goods and services other than health care.

- Economic costs and consequences are measured based on the value of market or non-market resources. Market resources are purchased with money and have a defined price (e.g. health worker salaries, drug costs)
- Non-market resources are not purchased with money and do not have a defined price. These include household work, volunteer services, and donated medical supplies.

Perspective (4)



This figure shows the key pathways involved when estimating the costs and consequences involved in an economic evaluation of a healthcare program.

Common methods for combining data on costs and consequences to evaluate economic outcomes (1)

Cost Benefit

- Costs and consequences measured in monetary terms.

Cost Consequence

- Compares costs and consequences by placing them in discrete categories.

Common methods for combining data on costs and consequences to evaluate economic outcomes (2)

Cost Effectiveness

- Costs (monetary) compared with outcomes in natural units (e.g. infections).

Cost Minimization

- Compares interventions based on monetary costs, if they have same effect.

Common methods for combining data on costs and consequences to evaluate economic outcomes (3)

Cost Utility

- Compares monetary with consequences measured via standard unit (e.g. QALY).

Return on Investment

- Calculates the size of the difference between positive consequences and costs.

Ten steps to conducting an economic evaluation (1)

1: Define a research question, including: population, costs and consequences, time horizon, analytic perspective, and decision-making context. (*see also Chapter 3.5*).
2: Describe the intervention and identify any that were not considered , such as specific interventions for population subgroups. (*see also Chapter 3.3*).
3: Establish the effectiveness of the intervention or policy (using primary data/evidence synthesis). Note factors that may influence data reliability.
4: Describe the relevant costs and consequences for each alternative intervention or policy.
5: Measure relevant inputs for costs and consequences, using appropriate and comparable units. Justify the included measures and their information sources.

Ten steps to conducting an economic evaluation (2)

6: Estimate values for costs and consequences. Record the source of these values and whether they are market values or not, and if values were adjusted.
7: Adjust estimates of costs and consequences to account for their changing value over time, via application of discount rates.
8: Compare the costs and consequences of different interventions by combining estimates using an established analysis method.
9: Describe uncertainty uncertainty in findings by: analysing statistical variance within estimates, accounting for heterogeneity across subgroup, and conducting sensitivity analysis.
10: Describe results and discuss aspects including: differences between study's methods and findings and those in comparable studies; generalizability of results.

Research limitations

Evidence gaps and **methodological challenges** have limited the prevalence and use of evaluations of economic impacts in Health EDRM research.

- These gaps include a lack of studies that incorporate economic evaluations (most are economic impact studies), use a societal perspective for economic outcomes, or are set in low- and middle-income countries.
- Researchers often use different methods, or adapt methods to their needs, which can limit the ability of others to compare the findings of a study with otherwise similar studies.

Research limitations: methodological challenges

Methodological challenges:

- **Attributing outcomes**: difficult to use randomized trials to attribute and measure outcomes associated with interventions in Health EDRM, making it hard to conduct economic evaluations.
- **Measuring economic outcomes**: difficult to measure different stakeholders' preferences for health and non-health outcomes and to create a combined measure of economic outcomes.
- **Time variance**: must consider how to apply discount rates in economic studies given the potential (in)frequency of a given disaster.

Research limitations: attributing outcomes

Attributing outcomes

- In many circumstances it may not be feasible to use a randomized trial. This increases the difficulty involved in conducting a robust economic evaluation.
- However, if sufficient data can be collected, researchers may be able to create a quasi-experimental study by using natural variation in people's exposure to interventions (see also chapters 4.5 and 4.14).

Research limitations: measuring economic outcomes

Measuring economic outcomes

- It is difficult to measure different stakeholders' preferences for health and non-health outcomes and to create a combined measure of economic outcomes.
- Population preferences for these outcomes may also change over time and need to be accounted for.
- Future research may expand the scope of existing measures, such as recent efforts to adapt the QALY approach to better account for broader wellbeing.

Research limitations: time variance

Time variance

- It is important to consider how to apply discount rates in economic studies in Health EDRM, given the potential (in) frequency of a given emergency or disaster.
- A discount rate accounts for the difference in stakeholder preferences for an outcome now versus one in the future, as well as uncertainty and the time value of money, and discounts the expected value of an intervention.
- Recommended time horizons and discount rates are available for specific contexts and uses, but there is persistent debate on the most appropriate values to use.

Conclusions (1)

- Researchers use economic evaluations and economic impact studies to identify and explain the costs and consequences involved in policies and programmes that support Health EDRM.

- Practitioners and policymakers can then use the evidence generated by these studies to guide their decision making on specific issues and broader strategic planning.

Conclusions (2)

- Established methods and concepts are available to researchers to synthesize and improve the current evidence base of economic studies, although there are challenges to expanding research in this area.
- Nevertheless, there are opportunities for economic studies to fill knowledge gaps and to address the ongoing needs of decision makers.
- Researchers and stakeholders can use these opportunities to advocate for putting greater effort into assessing and addressing the economic aspects of past, present and future health emergencies and disasters.

Key messages (1)

- Evaluating economic impacts in Health EDRM can inform and improve prevention, preparedness, response and recovery activities.
- Economic evaluations and economic impact studies are established ways to evaluate the impacts of interventions and events. Researchers can draw upon standardized methods and knowledge built by existing communities of expertise.

Key messages (2)

- Current research gaps mean that researchers have the opportunity to develop specific guidance on how to examine economic outcomes in the context of Health EDRM and to conduct more research that incorporates economic evaluations, uses a societal perspective for economic outcomes and is set in low- and middle-income countries.
- All of these features can offer useful and usable information to improve Health EDRM practices.

Further readings

Madhav N, et al. Pandemics: Risks, Impacts and Mitigation. In: Jamison DT, et al, editors. Disease Control Priorities (third edition). Washington DC: World Bank. 2017.
Introduces several key concepts linked ton analyzing and addressing the risks of pandemics, covering core themes that can be applied across Health EDRM research.

Peters DH, et al. Financing Common Goods for Health: Core Government Functions in Health Emergency and Disaster Risk Management. Health Systems & Reform. 2019: 5(4):307–321.
Provides an estimate of the costs needed for key Health EDRM functions in 67 low- and middle-income countries.

Clarke L, Le Masson V. Shocks, stresses and universal health coverage: pathways to address resilience and health. ODI Working Paper 526. 2017.
Explores why universal health coverage (UHC) is important for health and wellbeing, sustainable development, and resilience.

References (1)

This chapter: Clarke L, Drummond MF. Chapter 4.7: Evaluating economic impacts in health emergency and disaster risk management.
Methods for the economic evaluation of healthcare programmes: Oxford, UK: Oxford University Press. 2015.
Cost of an Ebola case: Pathogens and Global Health. 2015: 109(1):4–9.
Impact of a Natural Disaster on Diabetes: Exacerbation of disparities and long-term consequences: Diabetes Care. 2009: 32(9): 1632–8.
Economics of Disaster Risk, Social Vulnerability, and Mental Health Resilience: Risk Analysis. 2011: 31(7): 1107–19.
Projecting excess emergency department visits and associated costs in Brisbane, Australia, under population growth and climate change scenarios: Scientific Reports. 2015: 5: 12860.

References (2)

Excessive Heat and Respiratory Hospitalizations in New York State: Estimating Current and Future Public Health Burden Related to Climate Change: Environmental Health Perspectives. 2012: 120(11): 1571–7.

Report of the open-ended intergovernmental expert working group on indicators and terminology relating to disaster risk reduction: 2017. https://www.undrr.org/publication/report-open-ended-intergovernmental-expertworking-group-indicators-and-terminology.

Case study, Comparing the value of stockpiling approaches: Journal of the Royal Society, Interface. 2011: 8(62):1307–13.

Case study, Preparing for public health emergencies: PLOS Computational Biology. 2017: 13(6):e1005521.

Understanding the economic impact of health emergencies and disasters (1)

Infectious disease outbreaks: Ebola Virus Disease (EVD) in West Africa (2014-2016): Bartsch and colleagues estimated costs associated with individual patient cases of EVD.

- They looked at individuals who survived and who died after receiving care for EVD, in Guinea, Liberia and Sierra Leone during the 2014-2016 outbreak.
- Estimates of costs included supportive care, personal protective equipment, wages for health workers, and productivity losses linked to health-related absence from work.
- They compiled costs associated with 17,908 cases of EVD and 6373 deaths caused by EVD, as of December 2014, to estimate total societal costs of US$82 to US$356 million.

Understanding the economic impact of health emergencies and disasters (2)

Infectious disease outbreaks: Ebola Virus Disease (EVD) in West Africa (2014-2016). Kirigia and colleagues estimated economic losses associated with EVD deaths.

- They focused on individuals who died in Guinea, Liberia, Mali, Federal Republic of Nigeria and Sierra Leone during the 2014-2016 outbreak.
- They measured losses based on expected overall losses of economic outputs, excluding those related to the provision of health care.
- They compiled costs associated with 11,234 deaths from 27,543 EVD cases, as of 28 June 2015, and estimated that cumulative future economic losses would be over US$155 million.

Understanding the economic impact of health emergencies and disasters (3)

Extreme weather events: Hurricanes in the USA. Fonseca and colleagues forecast economic impacts associated with hurricane-related disruption to health care.

- They focused on individuals with diabetes impact by Hurricane Katrina, which made landfall in the USA in August 2005. Estimates of health outcomes included measures of blood sugar, blood pressure and lipids.
- They drew on a previous study to combine these measures to estimate life expectancy, quality-adjusted life expectancy and future costs of diabetes-related complications.
- They forecast that disruption to diabetes patients' access to healthcare services and supplies because of the damage to the health system might lead to US$504 million in additional healthcare costs over the lifetimes of affected individuals.

Understanding the economic impact of health emergencies and disasters (4)

Extreme weather events: Hurricanes in the USA. Zahran and colleagues assessed mental health resilience and related economic impacts for people exposed to hurricanes.

- They focused on population impacts, specifically for single mothers, of Hurricane Katrina and Hurricane Rita, which made landfall in the USA in 2005.
- They measured costs by calculating expected declines in productivity and wages following the hurricane events and found that, following the hurricane events, single mothers had over three times more poor mental health days and five times more days absent from work than the general population. These effects were linked to economic losses of US$4200 per person and a total of US$130 million for all single mothers in the affected.

Understanding the economic impact of health emergencies and disasters (5)

Extreme weather events: Heatwaves in Australia and the USA. Toloo and colleagues forecast healthcare costs associated with more common and more intense heatwaves.

- They focused on emergency department use by individuals impacted by heatwaves in Brisbane, Australia. They estimated emergency department use for a younger and older age group and linked use to health issues such as exacerbated cardiovascular issues, diabetes, and renal complaints. They estimated costs by combining data from 2012 and 2013, which described the costs of excess emergency department visits with forecasts for extreme temperature prevalence in 2030 and 2060.
- They forecast that expected heatwaves could increase emergency healthcare costs in Brisbane by between AU$78,000 and AU$260,000 in 2030 and between AU$215,000 and AU$1,985,000 in 2060, without adjusting for inflation.

Understanding the economic impact of health emergencies and disasters (6)

Extreme weather events: Heatwaves in Australia and the USA. Lin and colleagues forecast healthcare costs associated with hospital admissions linked to a range of different heatwave scenarios.

- They focused on respiratory-related hospital admissions in New York, USA. They combined estimates of daily hospitalization costs with excess days of hospitalization per year attributable to extreme heat, using a range of scenarios forecast by the Intergovernmental Panel on Climate Change (IPCC).
- They estimated that heatwave-related annual admissions created additional costs of US$0.64 million per year from 1991-2004, with estimated excess costs of US$5.5 to US$7.5 million per year from 2045-2065, and US$26 to US$76 million per year from 2080-2099.

Case study 1: *Comparing the value of stockpiling approaches (1)*

This economic evaluation assessed stockpiling arrangements of antiviral medicines ahead of an influenza pandemic in 10 high- and middle-income countries.

Focused on

- Different stockpile sizes
- Impacts on eligible recipients of antivirals
- Estimates of mortality associated with infectious disease outbreaks
- Costs of antiviral stockpiles

Case study 1: *Comparing the value of stockpiling approaches (2)*

Economic outcomes

- Treatment costs
- Work absenteeism

Findings

- USA had the potential to avert future costs by US$22 billion.
- Indonesia could reduce expected mortality by more than 9 million deaths by improving stockpiling.

Case study 2: *Preparing for public health emergencies (1)*

- This economic evaluation examined the effects of vaccination interventions during disease outbreaks in Chicago, USA.
- Tested vaccine versus no vaccine intervention on different population subgroups during outbreaks of varying intensities.
- Cost-benefit analysis and return on investment (ROI) analysis were used. All calculations are in US$.

Case study 2: *Preparing for public health emergencies (2)*

Findings

- Highest ROI in a catastrophic outbreak was among high-risk people under 19 years old: $249.16 saved per $1 invested in vaccinations.
- Lower ROI in a catastrophic outbreak was among on-high-risk people 20-64 years old: $5.64 saved per $1 invested in vaccinations.
- Net benefits in all outbreak scenarios were highest among high-risk people 20-64 years old.

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