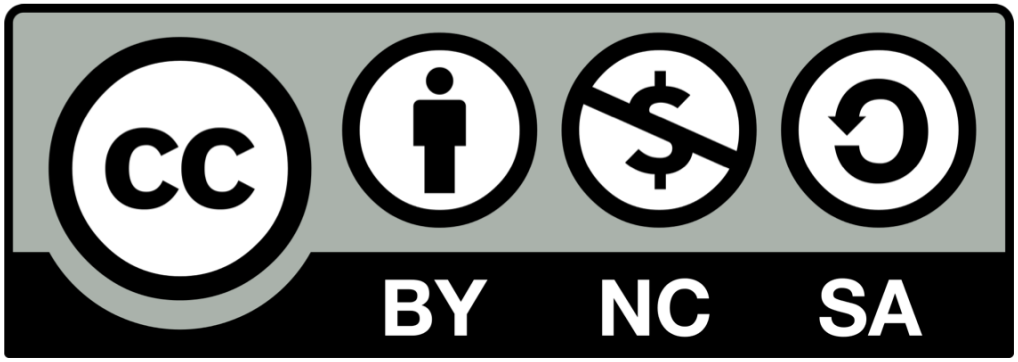
# Economic Evaluation

## Defining the Scope of a Cost-effectiveness Analysis II

TVEE
TEACHING VACCINE ECONOMICS EVERYWHERE

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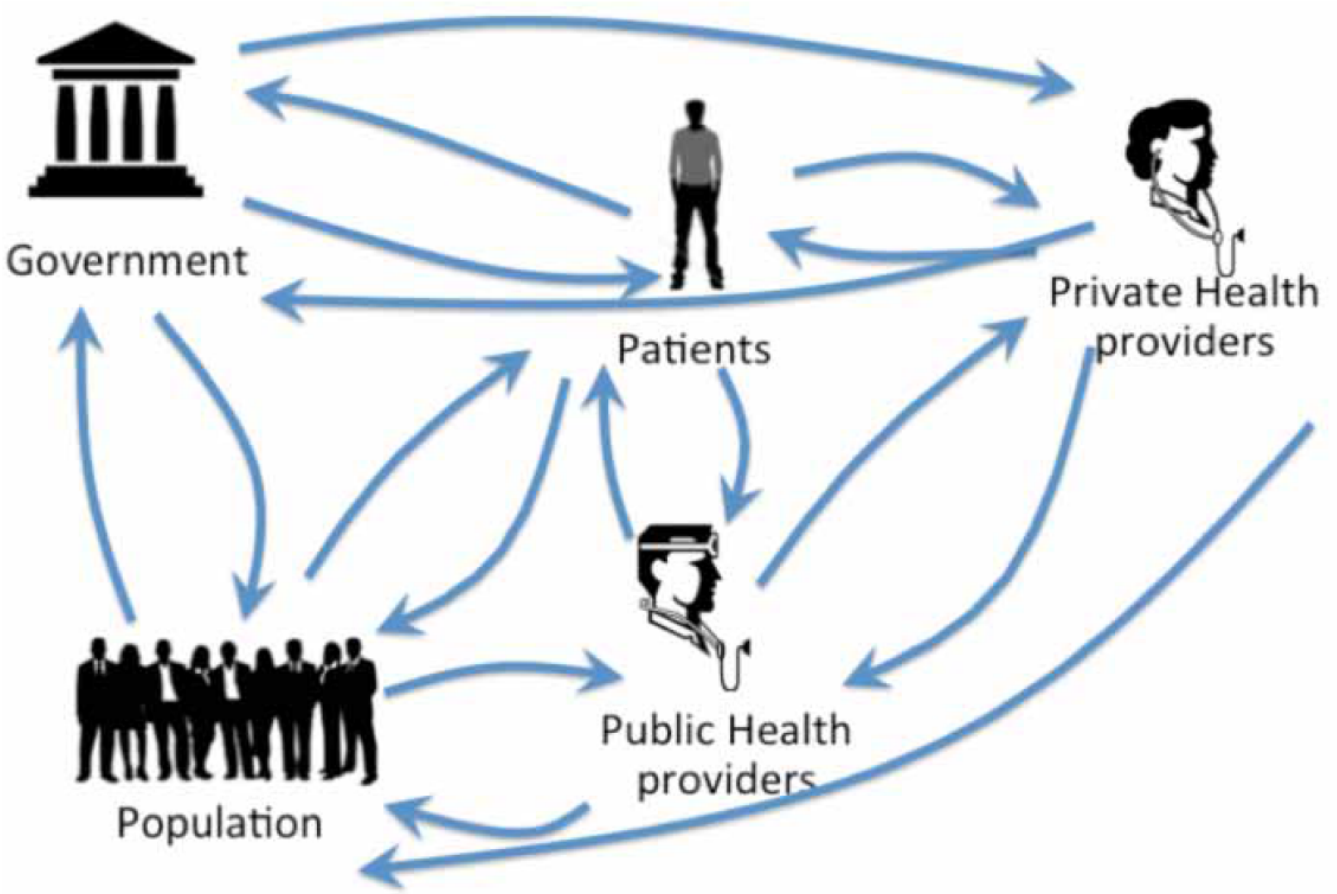
# Overview

- Defining the perspective of an economic evaluation
- What is the time horizon of impact for a vaccine program

# Objectives

- To define the perspectives impacted by a vaccine program
- To understand how to frame the time horizon of a vaccine program
- To consider the impact of vaccines on different stakeholders at different time points

# Perspective



# Study Perspective

- The choice of perspective or viewpoint determines the scope of the costs and benefits.
- Determined by the context of the study, persons or institutions affect by outcome of interest, and those that bear the costs of the intervention.
- Important to separate costs borne by different stakeholders such as providers, payors, patients, and others to allow analysis from different perspectives.
- Range of perspectives included in the analysis depends on availability of data, resources, and time to conduct the study
- However, analysts should be aware that a broader perspective that includes productivity losses or gains will improve cost-effectiveness. This could be used to justify higher vaccine prices
  - increases the break-even price per dose

*Walker, Damian G., Raymond Hutubessy, and Philippe Beutels. "WHO Guide for standardisation of economic evaluations of immunization programmes." Vaccine 28.11 (2010): 2356-2359.*

# Study Perspective

*Can influence how outcomes are measured*

| Perspective | Benefit categories | Definition |
|---|---|---|
| **Narrow** | Health gains | Reduction in morbidity and mortality through vaccination |
| | Healthcare cost savings | Savings of medical expenditures because vaccination prevents illness episodes |
| | Care-related productivity gains | Savings of patient's and caretaker's productive time because vaccination avoids the need for care |
| **Broad** | Outcome-related productivity gains | Increased productivity because vaccination improves physical or mental health |
| | Behaviour-related productivity gains | Vaccination improves health and survival, and thereby changes individual behaviour, for example by lowering fertility or increasing investment in education |
| | Externalities | Improved outcomes in unvaccinated community members, e.g. through herd effects and reduction in the pace at which resistance to antibiotics develops |

# Types of Perspectives

- Generally, there are most comprehensive study perspectives in vaccine economics evaluations:
  - Healthcare sector (payer + patient + provider)
  - Societal (population-level, including government)

- However, studies can be conducted from other perspectives as well, e.g.
  - The Patient
  - Family caregiver (proximal to the patient)
  - The Provider
  - Payer, both public and private parties
  - Employer (e.g. employee-based health insurance)
  - Government (payer and investor of vaccines)
  - Manufacturers and Distributors of Vaccines

# Recommendations on Perspective from U.S. Panel

- The U.S. Second Panel recommends that all CEA should be conducted using both healthcare sector and societal perspectives
  - The perspective you use is based on Target Audience
  - For example, a private insurer may only care about costs associated from payer perspective (not patient costs)

- Some examples of perspective-varying cost-benefit measures
  - Medical costs (current and future, related and unrelated) borne by third-party payers and paid out-of-pocket by patients,
  - Time costs of patients in seeking and receiving care,
  - Time costs of informal (unpaid) caregivers,
  - transportation costs,
  - effects on future productivity and consumption,
  - other costs and effects outside the health care sector

# How Perspective Influences the Cost to be Considered in Cost Analysis

| Cost | Societal | Government | Payer | Patient |
|---|---|---|---|---|
| Hospitalizations, physician consultation fees, medications, diagnostic tests etc. | Yes | Yes | Yes | Yes |
| Transportation, food, accommodation, etc. | Yes | No | No | Yes |
| Time loss from work, informal caregiving etc. | Yes | No | No | Yes |
| Pain and suffering | Yes | No | No | Yes |
| Others (welfare, education) | Yes | No | Yes | Yes |

# The Societal Perspective

- Medical costs (current and future, related and unrelated) borne by third-party payers and paid out-of-pocket by patients
- Time costs of patients in seeking and receiving care
- Time costs of informal (unpaid) caregivers
- Transportation costs
- Effects on future productivity and consumption
- Other costs and effects outside the health care sector

# Healthcare Sector Perspective

- Include all costs and benefits impacting a system of providers, payers and patients.
- Do no consider impact outside of the health system (e.g. long-term value to patients)
- Based on Direct Medical Costs reimbursed by a third party
- Can include out-of-pocket costs to the patient
- Can include current and future costs as a result of a pathway of care

*Sanders, Gillian D., et al. "Recommendations for conduct, methodological practices, and reporting of cost-effectiveness analyses: second panel on cost-effectiveness in health and medicine." Jama 316.10 (2016): 1093-1103.*

# Study Perspective Examples

- Healthcare Sector perspective: Healthcare costs (drug, hospital costs, analytic procedures) including costs arising from the consequences of treatment to patients, providers and payers

- Government perspective: Healthcare costs & other publicly provided services (community services, social services) where taxpayer funds are financed

- Societal perspective: Healthcare and other public sector costs incurred for the management of disease from all perspectives involved in care (e.g. patient, provider, public/private payers, government, family caregivers, etc.)

# Examples of Societal Perspective
# *CEA of Hib Vaccine*

The studies considered costs incurred by the health care provider, the government, the GAVI alliance, and households

Cost items include:

- Government cost for treating meningitis and pneumonia (outpatient and inpatient)
- Household expenditure for each type of disease including medicines, user fees, lodging, transport etc. in public and private sector.
- Opportunity cost in terms of time spent while looking after a sick child
- GAVI supported vaccine price
- Vaccine delivery cost including price of syringes, safety boxes, wastage factor, handling charges

# Example of Healthcare Sector Perspective *CEA of Rotavirus and Varicella Vaccines*

Studies estimated CEA of rotavirus vaccine and varicella vaccine from health care provider perspective included the following cost components

- Cost per dose of vaccine
- Cost of administering the full vaccine schedule (excluding vaccine cost)
- Daily cost of pediatric intensive care unit care
- Daily cost of general pediatric ward care
- Daily cost per outpatient visit

# Examples of Cost/Benefit from Patient perspective

Cost components under patient perspective include

- Fees for consultation in clinics, traditional healers, hospitals,
- Bed day charges at the health facility (private and/or public) etc.
- Expenses on medicines, diagnostic tests,
- Travelling expenses to the health facility for the patient and accompanied persons for treatment,
- Special food consumed for coping with the disease,
- Amount spent on meal / food taken while waiting for treatment,
- Expenses for overnight accommodation for seeking care etc.
- Time loss of the patient and the accompanied persons for seeking treatment,
- Informal caregiving,
- Work days lost by the patient for being sick etc., Including losses in productivity
- Pain and suffering from a particular disease.

# Example of Government Perspective

Ho et al. conducted a study on cost-effectiveness of rotavirus vaccine in Hong Kong in 2008 using government perspective.

Why did they consider government perspective?

- Decision to include a new vaccine into a national immunization program is primarily a government decision

- Including the societal perspective would strengthen the overall case for vaccination but is unlikely to be an important consideration for the government.

# Example from government perspective

In the CEA of rotavirus vaccine in Hong Kong, only those costs incurred by the government health care system were used.

Cost components:

- Cost to Hong Kong per hospitalization due to rotavirus
- Cost to Hong Kong per outpatient clinic visit due to rotavirus
- Cost of vaccinating each child (cost of vaccine plus administration cost)

# Example from Payer Perspective

The purchaser or payer perspective includes the costs that would be incurred or saved by a purchaser or payer (e.G. Insurance company).

Inclusion

- Hospitalizations, physician consultation fees, medications, diagnostic tests etc.

Exclusion

- Transportation or child care expenses incurred because of an illness,
- Time loss from work or informal caregiving.

# Analytical time horizon

- Should be of sufficient length to capture all costs and effects relevant to the decision problem
  - Life Cycle of Disease
  - Vaccine delivery protocol (e.g. number of provider visits)
  - Frequency of follow-up for disease management/advancement

- It should be selected to:
  - Cover all the main costs and benefits that are incurred
  - Allow for any seasonal or cyclical variations
  - Cover costs and benefits occurring in different time periods

- The time horizon used for modelling vaccine programs often depends on the type of vaccine evaluated, the intervention and target population, and thus the type of model developed.

- For costs and benefits accruing beyond one year, an appropriate discount rate should be applied to discount cost and benefits to present value.

# Time Horizon

- The analytic horizon may often be short (i.e. one year or less), e.g. vaccination campaigns, particularly if herd immunity can be ignored and only one (birth) cohort is modelled.

- When using a dynamic model, and if the indirect effects change non-linearly with the number of (birth) cohorts vaccinated, the analytic horizon should be long enough for the modelled infection to attain a new endemic equilibrium, as the current epidemiology is altered after the start or change in the vaccination programme.

# Time Horizon Examples

| Study | Analytical horizon |
|---|---|
| CEA of HIV/AIDS | Lifetime |
| CEA of Hib vaccine in India | 20 years |
| CEA of 7vPCV in Hong Kong | 10 years |
| CEA of rotavirus vaccine in Hong Kong | 5 years |
| CEA of rotavirus vaccine in Mexico | 5 years |
| CEA of seasonal influenza vaccine (many countries) | 1 year |

# Time Horizon Example: Influenza Vaccination

- Assume only seasonal influenza concerns
  - Influenza vaccination manufactured some time in the spring/ summer with strains of influenza predicted to be prevalent in the coming season
  - Most individuals to be vaccinated some time between early fall and early winter
  - Trying to prevent influenza incidence in the fall, winter, and early spring

- All of the events described above occur within one year
  - Is that the relevant time horizon?

# Time Horizon Example Influenza Vaccination

- If a person gets influenza, what happens?
  - Most patients will be symptomatic, recover, and go on with their lives
    - If this were the only set of events possible, then the time horizon would not need to be more than one year
- What are possible complications?
  - Pneumonia
  - Mortality
- What do these complications imply about the time horizon?

# Vaccination Time Horizon

## Mortality and Influenza

- If immediate mortality were the only complication then it is still the case that all events and effects would be within one-year
- The outcome could be influenza cases prevented or influenza mortality prevented
- The outcome could also be DALYs with a simple average DALY averted figure used as the loss associated with premature mortality

## Pneumonia and Influenza

- Pneumonia can last much longer than influenza and can have long- term negative impacts on quality of life
  - This suggests that the time horizon may be longer than one year
    - and approaching a lifetime
  - Could use the CHEC-list suggestion to follow until the situation
    - stabilizes
      - ✓ In other words, until all effects of ever having had influenza are gone

# Other Thoughts on Influenza Vaccination Time Horizon

- The time horizon that is most appropriate may vary for different clinical populations
  - Healthy adults under the age of 65 have low probability of complications
  - Risks are different for older adults, school-age children, and preschoolers

- Strains of influenza like H1N1 may have much different risk profiles, including different times of year at which incidence is high

# Exercise: Scope of CEA I & II

- Review questions in groups
- Discuss potential responses
- Respond to questions online

# Discussion Questions (Quiz)

1. In your opinion, which is the broadest perspective and why?

2. Identify appropriate perspective/s for the following components
   a. Time spent by relative for caring a sick child
   b. Travel expenses incurred by friends accompanied during visit to the health care provider
   c. Price of vaccines, syringes, safety boxes
   d. Expenses on diagnostic tests
   e. Treatment cost of focal neurological deficit arose as a complication of meningitis

3. Is there any difference in recommendations regarding perspective by the first and second panel on CEA in health and medicine? If yes, what is the difference?

4. What time horizon would you consider for CEA of the following vaccines?
   a. Pneumococcal Conjugate Vaccine (PCV)
   b. Human Papilloma Virus vaccine (HPV)