Methods for data collection and analysis: costing methods in global health

Presenter: Carol Levin, Ph.D.
Overview

- Review general concepts for costing methods
- Apply to an example for increasing access to PMTCT in Zimbabwe
- Insights for costs of scaled up programs
Prelude

- Bountiful costing terms and methods.
- Purpose determines the choice of methods.
- Time horizon and timing of costing matters.
- Perspective is about whose costs?
- Scale and scope will affect the total and unit costs.
Basic principles

- Define the problem
- Identify
- Measure
- Value
Identifying Costs- types of costs

- **Direct Health Care costs**
  - Treatment or preventative care
  - Hospital, facilities, communities, home
  - Medication, procedures, tests, equipment
- **Direct Non-Health Care costs**
  - Out-of pocket expenses- transportation, child care
- **Productivity costs (Indirect costs)**
  - Lost economic productivity due to disability or death
Identifying costs: Basic elements to consider

- Costs for the health sector
  - Staff costs, drugs, supplies

- Costs for patients and their families
  - Out of pocket expenses

- Costs for other sectors
  - Lost production form work absenteeism

For example
Cost methods

- Micro-costing methods
  - Bottom up costing
    - Quantify and cost out every input consumed in preventing or treating disease in an individual

- Gross costing or using average costs
  - Allocate the total budget (expenditures) to a particular department or service.
    - Top down costing

- Not mutually exclusive
Analytical approach - Measurement

### Step-down accounting

- Health facility level
- Identify major functions or cost centers of the facility

### Activity based costing

- Program level (i.e. HIV, TB, immunization)
- Identify the major activities of each organizational level of the program and define these as the cost centers.

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**Cost of maternal health services in selected primary care centres in Ghana: a step down allocation approach**

Valmeevik Ayindehiah, 1, 2, Patricia Okyere, 1, Gemma Savadogo, 1, Happiness Sauenga, 1, John Williams, 2, Rosa Saemben, 1, Hengim Ding, 2 and Svetla Ilyasova, 2

**Abstract**

There is a paucity of knowledge on the cost of maternal health care services in Ghana. This paper presents an analytical approach to the estimation of maternal health services costs using step-down allocation approach in selected maternal health facilities in two districts in Ghana. Costs were estimated for the year 2011. Direct medical service costs were collected from financial records maintained by the health centres. Indirect medical service costs were calculated from the literature. The step-down allocation approach recommended by World Health Organization was used for the analysis.

**Results**

The average annual cost of operating a health centre was $126,364. The mean cost attributable to ANC, delivery services, and delivery services, respectively, represented 56%, 30%, and 10% of the total cost. Even though maternal health services are free, allocation of these services at the health centres was low, particularly for ANC services, leading to high unit costs. The mean unit costs were $3.6, $6.0, and $5.8 per ANC, delivery, and maternal unit, respectively.

**Keywords**

Cost, Step-down allocation approach, Maternal care, Delivery, Maternal health services, Ghana

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**An activity-based cost analysis of the Honduran Community-Based, Integrated Child Care (AIC-C) Programme**

John J. Vidalino, 1, Center A Villalobos 2, and Jessie A. De Matos, 1

**Accepted**

21 May 2014

The Honduran AIC-C programmes are a social protection and nutrition programme of the Honduran Ministry of Health (MINS) that operates in communities to help reduce poverty and malnutrition in children. The study was designed to determine the cost of the programme. The study involved the collection of data on the activities carried out by the programme in the four selected districts in the country. Collecting cost data allowed the programme to assess the cost-effectiveness of its interventions. The study found that the programme was cost-effective in all the districts. The cost per child per month was $50, which was less than the cost per child per month in the control group.

**Keywords**

Vocational, community-based, nutrition, cost analysis, health care financing, community participation, social responsivity.
Empirical data collection methods

**Ingredients approach**

- Collect information on quantities and the prices used to value all resources.

**Expenditure approach**

- Use total expenditure from budget or expense reports from Ministry of Health, implementing organization (i.e. NGO), or donor.

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**In practice, it is a combination of both methods**
Cost Classification

Different way to consider costs categories

- Inputs
- Cost centers/function/activities
- Source of funding
- Level of service delivery
- Start-up costs verses recurrent
- Intervention specific costs verses joint or shared costs
- Combine categories inputs by activity
Cost categories: Inputs

Fixed costs* - remain the same regardless of the quantity of output produced
- Equipment (Vehicles, laboratory equipment, computers)
- Development of training or communication materials
- Overhead (building, utilities, indirect expenses)

Variable costs- depend on the quantity of output.
- Personnel allowances –travel and per diems
- Supplies (IEC materials, drugs and health commodities)
- Transport costs (fuel, maintenance, taxi, public transport)

* In the long-run there are no fixed costs
Valuing capital costs

- Large expenditures that last over one year.
- Could be a hospital, vehicle, laboratory equipment.
- Depreciation is included in costs.
- Also often investments that must occur at the beginning of a project or program.
Valuing volunteer labor

- Community health workers (CHW) provide a lot of support at both the community and health facility level.
- Economic or opportunity cost of next best use of CHW time.
Sources & methods for collecting quantity and price data

- Administrative data bases
  - From health facility
  - Project expense reports
  - MOH centralized records

- Standardized reporting forms
- Surveys for providers and beneficiaries
- Review of patient charts
- Observation or time-motion studies
- Expert panel
- Published price lists
Assessing costs and effectiveness of expanding high quality PMTCT services by community and facility strengthening in Mashonaland Central Province, Zimbabwe
Zimbabwe ARISE Project: Intervention objectives

- Increase access to the WHO’s recommended PMTCT prophylaxis regimen, including highly active antiretroviral therapy (HAART) to all pregnant women who need it for their own health.
- Increase community access to and uptake of PMTCT services.
- Evaluate the effectiveness of the intervention by measuring the decrease in HIV infection among HIV exposed infants.
Research Objectives

Economic evaluation objective:

- Determine the *CIDA funded frontline cost* per infant infection averted
- Sub-objectives:
  - Costs: Estimate the *incremental program costs* incurred to provide Option A in Mashonaland Province
  - Impact: Calculate the incremental cost-effectiveness, measured as *cost per infection averted*
Comparison of PMTCT options

**Table 1**: Comparison of Zimbabwe’s WHO 2006 (“MER-28”) and WHO 2010 Option A (“MER-14”) guidelines for HIV-positive women and their HIV-exposed infants

<table>
<thead>
<tr>
<th>WHO 2006, Prophylaxis</th>
<th>WHO 2010, Option A Prophylaxis</th>
<th>WHO 2010, ART</th>
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<tr>
<td><strong>Mother (CD4&gt;350):</strong></td>
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<tr>
<td>● ANC: Single-dose nevirapine (NVP) or dual-drug prophylaxis regimen containing zidovudine (AZT) starting at 28 weeks gestation until BF cessation</td>
<td>● ANC: 2x/daily AZT starting at 14 weeks gestation through pregnancy</td>
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<tr>
<td></td>
<td>● Labor: Single dose NVP at labor, plus initiation 2x/daily AZT+3TC for 1 wk postpartum</td>
<td>● Triple ARV therapy starting at 14 weeks gestation and continued for life.</td>
</tr>
<tr>
<td></td>
<td>● Mother (CD4&lt;350):</td>
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<tr>
<td></td>
<td>● Triple ARV therapy starting at 14 weeks gestation and continued for life.</td>
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<tr>
<td></td>
<td>● TDF+3TC+EFV is preferred regimen</td>
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<tr>
<td><strong>Infant:</strong></td>
<td></td>
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</tr>
<tr>
<td>● Daily AZT from birth until 6 wks age (irrespective of feeding method)</td>
<td>● Breastfeeding (BF): Daily NVP at birth through 1 wk after BF cessation</td>
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<tr>
<td></td>
<td>● Non-BF: Daily NVP at birth until 6 wks age</td>
<td>● Daily NVP or 2x/daily AZT from birth until 6 wks age (irrespective of feeding method)</td>
</tr>
</tbody>
</table>

**Figure 1.** PMTCT cascade\(^1\) and corresponding mother-infant patient volumes during the costing period, February 2012-January 2013.

Perspective and cost definitions

- **Donor perspective (CIDA)**
  - Frontline (financial) costs represent actual project expenses paid for by the project to deliver goods and services

- **Ministry of health perspective (MOH Zimbabwe)**
  - Economic or opportunity costs value all resources used to provide services even if not paid for in the current project budget:
    - Donated goods and services, volunteer labor, contribution of goods and services by MOH
Start up activities

- Intervention
  - Microplanning
  - Development and prodn of IEC materials
  - Development and prodn of training materials
- Sensitization and awareness raising
- Training
Recurrent activities

- Health system strengthening
- Procure CD4 machines
- Mentoring program
- Training and capacity strengthening
- Procurement
- Health Service Delivery (MOH)
- Community activities to increase demand for services
  - Continuous awareness raising and sensitization
- Supervision
# Cost input/activity categories

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<th>Variable costs</th>
<th>Fixed or capital goods</th>
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<td>Transport</td>
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<tr>
<td></td>
<td>• Fuel, parking, maintenance, repairs, taxis, tolls, insurance)</td>
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<tr>
<td>Personnel</td>
<td>Equipment</td>
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<tr>
<td>Office facilities</td>
<td>• CD4 machines</td>
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<tr>
<td>Management meetings</td>
<td>• Computers</td>
</tr>
<tr>
<td>Training/supervisory meetings</td>
<td>• Start-up activities</td>
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<tr>
<td>Overhead costs</td>
<td>• Microplanning</td>
</tr>
<tr>
<td></td>
<td>• Developing materials</td>
</tr>
<tr>
<td></td>
<td>• Training</td>
</tr>
<tr>
<td></td>
<td>• Sensitization and awareness raising</td>
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</table>
Cost outcomes

- Total intervention cost
- Cost profile (share of costs to inputs or activities)
- Cost per pregnant woman screened for HIV
- Cost per HIV positive woman treated
- Cost per infant infection averted
Arise Zimbabwe project: Costs of strengthening access to PMTCT (US $2012)

- Indirect programmatic costs
- Recurrent training meetings
- Recurrent planning meetings
- Supplies
- Personnel
- Equipment depreciation and repairs
- Transportation
- Vehicles
- Health Commodities
- Sensitization and awareness raising
- Training and mentoring
- Developing materials
- Microplanning
Start-up and recurrent costs by implementing partner (US 2012)
<table>
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<tr>
<th>Cost Category</th>
<th>Unit costs</th>
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<td><strong>Start-up</strong></td>
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<td>Microplanning</td>
<td>$ 0.93</td>
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<td>Developing materials</td>
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<td>Training and mentoring</td>
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<tr>
<td>Sensitization and awareness raising</td>
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<td><strong>Sub-total Start-up</strong></td>
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<tr>
<td><strong>Recurrent</strong></td>
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<tr>
<td>Health Commodities (consumable supplies)</td>
<td>$ 23.46</td>
</tr>
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<td>Transportation</td>
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<tr>
<td>- Capital (vehicles annualized depreciation)</td>
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<tr>
<td>- Recurrent (Fuel, parking, maintenance, repairs, taxis, tolls, insurance)</td>
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<td>Equipment (CD4 machines, computers annualized depreciation)</td>
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<tr>
<td>Personnel - implementation staff (excludes management team)</td>
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<td>Office facilities (supplies and communication, such as copying, telephone,</td>
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<td>postage, stationary, registers, support to PMTCT program)</td>
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<td>Project management meetings</td>
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<td>Training/supervisory meetings</td>
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<td><strong>Sub-total Recurrent</strong></td>
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<td><strong>Total Cost per beneficiary</strong></td>
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Summary of ARISE
Zimbabwe intervention costing methods

- Micro-costing approach
- Bottom up approach
  - Combine activity based costing, ingredients approach and budget expenditure data
- Payer perspectives
  - Donor and Ministry of Health
- Multi-level:
  - National (NGO), health facility, community
- Sub-sample of project intervention health facilities
- Incremental cost to existing PMTCT services
Limitations of micro-costing data

• Using data from demonstration projects may have limited information on cost of actual nationwide introductions
  ▫ Depends on scope of demonstration project
  ▫ How coordinated project is with national program
  ▫ Assumes HR and capital requirements are in place

• Projections of cost of scaling-up are based on assumptions
  ▫ Need information on health system infrastructure
  ▫ Identify resource gaps
Going to scale: project verses program—what is the difference?

- Scale and time horizon (returns to scale)
- Demonstration project informs scaled up program
- May or may not be integrated into existing services, systems (infrastructure, training, communication, job aids, staff, processes)
- Project may involve inputs and activities that would not occur in the absence of external donor support.
  - Abundance of planning meetings, awareness raising and sensitization activities
  - Capital expenses to support project
  - International technical expertise
Scaling up to national programs

• Constant returns to scale? Not likely.

• Increasing returns to scale? Lower cost per impact achieved?
  ▫ Scale up yields economies of scale.
  ▫ Investment in physical and human capital < extra cost of increasing coverage

• Diminishing returns to scale?
  ▫ Marginal cost of reaching more remote areas with intervention > than economies of scale achieved with scale up.
Concluding remarks

- There is general consensus on the principles of costing
  - Define the problem
  - Describe the intervention
  - Identify resources
  - Measure resources
  - Attach a value to resources
- There are multiple ways to value resources—or measuring ‘costs’ and there is no single “right” way to do it.
  - All have advantages and disadvantages
Best practice depends on...

- Purpose of the study
- Perspective
- Type and complexity of the health intervention or technology
- Precision required
- Generalizability and representativeness required
- Feasibility and costs of measurement method
<table>
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<tr>
<th>PMTCT Cascade</th>
<th>Average time spent by primary care counselor (minutes)</th>
<th>Average time spent by primary care nurse (minutes)</th>
<th>Average time spent by registered general nurse (minutes)</th>
<th>Average time spent by registered midwife (minutes)</th>
<th>Average time spent by community mobilizer (minutes)</th>
<th>Total labor cost per HIV + PW or HIV - PW</th>
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<td>General ANC care (health education only)</td>
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<td>Testing for HIV (pre-test counseling, HIV test, post-test counsel, return results)</td>
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<td>HIV positive PW</td>
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<td>HIV negative PW</td>
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<td>Enroll all HIV+ PW in care (Begin on MER 14 prophylaxis)</td>
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<td>Determine ART eligibility (CD4 testing, return CD4 results)</td>
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<td>Initiate ART for eligible PW (ART prep sessions 1, 2, 3 and initiation)</td>
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<td>Follow-up during ANC (time for drug dispensing during ANC only)</td>
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<td>Labor and delivery</td>
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<td>Access postnatal Care (3 days, 7 days, 6 weeks)</td>
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<td>Re-test HIV negative PW (with results older than 3 months)</td>
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<td>Drug dispensing (Nevirapine prophylaxis and Contrimoxalzole)</td>
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<tr>
<td>Determine HIV status of infant at 6 weeks (DBS sample, counsel, document)</td>
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<td></td>
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<td></td>
</tr>
<tr>
<td>Return HIV result to caregiver</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Rapid HIV Test for HIV-exposed infants at 9 months</td>
<td>20</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Initiate HIV+ baby on pediatric ART</td>
<td>20</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Drug dispensing pediatric ART</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Total clinical time HIV + PW (minutes)</td>
<td>0</td>
<td>533</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Total clinical time HIV - PW (minutes)</td>
<td>0</td>
<td>21</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Cost per minute</td>
<td>$ 0.03</td>
<td>$ 0.07</td>
<td>$ 0.08</td>
<td>$ 0.08</td>
<td>$ 37.64</td>
<td>$ 1.48</td>
</tr>
<tr>
<td>Total clinical cost HIV + PW</td>
<td>$ -</td>
<td>$ 37.64</td>
<td>$ -</td>
<td>$ -</td>
<td>$ -</td>
<td>$ 1.48</td>
</tr>
<tr>
<td>Total clinical cost HIV - PW</td>
<td>$ 0.00</td>
<td>$ 1.48</td>
<td>$ -</td>
<td>$ -</td>
<td>$ -</td>
<td>$ 18.86</td>
</tr>
<tr>
<td>Total clinical cost of HIV+ partner</td>
<td>$ -</td>
<td>$ -</td>
<td>$ -</td>
<td>$ -</td>
<td>$ 18.86</td>
<td>$ -</td>
</tr>
<tr>
<td>Total clinical cost of HIV- partner</td>
<td>$ -</td>
<td>$ -</td>
<td>$ -</td>
<td>$ -</td>
<td>$ -</td>
<td>$ 1.41</td>
</tr>
</tbody>
</table>
Methods for data collection and analysis

How to choose which health economic analysis to do?
Choosing the appropriate economic evaluation method

- What is the research question?
- Who is your audience?
- How will you use the information?
- When do you need it?
- How much money do you have?
What is the objective of the economic evaluation?

- Comparing costs and effects of alternative interventions using CEA or CEU?
- Costs of a new health intervention or technology?
- Costs of a demonstration project?
- Costs associated with project impact?
- Costs associated with scaling up?
  - What it would cost a national program to achieve a planned impact? (i.e. 70% coverage of ART therapy for HIV positive individuals).
- One or more of the above?
# Defining the economic evaluation

<table>
<thead>
<tr>
<th>Describe</th>
<th>Questions to consider</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Study objective(s)</strong></td>
<td>What is the specific research objective for the economic evaluation?</td>
</tr>
<tr>
<td><strong>Study design</strong></td>
<td>How will costs and effects be evaluated as part of the overall monitoring and evaluation strategy?</td>
</tr>
</tbody>
</table>
| **What is being evaluated?** | • Health outcomes  
• Health outputs (coverage, utilization)  
• Other performance or operational indicators  
• Costs |
| **Health outcomes**       | Which health outcomes will be evaluated?  
1. Cases averted  
2. Deaths averted  
3. Disability averted |
| **Health outputs**        | What additional intermediate output indicators will be evaluated?  
• Number of target group reached by intervention  
• Number of target group tested  
• Number of target group diagnosed (number positive, number negative)  
• Number of individuals treated |
Defining the economic evaluation

<table>
<thead>
<tr>
<th>Describe</th>
<th>Questions to consider</th>
</tr>
</thead>
</table>
| **Performance or operation indicators** | What operational indicators will be evaluated?  
1. Quality or other performance indicators  
2. Number of tests correctly identifying individuals for treatment.  
3. Number of target group correctly treated.  
4. Loss to follow up |
| **Costs**                     | Which costs will be included in the analysis?  
1. Intervention costs  
2. Medical treatment costs averted  
3. Client costs incurred or averted |
| **What will this data reveal?** | - Cost per case or death averted  
- Cost per individual (in target group) reached  
- Cost per person screened  
- Cost per person treated  
- Cost breakdown (cost profiles) for intervention components (inputs/activities)  
- *Information for program planners on the costs and benefits of proposed intervention.* |
| **How will the data be used?** | - Used in cost-effectiveness analysis to compare new intervention to status quo  
- To consider introduction or scaling up existing prevention or treatment activities in the country  
- To evaluate financial sustainability or affordability to the government |
Is there evidence on effectiveness of interventions?

Is effectiveness of interventions equal?

Can all outcomes be valued in monetary terms?

Can outcomes be measured as quality-adjusted life-years?

### Basic types of health care evaluations

#### Are both Costs and Outputs measured?

<table>
<thead>
<tr>
<th></th>
<th>NO</th>
<th>YES</th>
</tr>
</thead>
<tbody>
<tr>
<td>Compare two alternatives?</td>
<td>No</td>
<td>Describe Costs and Outcomes</td>
</tr>
<tr>
<td>NO</td>
<td>Examine Consequences Only</td>
<td>Examine Costs Only</td>
</tr>
<tr>
<td>Describe Outcomes</td>
<td>Describe Costs</td>
<td></td>
</tr>
<tr>
<td>YES</td>
<td>Efficacy or Effectiveness Evaluation</td>
<td>Cost Analysis</td>
</tr>
</tbody>
</table>
Getting started- a few ideas

• Integrate cost analysis into on-going evaluation.
• Depending on resources and when analysis is needed, may consider a rapid approach.
• Focus efforts on obtaining data on the largest input categories.
• Work closely with local counterparts to collect basic data and cost information.
• Look for local health economists who can direct you to resources.
Thank you.