**Cost estimation approaches**

Just as costs can be broken down into several categories, there are several approaches available to estimate costs. They include cost accounting methods, such as step-down cost accounting (SDCA) and activity-based costing (ABC). Researchers should decide whether to collect costs by aggregating individual cost elements (bottom-up approaches) or by disaggregating high-level expenditures into cost categories or facilities (top-down approaches). Mixed methods costing allows these accounting methods to be combined to suit the needs of the costing study.

**Step-down cost accounting** is an analytical approach to calculating unit costs that relies on a step-by-step approach. SDCA is typically broken into six or seven steps (Figure 3.3).



**Figure 3.3 Step-down cost accounting steps.**

**Activity-based costing** assigns resource costs to cost objects, such as products, services, or customers, based on the activities performed. ABC is considered a better way of costing clinically-provided services compared with traditional costing approaches that measure costs at the departmental level using top-down allocation procedures.

 In a study of a hospital in Iran, researchers used ABC to calculate the costs of medical services using ABC and a more traditional approach. The study revealed significant differences in the cost estimates using the two approaches. For example, emergency visit costs per patient were estimated as $29.21 using ABC compared with $19.20 using a more traditional approach. Similarly, radiology costs per patient were estimated at $4.01 versus $1.79 for ABC and a traditional approach, respectively.

**Bottom-up versus top-down approaches**

**Bottom-up approaches** may be either retrospective or prospective, and often lead to more detailed, accurate, and reliable cost estimates. Possible data sources for bottom-up approaches are inventories, supply lists, or use of direct observation and patient flow analyses. Bottom-up approaches to data collection and analysis are time consuming.

 Because **top-down approaches** frequently rely on financial and accounting records and other databases, they are retrospective. Top-down approaches rely on comprehensive data sources and aggregated cost data. Top-down approaches tend to be more efficient and less time-consuming but risk some loss of accuracy in the estimations they provide.

 Sometimes used interchangeably with bottom-up and top-down costing, **micro costing** and **gross costing** methods are additional methodological approaches that can be layered on top of a top-down or bottom-up approach. **Micro costing** focuses on highly detailed cost inputs. When done using a bottom-up approach, micro costing is most likely to provide an accurate identification *and* valuation of resources (Figure 3.4).

 **Gross costing** approaches use aggregate information on resource use, commonly estimating total costs and dividing by the relevant unit of interest.



**Figure 3.4 Cost estimation method matrix.**

**Data sources and measurement**

Sources of cost data are extensive. In some cases, data will be collected from **existing sources**, such as financial reporting or payroll systems; records for such expenditures as utilities; reimbursements and subgrant payments; pay slips; procurement records, etc. Depending on the research question of interest and the availability (or lack thereof) of records, the researcher can collect specific cost-related data through more **direct methods or tools,** such as interviewing, observation, or surveys. Figure 3.5 presents a basic overview of the relationships among measurement methods, the data collection time, and sources of cost data.



**Figure 3.5 Relationships among measurement methods, data collection time, and data sources.**

**Sampling**

Depending on the nature of the costing activity taking place, there may be a need for sampling sites or clinics. First, whether sampling is needed should be decided based on the number of sites, organizations, or entities from which data need to be collected. If the number is small, it may be feasible to collect information from every facility or location. If the number of sites is too large, then sampling is needed.

**Analyzing and Presenting Cost Data**

After the cost data have been collected from a variety of sources, they should be organized and analyzed to be of use to decision makers.

**Cost studies and cost systems**

**Cost studies** are often one-off studies that differ in approach and structure based on the existing records that are in place at an organization. There is usually great variation in the cost elements included, the methods used to gather costs, and geographic coverage, making comparisons and use of the data in other settings difficult.

A **cost system** is a tool that makes use of the widespread availability of routine data at health service delivery organizations to collect cost data routinely using existing records. It treats cost data as M&E data, enabling organizations to use cost data to inform program management and decision making.

 Figure 3.6 is an example of a comparison of family planning cost studies. The example looks at the cost per visit for injectables, a type of long-lasting reversible contraceptive. In this situation, there is an interest in understanding how the variation can be due to differences in the service delivery approach (was service delivery at a clinic or in the community?), differences in salaries for personnel, or other programmatic features. Unfortunately, conclusions about the impact of a program feature cannot be drawn, because of the wide variation in methods used for these studies.



**Figure 3.6 Injectable cost per visit (2010).**

**Case Study: The Costs of HIV Treatment, Care, and Support Services in Uganda**

**Background**

This study assessed the cost of HIV care services in public and non-public facilities that provide HIV care and support services in Uganda. The research gathered data from 12 sites and included adult and pediatric patients. The objectives were:

* To determine the **average annual unit cost per patient** (adult and child) for specific HIV treatment, care, and support services.
* To establish the key **cost components or “drivers”** of the HIV treatment, care, and support services.
* To determine the **costs borne by patients** (“out-of-pocket costs”) that are not incurred in a clinical facility.
* To **compare cost variations** by level of service delivery.

**Methods**

The data collected were used to estimate the per-patient costs for both ART and non-ART patients. Patient-level information was gathered on services received, physical functionality, socioeconomic background characteristics, and costs incurred by patients when receiving care.

 A purposive sample of 12 of Uganda’s accredited ART centers was chosen to reflect key characteristics thought to influence unit cost, including: level of service delivery; major implementing partner; type of ownership; and geographic location. The main sampling criterion was level of service delivery, with the final sample proportionally selected to represent the five service delivery levels in the country.

 The study aimed to conduct 600 patient interviews (an average of 50 per site) with adults, and 200 (an average of approximately 16 per site) with children (or their caregivers.) The numbers constituting each sample were determined to ensure a reasonable representation of the site populations and to facilitate any required subgroup analysis.

 Data were collected at the facility level on major cost elements, such as staffing, patient load, and services provided. The study captured both financial and economic costs.

Direct costs collected were:

* Staff time in caring for clients
* Commodities, including drugs to prevent and treat opportunistic infections; antiretrovirals (ARVs); and medical consumables and supplies used for clinic visits and for laboratory testing
* Capital expenditures for medical equipment; vehicles used directly for client care; and physical infrastructure used for client care

Indirect cost data collected at the facility were:

* Labor cost of administrative staff
* Overhead expenses (e.g., office supplies, travel expenses, communication), and equipment and building use generically at a facility
* Depreciation of equipment and assets (e.g., equipment and furniture in the clinical and diagnostic units)
* Costs to program clients (e.g., client time, transport, meals, out-of-pocket payments, user fees for services or drugs) and waiting time at the facility (to assess lost work time)

**Findings**

Results showed that the annual facility-level cost of providing HIV treatment, care, and support to adult HIV patients ranged from Ugandan shillings (UGX) 254,000 to UGX 824,000 ($116.28 to $376.20) across the 12 sites, with a median cost of UGX 567,000 ($258.78). When restricted to adults on ART, annualized costs ranged from UGX 403,000 to UGX 1,330,000 ($183.54 to $606.48), with a median of UGX 734,000 ($335.16). For child HIV patients, the study found that costs ranged from UGX 190,000 to UGX 1,869,000 ($86.64 to $852.72), with a median cost of UGX 630,000 ($287.28).



**Figure 3.7 Distribution of cost elements, adults, 12 sites.**

The main cost drivers for both adults and children were ARVs and laboratory tests (Figure 3.7). Among all adults, ARVs accounted for 51 percent of costs, and for children, ARVs accounted for 69 percent. For laboratory services, the percentages were 21 percent and 16 percent, respectively. First-line drugs accounted for the largest share of ARVs. The study also found that among the facilities contacted, public hospitals had a higher cost per adult patient than did non-public, not-for-profit hospitals, but only by approximately 12 percent (UGX 655,018 versus UGX 582,894.) Public hospitals had lower staff costs per patient whereas laboratory costs were higher. By contrast, PHCs had much lower per-patient costs than non-PHCs for adults (UGX 335,625 versus UGX 512,073.) The major factor here was much cheaper staff costs in PHCs (UGX 28,850 versus UGX 168,845.) Similar patterns were found for children.