Costs and Cost-Effectiveness of Community Health Investments in Reproductive, Maternal, Neonatal, and Child Health

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Executive Summary

Resilient health systems demand strong health promotion, service delivery, and surveillance systems that can extend services to hard-to-reach and vulnerable populations through community-based delivery of reproductive, maternal, neonatal, and child health (RMNCH) interventions. Globally, community health platforms provide a critical pathway through which primary health care services are delivered to millions of individuals. Essential components to inform governments' decisions to introduce additional community health interventions or expand the geographic scale of existing community health programs are the costs and government budget available to devote to these programs.

Rationale

This brief aims to broadly summarize existing information on the costs and cost-effectiveness of community-delivered RMNCH interventions, including large-scale community health worker (CHW) programs, to provide health decision-makers and planners with a baseline understanding of the types of costs associated with providing these services. To support efforts to advocate for and secure appropriate levels of funding for community health programming, tools and cost benchmarks referenced in this brief can help country-level planners identify what costs must be considered while deciding which community-level services are appropriate for a given context.

Key Messages

Based on the review of the evidence, key messages for health sector decision-makers interested in planning and financing community health programs include:

- **Community health service delivery is a cost-effective investment**
  Available cost-effectiveness data confirm the good "value for money" of community health investments. Planners must decide which cost-effective interventions align best with the community health needs of the population, given the available resource envelope.
- **Consider the initial and recurrent costs of implementation in securing financial resources to support community health programs**
  The financial resources needed to implement community health programs are varied and require considerable planning to accurately project required costs. Not only should there be sufficient funding for start-up costs, but a sustainable source of funding for recurrent costs should be identified.

- **Use tailored costing exercises and cost benchmarks to guide planning for community health interventions**
  Observed costs of community-based health interventions are presented in broad ranges that provide reasonable limits for planning purposes. With the increasing complexity of interventions, costs begin to climb. The cost per beneficiary range of $35 to $68 for home-based newborn care services is considerably higher than for community health interventions aimed at older children, such as home-based malaria management or integrated community case management (iCCM), which are each less than $18 per beneficiary. Although these figures represent a potential range of costs per beneficiary, focused costing of community health intervention packages based on health needs and demands, supply constraints, and normative costs will provide contextually appropriate cost estimates for a given set of services.
- **Use cost data from national-scale CHW programs as a starting point in planning national scale-up of community health interventions and programs**
  Health sector planners can benefit from recent efforts to quantify the costs of national-scale CHW programs (e.g., Ethiopia's Health Extension Worker Program, UNICEF/Management Sciences for Health costing of the CHW programs in Malawi and Sierra Leone, and Millennium Development Goal Health Envoy estimates). Estimates generated could then be used as a starting point for discussions on the types of costs associated with such programs, scale-up costs, and associated targets, such as the CHW coverage ratio.

Costs and Cost-Effectiveness of Community Health Investments in Reproductive, Maternal, Neonatal, and Child Health: Full Brief on Key Findings

Introduction

As part of a country's health system, community health platforms provide a critical pathway through which primary health care services are delivered to millions of individuals and serve as a key link between communities and health systems. Community health platforms comprise a diverse and varied set of actors, activities, and structures, but increasingly programs deliver services through community health workers (CHWs). CHW programs were instrumental in progress achieved throughout the era of the Millennium Development Goals (MDGs) and will continue to be an important force in achieving universal health coverage and improving population health in the years to come through the Sustainable Development Goals [1, 2]. The need to build stronger and more resilient health systems in low- and middle-income countries that can respond to the continued burden of communicable disease, the growing burden of non-communicable disease, and disease outbreaks demand strong service delivery and surveillance systems that extend to hard-to-reach and vulnerable populations. Although there has been growth in the delivery of community-based interventions, many remain vertically oriented around a single health area and rely heavily on donor funding. Furthermore, experience in the scale-up to national-level community health programs has been limited. Essential components to inform governments' decisions to scale community health programs are the costs and amount of a government's budget available to devote to these programs. The 2015 *Strengthening Primary Health Care through Community Health Workers: Investment Case and Financing Recommendations* makes a strong justification for CHWs providing primary care services and projects that governments can observe an economic return on investment of 10:1, largely due to a healthier, more productive population [3]. However, governments must identify and secure sufficient financing to implement these programs. For health sector planners to make informed decisions on adopting new community health programs or further scaling existing programs, information on the cost of community-level interventions is needed. While such cost and cost-effectiveness data of large national-scale CHW programs are limited, evidence from community provision of critical reproductive, maternal, neonatal, and child health (RMNCH) interventions is more widely available, though often limited to certain geographies or service settings.

Purpose and Methodology

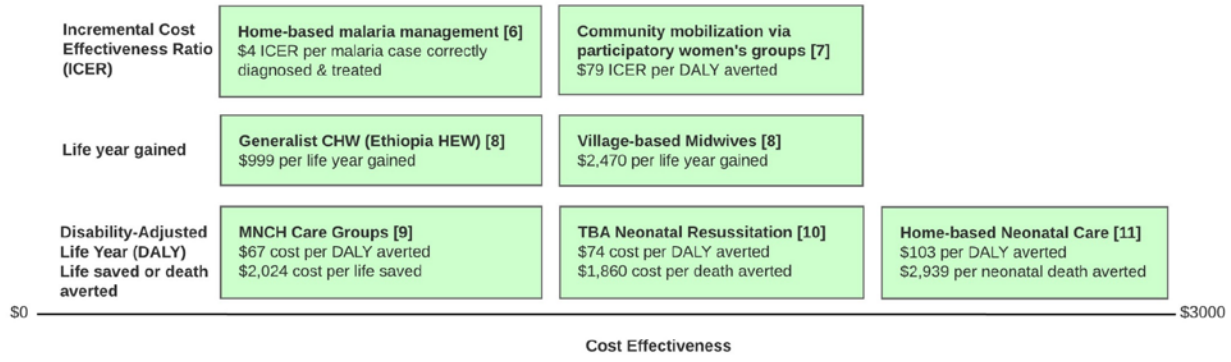
The purpose of this brief is to broadly summarize existing information on the costs and cost-effectiveness (when available) of community-delivered RMNCH interventions and large-scale CHW programs to provide health decision-makers and planners with a baseline understanding of the relative amount and types of costs associated with providing these services. This brief supports efforts to advocate for and secure appropriate levels of funding for community health programming by providing key decision-makers with reasonable,

documented cost benchmarks around the financial implications of investing in community-based delivery of RMNCH services. Data were collected by searching peer-reviewed and "grey" literature of empirical and modeled cost and cost-effectiveness studies. Data from selected publications were organized to illustrate the categories and relative costs associated with implementing community-based delivery of services, focusing on costs per capita or per beneficiary. When available, data were also extracted from cost-effectiveness studies to illustrate the effectiveness of providing certain interventions at the community level.

Key Message 1: Community health service delivery is a cost-effective investment

Government ministries and health sector planners often want cost-effectiveness data to help guide policy making and resource allocation decisions. Available evidence reminds us that investing in community health programming is highly cost-effective when compared to the World Health Organization's (WHO's) threshold of the cost per disability-adjusted life year (DALY) averted being less than three times a country's average per capita income [4]. Such thresholds are useful in terms of categorizing whether an intervention meets or fails to meet a fixed criterion for cost-effectiveness, but are not necessarily useful in helping countries determine which interventions offer the best use of a country's health budget [5]. In **Figure 1**, illustrative examples show that RMNCH Care Groups cost $67 per DALY averted, trained traditional birth attendants for neonatal resuscitation cost $74 per DALY averted, while home-based neonatal care is slightly more expensive at a cost of $103 per DALY averted —all three interventions are highly cost-effective per the WHO threshold. In addition to cost and cost-effectiveness considerations, planners will have to consider intervention acceptability and feasibility and which interventions best align with the community health needs of the population given the available resource envelope.

Figure 1. Illustrative cost-effectiveness measures for a range of community-based RMNCH interventions [6–11].



It should be noted that it can be difficult to make meaningful comparisons across cost-effectiveness data, given the variability in study time horizons, implementation settings, analytic perspectives, inclusion criteria for costs, and impact measures [5].[1] These varied cost impact measures coupled with the wide-ranging types of community health interventions and the diversity in contextual setting (including varied disease burdens) complicate efforts to make comparisons across interventions. However, the collective set of evidence points to a general consistent message that community-based interventions are frequently viewed as cost-effective.

Message 1 Key Takeaway: While more research is needed on the cost-effectiveness of comprehensive national-scale community health programs, the available cost-effectiveness data confirm good "value for money" in community health investment across a variety of specific community-delivered interventions. However, even good value for money has a cost, and planners should make sure that their expectations are reasonable compared to cost-effectiveness benchmarks. Continued advocacy is necessary to further support targeted investments in effective community health interventions at sufficient levels.

[1] For example, in reviewing the cost-effectiveness literature on community-based interventions, a variety of impact measures were reported: incremental cost-effectiveness ratio, cost per DALY averted, cost per life years gained, and cost per life saved or death averted, among others. See glossary for definitions.

Key Message 2: Consider the initial and recurrent costs of implementation in securing financial resources to support community health programs

The financial resources needed to implement community health programs are varied and require considerable planning to accurately project required costs. In particular, it is necessary to estimate the initial start-up costs versus recurrent costs necessary for the lifespan of a given community health program. Additionally, the cost of community health programs is influenced by contextual and design factors, including type of service or mix of services, cadre of community health provider, the geographic scope of the program, utilization of CHW services, and supply- and demand-side barriers.

The reviewed evidence provides an approximate range of observed costs to deliver a variety of community health interventions. However, it is difficult to generalize the level of these costs in all situations. In fact, cost and cost-effectiveness studies tend to assess small scale, vertically oriented, volunteer CHW programs, rather than large-scale, comprehensive programs that provide a full package of services. Therefore, the data presented provide illustrative examples of the cost of various inputs and should not be interpreted as the absolute cost of implementing any of the identified interventions or programs. Instead, the cost ranges are meant to serve as helpful guideposts for the relative amount needed to carry out a community health program; therefore, only publications that provided a breakdown of the total costs of running a community health program have been included.

Based on this review, the major start-up and recurrent cost categories associated with community health programs include:

Start-up:

- Planning and policy development workshops
- Recruitment
- Production of job aids (health communication materials, treatment protocols)
- Initial training costs
- Infrastructure (health posts, training schools), if applicable
- Mobilization of community support systems, if applicable

Recurrent:

- Salaries for paid CHWs and financial and non-financial incentives for volunteer CHWs
- Supplies, equipment, and medicines
- Management and supervision (periodic review meetings, staffing, transport)
- Refresher trainings and recurrent meetings
- Training and equipment for replacement CHWs and supervisors (due to attrition)

At a minimum, all these elements need to be considered in budgeting and resourcing community health programs.

Table 1 presents observed ranges for essential implementation costs of different CHW programs, including community delivery of RMNCH or primary care services and larger-scale CHW programs. The table breaks down the costs by one-time start-up costs, annual recurrent costs, and additional cost considerations that are often not presented in formal costing studies.

Table 1. Illustrative start-up and annual recurrent costs of community health programs

Start-up costs*	
Training: per CHW	iCCM programs in sub-Saharan Africa: Range from $265 to $1,114 per CHW trained [12] Generalist CHW: Ethiopia: $706 per CHW trained [3]
Training: per beneficiary	Generalist CHW program in sub-Saharan Africa: $0.12 per inhabitant served; estimated 2% of total program costs [13]
Annual recurrent costs	
Paid CHW salaries	Annual salary per CHW: $442 – Pakistan Lady Health Worker [14] $610 – Mozambique Agente Polivalente Elementar [15] $1,278 – Bangladesh Family Welfare Assistant [16] $1,220 – Malawi Health Surveillance Assistant [17] $1,343 – Bangladesh Health Assistant [16] $1,434 – Bangladesh Community Health Care Provider [16] $1,709 – Nepal Village Health Worker [18] $2,441 – Ethiopia Health Extension Worker [8] $4,323 – Indonesia Village Midwife [8] $4,773 – Brazil Agentes Comunitários da Saúde [19] $6,064 – Zambia Community Health Assistant [20] Annual salary per inhabitant served: Generalist CHW program in sub-Saharan Africa: $1.79 [13]
Volunteer CHW incentives†	Non-monetary (formal recognition, certificates, mentorship) – Ethiopia Health Development Army [3] Performance-based financing – Rwanda Agent de Santé Maternelle and Binômes [3] Loans, product sales – Bangladesh Shasthya Shebika [16] Annual stipend per volunteer CHW: $182 – Zimbabwe Village Health Worker [21] $212 – India Accredited Social Health Activist (AHSA) [20] $384 – India Anganwadi Worker [20]
Management and supervision	Generalist CHW program in sub-Saharan Africa: $0.60 per inhabitant served; estimated ~9% of total program cost [13]
Refresher trainings	iCCM programs in in sub-Saharan Africa: $0.30-$1.24 per service provided [12] $0.09-$0.79 per capita (children 2–59 months) [12]
Overhead	Generalist CHW program in sub-Saharan Africa: $0.90 per inhabitant served; approximately 13% of total program costs [13]
Additional cost considerations	
Preparation	Policy preparation, curriculum and training development, job aids (e.g., health communication materials, treatment protocols), consulting fees, training center assessment and selection, recruitment, community mobilization, and sensitization [3]. Cost will depend on the scale of the program and intensity of the planning efforts.
Medicines and Supplies	Medicine, supply, and commodity costs are not reported here as they are highly specific to an intervention and variable depending on utilization levels.
Infrastructure	Physical infrastructure such as health posts and training schools; information technology infrastructure for human resource and payroll systems [3]. Cost will depend on the current health system infrastructure.

Notes: All amounts adjusted to 2015 US Dollars.

* Training cost estimates should include training and equipment for replacement CHWs based on attrition rates.

† The cost of financial and non-financial volunteer incentives varies considerably depending on the roles and responsibilities assigned and inputs provided.

‡ Costs highly dependent on drug purchasing price and mix of services offered.

There are several notable trends in the type of community health costs and their relative amounts:

- Training costs are highly variable and largely dependent on the duration and intensity of the training. While many country programs report total training cost for a community health intervention, these costs are difficult to compare across settings because the training cost per CHW or per capita served is often not reported.
- CHW salaries are a major recurrent cost driver and should be considered carefully to identify appropriate compensation levels commensurate with training, workload, responsibilities, and time commitment, a factor that has been increasingly recognized as necessary to retain and motivate "professionalized" CHWs [3]. Based on reported salary data, large-scale, government-funded CHW programs pay salaries ranging from $400 to $5,600 annually; at the lower range from $30 to $150 per month and at the higher range from $200 to $465 per month. Analysis from countries in sub-Saharan Africa suggests a typical CHW salary of approximately $80 per month [$960 per year], which represents between one-tenth to one-third of the total CHW program cost [3]; however, what is appropriate for a country will depend on its social and economic context, and efforts should be made to harmonize remuneration within countries.
- Management and supervision are essential components of successful community health program implementation, and may cost more than anticipated, up to 10% of total cost [13]. These costs should therefore be adequately budgeted during community health program planning.
- Volunteer programs often provide CHWs with non-financial incentives, such as certificates, uniforms, backpacks, or bicycles. Some volunteer programs use performance-based financing mechanisms to reimburse CHWs for services delivered or offer access to micro-credit loans and profits from commodity sales, while other programs provide monthly honorariums/stipends in the range of $15 to $30 per month. Recent research in Malawi and Madagascar has assessed how financial and non-financial incentives can impact CHW performance [22, 23], emphasizing incentives as important motivators and the need to appropriately align incentives with CHW workload, time commitment, and environmental conditions.

Message 2 Key Takeaway: Community health programs need to consider the full cost of the strategy. Not only must there be sufficient funding to start the program, but a sustainable source of funding for recurrent costs must be identified. The cost categories presented in Table 1 serve as a starting point to begin estimating required start-up and recurrent implementation costs.

Message 3: Use tailored costing exercises and cost benchmarks to guide planning for community health interventions

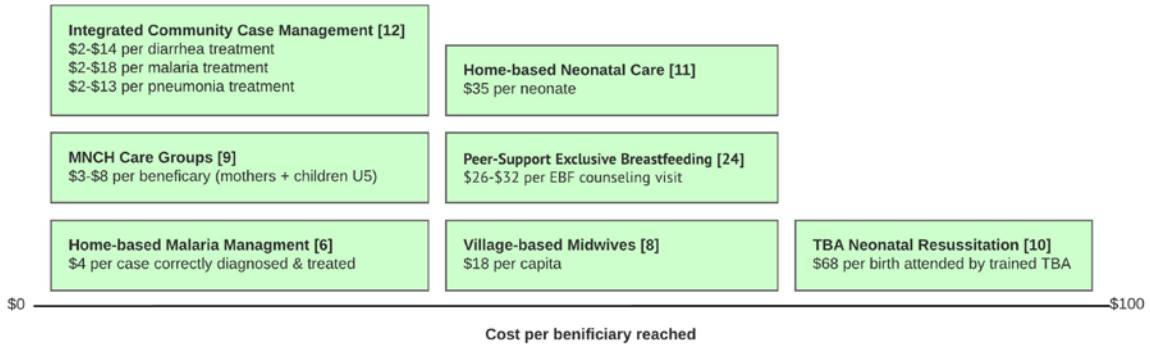
RMNCH interventions can be packaged within a community health strategy in numerous combinations tailored to the disease profile and contextual setting of a given area, providing planners great flexibility in program design. For example, community health strategies can draw upon different cadres of CHWs, volunteers, health committees, women's groups, participatory groups, care groups, grandmothers' groups, or a combination thereof to extend health education messages, establish community-to-clinic referral networks, provide rapid point-of-care testing services, and conduct facility outreach and mass media campaigns. Along with the substantial variation in context and program design, beneficiaries of community health programs can be defined as households, women, pregnant women, children, newborns, rural-based inhabitants, some combination of the above, or the entire population.

While the variation across community health delivery modalities makes cost comparisons challenging, reported costs gravitate around broad ranges that provide reasonable limits to consider for planning purposes (**Figure 2**). With increasing intervention complexity, total service costs begin to climb: the cost per beneficiary range of $35 to $68 for home-based newborn care services is considerably higher than for other community health interventions aimed at older children, such as home-based malaria management or integrated community case management, which are less than $18 per beneficiary.

Although these benchmarks can serve as a starting point, tailored costing exercises that systemically estimate the costs of a community health intervention or package of community-delivered services will provide the

most contextually specific estimate of total costs and the most appropriate for planning purposes. Resources and examples of this type of costing approach can be found at the end of this brief.

Figure 2. Cost per beneficiary for a range of community-based RMNCH interventions [6, 8–12, 24]



Even good value for money has a cost, and planners should make sure that their expectations are reasonable compared to benchmarks. Strong planning and management can guide efficiency gains within these ranges, but planning outside of these resource envelopes should be justified by strong theories of change for efficiencies identified (if cost is lower) or greater value for money (if cost is higher).

Message 3 Key Takeaway: Planners are faced with numerous decisions when designing community health programs, particularly regarding prioritization of RMNCH interventions, given limited resource envelopes. Cost benchmarks can help planners make realistic and feasible budgets for effective community health strategies.

Message 4: Use cost data from national-scale CHW programs as a starting point in planning national scale-up of community health interventions and programs

Over the past decades, many countries have developed national-level CHW cadres that have contributed to significant improvements in health status in their respective populations. While empirical information on the holistic cost of running such programs at a national scale is limited, recent efforts have been made to quantify the costs of national-scale CHW programs through cost modeling. These data, coupled with cost benchmarks from community-delivered interventions, provide useful guideposts for policy and decision-makers in planning and budgeting for community health.

As one of the largest CHW program in sub-Saharan Africa, Ethiopia's Health Extension Program is just one example, but is of interest as a national community health program using two complementary cadres: paid Health Extension Workers (HEWs) alongside a volunteer-based Health Development Army (**Table 2**).

Table 2. Program features across complementary cadres of Ethiopia's Health Extension Program

Program Characteristics	Health Extension Worker	Health Development Army
Launch year	2004 [25]	2010 [26]
Size	38,000 paid HEWs [3]	3 million volunteers (2016) [22]
Coverage Ratio	1 per 2,500 population [3]	1 per 25 population (~5 households) [3]
Qualifications	>10th grade education [27]	Select model family from community [27]
Training	1-year training program; 40 institutions provide training that covers 17 health service packages in family health, disease prevention and control, hygiene and environmental sanitation, and health education and communication [25]	7–10 day training conducted by a pair of HEWs in the community; target for each pair to train 360 model households/year [28]

Program Characteristics	Health Extension Worker	Health Development Army
Roles/Responsibilities	Health promotion, disease prevention, treatment of non-severe pneumonia, diarrhea, malaria, and malnutrition, provision of oral contraceptives [3]	Increase utilization of primary care services and promote healthy behaviors at the household level [3]
Compensation	Salaried, government employee: $1,008 – $2,400 annually [3, 8]	Non-financial incentives: community recognition, certificates, mentorship [3]
Service Delivery Location	Split time between health post and community to conduct household visits for postpartum women and newborns [27]	Household and village-based [27]
Time commitment	Full-time [3]	Volunteer, < 2 hours per week [3]
Supervision	By health center and district health team; One health center supervises 10 HEWs [27]	By HEWs and district health team [27]

Empirical estimates for Ethiopia's HEW program place the total annual programmatic costs at US $397 million with 10% comprising HEW salaries (**Table 3**) [3]. In addition to these recurrent annual costs, significant start-up costs—such as policy consultations, infrastructure development, curriculum development, and initial training—total approximately US $25.5 million to reach the current coverage level [3]. With a CHW to population ratio of 1:2,500, annually the HEW program costs approximately US $4.20 per individual served by a HEW [3]. This figure illustrates the recurrent annual cost of the program, but does not factor in the initial start-up costs that will vary depending on the size and scope of program scale-up. *We do not suggest that these costs can be applied as is to any other context.* The number of factors affecting cost is large and highly dependent on context. We provide these data as one *benchmark* of a well-documented nationally scaled program in one context.

Table 3. Ethiopia's current annual program costs per HEW

Cost category	Annual cost per HEW, empirical estimates (USD) [3] At current ratio of 1 HEW: 2,500 pop
Training	$2,808 per HEW
Apprenticeship	$2,136 per HEW
Salary	$1,008 per HEW ($37.8 million total)
Supplies	Not presented
Management	Not presented
Overhead	Not presented
Total program cost	$397 million

Modeled costs from Ethiopia also illustrate that CHW coverage ratio is another key consideration in community health program design and scale-up plans, in terms of cost and effectiveness. Per capita costs are variable as a function of the size of the population served, meaning that costs diminish as CHWs cover larger catchment areas [13]; therefore, establishing a realistic and attainable coverage ratio is critical to the cost and effectiveness of a community health program. For example, for Ethiopia's HEW program, under a modeled scenario where coverage ramped up evenly from 25% to full coverage of the rural-based population over the period from 2012 to 2015, the per capita (rural inhabitants only) cost dropped from $6.62 to $5.57 following full scale-up [13]. While total per capita costs may decrease as CHW coverage increases, the total one-time and recurrent costs may remain substantial in magnitude.

Message 4 Key Takeaway: Health sector planners can benefit from recent efforts to quantify the costs of national-scale CHW programs (e.g., Ethiopia's HEW Program, UNICEF/Management Science for Health [MSH]'s costing of CHW programs in Malawi [29] and Sierra Leone [30], and MDG Health Envoy estimates [3]). Estimates could then be used as a starting point for discussion of the types of cost associated with such programs, scale-up costs, and associated targets, such as the CHW coverage ratio.

Conclusion

As investments in community health interventions and platforms continue to increase, planners and policymakers will need estimates around the costs and cost-effectiveness of different community health delivery systems. Research supports the overall cost-effectiveness of community-based delivery of RMNCH interventions, though evidence on the cost-effectiveness of large-scale CHW programs remains limited. For planning purposes, policymakers should consider one-time and recurrent costs in projecting the necessary budget requirements for implementing their chosen community health platform.

Research on community health interventions delivered in a wide range of international settings have produced cost benchmarks for many of the cost categories needed for CHW programs, although actual costs will need to be adapted for specific local contexts. Furthermore, for countries considering large-scale CHW programs, recent efforts to quantify the costs of such programs can serve as a helpful planning and advocacy tool. This collective set of evidence on the cost and cost-effectiveness of different CHW delivery models can aid advocacy efforts to secure funding for scaling up community-based delivery of RMNCH services. Even cost-effective investments need to be appropriately scaled. Planners need to be cautious about budgeting below the minimum required for effective programming. This brief and reported benchmarks can help ground-truth planning efforts.

Resources for costing community health programs

- Costing of Social Norm Interventions: A Primer for the Passages Project
- Costing the Standard Days Method
- OneHealth Tool
- MSH Integrated Community Case Management (iCCM) Costing and Financing Tool
- UNICEF/MSH Community Health Planning and Costing Tool

Glossary of key terms in cost-effectiveness analysis

Disability-Adjusted Life Year (DALY): A metric to quantify the burden of disease from mortality and morbidity. A DALY is equivalent to one lost year of "healthy" life. DALYs are calculated by summing the years of life lost from premature mortality plus the years lost due to disability among persons living with the health condition [31].

Incremental Cost Effectiveness Ratio (ICER): A metric to present cost-effectiveness analyses, which compare the costs and effectiveness of two or more interventions. ICER is calculated from the difference in costs divided by the difference in health effects [5].

Life Years Gained: A metric to measure mortality that takes into account remaining life expectancy. Life tables specific to a country or region are used to calculate the remaining life expectancy at the point of an averted death. Under this method, saving the life of a younger person accrues more life years gained than saving the life of an older person [32].

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