

Policy Brief: The Cost of Immunization in Ethiopia

The Universal Immunization through Improving Family Health Services (UI-FHS) Project

The UI-FHS project in Ethiopia aims to strengthen the routine immunization system in over 100 woredas (districts) across six regions in Ethiopia, with a focus on equity and quality.

After designing and introducing the “Reaching Every District using Quality Improvement” (RED-QI) approach in three initial woredas, UI-FHS is now scaling up RED-QI and solidifying lessons learned in using quality improvement tools to strengthen the routine immunization system.

RED-QI is a process that helps health personnel address large, complex, priority problems within the immunization system by identifying root causes and making small, rapid, doable changes that can quickly be tested and vetted for adoption, adaptation, or abandonment at local level. UI-FHS builds capacity of woreda health officers to provide long-term, affordable technical and managerial support to their health workers, helps to operationalize the RED-QI approach in the woredas where it works, and encourages staff at even the most peripheral levels to develop, test, and share successful local solutions.

While UI-FHS focuses on routine immunization, the RED-QI approach can be applied to other family health service interventions.

Context

Over the past few decades, Ethiopia has made remarkable strides towards improving the access to and utilization of basic health services. As one of 16 core packages of Ethiopia’s flagship Health Extension Program (HEP), immunization coverage (as measured by percentage of eligible infants receiving the third dose of DTP [DTP3] vaccine by 12 months of age) has been following a sometimes interrupted but rising trajectory for the past ten years. The official country estimate in 2014 for DTP3 reached 84%; however, large variations remain among different data sources with 2015-2016 WHO/UNICEF estimates at 77% and 2011 Ethiopia Demographic Health Survey estimates at 37%. While it is clear that improvements have been made, data quality remains an issue, as well as uneven progress in different regions of the country.

The Federal Ministry of Health (FMOH) in Ethiopia has sought to make strides towards improving services across all woredas (districts) of Ethiopia through its Health Sector Transformation Plan (2015-2020) (HSTP), which has a large focus on equity and quality. The HSTP also includes costing projection models that identify and estimate resource requirements for the plan.

Given this context, UI-FHS undertook a costing exercise to better understand the resources that will be required by the Expanded Program on Immunization to reach all populations with equity and quality.

Costing Study Objectives and Methods

The objectives of the costing study were threefold:

- Obtain detailed cost estimates at various points in time to evaluate changes in total costs, unit costs, and cost structures as interventions were implemented in three woredas (both agrarian and pastoralist)
- Estimate the incremental cost of adding a new vaccine to the existing vaccination schedule
- Collect data to capture the different demographic, economic, and health systems variables that affect unit cost, as well as explore the feasibility/sustainability of scaled immunization performance

Data on the cost of immunization services were gathered prospectively in 2013 (baseline), 2014 (midline), and 2015 (endline) from a purposive¹ sample of health facilities in three woredas: Assaieta in Afar region, Arbegona in SNNPR, and Hintalo Wajerate in Tigray region. These three woredas served as UI-FHS “learning” woredas, where the RED-QI approach (see box on first page) was implemented between the baseline and midline (endline data were collected 12 months after the official close of project activities; although limited technical assistance was provided through September 2015). Data collected in 2013 (baseline), 2014 (midline), and 2015 (endline) refer to Ethiopian Calendar (EC) years 2005, 2006, and 2007, respectively, and results are presented using EC. In addition, the midline collected data on the incremental cost of adding a new vaccine to the existing vaccination schedule and the endline modeled a regression analysis to examine the different demographic, economic, and health systems variables that are important drivers of unit cost.

The main data collection tool was a modified form of the WHO’s EPI comprehensive multi-year plan (cMYP) costing tool²; review of documents and administrative records, survey of the sampled institutions, and in-depth interviews with key informants within the woredas and health facilities were also conducted. Throughout the study, the research team was confronted with issues of data quality, such as incompleteness of records including costs of certain inputs and vaccination coverage for different antigens, particularly tetanus toxoid. As such, data for a small number of observations were substituted with the average of all observed values within a given woreda.

Results

Key findings of the costing study included:

- Vaccine costs account for at least 75% of total costs; personnel and transport are the major non-vaccine cost drivers
- Integrating additional vaccines into the system may introduce economies of scale but will require additional resources
- Data quality remains a large issue – but overall, immunization coverage is generally trending upward
- Female literacy is associated with lower total costs for immunization (through increased utilization of services)
- Unit costs per fully immunized child are higher in pastoralist areas. Equitably improving coverage in these areas will require additional resources.

- **Vaccine costs account for at least 75% of total costs; personnel and transport are the major non-vaccine cost drivers**

Unit cost in USD per fully immunized child³ was \$21.8 in Arbegona, \$23.5 in Assaieta, and \$21.5 in Hintalo Wajerate in 2007 EC. Total annual immunization costs for children and women (up to TT2 vaccine) were \$61,362 USD for

¹ Health posts were selected within a given catchment area of a health center/Primary Health Care Unit (PHCU).

² WHO cMYP tools available at: http://www.who.int/immunization/programmes_systems/financing/tools/cmyp/en/

³ Fully immunized child (FIC) is defined here as receiving all vaccinations in the Ethiopian schedule.

Arbegona, \$35,737 for Assaieta, and \$99,211 for Hintalo Wajerate (the variance in cost per woreda is due to differing costs per child and to the different sizes of the population in the woredas). Vaccine costs amounted to at least three-quarters of total costs across all three woredas, and personnel and transport costs were the top two non-vaccine cost drivers. Among non-vaccine cost categories, personnel costs were the largest share, accounting for 59.7% of all non-vaccine costs in Arbegona, 41.9% in Assaieta, and 49.6% in Hintalo Wajerate. Cold chain equipment management and maintenance had the lowest costs in all three woredas. There were also some slight variations between cost categories in the different woredas, as seen in the table below.

Percentage of total immunization costs by cost category

Cost category		Arbegona	Assaieta	Hintalo Wajerate
Vaccine costs		75%	76%	80%
Non-vaccine costs	Personnel routine	13%	8%	8%
	Personnel outreach	2%	2%	2%
	Transport	6%	8%	5%
	Office equipment/supplies	1%	1%	1%
	Building/other overhead	1%	1%	2%
	Management/operational	2%	4%	2%
	Cold chain equip. mgmt./maintenance	0%	0%	0%

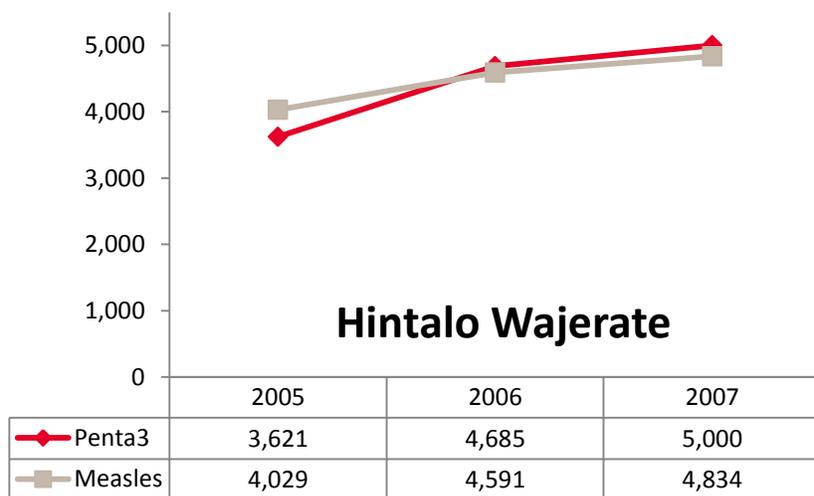
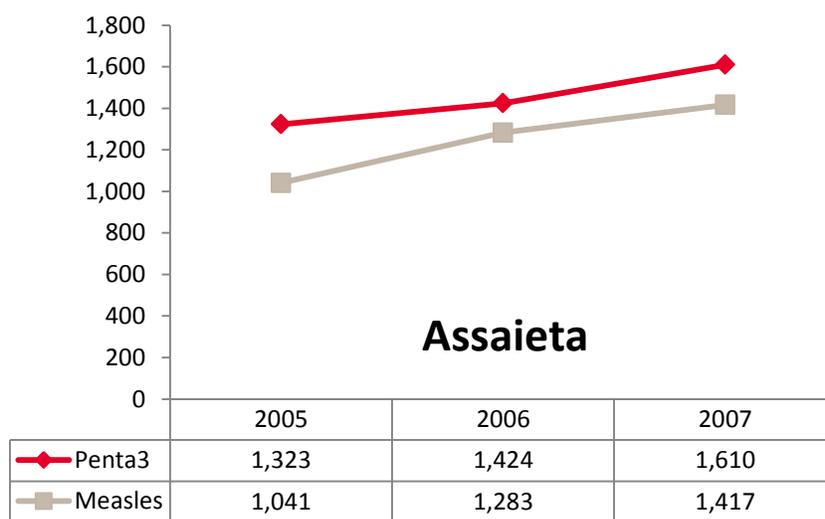
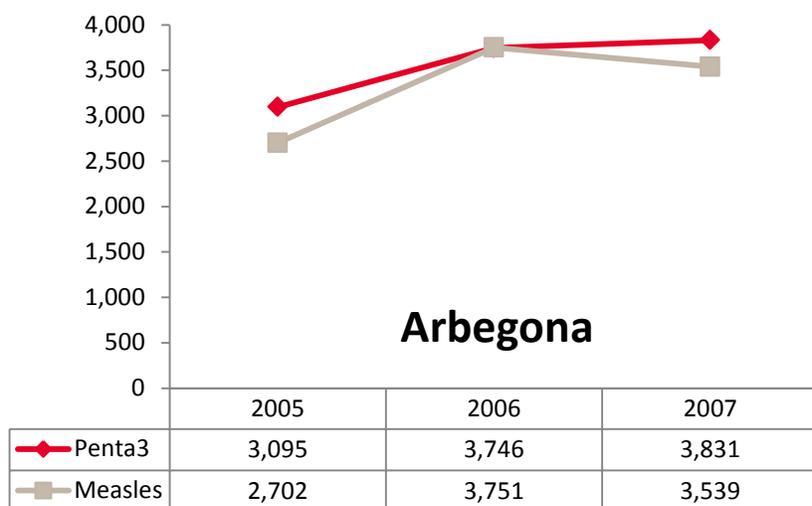
- **Integrating additional vaccines into the system may introduce economies of scale but will require additional resources**

With the introduction of Rotavirus vaccine in Ethiopia during 2006 EC, the incremental non-vaccine costs at health facility level to add this two-dose vaccination program was calculated. The annual recurring non-vaccine cost per dose of including Rotavirus vaccination in the overall schedule was \$2.07 USD in Arbegona, \$1.01 in Assaieta, and \$0.83 in Hintalo Wajerate. When combined with coverage survey data (not shown) showing higher coverage in Hintalo Wajerate, this finding helps illustrate that economies of scale can be reached within a well-functioning health system if appropriate resources are secured; if the health system is stronger and well-resourced in its operating costs, efficiencies can emerge and result in both improved public health outcomes and cost savings.

- **Data quality remains a large issue – but overall, immunization coverage is generally trending upward**

Administrative coverage data for 2007 EC for the three woredas were: 102% for Penta3 and 96% for measles in Arbegona; 96.4% for Penta3 and 92% for measles in Assaieta; and 101.7% for Penta3 and 93.8% for measles in Hintalo Wajerate. For most antigens, vaccination performance in the three RED-QI woredas has improved, and continued to improve beyond the time period of intervention. However, data quality continues to be a critical issue in Ethiopia. Throughout the course of data collection, data regarding the number of immunized recorded at the health facility was found to be inconsistent with other records or incomplete, and in several cases, facilities stopped recording vaccination altogether (e.g., tetanus toxoid for pregnant women). The number immunized over the years of the study is included on the following page.

Number of children immunized over 2005-2007 EC (administrative data)



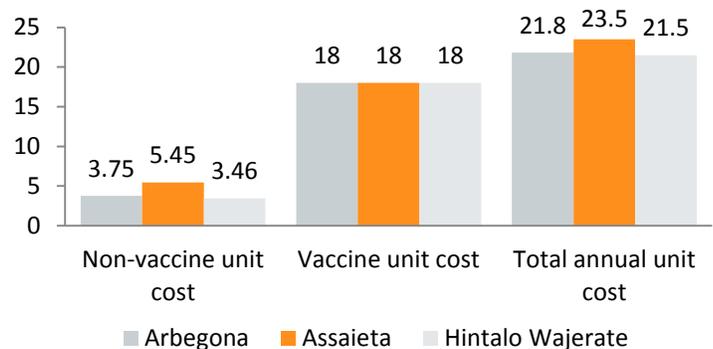
➤ **Female literacy is associated with lower total costs for immunization (through increased utilization of services)**

Similar to other studies, this costing study confirmed through regression analysis that female literacy is a significant factor in the total costs of immunization activities, such that a 1% increase in the proportion of literate females brings about a 0.19% decrease in total cost. An earlier study in Ethiopia⁴ also demonstrated maternal education as being among the significant predictors of immunization coverage at district level.

➤ **Non-vaccine unit costs per fully immunized child are higher in pastoralist areas. Equitably improving coverage in these areas will require additional resources**

Total unit cost per fully immunized child was higher in the study's pastoralist woreda, Assaieta, due to non-vaccine costs being higher (see table at right). In addition, a regression analysis showed that the overall cost of services is significantly lower in agrarian settings. If immunization is to improve in pastoralist areas over the short and medium term, significant additional resources will be required. This is especially true considering the low level of health infrastructure in these areas and the fact that reaching these "hard to reach" populations will rely in part on regular funding for mobile and outreach activities, which are more costly than static services.

Unit costs (USD) per fully immunized child, 2007 EC



Recommendations and Next Steps

This costing study highlighted several key points for action which the Federal Ministry of Health should consider:

1) Re-visit funding to woredas for non-vaccine costs, particularly for cold chain. The maintenance of cold chain equipment at woreda and last-mile delivery levels is critical for high and equitable coverage. In addition, ensuring that cost categories for other non-vaccine costs remain adequately funded within a context of a growing population, higher coverage goals, and additional vaccines is important to building on the progress already made.

2) Strengthening the health system is critical to effectively incorporate new vaccines into the system. Vaccine introductions often highlight existing flaws within the immunization system and emphasize the need to cover recurring operational costs to help reach economies of scale and increase efficiencies.

3) It is critical to focus on strengthening the quality and use of data at the health facility and woreda level. Improving data quality at peripheral levels provides a solid foundation for decision making and allows for visibility on progress and challenges within the immunization system; if staff better understand the potential value of their data for their use, the quality of data may improve. Data quality also affects the ability to conduct accurate studies such as these.

4) There is a need for customized strategies and increased funding to sustainably strengthen the health system and reach all target populations, particularly in pastoralist communities in Ethiopia. Mobile and outreach strategies, though more costly, are a critical component to reaching "the fifth child" and must be well-resourced in order to realize Ethiopia's vision of equity within its Health Sector Transformation Plan.

⁴ Kidane T. Factors influencing TT immunization coverage and protection at birth coverage in Tselemti District, Ethiopia. *Ethiop J Health Dev* 2004; 18(3):153-158.