WORKING PAPER

COMMON APPROACH FOR THE COSTING AND FINANCING ANALYSES OF ROUTINE IMMUNIZATION AND NEW VACCINE INTRODUCTION COSTS (EPIC)

Logan Brenzel
Consultant, BMGF

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Logan Brenzel, PhD
Consultant, Bill & Melinda Gates Foundation

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Preface

The purpose of this document is to synthesize and summarize the methods to be used for the EPI Costing and Financing of Routine Immunization and New Vaccine Introduction (EPIC) studies. This Common Approach was developed through discussions with country teams for Benin, Ghana, Honduras, Moldova, Uganda and Zambia, and with members of a Technical Steering Committee; and, partners of the GAVI Alliance Immunization Financing & Sustainability Task Team.

Country team members involved in preparation of the Common Approach included Anthony Kinghorn, Carl Schutte, Teresa Guthrie, Collins Chansa, Charlotte Zikusooka, Stanley Banda, (Uganda and Zambia country teams); Jean Bernard Le Gargasson, Xiao Xian Huang, Cesaire Damien Ahanhanso, Frank Nyonator, Justin Sossou, Leon Kessou, Moses Adibo, Anais Colombini (Benin and Ghana country teams); George Gotsadze, Ketevan Goguadze, Ivdity Chikovani, Daniel Maceira (Moldova country team); and Cara Janusz, Ida Bernice Molina, Gabriela Felix, Werner Valdez, Stephen Resch, Carlos Castaneda, Barbara Jauregui (Honduras country team).

Steering Committee members included Carol Levin (University of Washington); Ulla Griffiths (London School of Hygiene and Tropical Medicine); Raymond Hutubessy (WHO); Stephen Resch (Harvard School of Public Health); and Mike Hanlon (Institute for Health Metrics). GAVI IF&S TT members participating providing feedback on the study included Santiago Cornejo and Marya Paytna (GAVI Secretariat); Claudio Politi (WHO/HQ); Gian Gandhi and Tom O'Connell (UNICEF); Mike McQuestion (Sabin Institute); Niyazi Cakmak (WHO EURO); Amos Petu (WHO ESA); Alexis Saytalou (WHO WCA); Claudia Castillo (PAHO). Additional guidance was provided by Damian Walker (BMGF) and David Bishai (Johns Hopkins University School of Public Health).

This Common Approach is a guide for the design and conduct of the EPIC country studies, though it is recognized that the approach would be customized to country realities and priorities. Country teams that are required to use different approaches to the ones recommended here, should elaborate on why alternatives were taken.

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1. RATIONALE FOR THE STUDIES

The cost and financing of national immunization programs have been evaluated since the early 1980s, particularly as part of Universal Childhood Immunization (UCI) by 1990. Early estimates suggested that the cost per child fully immunized against traditional vaccines such as tuberculosis, diphtheria, pertussis, tetanus, polio, and measles was $20 on average (Brenzel and Claquin, 1994). This average figure was confirmed in subsequent country studies (Levin A and Kaddar M, 2000).

With the advent of the GAVI Alliance in 1989, countries were required to develop a Financial Sustainability Plan (FSP) in which current and future costs and financing of the national immunization program were assessed. The purpose of the FSP was to ensure financial sustainability of the EPI as new and more expensive vaccines were introduced. Analysis of 50 FSPs revealed that the average cost per child was $17, and that governments were financing approximately 42% of immunization-specific costs (Lydon et al, 2008).

The FSP process gave way to development of the comprehensive multi-year plan (cMYP), which includes a tool for planning and budgeting for the national immunization program. With the cMYP, countries estimate current and future program resource requirements and financing of the routine program as well as campaigns and shared program costs. Costs and financing of new vaccines also are included. Analysis of cMYPs for the period between 2004 and 2012 estimate an average cost per child of $21 and an average cost per fully immunized child (FIC) of $28 (Brenzel and Politi, 2012). Estimates vary greatly by region. In addition, government sources account for 56% of total financing of routine immunization, which is higher than previous estimates. A more recent evaluation of cMYPs (Brenzel, forthcoming) finds higher average costs of up to $44 per FIC in countries that have introduced new vaccines.

The results of the historical analysis of cMYPs need to be interpreted with caution because vaccine prices have declined since those country estimates were made. In addition, there is some concern over the reliability and accuracy of the estimates. Further, the cMYP is not designed to evaluate introduction costs of new vaccines, which is a question that now is raised more and more in discussions with countries.

There are few published articles on the costs of new vaccine introduction. Griffiths, et al (2009) estimated the cost of Hib vaccine introduction in Ethiopia as part of a Post-Introduction Evaluation (PIE) conducted with WHO. Walker et al (2004) examined the costs of HepB introduction in Peru and Bangladesh. Levin et al (2013) examine the introduction costs associated with Human Papiloma Virus (HPV) vaccine.

While there is a growing body of literature on the costs of new vaccines, the number of detailed studies examining routine immunization program costs and financing has dwindled. In addition, most GAVI-eligible countries have introduced the pentavalent vaccine, and older costing studies would not capture these costs. Therefore, there is a need to establish new baseline estimates of routine immunization costs with pentavalent vaccine in the schedule. Therefore, the EPIC studies will contribute to building the evidence-base on costs and financing of routine immunization, as well as provide valuable inputs into development of global policies and tools for use by countries.

The policy implications of having accurate cost and financing information are several. For instance, these data can be used to improve planning of resource requirements and country-level financing needs to ensure sustainability. Understanding the delivery costs per dose or per child of a new vaccine will be important for country preparation and domestic resource mobilization, as well as for updating GAVI Alliance policies on new vaccine introduction grants. Documented information on financial

flows for new vaccines and routine programs, particularly from government sources, will be useful inputs into policy dialogue on sustainability and co-financing of new vaccines.

The results of these analyses can be used to strengthen the assumptions within the cMYP costing and financing tool, as well as provide inputs into Post-Introduction Evaluations (PIEs) conducted in countries usually six months after new vaccine introduction. Detailed cost estimates can enhance cost-effectiveness evaluations of new vaccines by providing improved estimates of delivery costs. Finally, estimates from EPIC studies can help inform global modeling estimates on the costs of the Global Vaccine Action Plan (GVAP).

2. OBJECTIVE OF THE EPIC STUDIES

The purpose of the EPIC studies will be to provide detailed estimates of costs and financial flows in countries in which the pentavalent vaccine is part of the routine immunization program. The set of countries also will have introduced another new vaccine, such as pneumococcal or rotavirus vaccine, in 2011. The exercise will result in updated estimates of the delivery costs of routine immunization and new vaccine introduction, as well as identify and analyze variability in facility unit costs and productivity. Because there are several ongoing efforts to estimate the introduction costs of HPV vaccines, these vaccines will not be included at this time.

The main questions to be addressed in the EPIC studies are the following:

<u>Costing of Routine Immunization</u>

1. What is the total and unit economic cost of the routine immunization program at various levels of the health system?
2. What is the cost structure by line item and activity?
3. What is the total and unit delivery costs?
4. What is the cost of new vaccine introduction by major line item?
5. What are the factors that drive variation in facility total and unit costs? What are factors related to productivity of health facilities?
6. How do costs compare with estimates in the cMYP and with other economic indicators?

<u>Cost of New Vaccine Introduction</u>

1. What is the total incremental cost of new vaccine introduction, and how are these costs divided between initial start-up and ongoing costs?
2. What is the incremental delivery cost of the new vaccine?
3. How do the costs of vaccine introduction compare with budgets for introduction?

<u>Financing of Routine Immunization</u>

1. What is the total envelope of funding available for RI in the country?
2. What are the main sources of financing and for new vaccine introduction?
3. What are the intended uses of these funding sources for the RI program?

In addition to building the evidence-base on costing and financing of routine programs and new vaccine introduction, this exercise will also strengthen collaboration between in-country institutions, researchers, and international experts to build capacity to conduct cost and financing analyses of the national immunization. The aim is to catalyze a longer-term process and investment on collecting and analyzing routine immunization program cost and financing information.

3. APPROACH TO SAMPLING

As it is not possible to collect data from all facilities in each country, therefore a sample of facilities is required. The primary sampling unit will be primary health care facilities and clinics in the public and non-governmental sector. A limited sample of secondary hospitals could be included in the sample if it is believed they will be an important source of immunization activity.

There is need to better harmonize the sampling approach across countries to the extent possible. The intention of the EPIC study is both to generate estimates of national costs of routine immunization as well as to evaluate variation in facility costs. The sample should be representative of facilities providing routine immunization in a country, and these should be located in districts that also are representative of districts in the country. In addition, the sample should include facilities will represent the range of variation in costs and performance.

There is a large literature on household sampling, but a much more limited literature on facility sampling from which to draw from (Measure Evaluation, 2001). Figure 1 illustrates the proposed sample frame for the EPIC studies.

Stratified, random sampling is recommended with oversampling in rural areas if possible. The reason behind this suggestion is that costs are not normally distributed but are right-skewed. In this case, it would be useful to have a sample that would include more observations of facilities that would be associated with the right tail in order to have a greater probability of those facilities in the sample.

1. The first stage of the sampling procedure will be to select geographical areas that will be the focus of the study. If the country is small, the geographical area may be the entire country. If the country is large, provinces or regions may be selected. These tend to be selected purposively. It is suggested to select provinces or regions that reflect the range of immunization activity in the country (high performance – medium performance – low performance).

2. The next stage is to select districts within these regions or provinces from a list of districts arrayed by number of doses administered and population density. The approached used to select districts should be well documented. The number of districts selected will depend upon the total number of districts within each region or province.

3. The next stage of the sampling procedure is to develop a complete list of public and NGO PHC facilities and clinics, and secondary hospitals if included in the sample (sampling units).
    - Information should be obtained on the number of doses of vaccine administered in the past year at both district and facility level.
    - For each district, information on population density should be obtained.
    - Facilities could be classified as urban (urban/peri-urban) and rural/remote and also by ownership.

- This information should be arrayed in an Excel file. This spreadsheet will serve as the basis for sample selection.

4. The final stage of the sampling procedure is to randomly select facilities from the list within each district. The recommendation is to over-sample rural/remote facilities compared to urban/peri-urban facilities. Simple random sampling is recommended, as probability proportional to size (PPS) sampling based on the number of doses would tend to favor those facilities that administer a large number of doses.

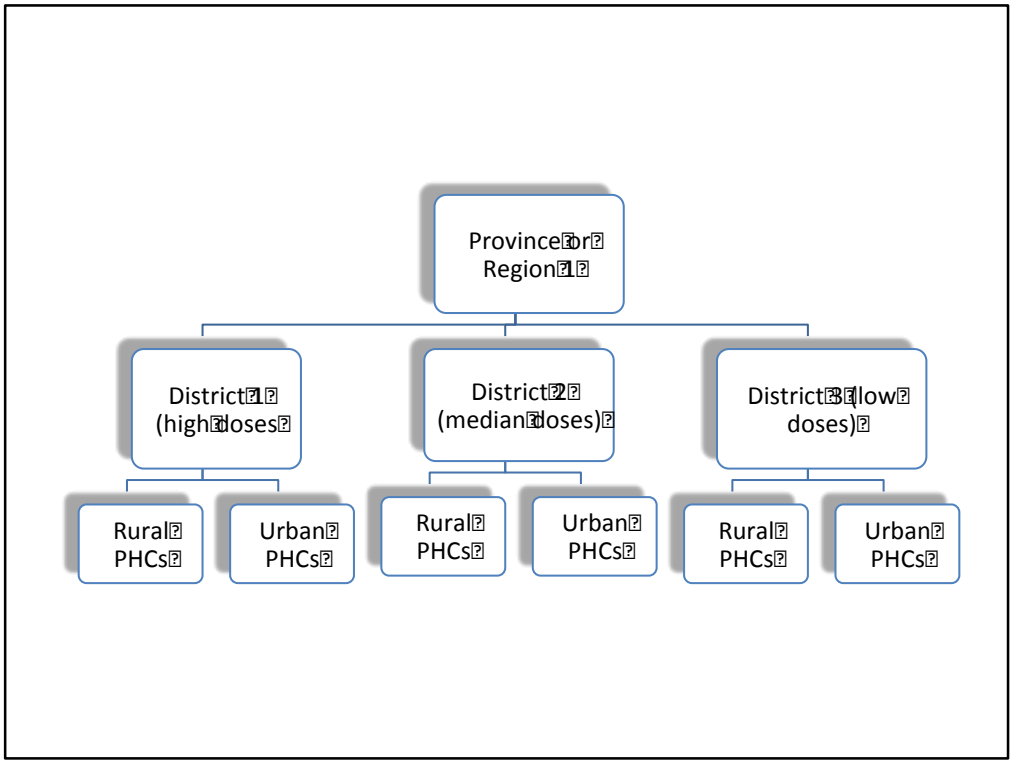
5. Sample size: The size of the sample will be balanced against the cost of visiting each facility and time required. One approach is to base sample size on a two-stage sample size determination with correction for proportions (see Annex 1 for details). This approach assumes that the variable of interest (mean facility cost) occurs with a probability of 0.5, and its inverse occurs with a probability of 1-0.5 or 0.5. The formulas also assume an acceptable level of error of 10%. Based on the formulas outlined in we estimate approximately 50 facilities per country.
    - The distribution of facilities between urban and rural will depend upon the number of districts in the sample.
    - It will be important for the study teams to report power estimates of their samples in their reports.

6. The sampling frame needs to be somewhat flexible to accommodate realities of country needs and preferences for sampling which will be important for validation of the findings.

7. Should a facility be dysfunctional, logistically not possible to survey, or respondents unavailable during the survey period, they should be replaced from the list of facilities following the same random sampling approach.

8. The sampling procedure will determine the weights used in the aggregation of costs and in statistical analysis of costs, and in reporting of average weighted total and unit costs for the facility sample. Weights are the inverse of the probability of being selected. With stratification, there are multiple probabilities of being selected and these probabilities should be multiplied by each other, with weights being the inverse of these joint probabilities. For example if one district is selected out of four (1/4), and two facilities are selected out of ten (2/10), then the probability of facilities being selected in the sample is (1/4 * 1/5 = 1/20). The sample weight for that facility would be the inverse or 20.

Figure 2: Example of the Proposed Sampling Frame for the EPIC Studies



4. Approach to Estimating the Cost of Routine Immunization

4.1 Scope of the cost analysis

Defining the boundaries of routine immunization (RI) program will be critical for the EPIC studies. RI can be defined as those immunization services or activities that are conducted on an on-going basis as part of the national program. Routine immunization services may be delivered in facilities, but also can include outreach services provided in homes or in a separate location on a scheduled day. The RI program may include more intensive activities such as Child Health Days if they are conducted out of facilities. Routine immunization differs from supplemental immunization activities (SIAs), such as campaigns and epidemic/outbreak response, in that these activities are more periodic in nature (scheduled yearly, or every few years). SIAs are excluded from this analysis at the facility and other levels of the health system.

The perspective taken for the costing exercise will be that of the government health service. Costs will be estimated retrospectively for 2011, or to coincide with the year of new vaccine introduction. Costs will be estimated in both local currency units as well as US dollars (converted based on mid-year exchange rates).

Both economic and financial costs will be estimated, though the focus will be on economic costs. Economic costs include a valuation of all inputs needed for the routine immunization program including valuation of time, supplies, equipment; and, annualization of costs that

adjusts for a discount rate. Financial costs focus on financial outlays for the program in the previous year.

A standard approach adapted from WHO (2002; 2008a; 2008b) is recommended for these studies. Routine immunization program costs will include the value of shared inputs with other health programs. An ingredients approach will be taken which identifies the type of inputs, quantifies the number of inputs, and multiplies by unit prices and the proportion used for routine immunization.

The exercise will focus on analysis of the economic costs of the routine immunization program at various levels of the health system: facility level, district level, regional/provincial health level, and national level. Estimates of administrative costs at various levels will be used to estimate national routine immunization costs. In addition, a series of unit costs will be generated from the exercise, including cost per capita, cost per dose, cost per infant in the target population, and cost per fully immunized child which will be measured as the number of children receiving the third dose of DTP or DTP-containing vaccine.

The studies should generate a series of cost benchmarks that could be useful for future costing exercises. These could be derived as unit costs based on line item costs per dose and/or per child.

Variation in total facility costs and unit costs will be identified and evaluated. Section 8 provides guidance on approaches for evaluating this variation through descriptive statistics and regression analysis. Finally, total routine immunization costs will also be compared and contrasted with EPI budgets, resource requirement estimates in the cMYP, government health spending and macroeconomic indicators.

4.2 Definitions of cost categories

The EPIC studies will evaluate RI costs by activity and input line item. Line items include salaried and volunteer labor; vaccines; injection and other supplies; per diems; transport and fuel; vehicle maintenance; cold chain energy and equipment; vehicles; and buildings costs. In addition, the analysis will examine major activity areas of routine immunization such as facility-based service delivery; HMIS and record-keeping; outreach services; supervision; vaccine supply and distribution; cold chain maintenance; social mobilization-advocacy, surveillance, program management, and training. Annex 2 presents a matrix between line items and functions to be estimated for the analysis.

4.2.1 Definition of EPIC study cost activities:

Routine facility-based service delivery: Time and resources spent on the act of administering the vaccine to children within the facility/compound.

Record-keeping, HMIS, monitoring and evaluation: Time and resources spent on data entry and analysis, including maintaining stock registers, maintaining records of children vaccinated, completing reports and analyzing, monitoring, and evaluating immunization program data.

Supervision: Time and resources spent by a facility (or district level) staff to supervise subordinate or peer health or community workers.

Outreach service delivery: Time and resources spent traveling to and from a place with the express purpose of vaccinating children outside of the facility.

Training: Time and resources spent attending and/or providing immunization-related training.

Social mobilization and advocacy: Time and resources spent mobilizing the community and households, and advocating for vaccination. This could include the cost of television and radio time, as well as the cost of hiring actors, etc.

Surveillance: Time and resources spent following-up post-vaccination events and active cases of diseases that are prevented by vaccination.

Vaccine, collection, distribution and storage: Time and resources spent collecting vaccines at the airport or other distribution points, storing vaccines in national or subnational cold stores, maintaining stock records of vaccines, and distributing vaccines down to the facility.

Program management: Time and resources spent on planning, budgeting, managing the immunization program at various levels. This would include the cost of time and resources spent on forecasting vaccine needs and procuring vaccines. Costs may include time spent preparing GAVI applications and other applications for funding and technical support. Costs may include attendance at immunization-related meetings. General management of the health system would not be allocated here.

Cold chain maintenance: Time and resources spent maintaining the cold chain at the respective level of analysis.

Other: Time and other resources spent on any other immunization-related activity not covered in the above categories. This category should be very small or not represented at all in the analysis.

4.2.2 Cost line items

Paid labor: Allocation of salaried labor to immunization-related activities.

Volunteer labor: Estimation of the market value of volunteer labor used for immunization-related activities.

Per diem and travel allowances: Any allowances paid to paid or volunteer workers for immunization-related activities.

Vaccines: Cost of traditional and new vaccines, including wastage.

Vaccine injection and safety supplies: Cost of auto-disabled syringes, diluent, reconstituting syringes, safety boxes and other supplies used for administration of vaccines.

Other supplies: Cost of stationery and other supplies for the immunization program.

Transport and fuel: Cost of bus fare, plane travel, and the cost of fuel for immunization-related transport.

Vehicle maintenance: Cost of maintaining vehicles (of all types) used for immunization-related activities.

Cold chain energy costs: The cost of running the cold chain (butane, gaz, electricity, etc), and the cost of ice.

Printing costs: The cost of printing immunization cards, training and IEC materials, and other immunization-related materials.

Utilities and communication: Costs related to building overheads, including maintenance, utilities, telephone, internet connections with some portion of these costs allocated to immunization.

Other recurrent: Other recurrent costs for immunization-related activities that are not included in the above line items. Normally, his category should be very small. For the financial cost analysis, this could include customs duties and taxes which are transfers.

Cold chain equipment: Value of all cold chain equipment used to store and transport vaccines.

Vehicles: Value of all vehicles and modes of transport (could include boats)

Lab equipment: Value of any specific equipment used for laboratory testing and diagnosis related to surveillance. Note that most of these costs will be health system costs, and not specific to immunization.

Other equipment: Value of other equipment, such as computers, printers, peripherals, furniture, other medical equipment used for immunization-related activities.

Other capital: Any other capital investments (this category should be very small)

Buildings: Value of building space used to delivery and store vaccines.

4.3 Data collection

Data on costs, outputs and facility characteristics should be collected using pre-tested, standardized questionnaire formats. A generic questionnaire format for health facilities was shared with the country teams as a starting point for customizing the form for each country context. Additional formats for data collection at the district, regional, and national level were developed to capture all relevant data on costs and outputs. Questionnaires were pre-tested and revised in an iterative process. Each country team was required to undertake training of enumerators and field supervisors in the use of the questionnaire. A copy of the generic questionnaire format can be obtained <here>.

4.4 Data analysis

Country teams are encouraged to analyze total and unit costs using an Excel-based format. These data should be exported, along with other data relevant for evaluating productivity and determinants into STATA or equivalent software for statistical analysis, including weighting. Costs should be reported as total, recurrent/capital, and unit costs, as well as evaluated by activity and line item.

4.4.1 Cost of labor: estimate of salary and benefits x % of time on RI activities

a. Enumerate which facility staff is involved in any RI activity.
b. Staff time is generally measured through survey recall during interviews. A good practice would be to ask first how the respondent spends their day, followed by some rough allocations across all immunization activities. Feedback and focus group discussion may enhance the quality of the information collected.
c. We will not be evaluating overtime of facility staff for this study, except in rare cases when overtime is paid in addition to regular salaries. The total number of working hours will be the standard set of hours for the facility. We also are not evaluating absenteeism or downtime.

4.4.2 Cost of vaccine: to be estimated for each vaccine using stock records

a. Value of vaccine used = value of vaccine doses administered + vaccine doses wasted converted into value of vaccine vials used.
b. Wastage factor: ((Number of vials at beginning of period + Number of vials received during period – Number of usable vials at the end of the period) x Doses per vial)/Doses administered
c. Wastage rates can be converted to a percentage: w = 100 – (100/wastage factor)
d. Sources of data: MOH records; donor agency records; UNICEF Supply Division.
e. The prices of vaccines should reflect freight and insurance costs (FOB/CIF) and can be obtained from UNICEF Supply Division; UNICEF local office procurement records; or the MOH/EPI.

4.4.3 Cost of injection supplies (and reconstitution syringes) safety boxes and diluent:

a. Where possible, the number of syringes used should be estimated based on stock position: (Number of syringes at the beginning of the period + Number of syringes received during the period – Number of syringes at the end of the period)
b. Wastage rate for syringes has been suggested to be 10%. However, this rate could be estimated as: ((Number of syringes used-Number of vaccine doses administered (with a syringe so oral polio doses are not counted)/Number of syringes used)) x 100
c. The prices of syringes should reflect freight and insurance costs (FOB/CIF) and can be obtained from UNICEF Supply Division; UNICEF local office procurement records; or the MOH/EPI.

4.4.3 Cost of waste disposal: Costs include the value of use of incinerators; transportation to and from the incinerator; and operating cost (fuel, maintenance, etc).

4.4.5 Costs of training: Initial training should be thought of as a capital cost, while ongoing, routine training is a recurrent cost. Training costs include the cost of venue, per diem for participants, cost of trainers, and reproduction of training materials.

4.4.6 Costs of social mobilization: These are costs associated with holding community meetings, printing flyers and educational materials, conducting events; other sensitization of the community (per diem, value of time, cost of materials). Some of these costs may be one-time costs and should be thought of as capital investments to be depreciated over an estimated useful life.

4.4.7 Vehicle maintenance: In the WHO Guidelines (2002), an estimate of 5% of annualized value of vehicles is recommended. In the cMYP, a figure of 15% of fuel cost is used to estimate vehicle maintenance. This study provides an opportunity to estimate these costs more directly. A suggested approach is to estimate total vehicle maintenance costs per facility (per district) and multiply that by the share of mileage (kms) made for routine immunization related activities. Other approaches are to obtain standard maintenance estimates from the manufacturer. Information on vehicle management may be obtained from Transaid (www.transaid.org) or JSI (www.jsi.com).

4.4.8 Cold chain maintenance: These costs include both the fuel and energy costs required to run the cold chain as well as the cost of repairs and spare parts. The cMYP Guidelines suggests estimating cold chain operation and maintenance as 5% of the capital cost of equipment. As the costing studies are an opportunity to assess actual cold chain maintenance costs, a more detailed analysis is proposed based on type of energy, frequency of energy replacement, unit prices and estimates of frequency of repairs.

4.4.9 Surveillance costs: The study teams are not required to undertake a comprehensive analysis of surveillance costs, as this would entail a separate level of effort. Rather, the focus should be on estimating the value of activities related to case detection and outbreak response. In addition, the surveillance set-up is different across countries, which makes harmonizing an approach challenging. The following approach is proposed:

a. Estimation of the proportion of time and value of time spent at the facility, district, regional and national levels on surveillance activities.
b. Estimation of the cost of transport that could be allocated to surveillance activities at all levels.
c. At district, regional and national level, expenditure information should be obtained on integrated disease surveillance (such as operating costs and overhead expenses) to be allocated to routine immunization on the basis of the proportion of VPD cases to total

investigations. In the case of where there was no activity in 2011, study teams could average over a longer time horizon to estimate the relevant share. The ratio would be specific for each district, region and at the national level.

d. Costs of laboratory services and the cost of capital equipment for surveillance will not be included. While this may result in surveillance costs being underestimated for these studies. Somda, et al (2009) might provide some useful benchmarks for the studies.

4.4.10 Other costs, such as customs duties: These costs could be significant for some countries. As they are transfers, they should factor into the financial cost estimates only, and would best be collected at national level.

4.4.11 Cold chain equipment: The capital cost of cold chain will be an important cost category for these studies.

a. Formula: number of cold chain equipment (by type) x replacement price
b. The number of cold chain equipment by type can be obtained during the facility survey. For more aggregated levels, use recent inventories of cold chain equipment (at district or nationally).
c. Replacement prices for cold chain equipment: these can be obtained from local donor offices procurement records; WHO; MOH/EPI financial records; and UNICEF Supply Division. These prices would include freight, etc.

4.4.12 Vehicles: In addition to the running cost of vehicles used for routine immunization, some portion of the purchase value of the vehicle should be allocated to the program as it represents an opportunity cost of using the vehicle for immunization rather than other services.

a. Formula: number of vehicles (by type) x replacement price (by type) x % use by the routine immunization program
b. Vehicles cost are annualized: Vehicle Cost x Annualization factor (based on useful life and 3% discount rate)
c. Replacement prices could come from MOH/EPI financial records; donor procurement records.
d. The percent use by the routine immunization program could be estimated as:
    a. Immunization kms traveled to total kms traveled within a period of time
    b. Interviews with responsible officer of the facility or district office
    c. Based on the share of facility hours for immunization

4.4.13 Computers and office equipment: The discounted annual value of these inputs should be evaluated in the cost study.

4.4.14 Buildings: Vaccinations provided in facilities will entail use of the primary health care facility and therefore has a resource cost. The value of buildings

will be related to the space that is used to administer vaccines, store vaccines and supplies for the program. If the building is rented, the value is equal to facility rent and a proportion of the facility utilized for immunization services. If the building is owned, then the value of building space for immunization could be estimated through the following approaches:

a. Area (square meters) of the vaccination area and the storage area can be estimated by pacing and/or through direct measurement.
b. Percent use of the building space: ratio of the area of the entire building to the area used by vaccination services. If services are not provided daily, this % use will need to be further allocated based on the % of time used.
c. Cost of buildings: obtain through interviews the current building cost (per meter squared). This information might be better obtained at higher levels of the health system.
d. Cost = (square meters x cost/square meter x % allocation to the immunization program) x annualization factor.

4.5 Annualization of capital costs

For capital inputs with a useful life greater than one year, economic costs reflect some portion of their value, as well as the cost of tying up capital in that input rather than utilizing it in another way. Such capital inputs include cold chain equipment, buildings, computers, furniture, initial investments in social mobilization, and initial training.

For economic cost evaluation, all capital costs need to be annualized based on a 3% discount rate and estimates of useful life. A "Useful Life" is defined as the period during which an asset or property is expected to be usable for the purpose it was acquired. It may or may not correspond with the item's actual physical life or economic life. A general rule of thumb is that useful life is equivalent to the number of years until the cost of maintaining and repairing a piece of equipment (opportunity cost of using an outdated model/make) outweighs the cost of buying a new piece of equipment.

It may be challenging to estimate useful life, particularly for very old equipment still in use. For this reason, a hierarchy of approaches was developed:

- First—ask for estimates of useful life. Best respondents would be district-level drivers (for vehicles), and facility-in-charge for cold chain equipment. At the national level, also ask the WHO logician to confirm a range of estimates. The purpose behind asking rather than using a standard estimate is that we would like to allow for variation across facilities and districts based on the reality.
- Second—estimate useful life (from the vehicle life estimator) but also compare that with responses above.
- Third – use estimates of useful life from either the national level (to apply to the country as a whole), or use benchmarks generated by WHO Choice for a range of countries. This option should be included in the sensitivity analysis.

Annualization factor: $1/(1+r)^n$ where r = discount rate, and n = number of years of useful life. This factor is sometimes referred to as the present worth of annuity factor. A table of these

factors is included in Annex 3. For economic evaluation, the annualized cost = Cost estimate x annualization factor. For financial cost evaluation, capital costs are divided by the number of years of useful life without discounting (straight line depreciation).

4.6 Tracing factors: For the analysis, shared costs shall be allocated both to routine immunization, as well as across activities/functions based on a common set of tracing factors (see Annex 4). While used in the analysis, all teams must ensure that they have collected the relevant information to generate these factors, as needed.

4.7 Unit prices

Unit prices should be based on replacement prices not historical prices of when the input was purchased. Sources of price information include the following:

- Vaccine unit prices – country records including FOB/CIF prices (estimate on a per dose basis)
- Review of procurement records at national and/or regional levels: this information tends to be a higher levels of the health system
- UNICEF and WHO Product Information Sheets
- Donor procurement records
- Interviews with key personnel at facility, district, regional or national level.

4.8 Cost Profiles

Analysis of the distribution of total costs by line item or by activity helps to inform the major categories of expenditure for the routine immunization program. Historically, labor costs have accounted for the greatest share of expenditure, but new vaccines are increasing in importance relative to total expenditure. Country teams also should aim to evaluate and discuss the distribution of total costs by line item and by activity for the sample of facilities, and for sub-national and national levels. Information might be best represented in tabular form or in pie or bar charts.

4.9 Unit costs

The following unit costs should be generated at the facility, district, and national levels, including:

- Cost per capita
- Cost per dose of vaccine
- Cost per infant in the target population
- Cost per fully immunized child, which is measured as the cost per DTP3 vaccinated child in these studies.

The program definition of a fully immunized child will vary across countries because of differences in the vaccine schedule (types of vaccines, and recommended age of vaccination). Because of this, the number of fully immunized children (FIC) will be proxied by the number of children less than one year of age who have received the 3rd dose of DTP-containing

vaccine. This measure should be fairly uniform across the countries but may require a bit of effort to extract from facility log-books.

Measles-containing vaccine may be given to children less than one year of age. If country teams are able to collect information on the number of children less than one year of age who have received both the 3rd doses of DTP-containing vaccine and the first dose of measles-containing vaccine, they should do so.

Finally, as a separate option, country studies could also collect information and estimate the number of fully immunized children for their respective age groups, as relevant for policy. For instance, in the Moldova case, estimating the number of FIC for <2 years might also provide useful country-specific information.

Note that the main output indicator for evaluating unit costs will be number of routine immunization doses provided by the facility in the year, which should be common across all countries.

4.7 Data analysis

Cost information should be analyzed using Excel to produce total facility costs and unit costs by line item and by functional activity. This could be accomplished using the country team's own spreadsheets, or by using the Database Tool for the costing and financing studies. This Database Tool allows for data entry, validation of values entered, and production of basic cost and unit cost information. In addition, the tool facilitates export of costing information to facilitate analysis of productivity and determinants, and further, in-depth analysis of cost information. For further detail, see Young, D. Immunization Costing Database, Beta Version. 2013.

4.8 Aggregating costs from facility to national level

The primary purpose of the cost analysis is to estimate total and unit costs, and also to evaluate the variation in these costs. However, for policy purposes, it is often useful to derive a single estimate of unit cost for the country as a way to benchmark and compare across countries. Aggregation should be based on facility costs and costs at various administrative levels. The following approaches may be used by the country teams.

4.8.1 Averaging: One approach is based on multi-level weighted averaging of costs (see Annex 5 for an illustration). This approach needs to be consistent with and adapted to the sampling frame and stratification process for each country.

a. Facility unit costs (cost/FIC or cost/dose) within each district could be weighted averaged and added to the routine immunization program coverage at district level. Facility-weighted costs should exclude vaccines and syringes as these costs will be reflected for the entire district.
b. Weighted average district costs (minus vaccine and supplies) would be multiplied by the number of districts, to generate total district level costs. In aggregating up to the national level, district weighted average unit costs should exclude vaccines, syringes, and cold chain as these will likely be incorporated into the estimate eat the national level.
c. A similar process could be used for estimating regional administrative costs.
d. The total district and regional level unit costs could be added to the national level costs to generate total country routine immunization program costs.
e. Total costs can then be divided by total doses, children in the target population, number of DTP3 immunized children, and total population to generate unit costs.

While relatively easy to construct, this approach has several limitations, including that costs are may not normally distributed and the sample may not represent the range of immunization costs in a district or region.

4.8.2 Statistical evaluation: The regression analysis of determinants of total facility cost can be used to generate total national costs (See Section 8).

Suppose that the total cost function to be estimated is something like the following:

Total facility cost = $A + B_1(\text{doses}) + B_2(\text{prices}) + B_3(\text{quality measure}) + b_4(\text{other control variable})$

The parameter estimate B_1 represents the change in total cost with respect to the change in the number of doses. The analysis would multiply the parameter estimate by the number of doses that have been administered to generate a total national cost at the facility level. This regression parameter could be generated for the sample of facilities as a whole, or could be conducted on subsamples related to 1) coverage groups to try to account for any scale effects; 2) facility types; or, 3) location of facilities.

District-level administrative costs would need to be incorporated into the national cost estimates. This might be done simply through weighted averaging at the district level,

recognizing the limitations of this approach. The sample size of districts is likely to be too small to undergo regression/statistical analysis.

This statistical approach has several advantages in that it controls for relevant factors driving the cost function as outlined in Section 8 below.

4.8.3. Raking

If a characteristic of facilities is known for the entire population of all facilities, such as the number of vaccinations produced or the number of personnel in the facility, the sampling weights can be "calibrated" using statistical raking to assure that they predict the correct value of that known aggregate. The sampling literature on raking assumes that sample weights that correctly predict known aggregates in the population will also be more accurate at predicting an unknown national aggregate like the total cost of vaccination. Useful references include: www.stata.com/meeting/uk10/UKSUG10.DSouza.ppt and http://econpapers.repec.org/paper/bocusug10/02.htm.

5. APPROACH TO NEW VACCINE INTRODUCTION COSTS

This Section outlines an approach for estimating the incremental costs of new vaccine introduction, focusing on pneumococcal and rotavirus vaccine introduction. Each country team should adapt the methods to the specific country context. In most cases, new vaccine introduction will be a retrospective analysis. However, there may be instances where the costs of new vaccine introduction will have to be estimated on a prospective basis.

5.1 Scope of the Exercise

The WHO Guidelines for Estimating Costs of Introducing New Vaccines into the National Immunization System serves as a basis for cost estimates (WHO, 2002). In addition, methods and approaches outlined in Section 4 on costing should also be borne in mind.

New vaccine introduction costs will need to be estimated at the national, district, and facility levels, if possible. The perspective of the analysis will be the government perspective. New vaccine introduction costs will be those that are incremental to the routine immunization system and specifically incurred as a result of new vaccine introduction (NUVI). Country teams are requested to estimate both economic and financial costs in local currency and US dollars based on the mid-point exchange rate for the year of interest.

The time period relevant for considering NUVI costs is not clear-cut. Investments for new vaccines may be incurred long in advance before a vaccine is introduced and may continue well after the initial introduction period. For instance, cold chain equipment may be purchased in anticipation of a new vaccine, but delays in introduction may mean that these costs are incurred much earlier than previously envisioned. Demonstration projects and studies might need to be conducted as part of evaluating new vaccine introduction, and these may continue long after the initial introduction period.

- *Suggested rule of thumb*: Expenditures for capital equipment incurred to fill gaps in the routine program 6 months prior to new vaccine introduction up to 6 months after the initial period of introduction should be attributed to NUVI costs, unless otherwise designated by the EPI manager. An incremental share of total costs based on storage volume would be allocated to new vaccine introduction.
- In large countries that are phasing in new vaccine introduction, the above time frame approach will need to be modified. An approach to classifying costs as investment costs (which could happen over a longer time period than a year) and recurrent costs may be better.

6.2 Incremental Costs

Table 3a below is adapted from WHO (2002) and identifies the types of incremental costs to be evaluated for new vaccine introduction, depending upon the type of new vaccine and whether the new vaccine is in addition to, or replaces an existing vaccine provided by the routine program. Annex 6 also provides additional guidance.

Table 3: Types of Incremental Costs to be Evaluated for New Vaccine Introduction

Type of New Vaccine	Inputs to Assess
Combination vaccine with no change in vial size and no extra vials for diluent	1. Vaccines 2. Disease surveillance 3. Initial training 4. Social mobilization 5. Additional printing and other operating costs
Combination vaccine with fewer doses per vial than previously used and/or with extra vials for diluent	1. Vaccines and reconstitution syringes 2. Vaccine distribution and storage 3. Disease surveillance related to new vaccine 4. Initial training 5. Social mobilization 6. Additional printing and other operating costs
Monovalent vaccine	1. Vaccines and additional safety boxes 2. Vaccine distribution and storage 3. Distribution system costs for transport and storage of new vaccine 4. Waste management costs 5. Additional personnel time 6. Disease surveillance related to new vaccine 7. Initial training 8. Social mobilization 9. Additional printing and other operating costs

Source: WHO, 2002. p8.

The incremental costs to be estimated for this new vaccine introduction include economic costs; financial costs; and fiscal costs. We are estimating these various types of costs to meet the needs of various constituencies and questions raised on NUVI costs. See Table 3b below.

Incremental economic costs for NUVI represent the incremental opportunity costs of new vaccine introduction. Economic costs would include the opportunity cost of health worker time, the valuation of donated time, value of other donations, value goods already owned and/or paid for, and the discounted, annualized value of capital goods (used and donated). We need to consider the capacity of the routine immunization program when making estimates of incremental economic costs. Firstly, in valuing the opportunity cost of time, the incremental economic cost reflects the value of the time that health workers would spend doing other things besides NUVI. This estimate is not 'incremental' in the sense that it is additional – health workers are paid a salary whether they are involved in NUVI or not. But, activities related to NUVI represent a real 'cost' to the system. The question arises whether this should be valued if there is excess capacity and lots of down-time of health staff. We think this is still an important aspect to estimate because at some point, capacity constraints will mean hiring additional staff.

Secondly, where there is excess capacity of the cold chain and NUVI vials do not require additional cold storage purchases, there may not be a perceived 'incremental' cost to the system. However, the space taken up by NUVI vials in the cold chain system also needs to be valued, in that this volume does have an opportunity cost for the system, and for the same

reasons as for staff, capacity constraints eventually will require additional investments. Therefore, the incremental economic cost represents the total opportunity cost of NUVI activities, and this estimate can be used in cost-effectiveness analysis of NUVI.

Table 3b: Cost Estimation for New Vaccine Introduction for Selected Line Items

Line Item	Economic Costs	Financial Costs	Fiscal Costs
Salaried Labor	Included to represent opportunity cost of time of existing staff involved in NUVI (FT and % of time)	Labor costs of new staff hired to accommodate NUVI	Included if new staff needs to be hired
Volunteer Labor	Economic Value Included	Excluded	Excluded
Per Diems	Included	Included	Included
Vaccines	Economic value of vaccines utilized	Financial costs of purchased vaccines	Financial cost of purchased vaccines
Vaccine Injection Supplies	Economic value of utilized supplies	Financial cost of purchased supplies	Financial cost of supplies
Transportation and other transport costs	Economic value included	Included	Financial cost of fuel and other transportation
Cold storage costs	Economic value of current cold chain volume – and/or – Economic value of additional cold storage equipment and supplies purchased for NUVI (discounted annualized share of total cost)	Financial costs of additional cold storage equipment and supplies purchase for NUVI using straight-line depreciation	Purchase cost of additional cold chain required for NUVI
Vehicles	Economic value of vehicle use for NUVI activities	Value of vehicles for NUVI using straight-line depreciation	Purchase cost of vehicles for NUVI

Incremental financial costs are estimated from incremental economic costs, and include the financial value of any new staff hired. Volunteer labor is excluded, as is the value of donated goods. Capital costs are depreciated on a straight-line basis. Financial information is useful for government planning and budgeting purposes.

Incremental fiscal costs have been added to our analysis, because these reflect what governments and donors have paid (or will pay) for activities, services, and goods related to the NUVI period. This information will help with planning and budgeting of NUVI, and will be used to

compare with the NUVI grant application for the GAVI Alliance. Fiscal costs are equal to the value of all additional purchases made.

NUVI costs also should be disaggregated into initial start-up costs (those one-time costs associated directly with NUVI, such as initial training or social mobilization campaigns); and ongoing, recurrent costs (those incremental costs that will go on in perpetuity as a result of the new vaccine (e.g., vaccine and injection costs; opportunity cost of time, etc.) The following sections provide more detail on the valuation of incremental costs of NUVI. It is very important that you understand the details about the type of vaccine that is being introduced – whether it requires reconstitution, the doses per vial, storage requirements, etc.

5.1.1 Vaccine costs:

a. When looking retrospectively, vaccine costs should be based on consumption (use) of new vaccines using the same formulas and approach outlined in the Section 4, specifically for the new vaccine in question.
b. If estimating vaccine costs prospectively, the total vaccine costs per year can be estimated based on achieving a target coverage rate in the future. GAVI has estimated it takes 2 years to achieve 60% coverage of a new vaccine based on experience with GAVI-eligible countries. Please also refer to the WHO Guidelines (2002) for facility level estimates or use the Vaccine Volume Calculator (WHO, 2009) for district and national estimations.
c. If a combination vaccine is to be introduced, the annual costs of the vaccine to be replaced by it should be subtracted from the total costs so as to obtain an estimate of the incremental costs. For instance, if pentavalent combination vaccine is being introduced, then the annual costs of HepB-DTP or DTP vaccines should be subtracted from the costs of the pentavalent vaccine. As this study focuses on pneumococcal and rotavirus vaccines, this will not be an issue for the country teams.
d. The estimated coverage rate for new vaccines is generally modeled on the coverage rate for DTP or DPT-combination vaccines.
e. If the new vaccine is a combination vaccine, similar wastage rates for other combination vaccines could be used in the analysis. Wastage rates can be determined from actual data in country and or from WHO estimates.
f. Buffer stock should only be estimated as an incremental cost at the district and national levels.

5.1.2 Syringes, diluent, and safety boxes:

a. If a monovalent vaccine is introduced, additional syringes will be required. Each vial of freeze-dried vaccine will need to be reconstituted with a sterile syringe. The costs of diluent required for reconstituting vaccines also must be estimated. Follow the guidelines outlined by WHO (2002) for syringe costs at the facility level, or the Vaccine Volume Calculator (2009) for district and national level estimations.
b. The cost of safety boxes is based on the annual number of additional syringes (ADS) resulting from the introduction of the new vaccine, relative to the storage capacity of the boxes purchased. Follow the WHO Guidelines for cost estimation.

c. The cost of diluent is similar to estimating vaccine cost except that it is based on the number of vials (rather than doses) to be utilized: c = price per vial x number of vials.
d. The number of vials of diluent needed should be equal to the number of vials of vaccine estimated above.

5.1.3 Waste management

a. If the new vaccine is a monovalent vaccine, this will require additional waste management. Capital costs are related to additional incinerators needed and the cost of the area required to house these incinerators. Recurrent costs include fuel and maintenance, time of staff, and any additional training required.

5.1.4 Vaccine distribution and storage

a. Introduction of new vaccines may have implications for cold storage and distribution costs for the routine immunization program. This line item could potentially represent a large share of the total cost of new vaccine introduction and estimation will be required.
b. If cold chain capacity was sufficient for introduction of a new vaccine there will be no incremental costs of cold chain.
c. Approach for estimating cold chain costs associated with NUVI: If countries have to expand their cold chain for the introduction of new vaccines, these costs need to be measured. Most studies will be retrospective in nature. In this case, estimates should be made of the costs of increases in vaccine volume at each level of the health system and the cost of additional cold chain required at those levels. The basic approach is to estimate the share of vaccine volume required for the new vaccine relative to total volume for the current vaccines in the schedule and also relative to total cold chain storage capacity in the country.
d. An important tool for estimating vaccine volume include the WHO Vaccine Volume Calculator spreadsheet: (http://www.who.int/immunization_delivery/systems_policy/logistics/en/index4.html). The Vaccine Volume Calculator can help estimate the:
    i. net storage volume per vaccine per child
    ii. net storage volume per injection supplies and diluents per child
    iii. weight of safe injection equipment
    iv. volume of injection equipment wasted per child
    v. cost of vaccines and injection supplies

For economic costs of existing cold chain for new vaccines the volumes required for the new vaccine could be compared with volumes of vaccines already in the cold chain. This ratio of the share of vaccine volume of the new vaccine could then be used to allocate total annualized cold chain cost to new vaccine introduction in the case of estimating economic cost. In cases where new vaccine volumes exceed current cold chain capacity, and new cold chain equipment was purchased (or should have been purchased), the share of the volume of the new equipment for the new vaccines can be used to allocate the annualized value of the equipment to new vaccine introduction.

e. If countries increased the frequency of delivery of vaccines and/or made adjustments to their current vaccine supply chain, it will be important to capture the change in transportation resource use and associated costs. In most cases, the structure of the supply chain will not change for new vaccine introduction (although this might be part of long-term reforms). A more likely scenario is that frequency of distribution of the vaccines to various levels may change, and the questionnaires should capture these changes in terms of frequency of vaccine collection.

f. The WHO Logistics Planning Tool spreadsheets may be helpful reference for developing questionnaires to capture the following information in facilities, at district and regional levels: (http://www.who.int/immunization_delivery/systems_policy/logistics/en/index4.html):
   i. vaccine and supply storage points at different levels of the health system
   ii. vaccine storage volumes
   iii. quantities to be transported by different routes
   iv. required storage capacity for vaccines at national and intermediate stores
   v. required cold chain at health facility level
   vi. transportation for vaccines and supplies

g. The incremental logistics cost per level of the health system is based on changes in the frequency of vaccine collection and distribution between levels. Economic incremental costs includes the cost of fuel, time of salaried labor, per diems, value of additional cold storage space involved in distribution or collection, vehicle use, and value of any other inputs associated with those additional vaccine collection/distribution activities. Financial costs would value additional capital investments using straight-line depreciation, and exclude any donations. Fiscal costs would refer to any additional payments made specifically for logistics systems for NUVI.

h. The WHO Excel-based tools contain product-specific information for vaccines, diluents, syringes, and cold chain equipment. However, please check whether this information is up-to-date date so that unit costs and other figures reflect current information. Updated inventories of cold chain equipment at various levels of the health system may have been generated as part of an EPI Review or other evaluation process and could be obtained from WHO Headquarters or the country office.

5.1.5 Surveillance, monitoring and evaluation

a. The incremental cost of surveillance associated with new vaccine introduction should be measured at the district and national levels. Discussions will need to be held with the EPI manager to determine whether the new vaccine added activities, time, or other requirements to the ongoing surveillance system. Surveillance costs include the additional value of personnel time, cost of training and meetings, cost of laboratory supplies and equipment, transportation costs (for transporting samples, and case follow-up), per diem for case detection trips, and other operational costs.
b. It may be that new vaccine introduction stimulated upgrading of the surveillance system in a country. However, the full cost of this upgrade should not be allocated to the new vaccine alone, but on a pro rata basis, perhaps on the basis of the

proportion of new vaccines delivered to total number of EPI doses given in the same year.

5.1.6 Initial training

a. NUVI will most likely require orientation and retraining of health staff. Initial training cost should be treated like a capital cost, with a useful life of approximately 2 years, when refresher training is expected to take place. Training costs include the costs of training staff, venue rental, per diems for participants, accommodation and travel for participants, cost of materials development and cost of reproduction of materials.

5.1.7 Personnel

a. If the new vaccine is a combination vaccine, then we can assume that it replaces an older vaccine and no additional time would be required for administration, and there would be no incremental cost, assuming that the new vaccine is delivered in a similar manner as the previous vaccine (i.e., had to be reconstituted or not). However, if the new vaccine represents an addition to the immunization schedule, additional time for administration and record-keeping might be required and needs to be included in economic costs.
b. The WHO Guidelines suggest a time requirement of an additional 15 minutes per dose of new vaccine. However, the economic costing done for the EPIC studies might have different results on a time basis that could be applied to NUVI cost.
c. Incremental fiscal costs of personnel would be calculated only if additional staff were hired to provide the new vaccine.

5.1.8 Costs of social mobilization

a. The incremental costs of advocacy, awareness raising, and social mobilization associated with NUVI need to be included in the analysis. These costs should be based on extensive interviews on what types of activities were undertaken prior to introduction, what activities were undertaken during the introduction period, and those that continue on after introduction. The relevant costs include the capital costs of developing media spots (TV, radio, print), costs of events and productions related to the new vaccines, costs of distributing messages, and costs of any media equipment or staff time (e.g. cost of actors, celebrities, etc). In addition estimates should include the cost of air- and radio-time for messages, transportation costs associated with sensitizing communities, printing costs of flyers and posters, and other communications costs.
b. Initial incremental social mobilization for a new vaccine should be treated as a capital cost, discounted over a period of useful life (2-3 years).
c. Incremental recurrent costs of social mobilization for the new vaccine would be those associated with any longer term sensitization, such as special radio or TV advertisements specific to the new vaccine that air past the initial NUVI period.

5.1.9 Other incremental costs

a. The cost of reprinting new child vaccination cards as a result of new vaccine introduction should be factored into the analysis. Printing costs can usually be obtained from EPI/MOH financial records.
b. Any other costs, such as the cost of surveys, cost of preparing the NVS application for GAVI for the new vaccine, or other evaluations should be factored into the analysis as appropriate. Incremental costs should factor in additional labor time, supplies, travel, and any other costs.

5.2 Data sources, collection and analysis

a. The primary source of information on the types of activities conducted and when they took place NUVI will be the national EPI manager and his/her staff, and perhaps at staff at regional or district level. Partner organizations, such as WHO or UNICEF or bilateral organizations, may have financially supported new vaccine introduction and their staff should be interviewed and records reviewed.
b. Other sources of information include the GAVI New Vaccine Applications in which a budget for NUVI is estimated. The cMYP may have relevant information as well.
c. At the facility level, data sources will include interviews with key staff (additional time required) and review of records (vaccines utilized, additional travel for social mobilization activities, etc.). However, in some cases, information on new vaccine introduction may not have trickled down to the facility level, so that data may be obtained mostly at higher levels of the health system.
d. Each country team is encouraged to develop specific data collection instruments to capture the incremental cost of NUVI at various levels of the health system. Evaluation of NUVI costs should be accomplished using Excel worksheets.

6. APPROACH TO FINANCIAL FLOW ANALYSIS OF ROUTINE IMMUNIZATION AND NEW VACCINE INTRODUCTION

6.1 Scope of the financial flow analysis

For the EPIC studies, the focus is on an analysis of financial flows for the routine immunization program and for new vaccine introduction from external, government, and other domestic sources. The purpose of this analysis is to measure the total resource envelope available for RI services, better describe funding flows, quantify funding available from various sources for routine immunization, and document how funds and commodities flow to end users. The total resource envelope available at various levels of the health system are different than expenditures (funds spent), which are an outcome of procurement, disbursement and public expenditure management systems. The resource envelope is an expression of intent, while expenditures reflect actualities. The focus is on financial flows for routine immunization and NUVI, and excludes financial flows for supplementary activities and campaigns.

6.2 Data collection

Data on financial flows for routine immunization only should be collected from the facility, district, regional, and national levels using the standardized questionnaire developed for this purpose. A copy of this questionnaire can be accessed <here>. These generic data formats for collecting information on financial flows will need to be pre-tested and adapted to country-specific realities.

The major donors for immunization generally are GAVI Alliance, WHO, UNICEF, JICA, USAID, DfID, Norway, other bilateral organizations, foundations (such as the Bill & Melinda Gates Foundation), private sector organizations, and communities. Effort should be made at the outset to identify the major non-governmental sources. Government sources include the national treasury, which may pass funding through the Ministry of Health or the national social insurance agency. Local government may generate revenues that are allocated to immunization and these will need to be explored and measured at the provincial and/or district levels. In many countries, facilities may not have knowledge about the resources allocated to them from various sources, and this information might need to be collected at higher levels of the health system.

6.3 Data analysis

Each country team will need to produce a 'map' that illustrates the various sources of financing and commodities and how these travel through the health system to reach ultimate users – e.g., primary health care facilities.

In addition, each country team will need to conduct quantitative analysis on financial flows using an Excel-based spreadsheet. In order to compare results and trends across country teams, we need to have a similar approach for classifying and coding financial flows. For the EPIC studies, we have decided to base our codes on the System of Health Accounts (SHA) 2011. The codes for the EPIC studies will be further disaggregated so that they correspond with our matrix of line items and activities. Please note that the SHA 2011 codes are different

than the original SHA 2001 codes and also differ from earlier versions of the National Health Accounts Producer's Guide (2001).

Please note that the financial flow exercise is not the equivalent to a National Health Accounts (NHA) that focuses on expenditures for routine immunization. As we have estimated costs, there is no need to re-estimate expenditures.

6.3.1 *Coding system*:

The SHA codes are organized around the following:

a. Revenues (Financing Sources-FS): classifies the funding source at country level. Additional codes (FSR=loans and FS.RI=source of source) can be used.
b. Health Care Financing (HF) which replaces Financing Agents (FA) in the Producer's Guide and previous sources
c. Health Providers (HP): type of facility/health care establishment
d. Health Care Functions (HC): similar to activity and functional classifications
e. Health Care Provision (FP): similar to line item classifications
f. Beneficiaries (GBD): infectious disease

For this exercise, it is more useful to trace funding flows between institutions rather than to classify the type of health care financing mechanism. For this reason, we will retain the coding of Financing Agents (FA) from the NHA Producer's Guide, rather than use codes pertaining to Health Care Financing (HF) in the current SHA.

The SHA 2011 codes were originally developed to evaluate health expenditures from a country perspective. There may be some limitations to using these codes to analyze funding flows that occur outside of the country. Namely, the codes do not allow us to trace funding flows from more than one external source to another: from GAVI Alliance to UNICEF Supply Division, for instance. These flows will need to be described and illustrated in the funding flow maps that are developed for each country study. A set of common financial flow scenarios has been developed with the associated coding to guide the analysis (see Annex 7).

6.3.2 Level of disaggregation and allocation

Study teams should try to disaggregate financial flows for routine immunization to the extent possible, excluding financial flows for SIAs and campaigns. Focus should be on identifying and quantifying all sources of financing (FS) and their use to the level of detail possible. In some cases, we may find that most of the funding flow is for campaigns rather than routine immunization, which is a finding in and of itself.

Allocation of shared funding to health care function (HC) and health care production (HP) shall be done to the extent possible, viz:

a. Salary flows for routine immunization will be equivalent to what has been estimated from the costing study at the national (aggregated) level
b. Administration/management = the country teams also could use the estimates generated in the cost analysis.

6.3.3 Outcomes of the analysis

At a minimum, each country study should produce a set of 2x2 tables, including:

a. FS to FA
b. FA to HP
c. FS to HC (if possible)
d. FS to FP (if possible)
e. All funding and commodity flows will be for a single beneficiary GBD code. The exception will be for the Honduras study where they think they can disaggregate by vaccine and by age group. All teams should be able to qualitatively describe the final beneficiaries of the funding flows.

6.4 Qualitative analysis of planning, budgeting, and financing

In addition to collecting and analyzing information on financial and commodity flows, this exercise also requires a qualitative assessment of planning and budgeting for the routine immunization program. Each country team should describe the process of planning and budgeting (whether top-down or based on bottom-up estimates). In addition, the final report should contain information on the cost estimates from the updated comprehensive multi-year plans (cMYP), EPI budget, gazette budget for the program (if available), and also supplement this section with a discussion of the quality of planning and prospects for financial sustainability and country ownership.

A comparison between cMYP estimates and those generated in the costing study should be attempted. One-to-one comparisons will be challenging as the cMYP line items are a mixture between economic and activity classifications. Comparisons should be done for $2011.

7. APPROACH TO VALIDATION AND VERIFICATION OF DATA QUALITY

Each EPIC study should be conducted to the highest quality and in the most robust manner. To accomplish this, country teams should undertake a process of data verification and validation prior to the analysis. The quality of data may be affected at various stages of the study, including:

- Data collection: interviewers are unclear of the purpose of a question and collect the wrong information, or they make errors in recording information; or, information is missing at a particular level of the health system.
- Data entry: persons responsible for data entry mis-code data from survey instruments which affects the analysis.

For this study, every effort should be taken to minimize the amount of data collection and data entry errors, as well as to minimize missing information to improve the quality of information.

7.1 Strategies for minimizing error and improving data quality

The following are some strategies for improving the overall quality of information used to estimate costs and financing of routine immunization. These strategies reflect the lessons learned from the EPIC study teams in data collection and entry:

7.1.1 Data collection

- Meet with key stakeholders in advance to discuss the purpose of the work, and to obtain their inputs into the design/direction of the study, including the sample;
- Develop and use of a standardized questionnaire to be used in all facilities, districts, and partner agencies;
- Pre-test all questionnaires to customize them to the specific country context;
- Translate questionnaires and data collection tools into the language used by data collectors to facilitate data collection;
- Train data collectors, including on-site and hands-on training in facilities using the questionnaire and data collection instruments;
- Notify regions, districts, and facilities in advance of scheduled interview dates will allow time to organize logbooks and registers, and to be present during the interview;
- Use of trained supervisors during data collection to review and verify questionnaires and to ask questions of interviewers;
- A quick review of the questionnaires with the In-Charge of the facility may facilitate data collection and availability of information;
- Include a field supervisor on the team who carefully checks for completeness of questionnaires prior to leaving facility area;
- After a batch of questionnaires have been completed, undertake a careful review to a) identify trends with respect to missing information or poor quality data in order to develop strategies to collect better data; b) identify trends with respect to data collectors understanding and use of survey instruments to provide an opportunity for retraining or updating;

- Undertake quick calculations in the field. Examples include ensuring that personnel time allocation adds to 100%; and that doses administered per month add up to total yearly doses administered as recorded in the logbooks;
- Set aside some time for revisiting facilities to do 'mop-up' of missing information or to double-check information; and,
- Obtain contact information of the facility 'in-charge' to follow-up on with any data queries.

7.1.2 Data entry

A database tool has been developed for use by the study teams to facilitate data entry from the pre-tested questionnaires. This tool allows for uploading of all facility-based information on costing, and undertakes simple initial calculations. The database tool also facilitates exporting the data into STATA for further statistical analysis.

Study teams are required to:

- Incorporate validation checks into any database entry tool (to catch missing cells, inconsistent numbers, text as compared to numeric values, differences in size of numeric values, etc);
- Perform double-data entry: each questionnaire is entered twice into the data entry tool and compared; and,
- Undertake 1uick check calculations are made to ensure that results are plausible.

8. APPROACH TO PRODUCTIVITY AND DETERMINANTS ANALYSIS

8.1 Background

In economics, total costs are a function of outputs, prices, and other factors that influence the shape and/or position of the cost curve with respect to outputs (Equation 1). A major assumption with these models is that output levels and input prices are exogenous. A cost function describes the minimum cost of providing a given volume of output as a function of exogenous prices and can be described as:

$$\mathbf{C = f(Q, P, Z),} \qquad \mathbf{(1)}$$

Where C is equal to total facility cost (non-weighted); Q represents outputs; P represents input prices; and Z represents a vector of production-related factors.

However, the assumption of cost minimization applies to competitive markets, and may not be the most useful in describing public health service provision. Namely that:

1) Empirical data on the value of resources used by non-minimizers will show a wide variation with many more units comfortably parked far from the minimum cost frontier.
2) While the average resource use of non-minimizers is interesting to planners who need to know what the wasteful spenders will spend next year, the estimate of average resource use is unstable.

Several non-statistical costing studies of immunization confirm that service volume; number of immunization sessions; type of strategy; and prices affect total vaccination program cost (Phonboon, et al 1989; Brenzel and Claquin; 1993; Kaddar et al 1999a; Kaddar et al 1999b; Levin et al 1999; Brenzel, 2006; Walker et al, 2004).

There have been very few statistical analyses of immunization program cost functions. Brenzel (2005) evaluated the determinants of immunization costs using a Cobb-Douglas functional form for a sample of 120 primary health facilities in India. This study found that the number of doses administered by a facility was positively and significantly associated with facility cost. Population density and the number of fully immunized children per working hour were negatively and statistically associated with cost. Price variables were difficult to obtain, but a variable for price per litre of fuel was not found to be statistically significant in the cost function analysis. Other production related factors, such as type of vaccine strategy was found to be significantly and positively associated with cost. Other variables considered, such as a community-level variable on predominate caste, was insignificant.

Literature on the determinants of immunization outputs and coverage also provides some insights. Bishai et al (2002) found that maternal education and child age affect immunization coverage in Bangladesh, and that residence in the MCH-FP area reduced socio-economic differences in immunization coverage. Brenzel et al (2006) show that public resources allocated to health and the number of hours facility staff spent on immunization per month were

positively and statistically associated with the number of doses administered in facilities in Tajikistan. There were no significant associations between volume of doses and distance to a vaccination collection point, community income levels, or amount of GAVI ISS resources in the district. Loevinsohn et al (2006) found that female literacy rates, TV ownership, and provincial dummy variables explained 48% of the variation in immunization coverage at the district level in Pakistan. There was no relationship between coverage levels and vaccine supply factors, number of vaccinators/capita, training, frequency of supervision, availability of micro-plans, and turnover of managers. Finally, several studies highlight the role of maternal education, hospital births, and mother's knowledge on the use of immunization services (Cutts et al, 1989; Cutts et al, 1991; Maekawa et al, 2007; Odusanya et al, 2008; and Ibnouf et al, 2007).

8.2 Suggested Approach for the Cost Determinants Analysis

8.2.1 Data sources

Data on potential determinants of facility costs need to be incorporated into the facility questionnaire and/or secondary data collection instruments. DHS and MICS surveys can also be used to obtain variables at the district level.

8.2.2 Suggested independent variables for data collection

a. Incorporated into and/or calculated from the facility-level questionnaire
    i. Prices: price of a liter of fuel, distance (Km) to the vaccine collection point, local wages of health workers
    ii. Quantities: number of doses administered; number of measles doses delivered
    iii. Quality: number of FTEs providing immunization-related services; doses/FIC; vaccine wastage rate; number of supervision visits per month; number of outreach visits per month;
    iv. Z's and control variables: Size of the birth cohort, facility ownership, number of beds, type of terrain or environment of the facility
    v. Running cost per km of the facility
b. Collected from the district level (Z's)
    i. Population density
    ii. Other variables that could 'shift the technology' of producing services
c. Estimated from DHS or MICS
    i. Mother's education level (median)
    ii. District income level (median)
    iii. % of children delivered at home
    iv. Number of weeks with vaccine stock outs
    v. Other?

8.3. Determinants Analysis

Country teams are expected to conduct a high-quality statistical analysis of health facility costs. The analysis of the costs of routine immunization should be accomplished in STATA. The following are recommendations for the analysis:

8.3.1 Dependent variable

The dependent variable should primarily be total facility routine immunization cost. This variable is not likely to be normally distributed. This should be verified and required transformation done. Usually cost function analysis is based on natural log of total cost. Unit cost (such as the cost per dose or cost per infant) could be evaluated but tests for correlation with independent variables must be done.

8.3.2 Functional form for evaluating the cost function

The general principle is that the cost function should be a long-run cost function. Various functional forms for the cost function should be explored based on the literature and theory. The equation for estimation should be driven by economic theory and not by trial and error.

8.3.3 Regression diagnostics and estimation

Country teams should ensure that the conditions for OLS regression are satisfied prior to conduct of their regression analysis. Factors to consider would be normality of variables; co-linearity among variables; potential role of outliers; heteroskedasticity; specification issues; and independence. A useful guide for regression diagnostics is the following link: http://www.ats.ucla.edu/stat/stata/webbooks/reg/chapter2/statareg2.htm.

Various types of estimation can be explored, including random effects; OLS with robust standard errors. While dropping observation is discouraged, as this may lead to bias in the parameter estimates. Analysis of potential outliers should be rigorous.

8.4 Background on Productivity of Health Services

Productivity is thought of as the relationship between units of output per unit of input. A more productive facility would be operating closer to its production possibility frontier. In economics, productivity and efficiency are related concepts. This exercise provides a unique opportunity to be able to examine variation in total cost for the sample of facilities.

There is a wealth of productivity measurement in the health sector in high-income countries (Hollingsworth, 2003). Productivity measurement in ambulatory care settings has sought to control for facility-level factors, provider-specific factors, and factors that influence the type of visit (Fetter, et al, 2003). In some research, health facility outputs are quality-adjusted. A useful recent publication is by Wagstaff, et al (2010).

8.4.1. Possible Productivity Indicators for Routine Immunization:

The following productivity indicators can be explored and evaluated/summarized for each country study.

- Doses/FTE (where FTE = all time spent in the facility for immunization per week divided by the number of working hours per week)
- Doses/staff/day
- Doses/FIC (FIC measured as DTP3 covered children – or penta3 covered children)
- Doses wasted/FTE
- Km traveled/dose
- Wastage rates for different vaccines
- Drop-out rate (Penta1 to Penta3 or DTP1 to 3)
- Vaccine collection distance/frequency

8.4.2 Analysis of Productivity at the Facility Level:

a. Typology/Quadrant analysis of facilities: facilities are ranked according to median values of high/low cost and high/low productivity and a qualitative profile is developed for each typology. All EPIC studies should contain this type of analysis.

b. Statistical evaluation of determinants of productivity of facilities, which would control for type of immunization schedule; facility-level factors; and provider factors. Country teams are encouraged to explore productivity relationships.
    i. Facility level factors include: ownership of facility, number of beds, facility size, whether user charges are in effect
    ii. Provider factors may include gender and age, number of staff

c. Frontier analysis of health facilities: this is a more sophisticated type of analysis of productivity of health facilities which will be explored in EPIC2.

9. PRESENTATION AND REPORTING

The following is a suggested outline for the final report. This outline should be modified based on the nature of the findings in each country and the methods used. In addition, the flow of your storyline will be more important than just filling in each heading for a report. In addition, a separate file (C&F Sample Tables Revised 070713) contains a suggested set of tables that could be prepared for the report.

Costing and Financing Analyses of Routine Immunization in [COUNTRY]

Executive Summary: 10-12 pages summarizing the purpose, main methods, results and recommendations.

1. **Purpose and Scope of the Study**
2. **Background**
    a. Routine immunization in [Country]
    b. Introduction of new vaccines in [Country]
    c. Current knowledge on costs and financing of immunization in [Country] and globally
3. **Cost Analysis of Routine Immunization**
    a. Methods
        i. Perspective and key assumptions
        ii. Sampling
            1. Sampling strategy
            2. Sample size and power estimations
            3. Representativeness of the sample
        iii. Data collection (instruments and process)
        iv. Data quality and verification process
        v. Data entry and analysis (including tracing factors)
        vi. Aggregation of costs
        vii. Limitations of the approach
        viii. Ethical issues
    b. Results (borh total and unit costs)
        i. Facility level
            1. Total costs (economic and financial)
            2. Cost profile (line items and activities)
            3. Outputs by facility (doses, FIC, others)
            4. Unit costs, including line item benchmarks (e.g., cost per dose for cold chain maintenance, etc)
            5. Variation in total and unit costs
        ii. District and province level administrative costs
        iii. National level administrative costs
        iv. Aggregated total national routine immunization costs and unit costs
    c. Discussion
        i. Comparison with updated cMYP
        ii. Comparison with national budget for EPI
    d. Conclusions

4. **Cost Analysis of New Vaccine Introduction**
    a. Methods
        i. Perspective and key assumptions
        ii. Data collection (instruments and process)
        iii. Data quality and verification process
        iv. Data entry and analysis
            1. Use of the Database tool or other tool/spreadsheet
        v. Limitations of the approach
    b. Results (economic and financial)
        i. Total incremental NUVI costs (economic, financial, fiscal)
        ii. Total incremental outputs
        iii. NUVI unit costs (per dose, per child)
        iv. NUVI costs by line item and activity
        v. Costs at various levels of the health system
    c. Discussion of Results
        i. Comparison with NUVI introduction grant
        ii. Utilization of NUVI introduction grant and other sources of financing
    d. Conclusions

5. **Productivity Analysis**
    a. Background on measurement of productivity for immunization and health care services
    b. Methods
        i. Measurement of productivity
        ii. Approaches undertaken
    c. Results
        i. Quadrant analysis
        ii. Statistical anslysis
    d. Discussion
    e. Conclusions

6. **Analysis of the Determinants of Routine Immunization Costs**
    a. Background on cost function analysis for immunization and primary health care
    b. Methods
        i. Independent and dependent variables: selection and measurement
        ii. Functional form of the cost function
        iii. Estimation techniques
    c. Results
        i. Descriptive statistics and diagnostics
        ii. Regression results
    d. Discussion (in comparison to literature)
    e. Conclusions

7. **Analysis of Financial and Commodity Flows for Routine Immunization and New Vaccines**
    a. Methods for the quantitative analysis of financial and commodity flows

i. Data collection (including from donor organizations)
ii. Coding and analysis
iii. Key assumptions
iv. Limitations of the approach

b. Results of the quantitative analysis
   i. FS to FA
   ii. FA to HP
   iii. FS to HC (optional)
   iv. FS to FP (optional)
c. Mapping of financial flows for [Country]
d. Background on health care financing and immunization program planning and budgeting in [Country]
e. Results of the qualitative assessment
   i. Quality and rigor of the planning and budget process for the EPI
   ii. Comparison with cMYP estimates of financing
   iii. Other observations
f. Discussion
   i. Implications for financial sustainability
   ii. Implications for country ownership of the program
g. Conclusions

8. Discussion and Highlights of Main Findings

- This section could include any of the qualitative findings from the studies
- Discuss quality of data, record-keeping found in facilities
- Discuss policy and program implications of the findings
- Other issues

9. Conclusions and Recommendations

10. References

11. Annexes:

A1 – Sampling frame
A2 – Final questionnaires
A3 – Codes for evaluating financial flows
A4 – Detailed results tables
A5 – List of variables used in the statistical analysis (summary statistics, etc)
A6 – etc.

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Annex 1: Sample Size Estimation

The countries included in this exercise have a wide range of facility types and numbers of facilities from which to draw a sample. For this exercise, it is recommended to undertake a stratified, random sampling approach, with over-sampling of rural facilities (Measure Evaluation, 2001).

1. Stage One

$$n_0 = \frac{Z^2 \, p \, q}{e^2}$$

Where a normal distribution is assumed [1], and:
n_0 = sample size
Z^2 = area under the normal curve (1.96 for 95% CI)
p = estimated proportion of an attribute that is present in the population (assume 0.5)
q = 1-p (0.5)
e^2 = desired level of precision (assume 10%)

Resulting sample size is $(1.96)^2 \, (0.5)(0.5)/(0.1)^2 = 96$

2. Stage Two (Finite correction for proportions)

Assume that the population of facilities is small. Then the sample size can be adjusted, because a given sample size provides proportionately more information for a small population than for a large population.

$$n = \frac{n_0}{1 + \frac{(n_0 - 1)}{N}}$$

Where:
n_0 = initial sample size and N = population size

If we assume approximately 100 primary care facilities in the geographical areas that have been sampled, the resulting sample size will be 96/(1+(96-1)/100) = 51 PHCs to be sampled in total.

[1] Normal distribution is assumed for sample size determination. However, it is likely that the distribution of costs will be skewed with some facilities having very low costs. To compensate for this, we recommend that the country teams over-sample in rural areas.

Annex 2: Final Matrix for Estimating Economic and Financial Costs of Routine Immunization

Line Item	Routine Facility-based Service Delivery	Record-Keeping & HMIS	Super-vision	Outreach Service Delivery	Train-ing	Social Mobiliz-ation & Advocacy	Surveill-ance	Cold Chain Mainten-ance	Vaccine Collection, Distribu-tion Storage	Program Manage-ment	Other
Salaried Labor	X	X	X	X	X	X	X	X	X	X	X
Volunteer Labor	X			X		X	X				?
Per Diem & Travel Allowances			X	X	X	X	X	?	X		
Vaccines	X			X							
Vaccine Injection & Safety Supplies	X			X							
Other Supplies	X	X		X	X	?	X			X	
Transport/ Fuel			X	X	?	X	X		X	X	
Vehicle Maintenance	X		X	X			X		X		
Cold Chain Energy Costs	X			X			X		X		
Printing	X	X			X	X					
Building overhead, Utilities, Communi-cation	X						X				
Other Recurrent											

Activity	Routine Facility-based Service Delivery	Record-Keeping & HMIS	Super-vision	Out-reach Service Delivery	Train-ing	Social Mobilization & Advocacy	Surveill-ance	Cold Chain Mainten-ance	Vaccine Collection, Distribution	Program Management	Other
Cold Chain Equipment	X			X			X		X		
Vehicles	X		X	X			X		X		
Lab Equipment							X				
Other Equipment	X	X								X	
Other Capital											
Buildings											
TOTAL											

Note: The "Xs" are areas where there may be overlap between activities and line items, though this may not be the case in every country situation, and are illustrative.

Annex 3: Present Value of Annuity Factors: $1/(1+i)^t$

t\i	1%	2%	3%	4%	5%	6%	7%	8%	9%	10%
1	0.9901	0.9804	0.9709	0.9615	0.9524	0.9434	0.9346	0.9259	0.9174	0.9091
2	0.9803	0.9612	0.9426	0.9246	0.907	0.89	0.8734	0.8573	0.8417	0.8264
3	0.9706	0.9423	0.9151	0.889	0.8638	0.8396	0.8163	0.7938	0.7722	0.7513
4	0.961	0.9238	0.8885	0.8548	0.8227	0.7921	0.7629	0.735	0.7084	0.683
5	0.9515	0.9057	0.8626	0.8219	0.7835	0.7473	0.713	0.6806	0.6499	0.6209
6	0.942	0.888	0.8375	0.7903	0.7462	0.705	0.6663	0.6302	0.5963	0.5645
7	0.9327	0.8706	0.8131	0.7599	0.7107	0.6651	0.6227	0.5835	0.547	0.5132
8	0.9235	0.8535	0.7894	0.7307	0.6768	0.6274	0.582	0.5403	0.5019	0.4665
9	0.9143	0.8368	0.7664	0.7026	0.6446	0.5919	0.5439	0.5002	0.4604	0.4241
10	0.9053	0.8203	0.7441	0.6756	0.6139	0.5584	0.5083	0.4632	0.4224	0.3855
11	0.8963	0.8043	0.7224	0.6496	0.5847	0.5268	0.4751	0.4289	0.3875	0.3505
12	0.8874	0.7885	0.7014	0.6246	0.5568	0.497	0.444	0.3971	0.3555	0.3186
13	0.8787	0.773	0.681	0.6006	0.5303	0.4688	0.415	0.3677	0.3262	0.2897
14	0.87	0.7579	0.6611	0.5775	0.5051	0.4423	0.3878	0.3405	0.2992	0.2633
15	0.8613	0.743	0.6419	0.5553	0.481	0.4173	0.3624	0.3152	0.2745	0.2394
16	0.8528	0.7284	0.6232	0.5339	0.4581	0.3936	0.3387	0.2919	0.2519	0.2176
17	0.8444	0.7142	0.605	0.5134	0.4363	0.3714	0.3166	0.2703	0.2311	0.1978
18	0.836	0.7002	0.5874	0.4936	0.4155	0.3503	0.2959	0.2502	0.212	0.1799
19	0.8277	0.6864	0.5703	0.4746	0.3957	0.3305	0.2765	0.2317	0.1945	0.1635
20	0.8195	0.673	0.5537	0.4564	0.3769	0.3118	0.2584	0.2145	0.1784	0.1486
21	0.8114	0.6598	0.5375	0.4388	0.3589	0.2942	0.2415	0.1987	0.1637	0.1351
22	0.8034	0.6468	0.5219	0.422	0.3418	0.2775	0.2257	0.1839	0.1502	0.1228
23	0.7954	0.6342	0.5067	0.4057	0.3256	0.2618	0.2109	0.1703	0.1378	0.1117
24	0.7876	0.6217	0.4919	0.3901	0.3101	0.247	0.1971	0.1577	0.1264	0.1015
25	0.7798	0.6095	0.4776	0.3751	0.2953	0.233	0.1842	0.146	0.116	0.0923
30	0.7419	0.5521	0.412	0.3083	0.2314	0.1741	0.1314	0.0994	0.0754	0.0573
40	0.6717	0.4529	0.3066	0.2083	0.142	0.0972	0.0668	0.046	0.0318	0.0221
50	0.608	0.3715	0.2281	0.1407	0.0872	0.0543	0.0339	0.0213	0.0134	0.0085

Annex 4: Tracing Factors for the EPIC Study Cost Analysis

The purpose of this table is to outline preferred approaches for allocating shared costs to routine immunization in the first instance, and then allocating routine immunization cost to relevant functions/activities as outlined in the matrix for the Common Approach. This is to ensure that country teams are collecting all relevant information that could be used to generate the appropriate ratios as needed. These tracing factors have been reviewed by a sub-group of the country teams.

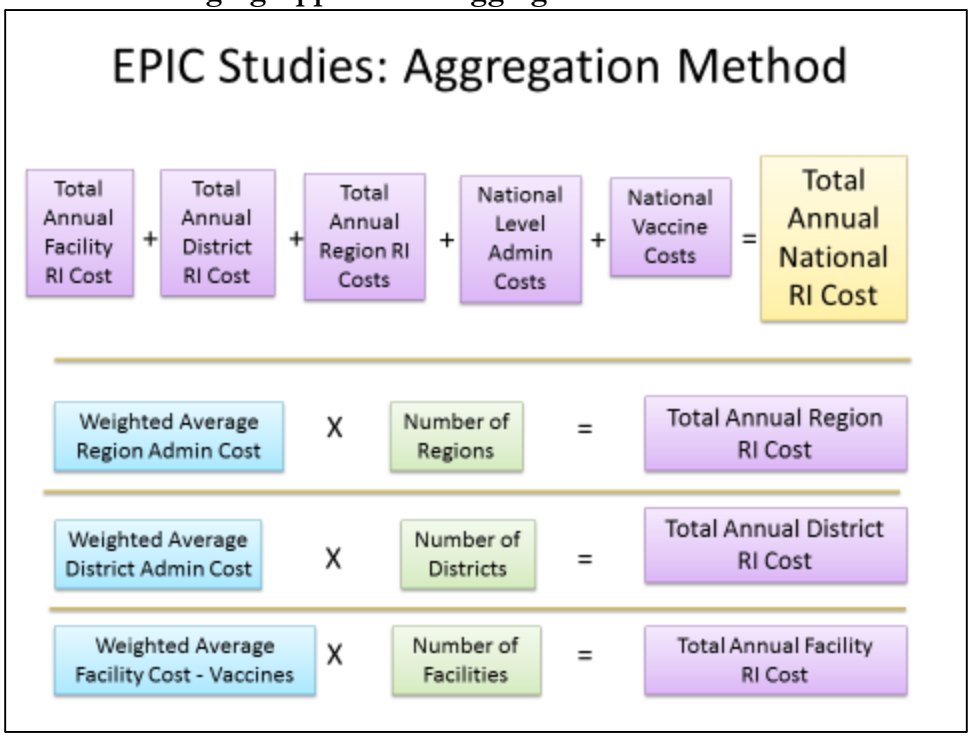
Line Item	Expenditure item	Type of shared costs	Tracing factors: Total to immunization portion	Tracing factor: Immunization portion to activities
Staff time	Salaries of health and other staff	Allocation to routine immunization and then activities	% of time	% of time
Other staff	Cost of CHW and volunteers	Allocation to routine immunization and then to activities.	% of time spent on immunization services as recorded during data collection	Allocate to the activities most relevant such as outreach or social mobilization or facility-based delivery based on interview results (% of time) supplemented with probing questions
Vaccines	Cost of vaccines	Allocation between routine, facility-based vaccines and those given during outreach sessions	100% to routine immunization (make sure that doses given during campaigns or SIAs are not included)	Facility statistics should help to allocate between doses given in the facility and during outreach sessions. If these are unavailable, then ask probing questions about approximately how many doses are given per outreach session to try to estimate the ratio.
Equipment	Annualized capital cost of equipment	Cold chain equipment: - Fridges could be allocated between routine and outreach - Small cold boxes / carriers to outreach - Incinerator - Office equipment to wide range of possible activities	% used for routine immunization (proportion of space use for routine) - In large facilities, vaccines may take up only a small proportion of total waste. - Focus on that equipment that is used for routine immunization, such as a computer used by the EPI manager	- % of doses for outreach/facility-based - allocation of small cold boxes/carriers to outreach based on the % of time in the week spent on outreach - Allocate between routine/outreach on the basis of the ratio of doses or similar ratio - Allocate office equipment/furniture to program management activity.

Line Item	Expenditure item	Type of shared costs	Tracing factors: Total to immunization portion	Tracing factor: Immunization portion to activities
Vehicles	Annualized capital cost of vehicles	• Vehicles at facility to mainly outreach and vaccine collection. • At higher levels to management / surveillance	% used for routine immunization based on vehicle log book data= share of kms travelled for routine immunization compared to other health activities. In the absence of this information, then use the ratio of routine doses/(total OP visits and Inpatient admissions) using the factors estimated in the attached Excel file.	If the vehicle logbook contains details on the purpose of the trip, then use these details to allocate. Otherwise, estimate ratios from the number of trips and kms per trips over total kms traveled for activities related to supervision, management, vaccine collection
Building	Building or rental value	Health facility Health Posts / other fixed sites	Number of square meters for the area relevant for routine immunization (where vaccines are administered, stored), or % of facility footprint allocated to immunization	Allocate to facility-based service delivery at the facility level; but at the management level, allocate to program management. Allocate 100% of health posts to outreach (Zambia case)
Transport	Specific questions for transport for; • Outreach • Vaccine collection • Supervision • Meetings (soc mob) • Other	All allocated directly to correct activity. If something crops up under Other we will have to choose the most likely fit, e.g. surveillance.	100% to routine immunization, unless trips are multi-purpose. Ask about share for routine. If unable to allocate directly, use the same ratios as generated for vehicles	100% to best fit activity. Problems may arise where one trip is used to do a number of activities e.g. outreach and supervision. For a trip that involved more than one purpose, allocate evenly across purposes.
Training	All training related costs including per diems, printing and travel allowances		100% to routine immunization	100% to training

Line Item	Expenditure item	Type of shared costs	Tracing factors: Total to immunization portion	Tracing factor: Immunization portion to activities
Social mobilization		Mainly per diems. Any transport costs to be recorded under transport tab.	100% to routine immunization. If the activity covers a number of different health topics (i.e. including non-immunization health topics), allocate evenly across the various topics and absorb only the immunization portion.	100% to social mobilization
Cold chain operating and maintenance	Various fuels and maintenance	Energy consumption for the facility needs to be allocated to routine immunization	Maintenance share for routine immunization ask directly in the q'naire Cold chain energy costs best based on kw/hour and the unit cost/kw hour	- 100% to cold chain maintenance - Estimated cold chain energy cost should not be double-counted in Overhead cost below
Overhead costs	Expenditures for heating, phone, internet, electricity, and stationery	Need to allocated first to routine immuniaation and then to activities	Total routine doses/Number of OP visits	Allocate all to program management (costs should be net of cold chain energy)
Waste disposal	Running costs of incinerator	Important to estimate additional cost for new vaccines; however, might be challenging to get at all of these inputs	Apportion to the routine immunization program based on a share of the vaccine load to total load in the incinerator. Energy costs also must be taken into account.	Allocate to facility-based and outreach based on share of doses. (This assumes that waste from outreach is returned for incineration. If not then allocate 100% to facility-based immunization.)
Health committee meetings and stakeholder groups	Mainly qualitative questions.	The value of community participant time should be costed.	Number of routine doses/total outpatient visits	100% to social mobilization

Line Item	Expenditure item	Type of shared costs	Tracing factors: Total to immunization portion	Tracing factor: Immunization portion to activities
NUVI	All cost items	Arguably these costs should be allocated on the same basis as historical costs where some form of allocation is required. For prospective costing one might make the assumption that total patient levels will remain the same.	All NUVI costs for consideration in this study would be included under routine.	NUVI costs could be allocated across activities in a similar manner as for routine immunization.

Annex 5: Averaging Approach to Aggregation



Annex 6: New Vaccine Introduction Cost Items

Line Item	National	Province	District	Facility	Comments
Additional staff time	X	X	X	X	Time spent on activities in the planning phase for new vaccine introduction; additional time at facility level to administer a new vaccine; additional time of cold chain technicians and drivers
New Vaccines	X		X	X	Cost of new vaccines introduced during the period of interest; or expected cost of new vaccines associated with anticipated coverage levels during the period of new vaccine introduction.
Vaccination Supplies	X		X	X	Additional cost of syringes, diluent, safety boxes and other relevant supplies associated with the numbers of new vaccines administered/expected to be administered within the NUVI period
Additional Transport Requirements					Additional number of vehicles and vehicle use required to transport amount of new vaccine volume, as well as additional number of trips for distributing new vaccines. Additional running costs of vehicles.
- Additional running costs	X	X	X	X	
- Additional vehicle capital costs	X	X	X	X	
Additional Cold Chain Requirements					Additional cold chain at all levels to accommodate the additional bulk of the new vaccine and temperature requirements
- Additional equipment and storage facilities	X	X	X	X	
- Additional running costs	X	X	X	X	Additional energy costs associated with any new cold chain equipment or storage facilities
Initial training	X	X	X		Costs associated with any initial training of staff on the features and requirements of the new vaccine (administration, cold storage, surveillance, use of new cards, record-keeping).
Social mobilization activities	X		X	X	Costs associated with media messages, advocacy, and other types of social mobilization in preparation and during NUVI
Additional travel costs	X		X		Costs associated with the need to oversee and supervise new vaccine introduction within the country (includes plane, bus, vehicle travel). Could also include international travel if relevant.
Surveys, special studies, and applications	X				Costs associated with any type of surveys or special studies undertaken in preparation of NUVI, as well as costs associated with the application process for the new vaccine.
Additional waste disposal requirements		X	X	X	Costs associated with additional equipment and operating costs for waste disposal.
Printing of revised vaccination cards	X				Costs of printing new cards
Additional other operating costs	X		X		Additional operating costs resulting from NUVI; Costs of additional meetings, etc associated with new vaccine introduction.

Note: The 'Xs' provide the levels for which costs are expected, but each country's situation will vary and need to customize this to each country context.

Annex 7: Coding for Financing Flow Analysis

Possible Coding for Common Scenarios for Tracking Immunization Financing

Scenario	Source of Source	Financing Source	Loans	Financing Agent	Health Financing	Health Providers	Health Care Functions	Health Care Provision	Global Burden of Disease
	FS.RI.	FS	FSR	FA	HF	HP	HC	FP	GBD
- Category		GAVI Alliance		Central Medical Stores	Central Govt	Hospitals, ambulatory, preventive, and administration	Preventive care and prevention and public health services	Pharmaceuticals	Infectious diseases
- Codes		FS.2.2.3		FA.1.1.1.3	HF.1.1.1	HP.1.1.1/HP.1.1.3; HP3.4.9.1/HP3.4.9.2	HC.6	FP.3.2.1.1	GBD.1.1
- Category		GAVI Alliance		EPI	Central Govt	Hospitals, ambulatory, preventive, and administration	Preventive care and prevention and public health services	All relevant line items	Infectious diseases
- Codes		FS.2.1.3		FA.1.1.1.1	HF.1.1.1	HP.1.1.1/HP.1.1.3; HP3.4.9.1/HP3.4.9.2; HP6; HP7	HC.6; HP.RI.3	FP.1 to FP.5	GBD.1.1
- Category	Government	Central Govt		Ministry of Health	Central Govt	Hospitals, ambulatory, preventive, and administration	Preventive care and prevention and public health services	Pharmaceuticals	Infectious diseases
- Codes	FS.RI.1.1	FS.1.1.1		FA.1.1.1	HF.1.1.1	HP.1.1.1/HP.1.1.3; HP3.4.9.1/HP3.4.9.2	HC.6	FP.3.2.1.1	GBD.1.1
- Category	WHO or UNICEF at country level	Central Govt		Rest of the World	Rest of the World	Hospitals, ambulatory, preventive, and administration	Preventive care and prevention and public health services	Health care services	Infectious diseases
- Codes	FS.RI.1.5	FS.7.2.2.2		FA.6.1.1 or FA.6.1.2	HF.4	HP6; HP7; HP.8.9?	HC.6; HP.RI.3	FP.3.1?	GBD.1.1
- Category	Central Government	Central Govt	World Bank HIPC Loan	Central Government (Treasury)	Central Govt	Hospitals, ambulatory, preventive, and administration	Preventive care and prevention and public health services	All relevant line items	Infectious diseases

- Codes	FS.RI.1.1	FS.2.1.2	FSR.1.1.1.3	FA.1.1.1	HF.1.1.1	HP.1.1.1/HP.1.1.3; HP3.4.9.1/HP3.4.9.2	HC.6; HP.RI.3	FP.1 to FP.5	GBD.1.1
- Category	MSF	MSF in country		MSF	MSF in country	Hospitals, ambulatory, preventive, and administration	Preventive care and prevention and public health services	All relevant line items	Infectious diseases
- Codes	FS.RI.1.4	FS.7.2.1.3 and F.7.2.2.3		FA.6.3	HF.4	HP.1.1.3/ HP3.4.9.2	HC.6	FP.1 to FP.5	GBD.1.1
- Category		Other revenues from households n.e.c		Households	Households	Hospitals, ambulatory, preventive, and administration	Preventive care and prevention and public health services	All relevant line items	Infectious diseases
- Codes		FS.6.1		FA.5	HF.3	HP.1.1.3/ HP3.4.9.2	HC.6	FP.1 to FP.5	GBD.1.1
- Category		Other revenues from community n.e.c		Community organiza-tions/ groups	Community-level financing	Hospitals, ambulatory, preventive, and administration	Preventive care and prevention and public health services	All relevant line items	Infectious diseases
- Codes		FS.6.2		FA.5.1	HF.3.1	HP.1.1.3/ HP3.4.9.2	HC.6	FP.1 to FP.5	GBD.1.1
- Category			Conces-sional loans taken by the government	Central Ministry of Health	Central government schemes	Hospitals, ambulatory, preventive, and administration	Preventive care and prevention and public health services	All relevant line items	Infectious diseases
- Codes			FSR.1.1.1.1	FA.1.1.1	HF.1.1.1	HP.1.1.3/ HP3.4.9.2	HC.6	FP.1 to FP.5	GBD.1.1

Classification of revenues of health care financing schemes (FS)

[NOTE: Shaded areas represent further disaggregation to the SHA 2011 codes for the EPIC studies.]

Code	Sub-code	Description	Notes: see tables 8.1 and 8.5 SHA 2011
FS.1		**Transfers from government domestic revenue**	
	FS.1.1	Internal transfers and grants	
	FS.1.1.1	*- Internal transfers within central government*	These categories can be repeated in FS.1.2 etc. Co-financing for GAVI new vaccines would be captured here. CCT payments by governments would be included here.
	FS.1.1.2	*- Internal transfers within region/local government*	
	FS.1.1.3	*- Grants from central government*	Such as block grants to regions and sub-national units
	FS.1.1.4	*- Grants from regional/local government*	
	FS.1.2	Transfers by government on behalf of specific groups	Gov't payment for poor, mothers, children etc.
	FS.1.3	Subsidies	Gov't subsidies to NGOs, for example.
	FS.1.4	Other transfers	
FS.2		**Transfers distributed by government from foreign origin**	All of GAVI support through UNICEF would fall under FS.2 as it is channeled eventually through the government to distribute
	FS.2.1	*Monetary transfers*	
	FS.2.1.1	*- from bilateral organizations*	
	FS.2.1.1.1	*- USG bilateral financial transfer*	
	FS.2.1.1.2	*- DfiD bilateral financial transfer*	
	FS.2.1.1.3	*- JICA bilateral financial transfer*	
	FS.2.1.1.4	*- NORAD bilateral financial transfer*	
	FS.2.1.1.5	*- Other agency bilateral financial transfer (Specify)*	Specify and add in more codes as necessary
	FS.2.1.2	*- from multilateral organizations*	
	FS.2.1.2.1	*- from UNICEF direct financial transfer*	
	FS.2.1.2.2	*- from WHO direct financial transfer*	
	FS.2.1.2.3	*- from PAHO direct financial transfer*	
	FS.2.1.2.4	*- from Other multilateral financial transfer (Specify)*	Specify and add in other codes as relevant
	FS.2.1.3	*- from GAVI Alliance*	
	FS.2.1.4	*- from other sources*	
	FS.2.1.4.1	*- from BMGF financial transfers*	
	FS.2.1.4.2	*- from CHAI financial transfers*	
	FS.2.1.4.3	*- from other external/NGO source financial transfers (Specify)*	Specify and add in other codes as relevant
	FS.2.2	*Commodity transfers*	
	FS.2.2.1	*- from bilateral organizations*	
	FS2.2.1.1	*- USG bilateral commodity transfer*	
	FS.2.2.1.2	*- DfiD bilateral commodity transfer*	
	FS.2.2.1.3	*- JICA bilateral commodity transfer*	

	FS.2.2.1.4	*- NORAD bilateral commodity transfer*	
	FS.2.2.1.5	*- Other agency bilateral commodity transfer (Specify)*	Specify and add in more codes as necessary
	FS.2.2.2	*- from multilateral organizations*	
	FS.2.2.2.1	*- from UNICEF commodity transfers*	
	FS.2.2.2.2	*- from WHO commodity transfers*	
	FS.2.2.2.3	*- from PAHO commodity transfers*	
	FS.2.2.2.4	*- from other external/NGO source commodity transfers (Specify)*	Specify and add in other codes as relevant
	FS.2.2.3	*- from GAVI Alliance*	
	FS.2.2.4	*- from other sources*	
	FS.2.2.4.1	*- from BMGF commodity transfers*	
	FS.2.2.4.2	*- from CHAI commodity transfers*	
	FS.2.2.4.3	*- from other external/NGO source commodity transfers (Specify)*	Specify and add in other codes as relevant
FS.3		**Social insurance contributions**	
	FS.3.1	Social insurance contributions from employers	
	FS.3.2	Social insurance contributions from employees	Household co-payment
	FS.3.3	Social insurance contributions from self-employed	
	FS.3.4	Other social insurance contributions	
FS.4		**Compulsory prepayment**	
	FS.4.1	Compulsory prepayment from households/individuals	
	FS.4.2	Compulsory prepayment from employers	
	FS.4.3	Other	
FS.5		**Voluntary prepayment**	
	FS.5.1	Voluntary prepayment from households/individuals	
	FS.5.2	Voluntary prepayment from employers	
	FS.5.3	Other	
FS.6		**Other domestic revenues not elsewhere classified (n.e.c)**	
	FS.6.1	Other revenues from households n.e.c	
	FS.6.2	*Other revenues from communities n.e.c*	
FS.7		**Direct foreign transfers**	
FS.7.1		**Direct foreign financial transfers**	Cash that does not go thru gov't but directly to beneficiaries
	FS.7.1.1	Direct bilateral transfers	
	FS.7.1.2	Direct multilateral transfers	
	FS.7.1.3	Other direct foreign transfers	This would include direct assistance from BMGF, CHAI, etc

FS.7.2		**Direct foreign aid in kind**	
	FS.7.2.1	Direct foreign aid in goods	Commodities that do not pass thru gov't but directly to beneficiaries
	FS.7.2.1.1	Direct bilateral aid in goods	
	FS.7.2.1.2	Direct multilateral aid in goods	
	FS.7.2.1.3	Other direct foreign aid in goods	This would include direct assistance from BMGF, CHAI, etc
	FS.7.2.2	Direct foreign aid in kind: services (including TA)	TA provided in-country can be captured under 7.2.2
	FS.7.2.2.1	*Direct bilateral foreign aid in kind*	
	FS.7.2.2.1.1	*- from USG bilateral aid in kind*	
	FS.7.2.2.1.2	*- from DfID bilateral aid in kind*	
	FS.7.2.2.1.3	*- from JICA bilaeral aid in kind*	
	FS.7.2.2.1.4	*- from NORAD bilateral aid in kind*	
	FS.7.2.2.1.5	*- from other bilateral aid in kind (Specify)*	Specify and add additional coding as relevant
	FS.7.2.2.2	*Direct multilateral foreign aid in kind*	
	FS.7.2.2.2.1	*- from UNICEF aid in kind*	
	FS.7.2.2.2.2	*- from WHO aid in kind*	
	FS.7.2.2.2.3	*- from PAHO aid in kind*	
	FS.7.2.2.2.4	*- from other multilateral aid in kind (Specify)*	Specify and add additional coding as relevant
	FS.7.2.2.3	*Other direct foreign aid in kind*	
	FS.7.2.2.3.1	*- from BMGF aid in kind*	
	FS.7.2.2.3.2	*- from CHAI aid in kind*	
	FS.7.2.2.3.3	*- from other direct foreign aid in kind*	Specify and add additional coding as relevant
	FS.7.3	Other direct foreign transfers n.e.c	
FS.7.9		***Any other source not elsewhere classified (n.e.c)***	
FSR.1		**Loans**	
	FSR.1.1	Loans taken by government	
	FSR.1.1.1	Loans from international organizations	World Bank and regional development bank loans for immunization
	FSR.1.1.1.1	Concessional loans	IDA loans and buy-downs
	FSR.1.1.1.2	Non-concessional loans	IBRD loans or mixed
	FSR.1.1.1.3	HIPC/Debt relief	HIPC/Debt relief for immunization captured here
	FSR.1.1.2	Other loans taken by government	
FS.RI.1		**Institutional units providing revenues to financing schemes**	These refer to the source of the source
	FS.RI.1.1	Government	
	FS.RI.1.2	Corporations	
	FS.RI.1.3	Households	
	FS.RI.1.4	Non-profit institutions	
	FS.RI.1.5	Rest of the world	

FS.RI.2 **Total foreign revenues (FS.2 + FS.7)**

Classification of health financing agents (FA)

Code	Sub-code	Description	Notes: see NHA
FA.1		General Government	
	FA.1.1	*Central Government Agencies*	
	FA.1.1.1	Central Ministry of Health:	
	FA.1.1.1.1	Central Ministry of Health (EPI programme)	
	FA.1.1.1.2	Central Ministry of Health (other programmes)	
	FA.1.1.1.3	National Medical Stores / Central Cold Stores	
	FA.1.1.1.4	National Laboratories	
	FA.1.1.1.5	National Surveillance Agency	
	FA.1.1.2	Other Central Ministries and Units	
	FA.1.1.3	National Health Service Agency	
	FA.1.1.4	National Health Insurance Agency	
	FA.1.2	*State/Regional/Local Gov't Agents*	
	FA.1.2.1	Provincial Level Ministry of Health	
	FA.1.2.2	Other Provincial Level Ministries/Departments	
	FA.1.2.3	District Level Ministry of Health	
	FA.1.2.4	Other District Level Ministries/Departments	
	FA.1.3	Social Security Agency	
	FA.1.3.1	Social Health Insurance Agency	
	FA.1.3.2	Other social security agency	
	FA.1.9	All other general government unit	
FA.2		Insurance Corporations	
FA.3		Other Corporations /Business (other than insurance)	
FA.4		Non-Profit Institutions Serving Households	NGOs such as Save the Children, MSF, etc.
FA.5		Households	
	FA.5.1	*Community organizations/groups*	
FA.6		Rest of the World	
	FA.6.1	*International Organizations (Multilaterals)*	
	FA.6.1.1	UNICEF	
	FA.6.1.2	WHO	
	FA.6.1.3	PAHO	
	FA.6.1.4	Other multilateral agent 1	
	FA.6.1.5	Other multilateral agent 2	
	FA.6.1.6	Other multilateral agent 3	
FA.6.2		*Foreign Govts (Bilateral Agents)*	
	FA.6.2.1	Govt of USA: PEPFAR, CDC, USAID etc	
	FA.6.2.2	Govt of United Kingdom:	

	FA.6.2.3	Govt of Japan (JICA):
	FA.6.2.4	Govt of Norway (NORAD):
	FA.6.2.5	Other bilateral agency 1
	FA.6.2.6	Other bilateral agency 2
	FA.6.2.7	Other bilateral agency 3
FA.6.3		*Other Foreign Entities*
	FA.6.3.1	BMGF
	FA.6.3.2	CHAI
	FA.6.3.3	Other International Foundation 1
	FA.6.3.4	Other International Foundation 2
	FA.6.3.5	Other International Foundation 3
FA.9		Any other agents not else where classified

Classification of Health Care Financing Schemes HF

Code	Sub-code	Description	Notes: see table 7.4
HF.1		**Government schemes and compulsory contributory health care financing schemes**	
	HF.1.1	Government schemes	
	HF.1.1.1	Central government schemes	Could be disaggregated into MOH, other ministries, central medical stores, national labs, national surveillance
	HF.1.1.2	State/regional/local government schemes	Could be disaggregated into provincial, district levels
	HF.1.2	Compulsory contributory health insurance schemes	Compulsory=social health insurance
	HF.1.2.1	Social health insurance	
	HF.1.3	Compulsory medical savings accounts	
HF.2		**Voluntary health care payment schemes (other than OOP)**	
	HF.2.1	Voluntary health insurance schemes	Voluntary = optional for citizens
	HF.2.2	Non-profit institutions financing schemes (NPISH)	
HF.3		**Household out-of-pocket payment**	User fees for immunization would be captured here
	HF.3.1	*Community level financing*	
HF.4		**Rest of the world**	Cost be disaggregated further by individual organization
HF.99		**Not disaggregated**	

Classification of Health Care Providers

Code	Sub-code	Description	Notes: see table 6.2
HP.1		**Hospitals**	
	HP.1.1	General hospitals	
	HP.1.1.1	General hospitals - public	
	HP.1.1.1.1	*National general hospitals*	
	HP.1.1.1.2	*Provincial or regional general hospitals*	
	HP.1.1.1.3	*District hospitals*	
	HP.1.1.2	General hospitals - social security	
	HP.1.1.3	General hospitals - NGO/private non-profit	NGO hospital financing of immunization here
HP.3		**Providers of ambulatory health care**	
	HP.3.1	Medical practices	
	HP.3.4	Ambulatory health care centers	
	HP.3.4.9	All other ambulatory centers	Vaccination services in PHCs would be classified here
	HP3.4.9.1	*Government facilities*	
	HP.3.4.9.3.1	*PHC Type 1 (Specify)*	
	HP.3.4.9.3.2	*PHC Type 2 (Specify)*	
	HP.3.4.9.3.3	*PHC Type 3 (Specify)*	
	HP.3.4.9.3.4	*PHC Type 4 (Specify)*	
	HP.3.4.9.2	*Social security facilities*	Specify further if necessary
	HP.3.4.9.3	*NGO facilities*	Specify further if necessary
HP.4		**Providers of ancillary services**	
	HP.4.2	Medical and diagnostic laboratories	
HP.6		**Providers of preventive care**	Includes public health institutes, epi surveillance and disease control centers, research providers
	HP.6.1	*Country Specific Preventative providers*	
	HP.6.2	*Research Providers*	
	HP.6.2.1	*Public research institutions*	
	HP.6.2.2	*Para-statal (quasi-public) research institutions*	
	HP.6.2.3	*Private research institutions*	
HP.7		**Providers of health care system administration and financing**	
	HP.7.1	Government health administrative agencies	
	HP.7.1.1	*National MOH*	
	HP.7.1.2	*Provincial MOH*	
	HP.7.1.3	*District MOH*	
	HP.7.2	Social health insurance agencies	Includes administration of health insurance schemes

	HP.7.3	Private health insurance administrative agencies
	HP.7.9	Other administrative agencies
HP.8		**Rest of the economy**
	HP8.1	Households as providers of home health care
	HP.8.9	Other industries n.e.c
FP.9		**Rest of the world**
FP.99		**Not classified elsewhere**

Classification of Health Care Functions HC (functions)

Code	Sub-code	Description	Notes: see table 5.1
HC.1		**Curative care**	
…			
HC.6		**Preventive care**	
	HC.6.1	Information, education and counseling programs	
	HC.6.1.1	*Social mobilization, advocacy*	
	HC.6.2	Immunization programs	
	HC.6.2.1	*Facility-based routine immunization service delivery*	
	HC.6.2.2	*Outreach routine immunization service delivery*	
	HC.6.2.3	*Training*	
	HC.6.2.4	*Vaccine collection, storage and distribution*	
	HC.6.2.5	*Cold chain maintenance*	
	HC.6.2.6	*Supervision*	
	HC.6.2.6	*Program management*	
	HC.6.2.7	*Other routine immunization program activity*	
	HC.6.5	Surveillance	
	HC.6.5.1	*EPI Surveillance*	
	HC.6.5.2	*Record-keeping and HMIS*	
HC.7		*Governance and health system financing and administration*	*Note that this category does not apply as management would be included in 6.2; only for strategic vision of health systems*
HC.99		**Not disaggregated**	
HC.RI.3		**Prevention and public health services**	
	HC.RI.3.3	Prevention of communicable diseases	Anything else not previously captured, such as operations research?

Classification of Health Care Provision FP (line items)

Code	Sub-code	Description	Notes: see table 9.1
FP.1		**Compensation of employees**	
	FP.1.1	Wages and salaries	
	FP.1.3	All other costs relating to employees	
	FP.1.3.1	*Per diem*	
FP.2		**Self-employed professional remuneration**	
	FP.2.1	*Volunteer labor*	
FP.3		**Materials and services used**	
	FP.3.1	Health care services	
	FP.3.2	Health care goods	
	FP.3.2.1	Pharmaceuticals	
	FP.3.2.1.1	*Vaccines and other goods*	
	FP.3.2.2	Other health care goods	
	FP.3.2.2.1	*Injection supplies*	
	FP.3.2.2.2	*Other supplies*	
	FP.3.3	Non-health care services	
	FP.3.3.1	*Transport*	
	FP.3.3.2	*Maintenance*	
	FP.3.3.3	*Printing*	
	FP.3.4	Non-health care goods	
	FP.3.4.1	*Utilities and communications*	
	FP.3.4.2	*Other*	
FP.4		**Consumption of fixed capital**	
	FP.4.1	*Cold chain equipment*	
	FP.4.2	*Vehicles*	
	FP.4.3	*Other equipment*	
	FP.4.4	*Buildings*	
FP.5		**Other items of spending on inputs**	
	FP.5.1	Taxes and customs duties	
	FP.5.2	Other	
FP.99		*Not disaggregated/n.e.c*	