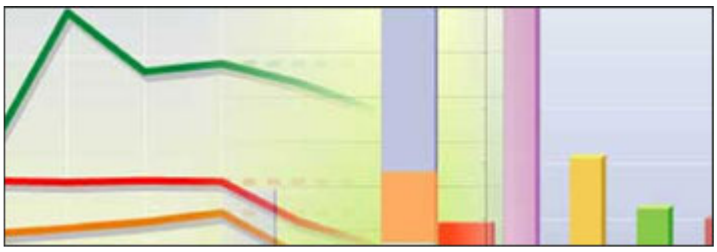

Final Reports of Technical Review Of Costing Tools

Commissioned by an Inter-agency Steering Committee and the Partnership for Maternal, Newborn and Child Health

This package contains the final reports of the independent technical "Review of Costing Tools Relevant to the Health MDGs" conducted by Bitran y Asociados and PATH.

September 2008

COSTING TOOLS REVIEW - PREFACE TO TECHNICAL REPORTS

SEPTEMBER 2008

During 2007/2008, several development partners commissioned an independent technical review of 13 costing tools that were designed to support costing and budgeting of health sector plans. A Steering Committee was formed to oversee the technical review.[1] The focus was on costing tools linked to the diseases or conditions addressed by the Millennium Development Goals, i.e., the health MDGs. The main aim of the review was to provide a description of the questions each tool can help countries answer as well as an assessment of technical validity and user-friendliness.

The Terms of Reference for this work were developed by the Partnership for Maternal, Newborn and Child Health (PMNCH), with input from the Steering Committee. PMNCH coordinated the review process. Proposals were sought from individuals and institutions with expertise in health economics, epidemiology/medicine, demography, as well as spread-sheet analytical skills. 16 proposals were received. After rigorous review, Bitran and Associates was selected by the Steering Committee to undertake the technical review of the 13 costing tools.

Knowledge of, and work experience with, the Marginal Budgeting for Bottleneck (MBB) Tool, one of the most complex tools to be reviewed, was considered to be an advantage of Bitran and Associates. However, the Steering Committee had some concern about potential conflict of interest linked to a (then) recent contract between Bitran and Associates and UNICEF/World Bank for a review of the MBB tool, translation of related materials, and support for implementation in one country, Honduras. The Steering Committee therefore decided to engage a second firm, PATH, to provide a "second opinion" of the analysis of the MBB tool. The report by PATH provides a complementary technical review of the MBB costing tool, using the same methodological approach.

The results of the review are presented in this document. It includes the two final versions of the technical review:

1. Bitran and Associates (dated 10 June 2008)
2. PATH (dated 22 April 2008)

Steering Committee members/tool developers had the opportunity to provide comments on several draft versions of the reports. Annex 6-9 in the report by Bitran and Associates lists all comments received and how they were addressed in each draft and final version.

It is important to note that these technical reviews are only relevant to the version examined.[2] The tools are evolving and harmonized as lessons are learned from their application by countries in health planning processes and as new science emerges. This ongoing work is facilitated by the inter-agency collaboration established through the platform provided by the Steering Committee.

[1] Members of the steering committee include NORAD, PMNCH, UNAIDS, UNDP, UNFPA, UNICEF, USAID through the Health Systems 20/20 and BASICS Projects, WHO and the World Bank.
[2] The Bitran and Associates report indicates which versions were reviewed.

WHO, UNICEF, the World Bank, and UNFPA, in collaboration with the Partnership for Maternal, Newborn and Child Health and the Norwegian Government

TECHNICAL REVIEW OF COSTING TOOLS FOR THE HEALTH MDGS

Final Report

Submitted by

Bitrán & Asociados

June 10, 2008

Executive Summary

In September 2002, 189 countries committed to eight Millennium Development Goals (MDGs) to be attained by 2015, including four health-related MDGs. An effective strategy for meeting the MDGs requires an assessment of which effective interventions are available and are appropriate to meet the target, taking also into account issues involving infrastructure, human resources, and financing. Costing tools can be a powerful tool for countries to use to estimate the costs of specific health actions. While all costing tools somehow address the issue of resource needs associated with specific actions, each tool has a different logic and approach.

To assist countries in the use of costing tools, several international development partners (including NORAD, UNFPA, UNICEF, UNAIDS, UNDP, WHO, World Bank, USAID through the Health Systems 20/20 and BASICS Projects) through the Partnership for Maternal, Newborn and Child Health (PMNCH) are conducting a review of 13 costing tools relevant to the health MDGs. The review is overseen by a Steering Committee of 13 members, including Tessa Tan-Torres (chair, WHO), Carlos Avila-Figueroa (UNAIDS), James J. Banda (WHO), Stan Bernstein (UNFPA), David Collins (Management Sciences for Health), Maha El Adawy (UNDP), Helga Fogstad (NORAD), Katherine Floyd (WHO), Rudolf Knippenberg (UNICEF), Andrea Pantoja (WHO), Sonya Rabeneck (PMNCH), Agnes Soucat (World Bank) and Eva Weissman (UNFPA). This technical review is one aspect of this project. This part of the study will (i) identify the questions each tool is designed to answer; (ii) describe the tools' input requirements; (iii) analyze the tools' outputs; and (iv) critically examine the tools' methods and underlying assumptions. Key to the study is the assessment we will make of the extent to which each costing tool appropriately answers the question(s) it was designed to address.

This review was conducted in four stages. In stage 1, we compared all tools with respect to their characteristics; the result of this stage is a ***comparison chart*** examining the main features of all 13 tools. In stage 2, we examined each tool in more depth, looking at its conceptual framework, formulas, and parameters, producing a ***short page written report on each tool***. In stage 3, we created a tool ***taxonomy*** using dimensions that may be useful for a potential user to decide which tool best suits his/her particular needs. Finally, in stage 4 we carried out a ***benchmarking*** in an attempt to compare and interpret similar results produced by different tools.

This review has produced a better understanding of which tools are applicable to which MDGs. Of the 13 tools included in this study, six are related to MDG 1, "Eradicate extreme hunger and poverty." Seven tools can be used to work towards MDG 4, "Reduce child mortality." Six costing tools are built around MDG 5, "Improve maternal health." Eight costing tools address MDG 6, "Combat HIV/AIDS, malaria and other diseases."

The purpose of this review, however, was not simply to understand the tools. With the costing tools broken into these smaller groups based on which MDGs and MDG targets each tool addresses, we then tried to compare the tools within these groups. We recognized that a potential costing tool user would most likely not consider all 13 tools as possibilities for a costing exercise, but would rather start the search for a costing tool with a narrower list of possible tools, those which address a particular MDG, as an example. Therefore, we wanted to examine closer a group of similar tools, and in doing so, we expected that, for example, three tools which address the HIV/AIDS component of MDG 6 might be comparable with regards to inputs and outputs. However, upon closer examination we found that there was very little, if any, overlap

with regards to inputs and outputs, making it nearly impossible to compare the tools. The taxonomy and benchmarking chapters of this report will discuss further our efforts at comparing the tools.

This review proved to be a demanding process; most of the tools are designed to be used only following some type of training, which the reviewers did not receive. Therefore, understanding the tools required us to spend significant time reviewing the user manuals, understanding the formulas and opening and testing each tool to better understand its logic. Even after doing these things, we were left with some doubts, many of which the tool focal points (identified in Annex 1) helped us to clarify. Our review was also limited by issues of usability and transparency. As pointed out by tool developers, most tools are not meant to be used without proper training; even with a user guide, many tools were difficult to understand. Some tools were not clear about how computations were made, and did not provide formulas for these computations. Each tool presented unique terminology that we had to make sense of in order to understand how the tool worked. We believe these barriers to understanding the tools also undoubtedly limit users' abilities to achieve the maximum benefit from the tools.

Nonetheless, this exercise revealed that if a user is willing to invest time in choosing the right tool, by examining which MDGs and MDG targets it addresses, which interventions it includes, what inputs, choices and outputs are required, the tools included in this technical review can help users work towards the MDGs. We are confident this final report will help potential users in determining which tools might best suit their costing needs.

List of Acronyms

ACSM	Advocacy, communication and social mobilization
ACT	Artemisinin-based combination therapy
AIM	AIDS impact
ANC	Antenatal care
ARI	Acute respiratory infections
ART	Antiretroviral therapy
AVD	Forceps or vacuum-assisted delivery
B-EONC	Basic emergency obstetric and neonatal care
BCG	Bacille Calmette Guerin vaccine
C-EONC	Comprehensive emergency obstetric and neonatal care
CHOICE	Choosing Interventions that are Cost Effective
CORE	Cost and Revenue
CPT	Cotrimoxazole preventive therapy
CTBC	Community (involvement in) tuberculosis care (and prevention)
CYP	Couple years of protection
DALYs	Disability adjusted life years
DOTS	Directly observed treatment, short course
DTP	Diphtheria, pertussis (whooping cough) and tetanus vaccination
EC	Emergency contraception
EmOC	Emergency Obstetric Care
EPI	Expanded program on immunization
FSP	Financial Sustainability Plan
GAVI	Global Alliance for Vaccines and Immunization
GDP	Gross domestic product
HAART	Highly active antiretroviral therapy
HBC	Home-based care
HC	Health center
HIV	Human Immune Deficiency Virus
HIV/AIDS	Human Immune Deficiency Virus/Acquired Immune Deficiency Syndrome
ICD	International Statistical Classification of Diseases & Related Health Problems
IDU	Injecting/injection drug user
iHTP	Integrated Healthcare Technology Package
IMCI	Integrated management of childhood illness
IPT	Intermittent presemptive/preventive/presumptive treatment
IRS	Indoor residual spraying
ITN	Insecticide treated bednet
IU	International units
IUD	Intrauterine device
JE	Japanese encephalitis vaccine
LBW	Low birth weight
LLITN	Long-lasting insecticide treated bednet
M&E	Monitoring and evaluation
MBB	Marginal Budgeting for Bottlenecks Toolkit
MDG	Millennium Development Goal
MDR	Multidrug resistant (TB)
MMR	Measles, mumps and rubella vaccine
MNT	Maternal and neonatal tetanus
MOF	Ministry of Finance
MOH	Ministry of Health
MSH	Management Sciences for Health
MSM	Men who have sex with me
NGO	Non-governmental organization
NTP	National TB Program

OI	Opportunistic infection
OPV	Oral polio vaccine
OR	Operational research
OVC	Orphans and other vulnerable children
P/PROM	Preterm/prelabor rupture of membrane
PAC	Post abortion complication
PAL	Practical approach to lung health
PCBF	Planning, Costing and Budgeting Framework
PDR	People's Democratic Republic
PEP	Post exposure prophylaxis
PID	Pelvic inflammatory disease
PLHIV	People living with HIV/AIDS
PMTCT	Prevention of mother to child HIV transmission
PPM	Public-private public-public mix
PPTCT	Prevention of parent to child HIV transmission
RAPID	Socioeconomic Impacts of High Fertility and Population Growth
RH	Reproductive Health
STI	Sexually transmitted infection
TA	Takayasu's arteritis
TB	Tuberculosis
TRIPS	Trade-Related Aspects of Intellectual Property Rights
TT	Tetanus toxoid
U5	Children Under 5
UN	United Nations
UNAIDS	The United Nations Joint Program on HIV/AIDS
UNDP	United Nations Development Program
UNFPA	United Nations Population Fund
UNICEF	United Nations Children's Fund
UNPD	United Nations Population Division
USD	United States Dollar
UTI	Urinary tract infection
VLBW	Very low birth weight
VTC	Voluntary testing and counseling
WHO	World Health Organization
WHO/EIP	World Health Organization/Evidence and Information for Policy
WRA	Women of reproductive age
WTO	World Trade Organization
XDR	Extensively drug resistant (TB)

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I. Introduction

In September 2002, 189 countries committed to eight Millennium Development Goals (MDGs) to be attained by 2015. Each MDG is broken into targets, with each target measured by progress indicators (not listed below). This report will focus on the health-related MDGs targets in bold italics in the table below:

Table 1: Millennium Development Goals and their targets

MDG	Targets
(1) Eradicate extreme poverty and hunger	Halve, between 1990 and 2015, the proportion of people whose income is less than $1 a day
	Halve, between 1990 and 2015, the proportion of people who suffer from hunger
(2) Achieve universal primary education	Ensure that, by 2015, children everywhere, boys and girls alike, will be able to complete a full course of primary schooling
(3) Promote gender equality and empower women	Eliminate gender disparity in primary and secondary education, preferably by 2005, and in all levels of education no later than 2015
(4) Reduce child mortality	***Reduce by two-thirds, between 1990 and 2015, the under-five mortality rate***
(5) Improve maternal health	***Reduce by three-quarters, between 1990 and 2015, the maternal mortality ratio***
	Achieve, by 2015, universal access to reproductive health
(6) Combat HIV/AIDS, malaria and other diseases	***Have halted by 2015 and begun to reverse the spread of HIV/AIDS***
	Have halted by 2015 and begun to reverse the incidence of malaria and other major diseases[1]
	Achieve, by 2010, universal access to treatment for HIV/AIDS for all those who need
(7) Ensure environmental sustainability	Integrate the principles of sustainable development into country policies and programs and reverse the loss of environmental resources
	Halve, by 2015, the proportion of people without sustainable access to safe drinking water and basic sanitation
	Have achieved by 2020 a significant improvement in the lives of at least 100 million slum dwellers
(8) Develop a global partnership for development.	Develop further an open, rule-based, predictable, nondiscriminatory trading and financial system (includes a commitment to good governance, development, and poverty reduction; both nationally and internationally)
	Address the special needs of the Least Developed Countries (includes tariff- and quota-free access for Least Developed Countries' exports, enhanced program of debt relief for heavily indebted poor countries [HIPCs] and cancellation of official bilateral debt, and more generous official development assistance for countries committed to poverty reduction)
	Address the special needs of landlocked developing countries and small island developing states (through the Program of Action for the Sustainable Development of Small Island Developing States and 22nd General Assembly provisions)
	Deal comprehensively with the debt problems of developing countries through national and international measures in order to make debt sustainable in the long term

[1] TB is one of the 'other major diseases' as the MDGs include indicators specifically for TB.

Table 1: Millennium Development Goals and their targets

MDG	Targets
	In cooperation with developing countries, develop and implement strategies for decent and productive work for youth
	In cooperation with pharmaceutical companies, provide access to affordable essential drugs in developing countries
	In cooperation with the private sector, make available the benefits of new technologies, especially information and communications technologies

Source: http://www.un.org/millenniumgoals/

A summary of the MDG targets included in this report, which are directly related to health and indicated in bold italics above, is as follows:

- Reduce the prevalence of underweight children under five years of age (MDG 1)
- Reduce by two-thirds, between 1990 and 2015, the under-five mortality rate (MDG 4)
- Reduce by three-quarters, between 1990 and 2015, the maternal mortality ratio (MDG 5)
- Achieve, by 2015, universal access to reproductive health (MDG 5)[2]
- Have halted by 2015 and begun to reverse the spread of HIV/AIDS (MDG 6)
- Achieve, by 2010, universal access to treatment for HIV/AIDS for all those who need (MDG 6)[1]
- Have halted by 2015 and begun to reverse the incidence of malaria and other major diseases (MDG 6)[3]

Ministries of Health are generally responsible for implementing, monitoring, and evaluating progress in reaching these MDGs. This effort includes many different health interventions. This technical review will focus on the following interventions:

- Child and adult immunizations
- Child health interventions
- Family planning
- General health systems improvements[4]
- HIV/AIDS prevention and treatment
- Malaria prevention and treatment

[2] These targets were added in October 2007 when the MDG framework was modified by the General Assembly (following the directions of the World Summit 2005 and the recommendations of the Secretary General.
[3] "Other major diseases" includes TB.
[4] Meeting the MDGs also requires other actions that do not directly involve the provision of health services but that instead promote health system change (for example, strengthening the national system for the procurement of essential drugs). For this reason, we have included "general health systems improvements" as an intervention.

- Maternal health interventions (including antenatal care)
- Tuberculosis prevention and treatment

Strategies to reach the MDGs. Each MDG requires an assessment of which effective interventions are available and are appropriate to meet the target, taking into account issues involving infrastructure, human resources, and financing. This assessment should be the basis to develop a country-specific strategy to meet the MDGs by 2015. Moreover, it provides a transparent framework for budgeting to meet the MDGs.

Costing the MDGs: the use of costing tools. Countries have at their disposal multiple actions that they can undertake to get closer to meeting the MDGs. Costing tools related with the MDGs have been designed by different authors and institutions to estimate the costs of these actions. Countries use costing tools in their planning and budgeting processes to assess the resource needs associated with specific actions. Countries also use costing tools for other purposes, such as for allocating resources for the district health system, to health centers and hospitals, for setting fees, and for contracting out the delivery of services. Costing tools can also help countries estimate the potential health impact of those actions and, thus, the potential progress towards reaching the MDGs. Country demand for costing tools is based on their need to measure the immediate and future financial needs for reaching the MDGs; when the current effort will not suffice to reach the MDGs, these costing tools may be used first to estimate and then to negotiate for additional resources from Ministries of Finance (MOFs) or to request additional external aid.

1. The problem

Development agencies and research institutions around the world have produced an array of costing tools that address specific questions related to the attainment of the health MDGs. Countries wishing to address one or more of those questions can in principle use the tools available, but at first glance the sheer number of tools may be overwhelming. Selecting the wrong tool may result in unnecessary costs, in delayed policy decisions and, worse yet, in wrong conclusions and actions.

2. Study objective

Given this problem, this study will assess 13 costing tools selected by the Steering Committee, as seen in the below table:

Table 2: Costing Tools Included in the Technical Review[5]

Tool name and version	Developed by
MBB Toolkit (Version September 7, 2007)	UNICEF / World Bank
RH Costing Tool (July 2007 Draft)	UNFPA
iHTP Simulation Tool (Version 2.1.17/2.1.18, November/December 2007)	WHO / MRC
Spectrum: PMTCT Cost Effectiveness Module (Version 1, January 2002)	Constella Futures/Futures Institute
Goals Model (Version 3.0, March 2003)	Constella Futures/Futures Institute
PCBF (Version August 2007)	MSH

[5] The costing tools included in this technical review are in constant development and undoubtedly will evolve beyond the versions reviewed here.

Table 2: Costing Tools Included in the Technical Review[5]

CORE Plus (Version 1, September 2007)	MSH
cMYP- Immunization (Version 1.3, December 2005)	WHO
Integrated Health Model (Version 2.0, November 2007)	UNDP
Planning and Budgeting for TB Control (Version 1.5.19)	WHO
Resource Needs Model HIV/AIDS (Version October 2005)	Constella Futures/Futures Institute
Malaria Cost Estimation Tool (part of CHOICE) (Version 1.2, April 2006)	WHO
Child Health Cost Estimation Tool (part of CHOICE) (August 2007 Draft)	WHO

Source: Authors.

Specifically, the study will (i) identify the questions each tool is designed to answer; (ii) describe the tools' input requirements; (iii) analyze the tools' outputs; and (iv) critically examine the tools' methods and underlying assumptions. Key to the study is the assessment we will make of the extent to which each costing tool appropriately answers the question(s) it was designed to address. The target audience for this report is not only the organizations commissioning this technical review, but tool developers seeking to discover how other tools function and how they might improve their own tool, and potential tool users who are trying to determine which tool can best suit their needs.

This review was conducted in four stages, to be explained in the methodology section of this report.

II. Methodology

Development agencies and research institutions around the world have produced an array of costing tools for countries to use in their planning and budgeting processes as they attempt to achieve the MDGs. The below section explains the basic process of costing tools' decision making and walks through costing interventions and health outcomes, and is followed by an explanation of how this technical review will proceed in analyzing a number of the tools available to countries to help them reach the MDGs.

A. Decision making

To help understand what a particular tool is capable and not capable of doing, it is important to analyze the motivation driving the costing tool itself. Costing tools use one of two major forms of decision making or targets. The first is coverage-guided decision making, meaning that the user's main concern is increasing coverage of interventions, and the tool's outputs will reflect this motivation. The second is impact-guided decision making, meaning that the user's main concern is achieving a specified health outcome. As seen in the below table, both forms of decision making can be accompanied with some sort of budgetary constraint, meaning that the user is also concerned with achieving or staying within certain budgetary or financing goals.

	Coverage-guided decision making	Impact-guided decision making
With budget constraint		
No budget constraint		

The type of decision making used by each tool is highlighted in the comparison chart and further discussed in the write-up on each individual tool.

B. Costing interventions and health outcomes

The following terminology will be used in our explanation of general costing of interventions and health outcomes, as well as throughout the report as we review each individual tool.

Table 3: Definition and examples of terms

Term	Definition	Example
Budget & Financing (B)	Budget is the total sum of money needed for a purpose, and financing refers to the resources available.	A program requires a budget of USD 1,2000,000 to implement child immunization programs. A MOH has allocated USD 100,000 to finance these programs in 2007. However, total financing available for child immunization programs is USD 500,000 including USD 400,000 from external aid. Therefore, there is a funding gap of USD 200,000.
Coverage (K)	Percentage of target population reached by the intervention or percentage of target population using the intervention.	90% coverage of child immunizations means that for a child population of 10,000, 9,000 are receiving all immunizations included in the program.
Demographics (N)	Selected population characteristics.	Number of children under five years of age is 50,000.
Effectiveness (E)	The ability to achieve an effect or an outcome under everyday or typical field conditions.	The effectiveness of the vaccine is 40% reduction of the disease morbidity.

Table 3: Definition and examples of terms

Term	Definition	Example
Epidemiology (G)	Selected indicators to measure disease prevalence and incidence.	The child under five mortality rate is 68 deaths per 1.000 live births. 25% of women between 15-49 years of age are HIV+.
Health Outcome (H)	Gain in health status arising from the delivery of the health intervention, given its effectiveness.	Vitamin A supplementation reduced the child mortality rate by 15%.
Health Production Function	Combination of interventions and effectiveness that produces health outcome.	A child that receives TB immunization and Vitamin A supplementation has a lower probability of dying before the age of 5.
Input Quantity (q)	Quantities of equipment and labor required to produce a given intervention.	A prenatal care visit requires 20 minutes of a medical doctor's time.
Input Price (p)	Amount of money for which input is bought or sold.	The price of a condom is USD 0.25.
Intervention	Activity or set of activities aimed at modifying the health status or producing a health outcome.	TB immunization for children under 5 years of age.
Intervention Cost	Monetary value of intervention, generally measured as the price of inputs multiplied by the quantity of inputs.	Prenatal care visits require 20 minutes of a medical doctor's time. The doctor's salary is USD 2/minute, so the cost is 20 x 2 = USD 40.
Intervention Price (P)	Amount of money for which an intervention is bought or sold.	A health facility charges users USD 1 for each curative care visit.
Intervention Production Function (Q)	Combination of inputs and their quantities that produce an intervention.	TB immunization requires a nurse (5 minutes), BCG vaccine (1 bottle), syringe (1), alcohol (5ml), cotton (1) and band-aid (1).
Macroeconomic Conditions (M)	A general measurement of a country's economic status.	GDP per capita is USD 500 and GDP growth is 3%.
Time (T)	Period or duration.	Programs designed for a 1 year execution.

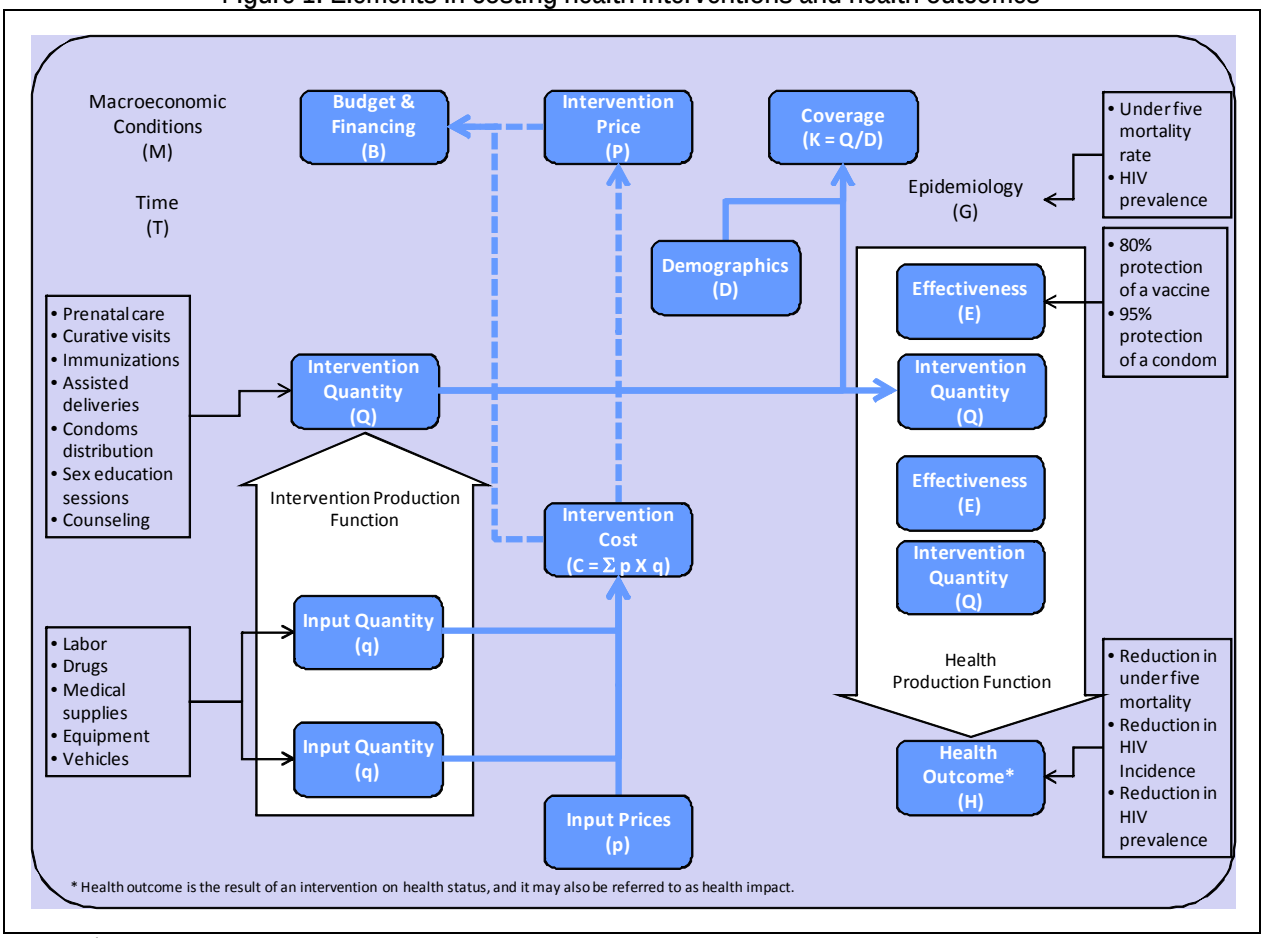
Source: Authors.

Costing involves two basic production functions. The first, the **intervention production function**, uses a medical technology which combines **inputs** to produce a given **intervention (**or **output)**. The **intervention cost** is calculated by multiplying the **quantity of inputs** times the **input prices**. The **intervention price** is the amount of money at which the intervention is bought or sold. Both the intervention cost and intervention price impact a larger **budget**. The budget can be compared against available **financing**.

The second, the **health production function**, is used to compute **health outcome.** Health outcome is generally calculated by multiplying the quantities of interventions produced by their **effectiveness**. Total **coverage** of the intervention is determined by dividing the intervention quantity by the size of the population, a subset of **demographics**. Demographic trends are partially influenced by disease prevalence and incidence (**epidemiology**). All these variables play out over a set period of **time** and under specific **macroeconomic conditions**.

To complement the preceding explanation, Figure 1 outlines these main elements involved in costing and how they relate to one another. This figure is not meant to be all-inclusive, but rather to highlight the key elements involved in the process of costing an intervention and achieving a target health outcome.

Figure 1: Elements in costing health interventions and health outcomes



Source: Authors.

Following the above logic, costing a child health intervention such as Vitamin A supplementation would first involve identifying inputs needed to deliver the intervention, such as the 100,000 and 200,000 IU Vitamin A capsules, the community health workers to distribute them and the community awareness campaigns to be run to educate the population about the upcoming health fair at which children will receive the supplementation. The way in which these inputs are combined to produce the intervention is the intervention production function. The intervention cost is calculated by multiplying the unit price of the two types of capsules times the number of capsules to be distributed, plus the number of health workers needed multiplied by the number of days they work multiplied by their daily pay rate, plus the cost of each community awareness campaign multiplied by the number of campaigns.. From this point an intervention cost can be calculated and the budgetary impact and financing implications analyzed.

To determine the health outcome of the child health intervention, the health production calculates the impact of Vitamin A supplementation on child health status under the assumption that the supplementation is 75% effective in reducing under 5 mortality in underweight infants. The coverage level can then be determined by calculating what percentage of children aged 6-11 months will be reached with this intervention. This intervention can be delivered as a one

month, one year or multiple year activity. Planners must also take into consideration the impact of the country's macroeconomic conditions that affect the health system performance. For example, slow economic growth decreases available resources for health and other sectors, and low incomes which are linked to malnutrition increase the need of Vitamin A supplementation.

C. Technical review methodology

Costing tools related to MDGs have been designed by different authors and institutions to estimate the costs of specific health actions. While all costing tools somehow address the issue of resource needs associated with specific actions, each tool has a different approach and logic. In an attempt to understand this logic and determine which tools are best suited for specific purposes, we conducted our technical review in four stages.

In stage 1, we compared all tools with respect to their characteristics; the result of this stage is a ***comparison chart*** examining the main features of all 13 tools. In stage 2, we examined each tool in more depth, looking at its conceptual framework, formulas, and parameters, producing a ***short written report on each tool***. In stage 3, we created a tool ***taxonomy*** using dimensions of scope, size, user friendliness and linearity that may be useful for a potential user to decide which tool best suits his/her particular needs. Finally, in stage 4 we carried out a ***benchmarking*** in an attempt to compare and interpret similar results produced by different tools.

With the exception of stage 2, each stage is explained in the body of this report. Given that stages 1, 3, and 4 rely on the information gathered in stage 2, we would like to further explain the methodology used to review each individual tool.

First, our explanation of the thirteen costing tools in this technical review uses the elements involved in costing from above and shows how they are incorporated in each tool. To simplify this process, we identified three key steps in the application of any tool.

- **STEP 1:**[6] *What decisions can the user make in this costing exercise?*

  Black boxes represent the different **choices** available to the user for adjusting the tool (such as modifying the intervention production function by including/excluding interventions).

- **STEP 2**:[5] *What are the data requirements of the tool?*

  Black boxes represent the **input data** required (including both the data which the tool builders entered –such as demand elasticities and technical coefficients in production functions– and the data which the user must enter).

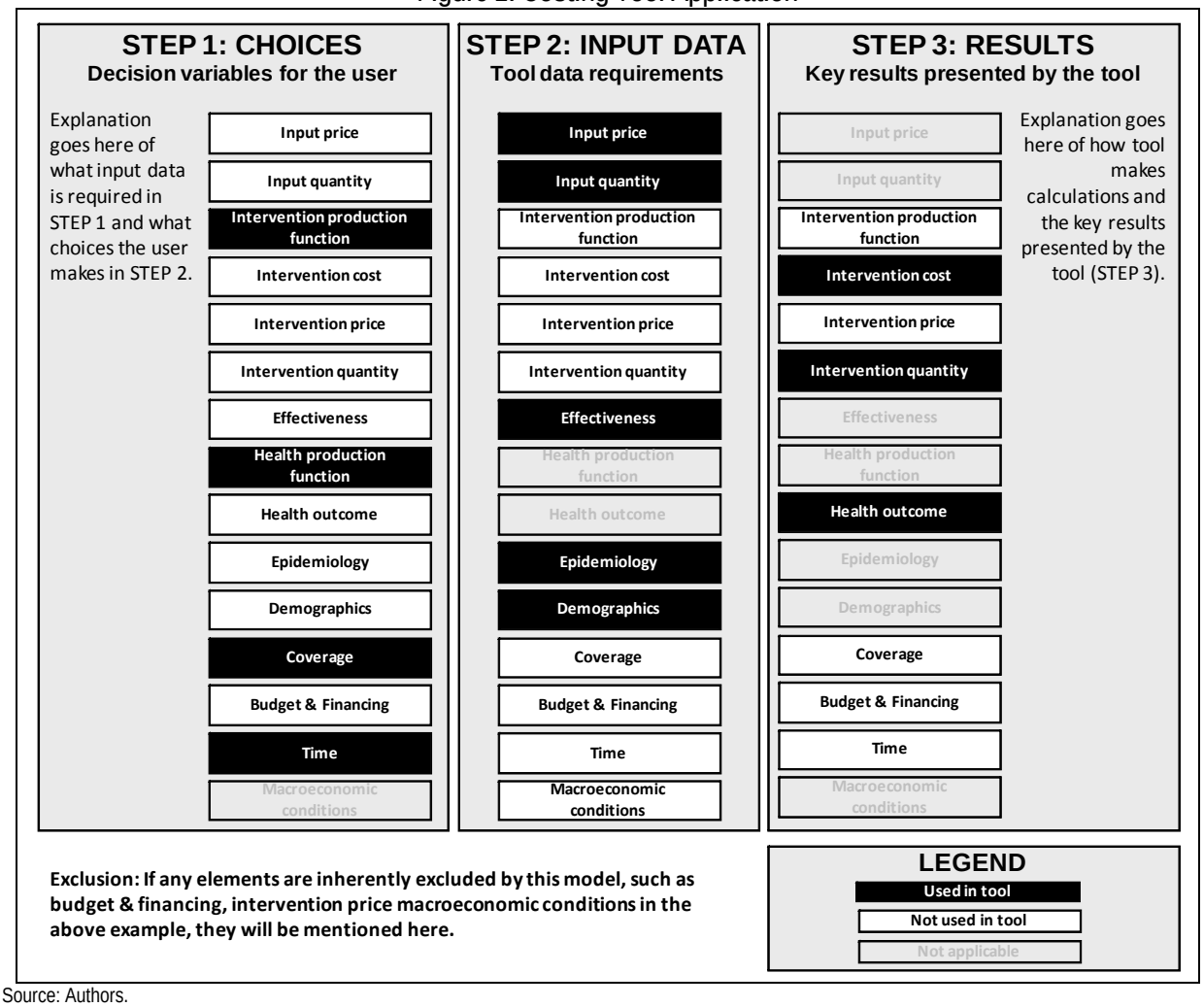
- **STEP 3**: *What does the tool compute?*

  Different tools answer different questions, and produce varying **results** or calculations; in this step, black boxes indicate the results the tool produces.

[6] It should be noted that some tools require users to first input data, and then the user makes choices to tweak the tool. However, other tools first require the user to make choices, and based on those choices, the tool requires specific input data. Therefore, STEP 1 and STEP 2 may be reversed for certain tools, and thus Figure 2 will be adjusted accordingly to accurately represent the sequence in which input data is required and choices are made.

This figure is helpful not only in showing what the tool does, but in showing what the tool does not do. In all three steps, black boxes indicate the element is used in that step; white boxes indicate the element is not used in that step; and grayed out boxes indicate that the element is not an appropriate choice for that step.[7] We will include a brief written explanation of the tool in the paragraphs on each side of the figure, as well as a box at the bottom indicating which costing elements the tool does not take into consideration at all, to help readers better understand the tool. Figure 2 provides an example of the costing tool application figure.

Figure 2: Costing Tool Application



Source: Authors.

[7] As inputs, we have grayed out "heath production function" and "health outcome," recognizing that sometimes these elements are built-into the tool (like in the MBB) but it is outside the scope of a costing tool to allow the user to input these elements. As choices, "macroeconomic conditions" has been grayed out. As results, "input price," "input quantity," "effectiveness," "health production function," "demographics: and "macroeconomic conditions" have been grayed out. "Epidemiology" is also grayed out as a result, although we recognize that some tools may produce "epidemiological" results and often present them in terms of "coverage." These decisions were made based on the authors' judgment and the actual usage of these elements in the thirteen costing tools in this review.

This figure provides a visual way in which users can understand a particular tool and compare the inputs, choices and results of various tools. Each figure will be presented in the context of a written chapter further explaining the tool. Each chapter is structured in a similar way so as to provide the same information about each tool and to help users compare tools. The chapters are broken into the following sections:

1. Tool description and overview

In this section we summarize the purpose of the tool and identify the tool's target audience. We present, in bullet form, the questions the tool can answer, as well as the MDGs and interventions the tool addresses, taken from the following lists:

The tool can be used to answer the following questions:

- What are the most effective interventions?
- What is the cost of scaling up health services relevant to the health MDGs?
- What is the impact of interventions on health MDGs?
- What is the most effective strategy to reach the health MDGs?
- What health MDGs can be achieved with the available resources?

The tool addresses the following MDG targets:

- Reduce the prevalence of underweight children under five years of age (MDG 1)
- Reduce by two-thirds, between 1990 and 2015, the under-five mortality rate (MDG 4)
- Reduce by three-quarters, between 1990 and 2015, the maternal mortality ratio (MDG 5)
- Achieve, by 2015, universal access to reproductive health (MDG 5)
- Have halted by 2015 and begun to reverse the spread of HIV/AIDS (MDG 6)
- Achieve, by 2010, universal access to treatment for HIV/AIDS for all those who need (MDG 6)
- Have halted by 2015 and begun to reverse the incidence of malaria and other major diseases (MDG 6)

The tool includes the following interventions:

- Child and adult immunizations
- Child health interventions
- Family planning
- General health systems improvements
- HIV/AIDS prevention and treatment
- Malaria prevention and treatment
- Maternal health interventions (including antenatal care)
- TB prevention and treatment

2. Understanding the tool

In this section, we explain the three steps of the tool's application (input data, choices and results) and include the explanatory figure. We also identify what type of decision-making drives the tool and for what time period the tool can be used, taken from the below lists:

The tool uses one or more of the following types of decision making[8]:

- Coverage-guided decision making, meaning that the user's main concern is increasing coverage of interventions; with budget constraint, the user is also limited by or concerned with achieving certain budgetary or financing goals or staying within defined budgetary or financing constraints
- Impact-guided decision making, meaning that the user's main concern is achieving a specified health outcome; with budget constraint, the user is also limited by or concerned with achieving certain budgetary or financing goals or staying within defined budgetary or financing constraints

The tool can be used for a specific planning period:

- Short-term planning, up to one year
- Medium-term planning, from one to nine years
- Long-term planning, for ten and more years

If applicable, this section also includes an explanation of the tool's production function and an explanation of how the tool calculates health outcomes (if applicable), including any assumptions made by the tool.

3. Formula review

In this section, we first provide a brief analysis of the tool's conceptual framework, discussing the tool's main objective, how the tool goes about reaching this objective and what is included and excluded from the tool.

We then discuss the generic formulas the tool uses to calculate the tool's results (as identified in our figure- most commonly intervention cost, intervention quantity, health outcome and budget & financing), taken from the tool's user manuals or provided by the tool's developer or point of contact. We will provide commentary on the formulas, focusing on assessing what kinds of costs are included in the formula (direct, indirect, fixed, variable, opportunity, etc.) and what elements might be excluded from the formula. A figure presents these generic formulas in a visual format.

To evaluate the formulas in the tool, as a means of assessing if the tool does what it says it does, we follow through cell-by-cell all the formulas the tool uses for a single intervention. We have chosen interventions that are most common among the largest number of tools (refer to Table 24), so that potential tool users can compare how multiple tools treat the same intervention. We used a condom-related intervention whenever possible; if the tool did not include a condom-related intervention, we chose voluntary counseling and testing (HIV/AIDS), antiretrovirals or antiretroviral therapy, BCG vaccine or insecticide treated bednets. The following table indicates which in interventions were used for each tool:

[8] See page 5 for a further discussion of this decision-making analysis.

Condom-related intervention	VCT	ARVs and ART	BCG vaccine	Insecticide treated bednets
▪ MBB ▪ RH Costing Tool ▪ Goals ▪ PCBF ▪ CORE Plus ▪ Integrated Health Model ▪ Resource Needs Model	▪ Spectrum: PMTCT	▪ Planning & Budgeting for TB Control	▪ cMYP	▪ Malaria Cost Estimation Tool ▪ Child Health Cost Estimation Tool

We present a detailed figure of the intervention trace and numerical calculations, whenever possible, to assess whether the formula provided in the manual is correctly programmed into Microsoft Excel. Note that our ability to do this analysis was severely limited for non-Excel based tools; for Spectrum: PMTCT, we were able to do a partial intervention trace and analysis based on data provided by the developer. We did not complete an intervention trace in the iHTP model.

4. Experience using the tool

In this section, we will explain the format of the tool and discuss various elements related to its ease of use, noting whether the tool is accompanied by a user manual or other documentation to help explain the tool, includes default values and is adaptable to local conditions. We will also identify the time commitment required for using this tool and how much training is suggested/required. This section notes in which countries the tool has been used in a costing exercise.

This assessment is based on information provided by the tool focal points/developers, the user manual or other documentation accompanying the tool, the reviewers' own assessment[9], and information provided by users (when available)[10] through questionnaires distributed and collected by the Steering Committee. The below table presents an overview of the survey results

[9] Reviewers' assessment is made based on experience with tool, although reviewers did not receive any training, which many tools require for use.

[10] Following the user's meeting in Senegal in January 2008, this section has been complemented with information provided by actual tool users through questionnaires distributed and collected by the Steering Committee. While the reviewers had originally planned to distribute their own survey following the reviewers' presentation at the meeting, the presentation was canceled and there was no opportunity to distribute the questionnaire. However, the Steering Committee has shared the results of the two different questionnaires they distributed, to which they received twenty total responses. One questionnaire was in email format and contained only one question about the actual use of a specific costing tool, which unfortunately was unusable for this report due to lack of detail. Thirteen responses were received to a more detailed, thirty-three question survey. We have included the relevant information from these surveys in this report, the full surveys are available upon request.

for each of the tools. Specific responders are named in the sections in which their responses are included.

Table 4: Summary of Questionnaires Received from Users

Tool Name	Number of questionnaires received
MBB	0
RH Costing Tool	1
iHTP Simulation Tool	3
Spectrum: PMTCT Cost Effectiveness	0
Goals Model	0
PCBF	0
CORE Plus	1
cMYP Immunization	0
Integrated Health Model	0
Planning & Budgeting for TB Control	5
Resource Needs Model HIV/AIDS	2
Malaria Cost Estimation Tool (CHOICE)	1
Child Health Cost Estimation Tool (CHOICE)	0
TOTAL	*13*

Source: Authors, based on information provided by the Steering Committee.

III. Stage 1: Characterization and comparison of tools

A. Key features comparison chart

The comparison chart is designed to provide a broad comparative overview of the features, advantages, and limitations of each tool. It can be used as a first step for potential users seeking a general overview of each tool.

Across the top are listed the 13 costing tools under review, and down the side are various tool characteristics. An "X" indicates the tool in that column possesses the characteristics listed on the same row the left-hand side. This chart can help the reader see the main characteristics of any individual tool, and to also compare several tools along the same characteristics. It should be noted that in an attempt to provide the most thorough overview of each tool, we did not limit the number of categories a tool could fall into.

The characteristics included in the comparison chart are as follows:

- **Focus:** does the tool look mostly at scale-up costs, the cost of achieving a certain level of coverage, or the cost of a multi-year strategic plan? Or is the tool focused on the impact of resource allocation on health outcome?
- **Questions the tool can answer:** does the tool try to determine what are the most effective interventions, or simply the impact of interventions on health MDGs? Does the tool determine the cost of achieving the health MDGs, or simply note which health MDGs can be achieved with the available resources? Can the tool determine which is the most cost-effective strategy to reach the health MDGs?
- **Methodology:** the tool is driven by coverage- or impact-guided decision making, with or without budget constraint? For what planning time period can the tool be used?
- **MDG targets addressed:** of the health-related MDG targets, which does each tool address? We determined that a tool officially addressed an MDG target if clear priority is given to the MDG. If a tool simply mentions an intervention but the tool's focus is in another health area (ex. an HIV/AIDS tool includes a reference to a joint HIV-TB intervention), we do not list the MDG target corresponding to the secondary intervention (in this case, the part of MDG 6 which relates to malaria and other diseases).
- **Interventions included:** which interventions does the tool include? If an intervention is mentioned in a tool, albeit it on one line, we have attempted to include it here.
- **Outputs:** what are the tool's outputs? How are these outputs presented?

Before presenting the comparison chart, some general observations about the findings seen in the comparison chart are as follows:

- With regards to focus, the majority of the tools (11 of 13) can determine the cost of achieving a target coverage level.

- Not surprisingly, with regards to questions the tool can answer, nearly all costing tools in this exercise (12 of 13) determine the cost of scaling up health services relevant to the health MDGs.
- The majority of tools (11 of 13) use coverage-guided decision-making. All tools (13 of 13) can be used for medium-term (one to ten years) planning, although some can also be used for both shorter and/or longer periods of time.
- The thirteen costing tools in this exercise address all of the health-related MDGs and their targets, although slightly more emphasis is on MDG 6, "Combat HIV/AIDS, malaria and other diseases." Correspondingly, while all interventions are addressed, HIV/AIDS prevention and treatment occur most frequently, in ten of the thirteen tools.
- As far as outputs, nearly all tools (12 of 13) compute total cost, with 10 of 13 also computing scale-up cost. Findings are almost always presented in a summary table, although many tools also generate graphs.

The full comparison chart can be seen below. Please note that all information contained in this comparison chart is also discussed in each individual tool's written review.

Table 5: Tools' Features Comparison Chart

	Tool Name	MBB Toolkit	RH Costing Tool	iHTP Simulation Tool	Spectrum: PMTCT Cost Effectiveness	Goals Model	PCBF	CORE Plus	cMYP - Immuni-zation	Integrated Health Model	Planning & Budgeting for TB Control	Resource Needs Model HIV/AIDS	Malaria Cost Estimation Tool (CHOICE)	Child Health Cost Estimation Tool (CHOICE)
	Tool Developer	UNICEF / World Bank	UNFPA	WHO / MRC	Constella Futures/ Futures Institute	Constella Futures/ Futures Institute	MSH	MSH	WHO	UNDP	WHO	Constella Futures/ Futures Institute	WHO	WHO
Focus	Determine cost of scale up package of interventions	X	X	X	X			X		X	X			X
	Determine cost of achieving target coverage	X	X	X	X			X	X	X	X	X	X	X
	Determine cost of multi year strategic plan		X	X	X		X			X	X			X
	Determine impact of resource allocation on outcome				X	X								
Questions the tool can answer	What are the most effective interventions?			X										
	What is the cost of scaling up health services relevant to the health MDGs?	X	X	X	X		X	X	X	X	X	X	X	X
	What is the impact of interventions on health MDGs?	X			X	X	X		X					
	What is the most cost-effective strategy to reach the health MDGs?			X	X	X								
	What health MDGs can be achieved with available resources?			X		X	X				X			
Methodology	Coverage-guided decision making	X	X	X			X	X	X	X	X	X	X	X
	with budget constraint			X			X	X	X		X			
	Impact-guided decision making				X		X		X		X		X	X
	with budget constraint						X				X			
	Short-term focus (1 year)			X			X	X			X			
	Medium-term focus (1-10 years)	X	X	X	X	X	X	X	X	X	X	X	X	X
	Long-term focus (10+ years)			X	X		X	X			X			
MDG targets addressed	Reduce the prevalence of underweight children under five years of age (MDG 1)	X		X			X	X		X				X
	Reduce by two-thirds, between 1990 and 2015, the under-five mortality rate (MDG 4)	X		X			X	X	X	X				X
	Reduce by three-quarters, between 1990 and 2015, the maternal mortality ratio (MDG 5)	X	X	X			X	X		X				
	Achieve, by 2015, universal access to reproductive health (MDG 5)	X	X	X			X	X		X				
	Have halted by 2015 and begun to reverse the spread of HIV/AIDS (MDG 6)	X		X	X	X	X	X		X		X		
	Achieve, by 2010, universal access to treatment for HIV/AIDS for all those who need (MDG 6)	X		X	X	X	X	X		X		X		
	Have halted by 2015 and begun to reverse the incidence of malaria and other major diseases (MDG 6)	X		X			X	X		X	X		X	X
Interventions included	Child and adult immunizations	X		X			X	X	X	X				
	Child health interventions	X	X	X			X	X		X				X
	Family planning	X	X	X			X	X		X				
	General health system improvements	X	X	X			X	X		X	X			
	HIV/AIDS prevention and treatment	X	X	X	X	X	X	X		X	X	X		
	Malaria prevention and treatment	X	X	X			X			X			X	X
	Maternal health interventions	X	X	X	X		X	X		X				
	TB prevention and treatment	X					X	X	X	X	X	X		
Outputs	Average cost per intervention		X	X	X			X		X	X			
	Total cost	X	X	X	X		X	X	X	X	X	X	X	X
	Scale up cost	X	X	X			X	X	X	X	X		X	X
	Funding gap	X		X			X	X	X		X			
	Coverage	X				X	X							
	Impact on health outcome	X			X	X	X							
	Budget	X					X	X	X		X			
	Summary table	X	X	X	X	X		X	X	X	X	X	X	X
	Graphs	X	X	X	X	X			X	X	X	X	X	X

Source: Authors in consultation with tool focal point(s).

IV. Stage 2: Costing tools review

We reviewed the thirteen costing tools with the primary goal of understanding each tool's logic and approach. The elements summarized in the comparison chart are expanded in these chapters. We analyzed each tool's conceptual basis and methodology, as well as the tool's format and design. For each tool we have identified the questions the tool can answer, interventions included and health MDG targets addressed. We have examined the data requirements of and information required by each tool, the choices the user has to craft the tool to each user's specific situation or circumstances, and the tool's outputs. We developed a figure to help users understand the input data, choices and outputs of each tool. We have reviewed and analyzed the formulas the tool uses to calculate the outputs. We have measured the tool's usability and identified in which countries the tool has been used to date.

Our findings on each tool are found below.

A. Marginal Budgeting for Bottlenecks Toolkit (MBB) Developed by UNICEF and The World Bank – Version September 7, 2007

1. Tool description and overview

The MBB is a tool to help users design, plan and budget health programs by focusing resources and strengthening health outcomes related to the maternal and child health MDGs. This tool was designed to be used by health economists and policy makers working in Ministries of Health, with initial technical assistance from UNICEF and The World Bank.

The tool can be used to answer the following questions:

- What is the cost of scaling up health services relevant to the health MDGs?
- What is the impact of interventions on health MDGs?

The tool addresses the following MDG targets:

- Reduce the prevalence of underweight children under five years of age (MDG 1)
- Reduce by two-thirds, between 1990 and 2015, the under-five mortality rate (MDG 4)
- Reduce by three-quarters, between 1990 and 2015, the maternal mortality ratio (MDG 5)
- Achieve, by 2015, universal access to reproductive health (MDG 5)
- Have halted by 2015 and begun to reverse the spread of HIV/AIDS (MDG 6)
- Achieve, by 2010, universal access to treatment for HIV/AIDS for all those who need (MDG 6)
- Have halted by 2015 and begun to reverse the incidence of malaria and other major diseases (MDG 6)

The tool includes the following interventions:

- Child and adult immunizations
- Child health interventions
- Family planning
- General health systems improvements
- HIV/AIDS prevention and treatment
- Malaria prevention and treatment
- Maternal health interventions
- TB prevention and treatment

Table 6 presents the complete list of interventions included in the MBB tool by service level and subgroups.

Table 6: List of Interventions Included in MBB Tool

Service level	Subgroup	Intervention
Community-based	Family Preventive/WASH Services	Insecticide Treated Mosquito Nets (ITNs) for children under 5
		Use of safe drinking water
		Use of sanitary latrine
		Hand washing by mothers
		Condom use
		Reduction of indoor air pollution
	Family neonatal care	Clean delivery and cord care
		Early breastfeeding and temperature management
		Universal extra community-based care of low-birth weight (LBW)infants
	Infant and child feeding	Breastfeeding for children 0-5 months
		Breastfeeding for children 6-11 months
		Complementary feeding
		Supplementary feeding for moderately malnourished children (< 2SD)
		Care for orphans
	Community Management Illnesses	Oral Rehydration Therapy
		Zinc for diarrhea management
		Vitamin A - Treatment for measles
		Community based malaria treatment of children with Artemisinin-based Combination Therapy (ACT)
		Antibiotics at community level for pneumonia
		Antibiotics at community level for diarrhea and enteric fevers

Table 6: List of Interventions Included in MBB Tool

Service level	Subgroup	Intervention
		Community based management of neonatal pneumonia
Schedulable services	Preventive care for adolescents and adults	Family Planning
		Preconceptual folate supplementation
	Preventive pregnancy care	Antenatal Care
		Calcium supplementation in pregnancy
		Tetanus immunization
		Deworming in pregnancy
		Detection and treatment of asymptomatic bacteriuria
		Detection and management of syphilis in pregnancy
		Prevention and treatment of iron deficiency anemia in pregnancy
		ITN for pregnant women through antenatal care (ANC)
		Intermittent Presemptive Treatment (IPT) for pregnant women
		Balanced protein energy supplements for pregnant women
	HIV/AIDS prevention and care	Prevention of mother to child transmission (PMTCT) (includes testing and counseling, AZT + sd NVP and infant feeding counseling)
		PMTCT (testing and counseling, ART and infant feeding counseling)
		Condom use
		Cotrimoxazole prophylaxis for HIV+ mother
		Cotrimoxazole prophylaxis for HIV+ adults
		Cotrimoxazole prophylaxis for children of HIV+ mothers
	Preventive infant & child care	Measles vaccine
		BCG vaccine
		TT vaccine
		OPV vaccine
		DPT vaccine
		Pentavalent (DPT-Hib-Hepatitis)
		Hib vaccine
		Hep B vaccine
		Yellow fever vaccine
		Meningitis vaccine
		Pneumococcal vaccine
		Rotavirus Vaccine
		Vitamin A – supplementation
		Zinc preventive
		Indoor Residual Spraying (IRS)
		Intermittent Presumptive Treatment (IPT) for children
		ITN for under five through EPI
Clinical services	Clinical primary level skilled maternal & neonatal care	Skilled delivery care
		Resuscitation of asphyctic newborns at birth
		Antenatal steroids for preterm labor
		Antibiotics for Preterm/Prelabour Rupture of Membrane (P/PROM)
		Detection and management of (pre)ecclampsia (Mg Sulphate)
		Management of neonatal infections at PHC level
	Management of Illnesses at Primary Clinical Level	Antibiotics for U5 pneumonia
		Antibiotics for diarrhea and enteric fevers
		Vitamin A - Treatment for measles
		Zinc for diarrhea management
		Chloroquine for malaria - (P.vivax)
		Artemisinin-based Combination Therapy for children
		Artemisinin-based Combination Therapy for pregnant women
		Artemisinin-based Combination Therapy for adults

Table 6: List of Interventions Included in MBB Tool

Service level	Subgroup	Intervention
		Management of complicated malaria (2nd line drug)
		Antibiotics for opportunistic infections
		Male circumcision
		ART for children with Aids
		ART for pregnant women with AIDS
		ART for adults with AIDS
		DOTS for TB
	Clinical first referral illness management	Basic emergency obstetric and immediate neonatal care (B-EONC)
		Management of severely sick children (referral IMCI)
		Clinical management of neonatal jaundice
		Universal emergency neonatal care (asphyxia aftercare, management of serious infections, management of the VLBW infant)
		Management of complicated malaria (2nd line drug)
		ART for children with AIDS
		ART for pregnant women with AIDS
		ART for adults with AIDS
		Management of first line ART failures
		Management of TB moderate toxicities
	Clinical second referral illness management	Comprehensive emergency obstetric and neonatal care (C-EONC)
		Other emergency acute care
		Management of complicated Aids
		Management of MDR TB

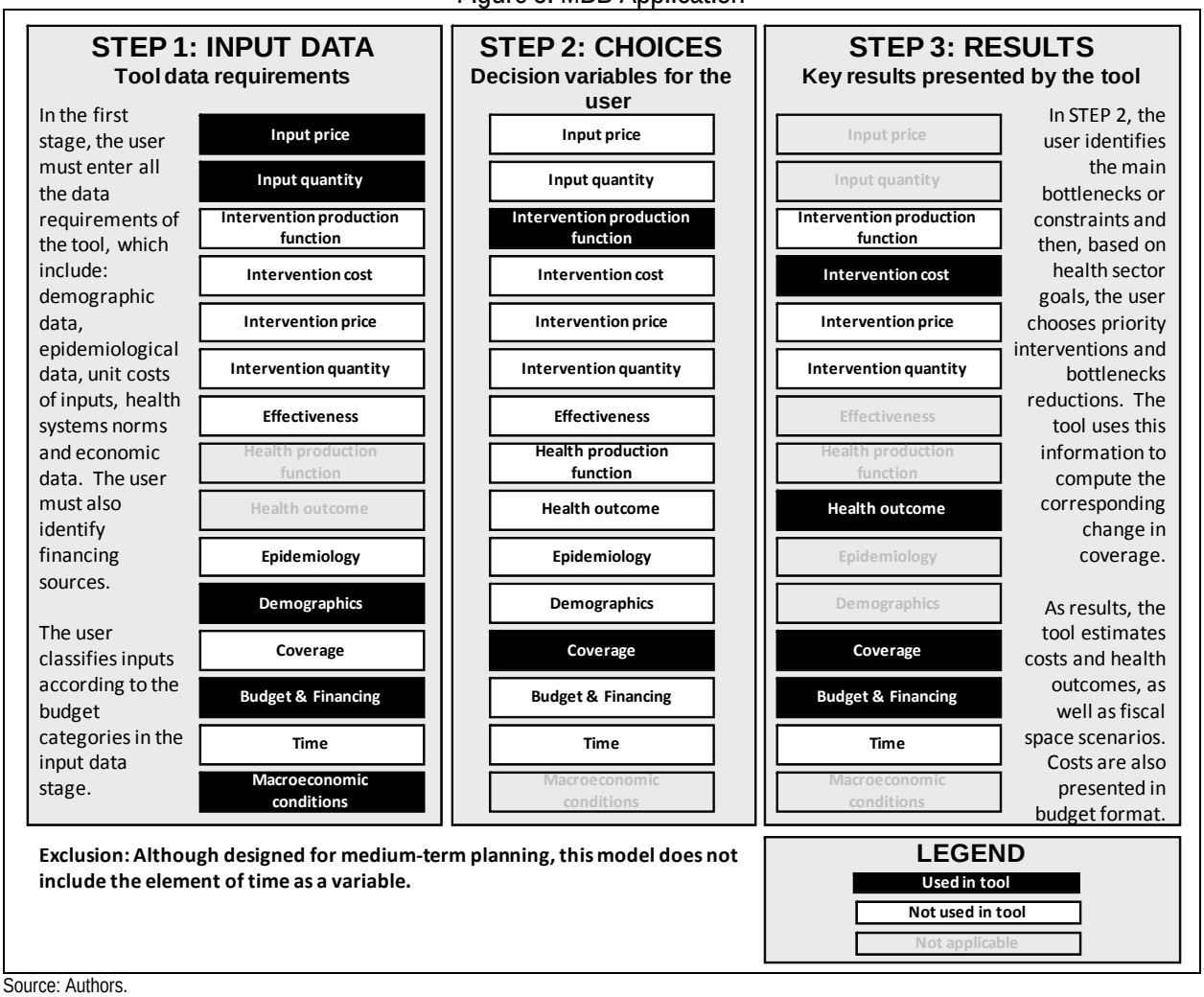
Source: Technical Notes, MBB Toolkit.

The MBB Toolkit helps users first perform a "bottleneck analysis" of a health system, identifying any limitations to the six key determinants in the utilization of health services (as defined by the tool's developers). The six determinants are: availability of essential commodities, availability of human resources, access to care, initial utilization of care, continuous utilization of care and utilization of effective care. As such, the tool helps users identify the main areas of a health system which could benefit from additional resources to improve health MDGs related indicators. By identifying these bottlenecks, the tool's outputs help policy makers select the health interventions they wish to implement, estimate the incremental resources needed to implement the interventions and progress on health MDGs related goals, and project the estimated impact of the chosen strategies on health MDGs.

2. Understanding the tool

In STEP 1, the tool requires the user to provide data on input prices, demographics, health sector financing and general macroeconomic conditions. Included in this data are health system design and epidemiological data. The user classifies inputs according to budget categories so that the tool can later present costs in budget format. In STEP 2, the user chooses priority interventions and increases their utilization coverage. The tool also automatically calculates most input quantities based on health system norms built into the tool. In STEP 3, the tool uses built-in interventions' effectiveness and user-defined changes in coverage to compute the corresponding health impacts (health outcome). This tool also estimates costs and calculates resource requirements (intervention cost). Costs are also presented in budget format (budget & financing). Coverage is also a result. The below figure summarizes the tool's logic.

Figure 3: MBB Application



Source: Authors.

This tool is driven by coverage-guided decision making. It can be used for medium-term planning. The production function is specified by the user by entering input requirements norms (approved protocols that establish the combination of inputs in the provision of care). Health outcomes are computed automatically by the tool based on the increase in utilization and built-in effectiveness of the intervention. Although the tool allows local experts to adapt interventions' effectiveness to local conditions, it is not recommended. Health outcomes are presented as percent achievement of MDGs.

3. Formula Review

a. Conceptual Framework Analysis

The centerpiece of the MBB Toolkit is the bottleneck analysis. The main goal of the bottleneck analysis approach is to identify the limitations a health system faces to reach a desired level of service coverage. The developers identified six key limitations, or coverage determinants, in the provision of care that are defined in Table 7. Bottlenecks are measured in

terms of these six coverage determinants, and a coverage determinant bottleneck is defined as the difference between the maximum achievable coverage and the actual coverage. The end result of any reduction in bottlenecks is an increase the utilization of effective interventions.

Table 7: MBB Toolkit's six coverage determinants

Coverage determinant	Definition
Availability of essential commodities	Availability of critical health system inputs
Availability of human resources	Availability of human resources for the adequate functioning of the health system.
Physical access	Physical access of health services to the users and vice versa.
Initial utilization	The first use of multi-contact services.
Timely continuous utilization	Utilization considering continuity and compliance of multiple visits for care.
Effective coverage	Utilization of a combination of inputs and processes produce a desired health effect.

Source: Edited from UNICEF/World Bank, MBB Tool Technical Notes version 4, Revision November 28, 2007.

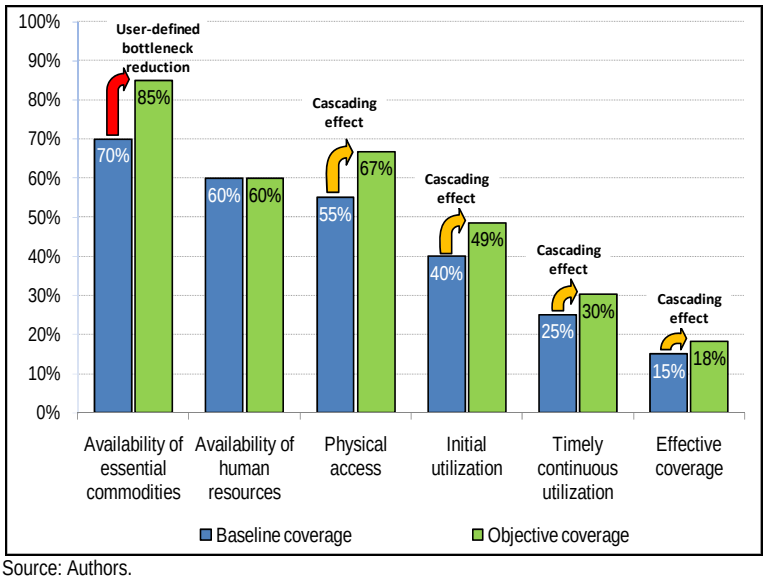
The developers make three key assumptions in the bottleneck analysis model:

1. Coverage determinant bottlenecks are hierarchical, with each bottleneck having a ceiling that is set by its preceding determinant and each, in turn, determining the ceiling of the next. For example, if physical access is 50% and initial utilization is 40%, the bottleneck for initial utilization is 10%.
2. Reductions in bottlenecks have a cascading effect, where changes in one produce changes in the ones that follow.
3. The magnitude of the cascading effect is set by the baseline ratio between coverage determinants.

To illustrate the last two assumptions, consider the case where the user decides to reduce only the availability of essential commodities bottleneck by half, and leave the remaining bottlenecks as they are. Availability of essential commodities coverage rises to 85%.[11] Availability of human resources remains unchanged and even though the user only chooses to reduce the essential commodities bottleneck, the determinants for physical access, initial utilization, timely continuous utilization, and effective coverage all rise automatically. Also, to illustrate how the tool computes the magnitude of this effect, the ratio between essential commodities and physical access in the baseline is 1.27 (70% ÷ 55%) which remains the same when compared to the objective coverage ratios of essential commodities to physical access (1.27 = 85% ÷ 67%). In sum, a 15% increase in essential commodities increases physical access in 12%; initial utilization in 9%; timely continuous utilization in 5% and effective coverage in 3%. The results of this example can also be seen in Figure 4.

[11] The bottleneck for availability of essential commodities is 30%, and a reduction of 50% of this bottleneck implies that availability of essential commodities coverage rises to 85%

Figure 4: Example: Cascading effect of reducing availability of essential commodities bottleneck



Source: Authors.

The analysis of this conceptual framework follows.

The order of precedence of coverage determinants appears arbitrary. Developers identified the stages of provision of services to be: availability, accessibility, and utilization. This is the order that generates the cascading effect. Note, though, that an increase in demand could increase utilization without there being an increase in availability of essential commodities or human resources. Notice also that changing the order would change the results, so the order matters.

The cascading effect is the tool's centerpiece and the strongest assumption. It can be argued that since the coverage determinants represent stages in the provision of health services, that these determinants are interrelated by construction. Yet, the question is how should the interrelation be represented? And how much should one determinant affect another determinant?

For example, the tool first assumes that greater availability of essential commodities increases accessibility, yet there is no argument for this effect, or for the link itself. For example, an increase in the number of syringes in a health facility does not mean that more people will have access to immunizations, because access may be limited by the travel distance. Second, the tool also assumes that greater availability of essential commodities increases utilization, although it has a smaller impact on utilization than on access. No empirical evidence is presented to support this assumption. A supportive argument for this assumption is that utilization is low because there is a lack of supply, and greater availability of essential commodities increases supply and thus utilization. But even if this were true, any assumption of the magnitude of this effect is arbitrary. For example, why should the magnitude of the effect be linear?

It is easier to argue in favor of physical access having an effect on utilization, when referring to the ability of the population of reaching the health provider. Only in the case of outreach services does it make sense to argue that greater access of the supply to the population increases utilization.

b. Formulas Used to Calculate Tool's Outputs

This section evaluates the formulas used to calculate the tool's outputs, which are "intervention cost" and "health outcome." The MBB computes the cost of increasing health intervention utilization coverage, presented as the additional or marginal costs of the intervention. To test the formulas, we follow through cell-by-cell all the formulas the tool uses in one intervention: condom use.

Intervention cost and health outcome

The Technical Notes (pages 92-93) identify the general cost formula to be the following:

$$\text{Total cost per service level} = \sum_{\text{Interventions}} \text{Intervention cost}$$

$$\text{Intervention cost} = \sum_{\text{Inputs}} \text{Marginal input cost}$$

$$\text{Marginal input cost} = \text{Input price} \times \text{Input quantity per intervention} \times \text{Target intervention quantity per population} \times \text{Population}$$

$$- \text{Input price} \times \text{Input quantity per intervention} \times \text{Baseline intervention quantity per population} \times \text{Population}$$

Cost of the user-chosen health interventions are computed by multiplying input quantities required for the intervention times input prices resulting in the total cost of the intervention. This tool makes two key assumptions during cost computations. First, the tool assumes that supply affects utilization. Second, the costs reflect system inefficiencies.

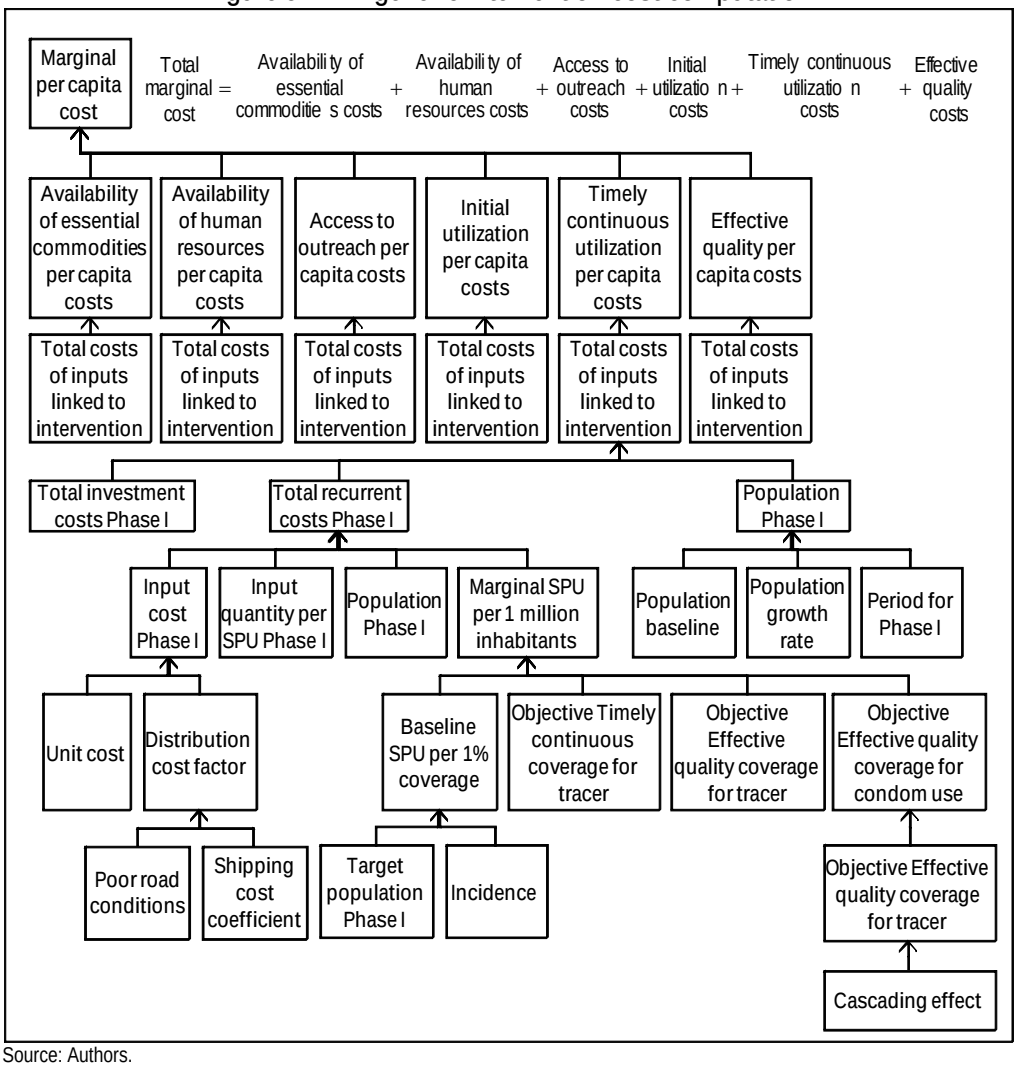
Costs are not presented per intervention; instead, costs are presented per service level. The MBB uses three levels of service: community-based, schedulable (preventive), and clinical. Regardless of the grouping, the MBB includes variable costs and fixed costs and even investment costs. Investment costs are computed either when the user includes a new intervention into the system that requires initial investment, or when the increase in coverage for an intervention requires investment costs. The quantities of inputs are based on country-specific norms that are entered in STEP 1 of the application of the tool. Input prices are also entered in STEP 1 and include transportation costs. An important note is that the MBB subtracts the cost associated to the baseline coverage of the intervention so that the final computation represents the cost of increasing coverage of interventions.

We present a generic figure of the cost computation for an intervention. Keeping in mind that the MBB is not designed to compute costs per intervention, this is an attempt to make a comparison with the other tools reviewed here. As mentioned above, the MBB classifies inputs associated to interventions per service delivery mode and coverage determinant. So, an intervention may have inputs linked that are classified in all coverage determinants, in some coverage determinants or in one.[12]

[12] We do not know if there is an intervention that has no inputs linked to it.

Consider the case of an input under time continuous utilization, this input is classified as recurrent or investment cost. The input cost is computed considering the unit cost and a distribution factor, where the latter is an estimate of the effect of poor road conditions and a shipping cost. Input quantity is the norm established by the user. The key part of this computation, though, is the change in coverage –in the figure is denominated "Objective SPU per 1 million inhabitants"[13]– which is computed based on the change in coverage specific to timely continuous utilization. Changes in this coverage can come directly from the reduction of the timely continuous utilization bottleneck or from the cascading effect of reductions in the previous coverage determinants (availability of essential commodities, availability of human resources, accessibility, or initial utilization).

Figure 5: MBB generic intervention cost computation



Source: Authors.

The Technical Notes (pages 92-93) identify the general health outcome formula to be the following:

[13] SPU stands for service production unit or target population of the associated cost center.

$$\text{Health outcome} = \frac{\text{Intervention effectiveness} \times \text{Population that benefits from the intervention} \times \text{Increase in intervention coverage}}{100\% \text{ coverage} - \text{Intervention effectiveness} \times \text{Population that benefits from the intervention} \times \text{Increase in intervention coverage}}$$

The intervention effectiveness is measured as the percent reduction the intervention is expected to generate on health indicators (i.e., infant mortality rate, neonatal mortality rate, maternal mortality rate, among others). The tool assumes that the intervention effectiveness is constant regardless of current coverage levels. The denominator of the formula is an attempt by the tool to correct the health impact of the increase in the intervention's coverage by the impact that the current coverage has on health. This adjustment increases the impact of the increase in intervention coverage, without a clear argument, and users should know this may result in an overestimation of impact assessment.

The MBB also has a built-in model that is central to all computations, including changes in intervention coverage and health outcomes. The model is a new approach that links supply and demand. This model assumes a relation between the six determinants of intervention utilization identified by the authors. The assumption is that availability of inputs has an impact on access and on utilization, in that order. There is no empirical evidence that supports this relation, nor its magnitude. It is unclear, though, whether there would be significant changes in results if the model did not link these determinants.

Intervention: Condom use

As mentioned above, the MBB was not designed to cost interventions, so to trace "condom use" –a non-tracer intervention of the HIV/AIDs prevention and care subpackage– through the tool we had to make the following simplifications:

- In I-Coverage:
    - The only bottleneck reductions will be within the subpackage where the chosen intervention is (HIV/AIDS prevention and care)
    - We reduce all bottlenecks within this subpackage by 50%;
- In I-Interventions, we excluded all other interventions for Phase I, Phase II, and Phase III;

These simplifications allow us to trace condom use since all other coverages are held constant, except for PMTCT (testing and counseling, AZT + sd NVP and infant feeding counseling) which is the subpackage's tracer intervention.[14]

The cost computations are basically found in "M-Cost" and Figure 6 illustrates the stages.[15] We begin with the more straightforward computations. The **input cost in Phase I** is $0.03 and it is computed using the following formula:

[14] Condom use has a one input that appears under initial utilization and under timely continuous utilization. In the first case the cost ends up being zero because the objective SPU per 1 million inhabitants was forced to zero.
[15] Due to the large amount of formulas, we were not able to include all of them in a single figure.

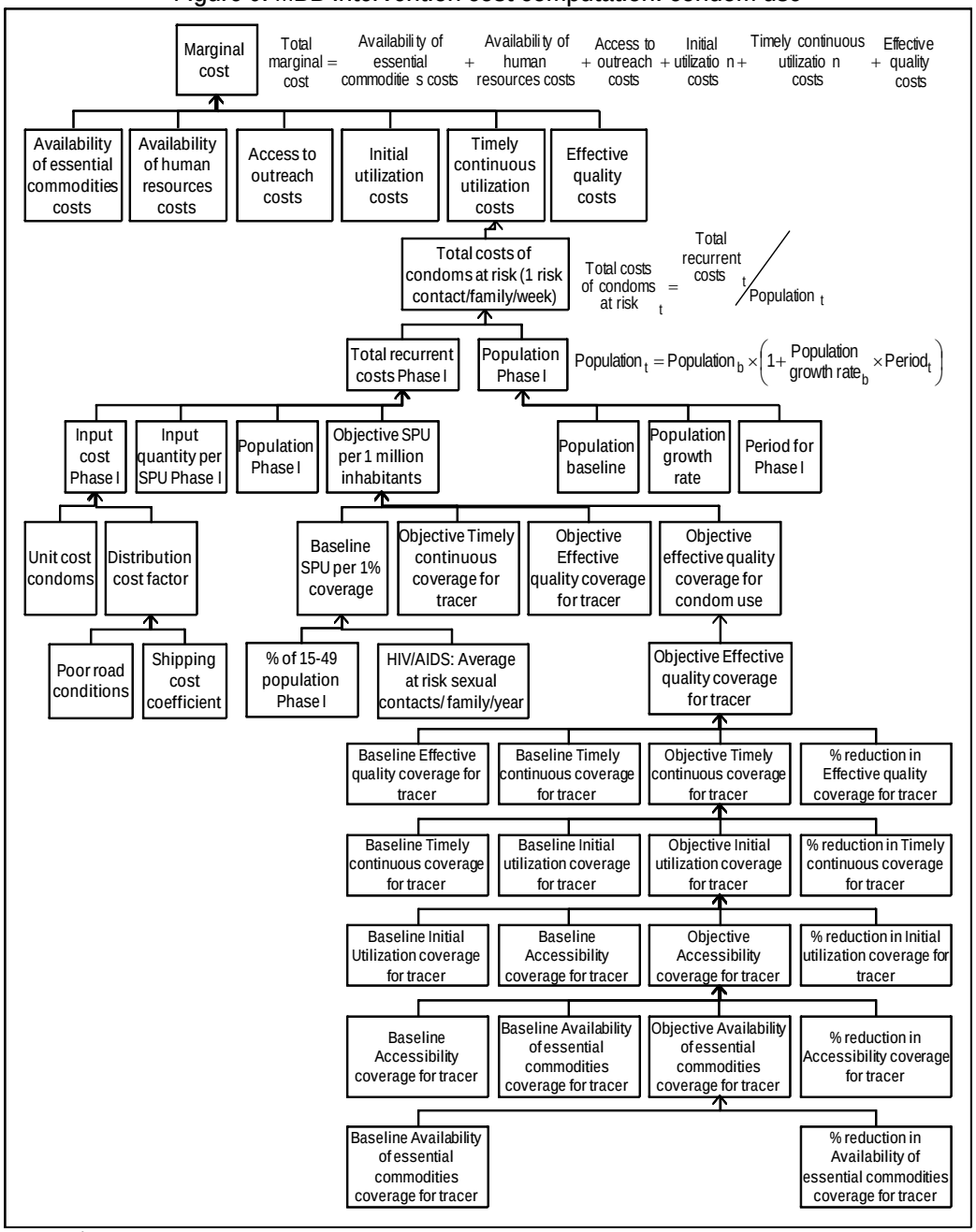
$$\text{Input cost}_{\text{Phase I}} = \text{Input cost}_{\text{condoms}} \times \text{Distribution factor}$$

$$\text{Distribution factor} = \text{Poor road conditions} \times \text{Shipping cost coefficient}$$

$$\text{Distribution factor} = 1.2 \times 1.2 = 1.44$$

$$\text{Input cost}_{\text{Phase I}} = 0.02 \times 1.44 = 0.029$$

Figure 6: MBB intervention cost computation: condom use



Source: Authors.

Input quantity per SPU is set at two thirds by the tool. **Population in Phase I** is 755.8 million and it is computed is simply by increasing the **population in Baseline** by the **population growth rate** times the **period** set by the user at 3 years, so that:

$$\text{Population}_t = \text{Population}_b \times \left(1 + \text{Population growth rate}_b \times \text{Period}_t\right)$$

$$\text{Population}_{\text{Phase I}} = 700_{\text{baseline}} \times (1 + 2.66\% \times 3) = 755.8 \text{ million}$$

The remaining element to compute the **total recurrent costs for Phase I** is the **objective SPU per 1 million inhabitants** which is 3,750.29.

$$\text{Objective SPU per 1 million fnhabitants} = \text{Baseline SPU per 1\% coverage} \times \text{Objective Effective quality coverage for condom use} \times \frac{\text{Objective Timely continuous coverage for tracer}}{\text{Objective Effective quality coverage for tracer}}$$

where :

$$\text{Baseline SPU per 1\% coverage} = \frac{\text{Proportion of 15 - 49 in population Phase I}}{2} \times \text{HIV/AIDS average risk sexual contacts per family per year} = \frac{44\%}{2} \times 52 = 114.57$$

$$\text{Objective Effective quality coverage for condom use} = \text{Objective Effective quality coverage for tracer} = 32.131\%$$

$$\text{Objective Timely continuous coverage for tracer} = 32.7\%$$

The **Objective timely continuous coverage for the tracer** is determined when the user inputs the desired level of bottleneck reductions for all coverage determinants of the tracer intervention. As mentioned above, we entered a 50% reduction of all bottlenecks in the "I-Coverage" worksheet. The table below shows part of the information needed and the results.

Table 8: Baseline coverage, bottleneck reductions and objective coverages

HIV/AIDS prevention and care essential commodities availability bottleneck reduction		50%
HIV/AIDS prevention and care human resources availability bottleneck reduction		50%
HIV/AIDS prevention and care accessibility bottleneck reduction		50%
HIV/AIDS prevention and care initial utilization bottleneck reduction		50%
HIV/AIDS prevention and care timely continuous utilization bottleneck reduction		50%
HIV/AIDS prevention and care effective quality bottleneck reduction		50%
Coverage determinants	Baseline	Phase I
Availability of essential commodities	57.8%	78.9%
Availability of human resources	73.6%	86.8%
Geographical accessibility	61.2%	81.3%
Initial utilization	7.2%	45.4%
Timely continuous utilization	3.2%	32.7%
Effective quality coverage	3.1%	32.1%

Source: MBB version 4 with authors edits.

Thus the **objective SPU per 1 million inhabitants** is:

$$\begin{matrix}\text{Objective SPU}\\ \text{per 1 million}\\ \text{fnhabitants}\end{matrix} = 114.57 \times 32.131\% \times \frac{32.7\%}{32.131\%} = 3{,}750.29$$

The tool computes the **baseline SPU per 1 million inhabitants** in the same manner and the result is 2,634.99:

$$\begin{matrix}\text{Baseline SPU}\\ \text{per 1 million}\\ \text{fnhabitants}\end{matrix} = 114.57 \times 22.5\% \times \frac{32.7\%}{3.1\%} = 2{,}634.69$$

Finally, the **total recurrent costs for Phase I** are:

$$\begin{matrix}\text{Total}\\ \text{recurrent costs}\\ \text{Phase I}\end{matrix} = \begin{matrix}\text{Input}\\ \text{costs}\\ \text{Phase I}\end{matrix} \times \begin{matrix}\text{Objective SPU}\\ \text{per 1 million}\\ \text{inhabitants}\end{matrix} \times \begin{matrix}\text{Input quantity}\\ \text{per SPU}\\ \text{Phase I}\end{matrix} \times \begin{matrix}\text{Population}\\ \text{Phase I}\end{matrix} - \begin{matrix}\text{Input}\\ \text{costs}\\ \text{Baseline}\end{matrix} \times \begin{matrix}\text{Baseline SPU}\\ \text{per 1 million}\\ \text{inhabitants}\end{matrix} \times \begin{matrix}\text{Input quantity}\\ \text{per SPU}\\ \text{Baseline}\end{matrix} \times \begin{matrix}\text{Population}\\ \text{Baseline}\end{matrix}$$

where,

$$\begin{matrix}\text{Input}\\ \text{costs}\\ \text{Phase I}\end{matrix} = \begin{matrix}\text{Input}\\ \text{costs}\\ \text{Baseline}\end{matrix} = 0.029$$

$$\begin{matrix}\text{Input quantity}\\ \text{per SPU}\\ \text{Phase I}\end{matrix} = \begin{matrix}\text{Input quantity}\\ \text{per SPU}\\ \text{Baseline}\end{matrix} = 0.67$$

$$\begin{matrix}\text{Total}\\ \text{recurrent costs}\\ \text{Phase I}\end{matrix} = 0.029 \times 3{,}750.29 \times 0.67 \times 755.8 - 0.029 \times 2{,}634.69 \times 0.67 \times 700.0 = 19{,}013.07$$

Dividing **total recurrent costs for Phase I** by population in Phase I gives us the Total costs of condoms at risk:

$$\begin{matrix}\text{Total costs of}\\ \text{condoms}\\ \text{at risk}\end{matrix} = \begin{matrix}\text{Total}\\ \text{recurrent costs}\\ \text{Phase I}\end{matrix} \div \begin{matrix}\text{Population}\\ \text{Phase I}\end{matrix}$$

$$\begin{matrix}\text{Total costs of}\\ \text{condoms}\\ \text{at risk}\end{matrix} = \frac{19{,}013.07}{755.8} = 2.52 \times 10^{-5}$$

Since this condoms is the only input linked to condom use, this total cost is equal to the marginal cost associated to condom use.

c. Conclusions

The MBB's main goal is to obtain results that can translate into a Medium Term Expenditure Framework. To do so, it uses a bottleneck analysis approach that generates costs by allocating inputs to coverage determinants and generates health outcomes from the evidence-based effectiveness of the interventions included in the tool. The bottleneck analysis is an interesting approach that links stages in the provision of care. Yet, how they are linked and the magnitude of this link is the central assumption of the tool. The correlation between accessibility and utilization has extensive evidence to support it, but not the other links. The more interesting result from this tool is its ability to link scaling up choices to health outcomes using the indicators for the MDG targets.

4. Experience using the tool[16]

The MBB Toolkit is an MS Excel file with 27 sheets organized into 4 categories: input, model, output, and reference. Accordingly, sheets are assigned a category by including in its name an "I", "M", "O", or "R," respectively. The user enters data only on the input ("I") sheets. As already noted, this tool is not intended to be self-explanatory or to be used without expert guidance, but rather to be used by Ministries of Health with the initial technical assistance from UNICEF and The World Bank. A five-day training course can be done in two ways: at the regional level, regrouping five to six countries, or at national level with a country application. Both types require a multidisciplinary national team blending competencies in health, economics including macroeconomics, epidemiology, statistics and Excel. A partially incomplete user manual is also available.

This tool has been applied in at least 26 countries, including Angola, Benin, Burundi, Burkina Faso, Cameroon, Comoros, Cote d'Ivoire, Ethiopia, Ghana, Guinea, Guinea Bissau, India, Lesotho, Liberia, Madagascar, Malawi, Mali, Mauritania, Mozambique, Niger, Nigeria, Rwanda, Sierra Leone, Swaziland, Uganda and Zambia. A website is not yet available.

[16] Information included in this section is based on information provided by the tool's developers and the reviewers' experiences.

B. RH Costing Tool Developed by UNFPA – July 2007 Draft

1. Tool description and overview

The Reproductive Health (RH) Costing Tool is a tool to help users estimate how much it would cost to scale up an essential package of reproductive health services from current to universal coverage levels. This model can also be used to cost the health system improvements required. This tool was designed to be used by health planners at the country level.

The tool can be used to answer the following questions:	The tool addresses the following MDG targets:	The tool includes the following interventions:
▪ What is the cost of scaling up health services relevant to the health MDGs?	▪ Achieve, by 2015, universal access to reproductive health (MDG 5)	▪ Child health interventions (newborns only) ▪ Family planning ▪ General health systems improvements ▪ HIV/AIDS prevention and treatment ▪ Malaria prevention and treatment (in the context of antenatal care) ▪ Maternal health interventions

This tool can help countries cost a scale-up package of reproductive health services by choosing the desired interventions from a list of 45 different interventions, as well as create a detailed list of all the drugs and supplies required to provide one year of RH interventions, complete with prices. The tool can also cost health system improvements such as investments to physical and human infrastructure.

2. Understanding the tool

This tool is divided into two parts, as it costs both reproductive health interventions and health system improvements. As such, the user inputs data into each part. The user first chooses which interventions to include from the tool's list of 45 different interventions (STEP 1). The user can also manually input up to three additional interventions. The below table outlines which interventions are built-in to the tool:

Table 9: List of Interventions Included in RH Costing Tool

Family planning	Short-term methods
	Oral contraceptive (pill)
	Injectables
	Condom – Male
	Condom – Female
	Long-term methods
	Intrauterine Device (IUD)
	Implant
	Sterilization – Female
	Sterilization – Male

Table 9: List of Interventions Included in RH Costing Tool

	Other methods
	Other method
	Emergency Contraceptives (EC)
ANC and Delivery Care	Antenatal care (ANC)
	Treatment of Severe Anemia
	Hypertensive Disorders of Pregnancy
	Malaria Prevention with ANC
	Malaria Treatment with ANC
	Delivery Care
	Postpartum Care
Obstetric Complications	Emergency Pre-Referral Care
	Prelabor Rupture of Membranes
	Prolonged Labor (> 18 hours)
	Forceps or Vacuum-Assisted Delivery (AVD)
	Cesarean Section (C-Section)
	Antepartum Hemorrhage
	Postpartum Hemorrhage
	Puerperal Sepsis
	Eclampsia / Severe Pre-eclampsia
	Post Abortion Complications (PAC)
Other Maternal Conditions	Obstetric Fistula (OF)
	Urinary Tract Infection (UTI)
	Mastitis
Newborn Interventions	Routine Newborn Care
	Newborn Sepsis / Infections
	Birth Asphyxia / Breathing Difficulties
	Low-Birth Weight (LBW)
HIV Related Interventions	Condom Programs targeting Commercial Sex Workers
	Condom Programs targeting Men who have Sex with Men
	Condom Programs targeting Adolescents (15-24)
	Condom Programs targeting Other vulnerable Populations
	Antiretroviral Therapy (ARV) First Line
	Antiretroviral Therapy (ARV) Second Line
	Prevention of Mother to Child Transmission of HIV (PMTCT)
	Voluntary Counseling and Testing for HIV (VCT)
	Post-Exposure Prophylaxis (PEP)
Sexually Transmitted Infections	Chlamydia
	Gonorrhea
	Syphilis
	Trichomonas
	Pelvic Inflammatory Disease (PID)
	Cervical Cancer Screening

Source: Annex 1: Description of Interventions, Reproductive Health Costing Model User Guide, UNFPA, July 2007, p. 2-3.

Furthermore, in STEP 1 the user has the ability to choose the time frame for the scale-up and must identify both current and desired coverage levels.

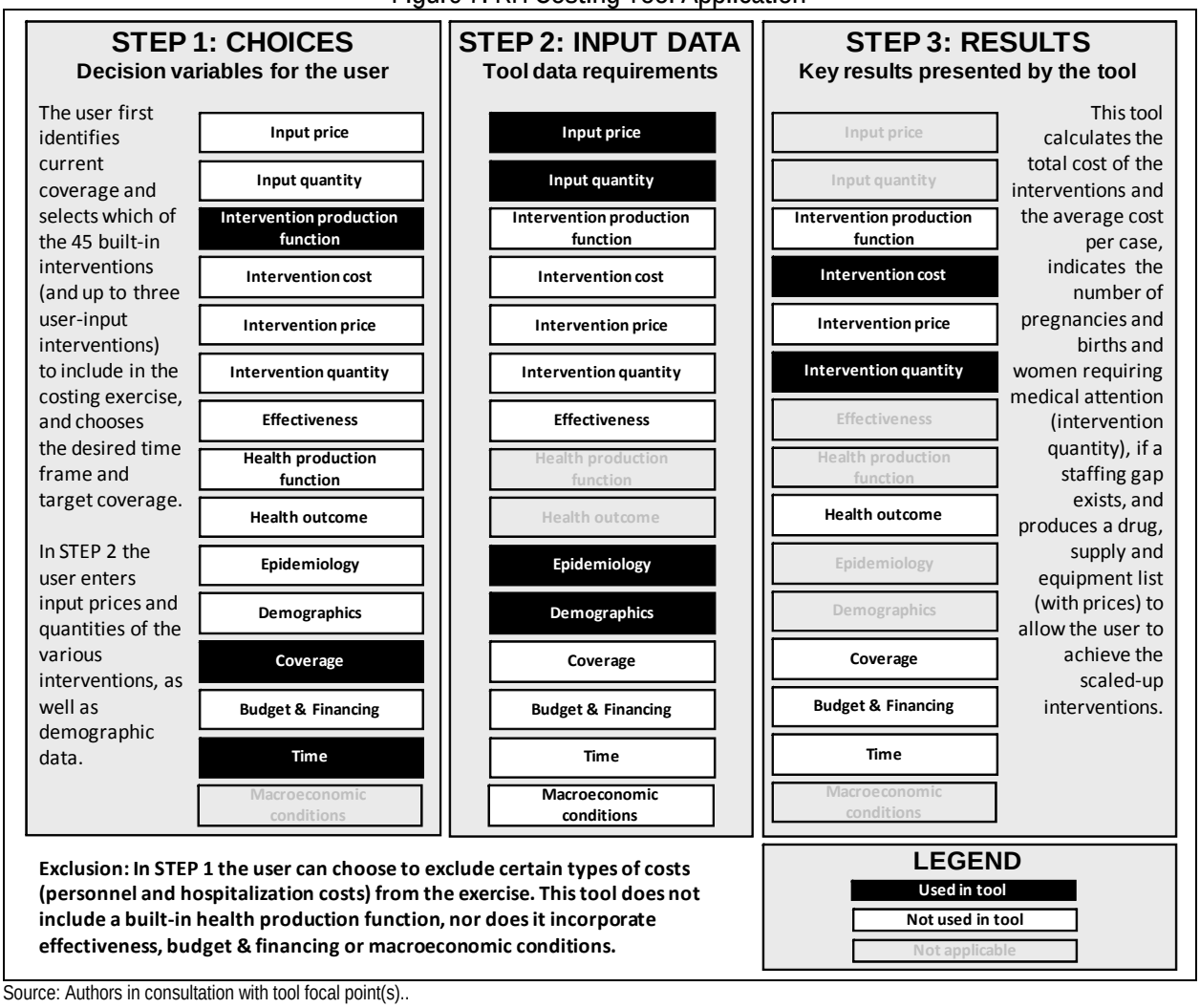
STEP 2 is broken down into two parts: the first part of the tool requires users to input population data and various input prices and quantities for family planning information, maternal and neonatal health incidence and prevalence data, and drug and medical supply prices. The

model provides country-specific suggested values for each of these inputs from a large database. The second part of STEP 2 requires further input prices and quantities related to the cost of health system improvements, including meeting, training and conference costs, health facilities costs, human resources staffing and costs, assessments and reviews activities and costs, referral costs, equipment costs, and costs of promotion and other outreach activities. Most of the data in the database comes from UN sources such as the UN Population Division, WHO's Global Burden of Disease and other databases, UNICEF's maternal health database, and Demographic and Health Surveys. The lists of drugs and supplies required to provide the different interventions are based on WHO treatment guidelines. Health facility-level data must be supplied by the user.

With this information, the tool calculates the total cost for each intervention (STEP 3), as well as the average cost per case. This tool also identifies if a staffing gap exists. This tool produces a list (with prices) to allow the user to acquire the drugs, supplies and equipment needed to scale-up the chosen interventions. Results are presented in table and graph format.

This tool does not incorporate budget & financing, effectiveness, health outcome, health production function, intervention price or macroeconomic conditions. The below figures helps to further explain this tool's logic and shows how the other elements of costing are incorporated.

Figure 7: RH Costing Tool Application



Source: Authors in consultation with tool focal point(s)..

This tool is driven by coverage-guided decision making. It can be used for medium- and long-term planning to help the user move from current coverage to the desired scale-up coverage levels in the context of existing national maternal or reproductive health plans or strategies. The time period 2007 to 2015 is built into the model, but these dates can be modified by the user. The model includes a built in production function based around the 45 essential RH interventions, activities and investments required to upgrade a health system. The tool does not compute health outcome,

3. Formula Review

a. Conceptual Framework Analysis

- Tool Objective: "Estimate how much it would cost to scale up a basic package of reproductive health services, ranging from family planning, antenatal and delivery care to emergency obstetric care and HIV/STI prevention and treatment, from current to universal coverage levels" (or any other desired coverage level) (user manual p. 4)

- How: Two-part model: first part estimates the direct costs associated with providing an essential package of 45 reproductive health interventions; second part costs out activities and investment required to improve the health system of a country in order to scale up and provide that package of RH interventions.
- Included: Part 1: drug, supply and staff time requirements; Part 2: investments in the infrastructure and human capital (building and rehabilitating medical facilities, equipping them, training and retaining staff, improving the referral and medical supply system) as well as demand creation, outreach, supervision, monitoring and evaluation activities required to upgrade a health system
- Limitations and Exclusions: The model aims to cover the most essential reproductive health interventions that can be provided in countries with limited resources and health system capacity. For that reason, it currently does not include more resource-intensive interventions such as the detection and treatment of reproductive cancers and the treatment of infertility. If a country wishes to include these interventions in its package of essential reproductive health interventions, these interventions can be manually added.
- Analysis: By outlining the formulas for the tool's main outputs, intervention cost and intervention quantity, and by following through one intervention as an example, we believe this tool's calculations are sound. Any costs excluded have been noted below.

b. Formulas Used to Calculate Tool's Outputs

This section will focus on the formulas used in Part 1 of the tool, although Part 2 is an integral part of the model focusing on more comprehensive facility cost calculations such as investments in infrastructure and human capital.

In evaluating the formulas used in Part 1 of the tool to calculate the main output (total cost of providing a package of essential reproductive health interventions), two kinds of computations are the basis for the total cost, which are "intervention cost" and "intervention quantity." To review the formulas in the tool, we follow through cell-by-cell all the formulas the tool uses for the intervention "Condom Male" (under Family Planning – Short-term methods). We use the case of Uganda for the years 2007-2015.

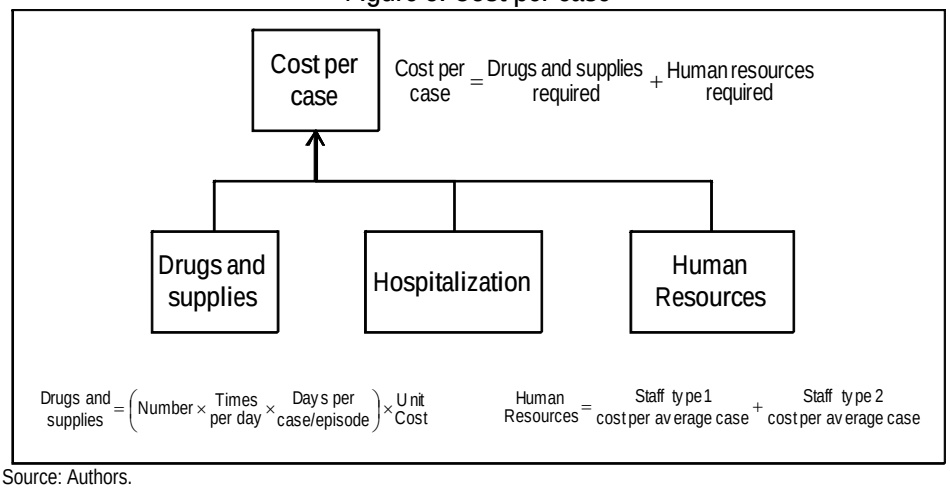
This section begins with a subsection with brief review of the generic formulas, the two next subsections present the computations for the selected intervention, and the final subsection presents the overall review.

Total cost of an intervention

The tool computes total cost based on the cost per case (what we refer to as intervention cost) and number of cases (intervention quantity). Intervention cost is computed once and can be projected in time either as a constant (assuming real costs) or adjusting for expected inflation. Then, each year the cost per case is multiplied by the number of cases to obtain the annual total cost.

The user manual (p. 5) identifies the general **intervention cost** or **cost per case** formula to be the following:

Figure 8: Cost per case



Source: Authors.

The tool computes total cost by multiplying the input prices by coverage. Since the user identifies the percent of the population receiving different treatment lines and the staffing allocation, these costs could represent either normative or actual costs. Normative costs would be the predetermined staffing allocation based on protocols. Actual costs are based on how the services are actually being delivered (which may differ from a protocol). The user also specifies input quantities; again these costs could represent either normative or actual costs. Part 1 is designed to cost the direct, variable cost associated with the different interventions. This includes drugs and medical supplies, personnel time and hospitalization costs that can be directly allocated to the specific interventions. The personnel costs as calculated in Part 1a+b will be useful only in certain types of costing exercises as only the staff time that is spent specifically on the interventions listed is costed. Neither down time nor time spent on other activities is accounted for in this approach.

In many cases it will be necessary to take a more comprehensive approach to personnel cost. In these cases it is recommended to use Part 1a+b solely for the calculation of drug and medical supply requirements and to use the more calculations of personnel costs in the health system part (Part 2) of the RH Costing model.

Drugs and supplies required represent the direct variable costs associated with the intervention. Drug prices are based on quotes from the UNICEF Supply Catalogue and the MSH International Drug Price Indicator. Part 1 also provides the possibility to calculate direct, variable costs associated with hospitalization, but in most cases the user would want to use the more comprehensive facility overhead cost calculations provided in Part 2 of the model. Personnel cost/salaries are based on information provided by WHO´s CHOICE project. The user determines the personnel that participate in the intervention, the gross annual salary(ies) for these personnel, the time spent in intervention and contacts per day and the number of days per visit.

In sum, the user defines the production function for the interventions being costed and personnel costs should be country-specific.

This tool also calculates **intervention quantity** or **number of cases** in the form of the number of women requiring interventions (based on the target population; pregnancies and births

are only used for maternal interventions. Family planning interventions are based on women of reproductive age, the contraceptive prevalence rate, STIs in men and women ages 15-59, incidence rates, etc.). The general formula is as follows (manual p. 25):

$$\text{Intervention quantity} = \text{Target population} \times \text{Incidence} \times \text{Coverage rate}$$

The user is asked to enter an incidence value for the first year and one for the last year of the projection. The incidence for the years in-between is then calculated using intrapolation and incorporated into the number of cases calculation. Coverage scale-up is linear but can be manually modified if desired.

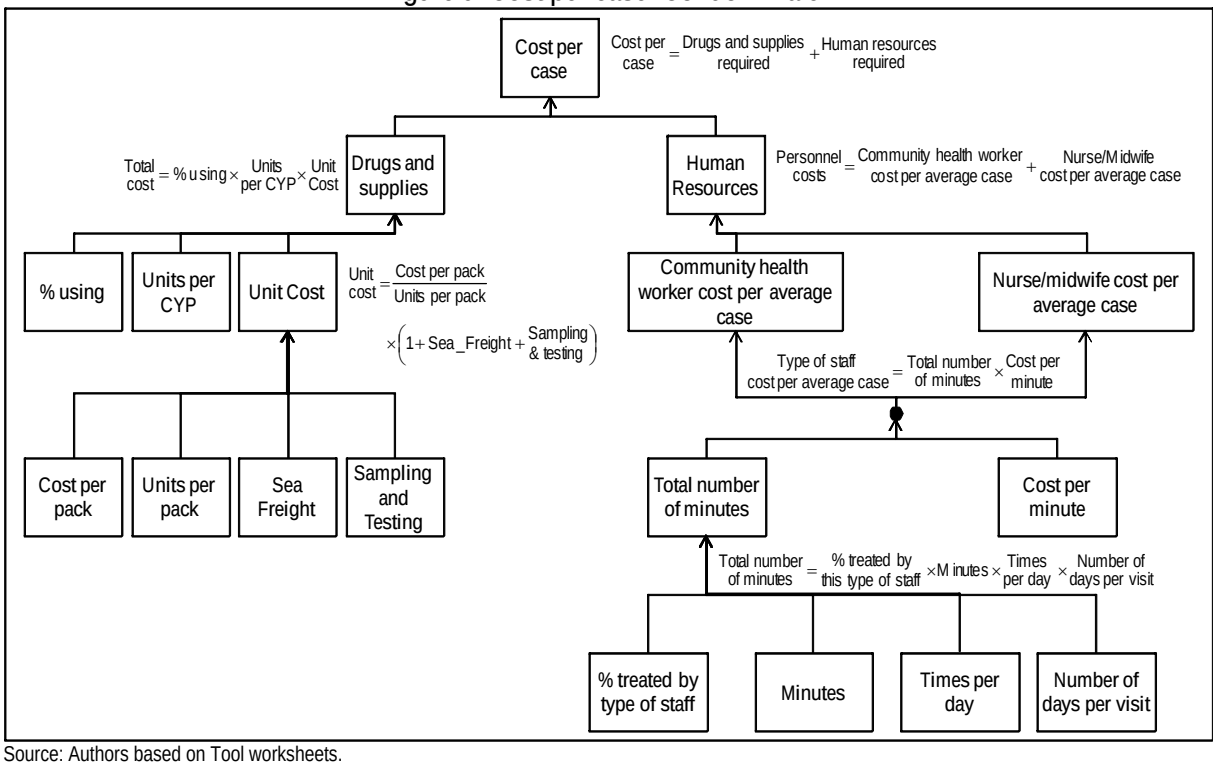
Intervention: Family Planning – Short-term methods – Condom Male

Calculations related to the intervention "Condom – Male" appear in the tool in two places:

- The cost per case in Part 1a of the tool ("RH Services - Cost per Case" workbook), on the "3. Condom-M" worksheet; and
- The population receiving the intervention in Part 1b, the "RH Services – Total Cost" workbook, "Pop Requiring Service" worksheet.

Figure 9 shows a flow diagram for all the computations and the formulas at each stage. The cost per case is the sum of the drugs and supplies required per case plus the human resources required per case.

Figure 9: Cost per case: Condom Male



Source: Authors based on Tool worksheets.

Drugs and supplies are calculated to be $2.85, based on the below calculations. The only supply item being considered is the pack of condoms (at a cost of $2.57 and with 144 units per pack), so the computations are straightforward. Sea freight is assumed to be 25% of the unit cost, and sampling and testing is assumed to be 8% of unit cost.

$$\text{Unit cost} = \frac{\text{Cost per pack}}{\text{Units per pack}} \times \left(1 + \text{Sea\_Freight} + \frac{\text{Sampling}}{\text{\& testing}}\right)$$

$$\text{Unit cost} = \frac{\$2.57}{144} \times (100\% + 25\% + 8\%) = \$0.024$$

$$\text{Total cost} = \%\,\text{using} \times \frac{\text{Units}}{\text{per CYP}} \times \text{Unit Cost}$$

$$\text{Total cost} = 100\% \times 120 \times \$0.024 = \$2.85$$

Personnel costs are calculated to be $0.30, as follows:

$$\text{Personnel costs} = \frac{\text{Community health worker}}{\text{cost per average case}} + \frac{\text{Nurse/Midwife}}{\text{cost per average case}}$$

$$\frac{\text{Type of staff}}{\text{cost per average case}} = \frac{\text{Total number}}{\text{of minutes}} \times \frac{\text{Cost per}}{\text{minute}}$$

$$\frac{\text{Total number}}{\text{of minutes}} = \frac{\%\text{ treated by}}{\text{this type of staff}} \times \text{Minutes} \times \frac{\text{Times}}{\text{per day}} \times \frac{\text{Number of}}{\text{days per visit}}$$

$$\frac{\text{Community health worker}}{\text{cost per average case}} = 75\% \times 35 \times 1 \times 1 \times \$0.00 = \$0.00$$

$$\frac{\text{Nurse/Midwife}}{\text{cost per average case}} = 25\% \times 35 \times 1 \times 1 \times \$0.03 = \$0.30$$

$$\text{Personnel costs} = \$0.00 + \$0.30 = \$0.30$$

Tool's data inputs for these computations that are built-in to the tool are: % treated by this type of staff, minutes, times per day and no. of days/visits. This information should be reviewed and, if time and resources allow it, adjusted if better data is available. The current default set up assumes that 75% of condoms are provided at community level through community health workers and 25% at clinic level through nurses. These assumptions are, of course, very specific to the country and would be expected to be changed by the user.

Notice that there are two personnel types included for this intervention (community health worker and a nurse or midwife), and that the cost per minute of the community health worker is zero. The model tries to provide default values for all inputs, but the user is expected to review those inputs and replace them with local values, especially in the case of salaries. The WHO database used for default salaries does not include salaries for community health workers; for that reason, the default is zero. In a costing tool application, the user would have filled in the salary on the salary sheet and thus the cost would not show up at zero.

The total personnel cost per case is $0.30. This $0.30 includes an estimated time in the provision of the intervention of 35 minutes, where 20 minutes are for counseling and the remaining 15 are for 3 resupply visits of 5 minutes each.

Finally, the cost per case is computed to be $3.15 by adding the two components:

$$\text{Cost per case} = \text{Drugs and supplies required} + \text{Human resources required} = \$2.85 + \$0.30 + \$0.00 = \$3.15$$

Intervention quantity, or number of users, is calculated based on data from the UNPD Population Projections, Medium Variant, 2004 Revision (Part 3 – RH Database.xls). For the case of "Condom – Male", the tool uses the population group "Women of Reproductive Age (15-49)" from the UNPD database to estimate the number of users[17]. The formula for number of users is:

$$\text{Total number of users} = \text{Women in reproductive age (15-49)} \times \text{\% of women in union} \times \text{Contraceptive prevalence rate (all methods)} \times \text{Method mix : condom-male}$$

$$\text{Total number of users (for 2007)} = 6{,}491{,}202 \times 65\% \times 23\% \times 8.3\% = 80{,}512$$

So, the tool computes the number of "Women in reproductive age (WRA) in Union" as WRA (15-49 years of age) times the % of women in union. Then, it multiplies this population group by the contraceptive prevalence rate (CPR) for all methods and then by the percentage who use condoms (Method mix: condom – male). All this information is provided by the tool, but the tool suggests that the user must review the numbers and if possible update the information.

To project the number of cases in time, the tool asks the user to specify target coverage. The tool provides several options to specify the target contraceptive coverage (see user guidelines, p. 20):

1. As a specific contraceptive prevalence rate to be achieved (all methods or modern methods only)

2. As an unmet need level to be achieved

3. As a proportion of family planning demand satisfied (PDS) 6 by the target year 2015

In this example, we chose to specify a contraceptive prevalence rate to be achieved, including all methods, of 60% by 2015. Given this, the tool includes a formula that computes percent of demand satisfied, given by the formula:

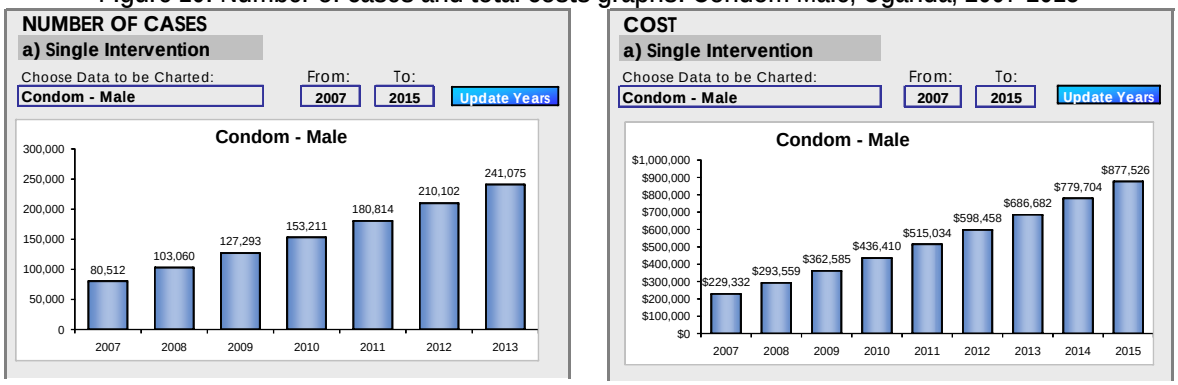
$$\text{\% of demand satisfied} = \frac{\text{Contraceptive prevalance rate (all methods)}}{\text{Contraceptive prevalance rate (all methods)} + \text{Unmet need}}$$

[17] The calculations for the male condom are rather confusing as married women of reproductive age are used as the multiplier which is technically correct. To ensure consistency among methods, women are used as proxies for couples needing protection.

Part 3 of the tool provides information on contraceptive prevalence – both all methods and modern methods only as well as on unmet need based on the most recent DHS. Depending on the option chosen by the user, the model will automatically compute the target CPR for the final year.

Finally, the tool computes the total cost of the intervention per year by multiplying the cost per case and the number of cases each year. The tool presents the results in the following figures:

Figure 10: Number of cases and total costs graphs: Condom Male, Uganda, 2007-2015



Source: Authors based on Tool worksheets.

c. Conclusions

The tool says it estimates how much it would cost to scale up a basic package from current to universal coverage levels. The tool performs well based on a bottom-up costing framework. Input prices are standard and built-in to the tool, and the production function of the intervention are also built-in to the tool. Yet, the user inputs target coverages, so the tool only computes universal coverage when this is the users target level. This means the tool is more flexible to country needs.

4. Experience using the tool[18]

This tool consists of four Excel workbooks, three of which require data entry. A detailed user manual is available, which walks users step-by-step through the tool using examples and screen shots from tool. For increased usability, the model is color-coded. Red and blue cells may be prefilled with country-specific values from a large database; red font denotes an input that under all circumstances should be reviewed by the user and replaced with better or more recent local data where available, whereas blue cells contain more universal data and can be changed if desired, but likeliness of data having large impact on results is slim. Black cells denote formulas or descriptions and cannot be changed. The developer suggests one to four days of training prior to using the tool, depending on user's experience and background. Skills required to use the tool include Excel knowledge, reproductive health knowledge and some experience with finance or

[18] Information included in this section is based on information provided by the tool's developers, the reviewers' experiences, and the experiences of one user from Indonesia.

budgeting. The developer suggests a time commitment for using this tool of one to two weeks, although it took one user from Indonesia one week to run the program and a total of four months from data entry to results[19].

The user from Indonesia reported needing both training and technical assistance to use the tool. This user consulted the tool's user manual but found interaction with stakeholders and reproduction health experts more useful. While navigation is "easy and enjoyable," careful attention to detail is required. This user was able to adapt the tool to local circumstances, and the user was satisfied with the results provided (when UNICEF price quotations were overridden with local data), therefore deeming the costing exercise as "successful." However, the user suggested the need to include other costs to support the increase in coverage rates needed to meet MDG target, for example, the cost to recruit additional midwives, operational costs for RH services, cost of outreach programs and investment costs.

This tool has been applied in at least fourteen countries since 2005, including Armenia, Azerbaijan, Dominican Republic, Ethiopia, Georgia, Ghana, Indonesia, Lao PDR, Mongolia, Tajikistan, Turkey, Uganda, Yemen and Zimbabwe. Some of these countries used previous versions of the RH Costing Tool which did not include the health systems component.

[19] This exercise in Indonesia included costing for 19 provinces and should be considered a special case.

C. iHTP Simulation Tool Developed by the WHO / MRC – Version 2.1.17/2.1.18, November/December 2007

1. Tool description and overview

The Integrated Healthcare Technology Package (iHTP) Simulation Tool is a tool to help users improve health service delivery and resource planning by demonstrating which health services are necessary based on the target population demographics and disease profiles and cost-effectiveness. This tool was designed to be used by planners, decision-makers and managers at all levels of the healthcare system. The tool can also be used by technical assistance agencies.

The tool can be used to answer the following questions:	The tool addresses the following MDG targets:	The tool includes the following interventions, although the users can also create scenarios for any desired interventions:
▪ What are the most effective interventions? ▪ What is the cost of scaling up health services relevant to the health MDGs? (partially) ▪ What is the most cost-effective strategy to reach the health MDGs? (partially) ▪ What health MDGs can be achieved with available resources?	▪ Reduce the prevalence of underweight children under five years of age (MDG 1) ▪ Reduce by two-thirds, between 1990 and 2015, the under-five mortality rate (MDG 4) ▪ Reduce by three-quarters, between 1990 and 2015, the maternal mortality ratio (MDG 5) ▪ Achieve, by 2015, universal access to reproductive health (MDG 5) ▪ Have halted by 2015 and begun to reverse the spread of HIV/AIDS (MDG 6) ▪ Achieve, by 2010, universal access to treatment for HIV/AIDS for all those who need (MDG 6) ▪ Have halted by 2015 and begun to reverse the incidence of malaria and other major diseases (MDG 6)	▪ Child and adult immunizations ▪ Child health interventions ▪ Family planning ▪ General health systems improvements (partially) ▪ HIV/AIDS prevention and treatment ▪ Malaria prevention and treatment ▪ Maternal health interventions ▪ TB prevention and treatment

In addition to costing, this tool can help users determine if all required resources needed to deliver a defined set of interventions, services or packages are available. Along the same lines, the model can help users analyze if resources are being used rationally, and can identify the most optimal mix of inputs. The tool can be used to determine the resource requirements for any mix of services for various levels of care.

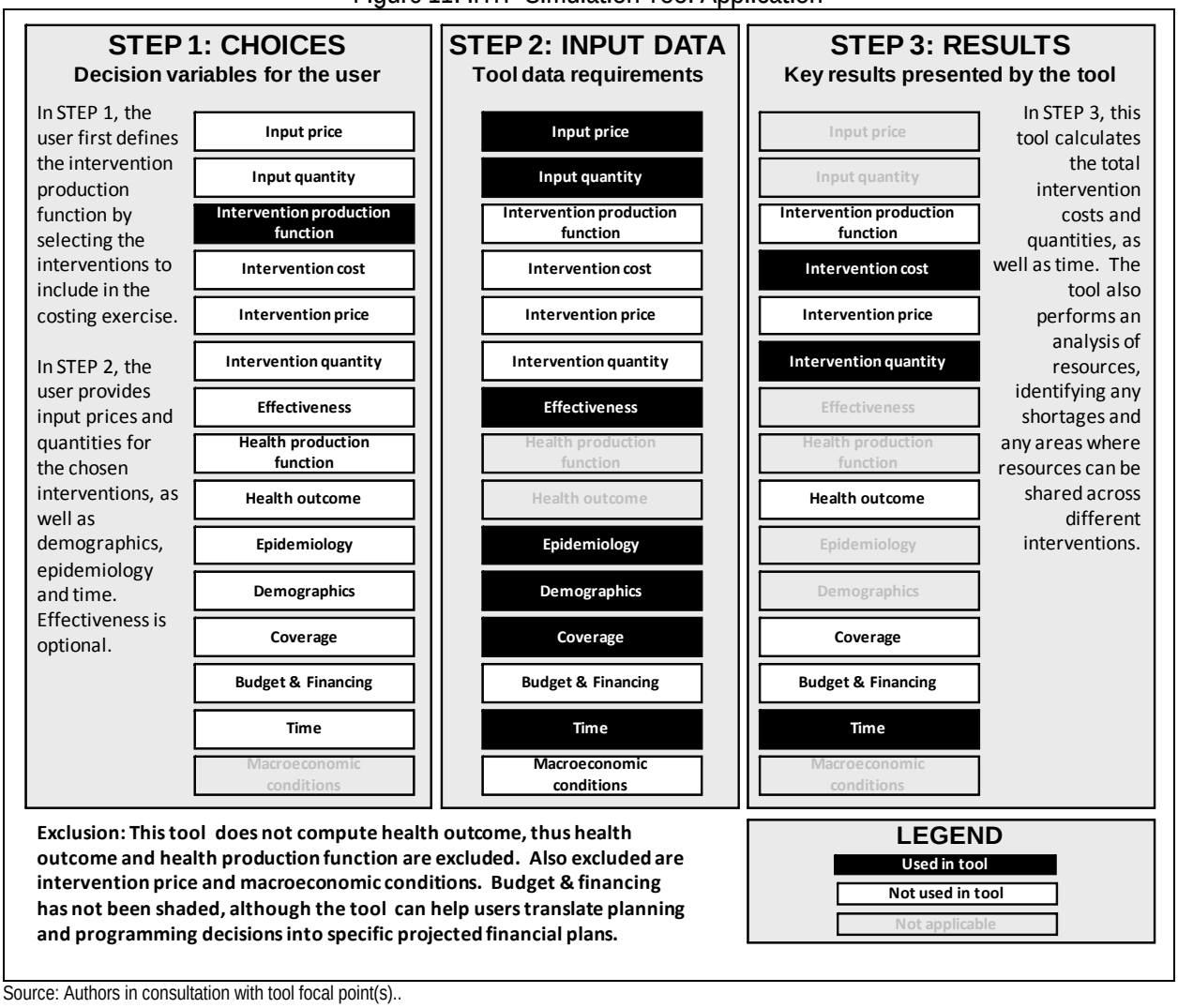
2. Understanding the tool

This tool uses intervention-based resource planning and costing as a conceptual framework to identify the optimal mix of resource inputs. The tool itself is highly flexible and adaptable to local conditions.

Users of this tool first select the interventions (called scenarios) to include in the costing exercise (STEP 1). Built into the tool are 6,000 WHO scenarios and procedures linked to the International Statistical Classification of Diseases and Related Health Problems (ICD). In STEP 2, the tool asks the user for the following input information: coverage, input quantities and prices, demographical and epidemiological data, as well as time. Effectiveness is an optional input. Specific input requirements are: procedure duration, percentages for several decision possibilities, criticalities of resources/technologies, pharmaceutical dosages, human resource effectivity and technology constraints. The tool includes a medical equipment database, pharmaceutical database based on WHO pharmaceutical database, clinical guidelines adaptable to any country situation, epidemiological profiles and other built-in data linked to the ICD from which some of this information can be taken. As results in STEP 3, the tool identifies the most optimal mix or inputs from STEP 2, and thus calculates intervention cost and intervention quantity (in the form of resource type and quantity). The tool also identifies where resources can be shared and produces a schedule of resources and determines any resource gaps. Time is also a result.

The following elements are not included in this tool: health outcome, health production function, intervention price, macroeconomic conditions. Although budget & financing has not been shaded in below figure, the tool can help users translate planning and programming decisions into specific projected financial plans. The below figure further helps to explain this tool's logic and shows how the different elements of costing are incorporated.

Figure 11: iHTP Simulation Tool Application



Source: Authors in consultation with tool focal point(s)..

This tool uses coverage-guided decision making, with budget constraint, for short-, medium- and long-term planning. The tool does not make health impact calculations.

3. Formula Review

a. Conceptual Framework Analysis

- Tool Objective: Recognizing that "effective and efficient healthcare delivery is dependent on the availability of the right mix of healthcare technologies required for delivery of specific health interventions," this tool tries to help users "to ensure that all resources needed for any particular medical intervention are available in an adequate mix that is specific and particular to the local needs and conditions." (website)
- How: program-based (non-Excel) tool allows users to determine which services are necessary and cost-effective given available resources.

- Included: over 6,000 WHO scenarios and procedures and the corresponding resources and technology requirements. Tool also includes healthcare needs, disease profiles, patient demographics, clinical practice, medical device availability and system capacity for its management. Users are able to create scenarios for any interventions.
- Limitations and Exclusions: Developers are currently working to add built-in immunizations scenarios.

b. Formulas Used to Calculate Tool's Outputs

This section evaluates the formulas used to calculate the tool's main outputs: intervention cost and intervention price. Because this is a program-based (non-Excel) tool, we were not able to trace an intervention to verify the formulas used. However, after discussing the formulas used to calculate the tool's outputs, we do provide some general concluding remarks about the formulas.

Intervention cost, intervention price and intervention quantity

This section evaluates the formulas used to calculate the tool's two kinds of outputs, which are "intervention cost" and "intervention quantity."

$$\text{Intervention Operating cost} = \text{Total technology Operating cost}$$

$$\text{Total technology Operating cost} = \text{Human Resource Operating cost} + \text{Medical Device Operating cost} + \text{Pharmaceutical Operating cost} + \text{Facility Operating cost}$$

$$\text{Re-usable technology Operating cost} = \text{Total number of patients requiring the intervention} \times \text{Required time per patient in minutes} \times \text{Technology cost per minute}$$

$$\text{Consumable technology Operating cost} = \text{Total number of patients requiring the intervention} \times \text{Required time per patient in minutes} \times \text{Technology cost per minute}$$

where :

$$\text{Technology cost per minute} = \text{Technology cost per year} \div \text{Technology available minutes per year}$$

$$\text{Technology cost per year} = \frac{\text{Capital cost}}{\text{Life span in years}} + \text{Total recurrent cost per year}$$

$$\text{Total number of patients requiring the intervention} = \text{Population indicator} \times \text{Coverage rate} \times \text{\% patients presenting at level}$$

This tool computes operating costs of interventions. These operating costs are split between re-usable (i.e. human resources, re-usable devices and facilities) and consumable technology (i.e. pharmaceuticals and disposable devices). The tool considers the depreciation of re-usable inputs like devices and facility, hence incorporating fixed costs of providing an intervention.

The intervention quantity is based on need, where need is computed based on the incidence of the health problem that requires the intervention (for example, total number of eclampsia cases), intervention coverage rate (for example, 60% coverage of eclampsia) and also level of care (for example, percentage of patients that receive the intervention in the first level of care). Including level of care is important, because it recognizes the differences in costs that arise across care levels.

Comments

We were unable to trace interventions in this tool because it is a program-based tool. Although users do not need to see the inner workings of the tool, it is our opinion that greater information regarding computations should be provided to the users.

4. Experience using the tool[20]

This tool is a program-based (non-spreadsheet) software with thousands of interventions ("scenarios") built-in. Some data is also available as part of the tool. This tool has been used in China, Democratic Republic of Congo, Kyrgyzstan, Malawi, Mexico, Mozambique, Namibia, South Africa, Sri Lanka and Ukraine. Nearly two dozen other countries have been introduced to the tool but have not used it as of yet.

Developers suggest users attend a training workshop of three to five days to become familiar with the software, and three to six months to use the tool and get results. Past users of the tool reported it takes at least one month to get results from the tool, with one user using the tool for eight-plus months. All users required technical assistance in doing so. In additional to the help files (somewhat incomplete at present, according to one user from Ukraine), there is a resource kit available for post-training support. The team of users should include clinical experts and those who can provide information on epidemiology and costs. Basic computer skills are required for all users.

Users of the tool reported navigation of the tool to be "easy," although one user from the Ukraine reported experiencing initial problems with new features and updates. Users reported they were able to adapt the tool to their local needs, and that the costing exercise was "successful." Two of three users were satisfied with the results, calling them "accurate and useful"; the team of users from Mexico were partially satisfied and would like the tool's features to continue to be refined. The user from the Ukraine reported that it would be useful to have exact definitions for each type of cost, as well as access to the formulas used in the tool's calculations.

More information about the tool can be found on the tool's website, http://www.ihtp.info.

[20] Information included in this section is based on information provided by the tool's developers, the reviewers' experiences, and the experiences of three users from the Democratic Republic of the Congo, Mexico and Ukraine.

D. Spectrum: PMTCT Cost Effectiveness Developed by Constella Futures/Futures Institute – Version 1, January 2002

1. Tool description and overview

Spectrum consolidates previous models into an integrated package; Prevention of Mother-to-Child Transmission (PMTCT) is one of the modules included in Spectrum and can be used for evaluating strategies to prevent mother-to-child transmission of HIV. This tool was designed to be used by public sector policy makers and planners.

The tool can be used to answer the following questions:	The tool addresses the following MDG targets:	The tool includes the following interventions:
▪ What is the cost of scaling up health services relevant to the health MDGs? ▪ What is the impact of interventions on health MDGs? ▪ What is the most cost-effective strategy to reach the health MDGs?	▪ Have halted by 2015 and begun to reverse the spread of HIV/AIDS (MDG 6) ▪ Achieve, by 2010, universal access to treatment for HIV/AIDS for all those who need (MDG 6)	▪ HIV/AIDS prevention and treatment ▪ Maternal health interventions

This program is designed to assist public sector policy makers and planners to make public policy decisions by quickly generating alternative projections as the result of varying one or several of the model assumptions and forecasting future program needs and costs to achieve a particular goal.

2. Understanding the tool

This tool uses as a conceptual framework the idea users can make better decisions about preventing HIV/AIDS vertical transmission if they are able to evaluate the costs and the benefits of specific courses of action. As such, the current program allows the user to choose from 7 built-in treatments to include in the costing exercise, as well as a no-treatment option. The interventions included are: Long-course ZDV; Short-course ZDV (Thailand regimen); Short-course ZDV - PETRA Arm A; Short-course ZDV - PETRA Arm B; Neonatal only; Nevirapine HIVNET 012 protocol; Universal Nevirapine.[21] The user also defines the time frame for the projections, as well as the desired coverage (STEP 1).

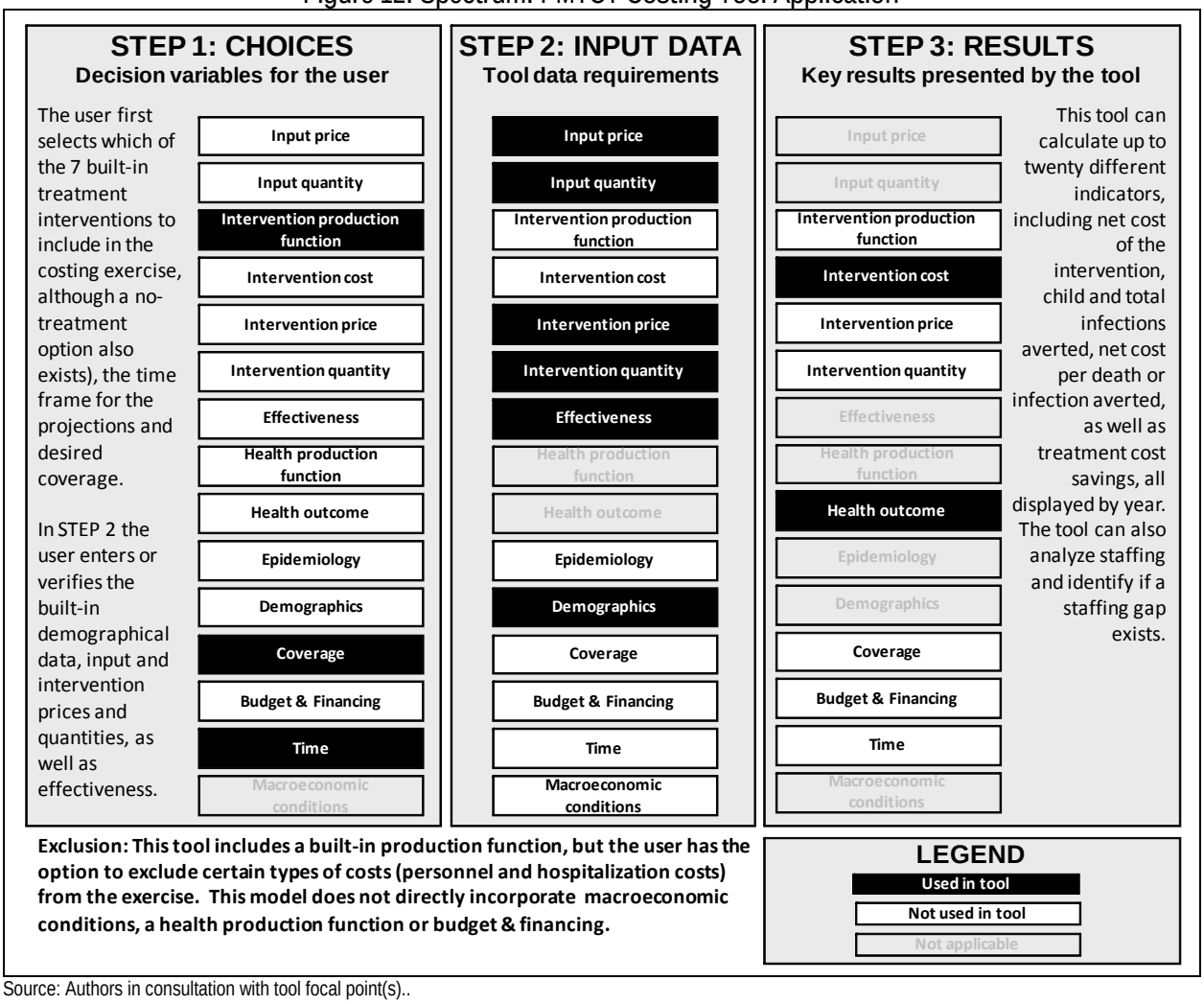
In STEP 2, the user enters or verifies the built-in demographics data, input prices and quantities and effectiveness. Much of the data is built-in (included within the tool) and should be verified, such as the vertical transmission rate of HIV. Other data is more user-specific and must be entered from scratch, such as user fees to offset intervention costs. The tool stresses the need to have made public policy decisions prior to starting to use the tool.

[21] This model was revised in January 2008; the treatment options included in the new version are Single dose Nevirapine, Dual prevention ART, Triple prevention ART, None, and up to four user-specified other options.

In STEP 3, the tool calculates up to twenty different indicators, including child and total infections averted, treatment cost savings, net and total intervention costs, and net cost per infection or death averted. The tool shows how costs are distributed between various elements of an intervention (i.e. what portion of an intervention corresponds to staffing, formula, HIV testing, etc.). The tool can also analyze staffing and identify if a staffing gap exists. These results are presented in various charts and graphs.

This tool does not directly incorporate the following elements: budget & financing, health production function, macroeconomic conditions. However, these elements are included in the model to the extent that they are reflected in the personnel costs and judgments about feasible coverage. The below figure summarizes how this tool incorporates the various elements of costing.

Figure 12: Spectrum: PMTCT Costing Tool Application



Source: Authors in consultation with tool focal point(s)..

This tool is driven by impact-guided decision making. It can be used for medium- and long-term planning. The model includes a built in production function based around the 7 possible treatment options, as well as the no-treatment option. The total costs of the intervention

are compared to the number of infections and deaths averted to calculate the cost-effectiveness ratios. In this respect, the model recognizes budgetary constraints but it shows expenditures and savings separately since they often accrue to different budget sectors and, thus, do not represent a direct trade-off in any particular budget domain.

3. Formula Review

a. Conceptual Framework Analysis

- Tool Objective: to consolidate previous models into an integrated package for determining the future consequences of today's reproductive health programs and policies.
- How: program-based (non-Excel) tool evaluates the costs and benefits of intervention programs to reduce vertical transmission of HIV. Calculates the cost of appropriate treatment for babies born under three circumstances: where the mother is known to be HIV+, where the mother is known to be HIV-, and where the mother's HIV status is unknown.
- Included: seven built-in treatment choices, as well as several additional coverage choices.
- Limitations and Exclusions: Does not take into consideration actual service availability (appropriate counseling, testing, training, formula, hospital for C-section birth, etc.) in the particular country setting. Productivity gains contributed by those children who are not HIV+ (due to the intervention) are not considered. Excludes treatment costs after the initial postpartum period and the costs associated with raising an orphan child.

b. Formulas Used to Calculate Tool's Outputs

This section evaluates the formulas used to calculate the tool's main outputs: intervention cost and health outcome. Although this tool is program-based, we are able to review the formulas the tool uses for the intervention "Pretest counseling" using calculation information provided by the developer.[22]

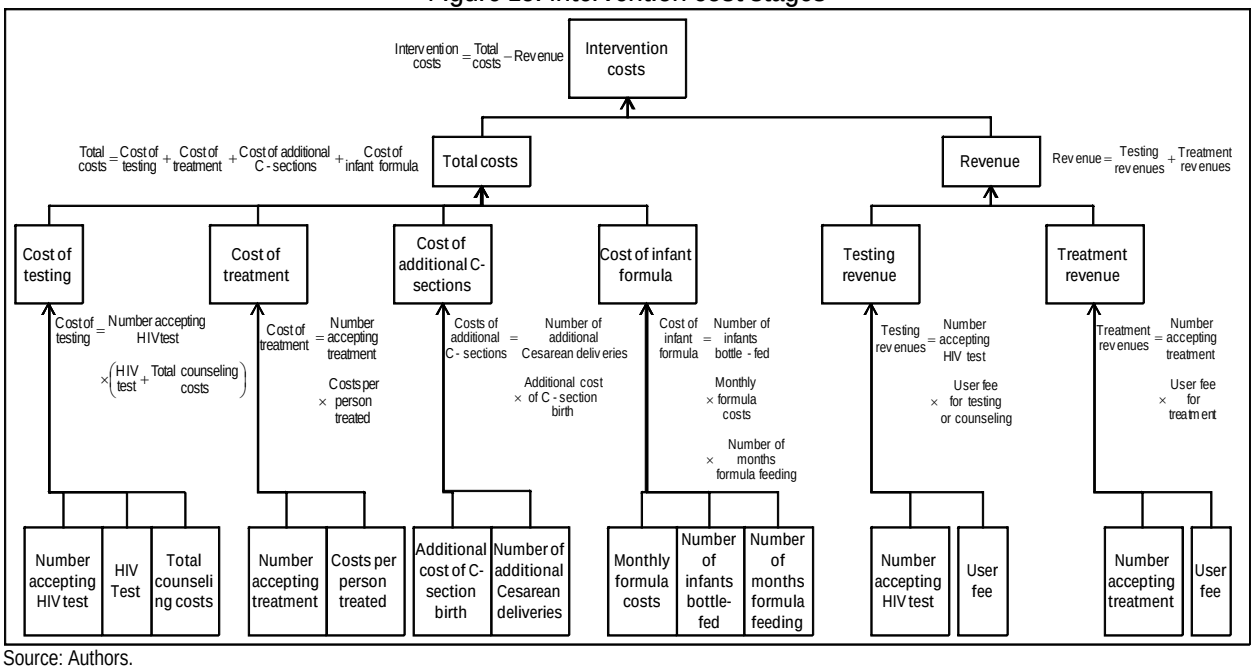
This section begins with a subsection with brief review of the generic formulas, the two next subsections present the computations for the selected intervention, and the final subsection presents the overall review.

Intervention cost and health outcome

This tool produces as outputs intervention cost and health outcome.

[22] Developers provided an MS Excel file with the computations the tool makes. It includes sample data, but they do not indicate for which country the data is for.

Figure 13: Intervention cost stages



Source: Authors.

Intervention cost is calculated using the following formula (see manual, p. 86):

$$\text{Intervention Costs} = \text{Total Costs} - \text{Revenue}$$

where :

$$\text{Total Costs} = \text{Cost of Testing} + \text{Cost of Treatment} + \text{Cost of Additional C-sections} + \text{Cost of Infant Formula}$$

$$\text{Revenue} = \text{Testing Revenues} + \text{Treatment Revenues}$$

$$\text{Cost of Testing} = \text{Number Accepting HIV Test} \times \left(\text{HIV Test} + \text{Total Counseling Costs}\right)$$

$$\text{Cost of Treatment} = \text{Number Accepting Treatment} \times \text{Costs per Person Treated}$$

$$\text{Cost of Additional C-Sections} = \text{Number of additional Cesarean deliveries} \times \text{Additional Cost of C-Section Birth}$$

$$\text{Cost of Infant formula} = \text{Number of Infants Bottle-Fed} \times \text{Monthly Formula Costs} \times \text{Number of Months Formula Feeding}$$

$$\text{Testing Revenues} = \text{Number Accepting HIV Test} \times \text{User Fee for Testing/Counseling}$$

$$\text{Treatment Revenues} = \text{Number Accepting Treatment} \times \text{User Fee for Treatment}$$

The computation of intervention costs in this tool is the difference between total costs (of the intervention) minus revenues. This represents the intervention costs that require financing. Total costs represent the costs of the intervention, which include the cost of testing, treatment, additional C-sections and infant formula, or the variable costs of the intervention. No fixed costs

appear to be taken into consideration, such as the rental rate of the facility where the testing and counseling is taking place, or salaries of the health personnel providing care. The formulas for revenues are straight-forward, calculated by multiplying the price (user fee) by the quantity.

Costs are calculated at each stage of the process, including testing, counseling, treating, delivery and breastfeeding replacement. Costs of raising orphan children are not included. When making health impact calculations, unlike other programs this model does not include the benefits of productivity gains contributed by those children who are not HIV+.

Health outcome is measured as the number of health problems being averted or a reduction in morbidity (see manual, p. 86-87). For example, the number of infant infections averted is the number of infant infections in the case of no intervention minus the number of infections with the intervention and number of adult infections averted is equal to the number of women receiving counseling and testing multiplied by the number of adult infections avoided per women counseled. Note that some women who undergo counseling and testing may change their behavior to avoid becoming infected or to avoid passing on an infection.

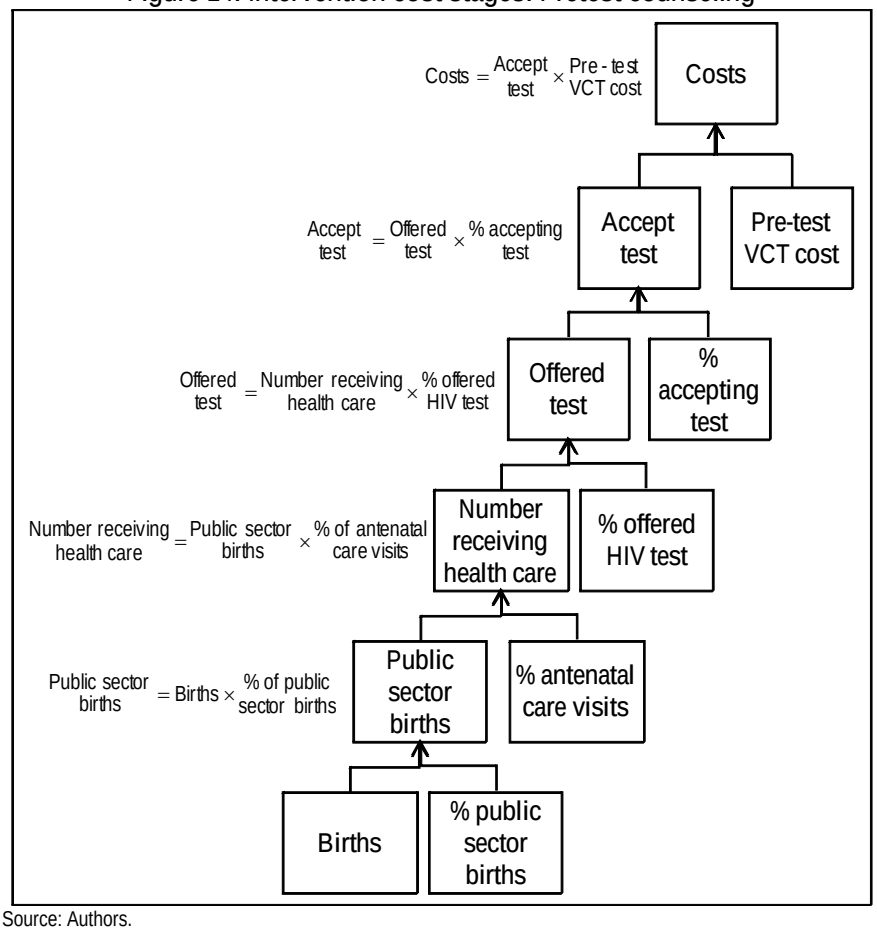
$$\text{Infant infections averted} = \text{Infant infections with no intervention} - \text{Number of HIV positive infants}$$

In the case of adults, the number of adult infections avoided is equal to the number receiving test results multiplied by the adult infections avoided per person counseled. The number of infections avoided assumes that all the adults who receive HIV test results receive counseling; this in turn is multiplied by the effectiveness of counseling (adult infections avoided per person counseled). However, we do not know if everyone tested receives counseling. The effectiveness of counseling does not depend on the result of the test. Is counseling as effective among those who test positive as with those who test negative?

Intervention: Pretest counseling

We traced Pretest counseling for HIV/AIDS in this tool. Figure 14 is a complete flow chart for this intervention.

Figure 14: Intervention cost stages: Pretest counseling



Source: Authors.

c. Conclusions

Since Spectrum is a program-based tool, our formula analysis is based on user manual formulas and the formulas included in the MS Excel file. The MS Excel file was easy to follow, and the user manual had many formulas.

4. Experience using the tool[23]

This tool is a Windows-based program (non-spreadsheet) with multiple interfaces. A sample data set is included in the user manual, which also includes detailed formulas for the tool's calculations. The developers suggest one day of training prior to using the tool, as well as knowledge of PMTCT programs.

This tool has been applied in Dominican Republic, Mexico and Panama, among other countries. This tool is freely available on the internet and thus other applications are possible.

[23] Information included in this section is based on information provided by the tool's developers and the reviewers' experiences.

This model was updated in January 2008 to include the currently available PMTCT options. More information about the tool can be found on the tool's website, http://www.futuresinstitute.org/pages/resources.aspx.

E. Goals Model Developed by Constella Futures/Futures Institute – Version 3.0, March 2003

1. Description and overview of tool

The Goals Model allows users to determine the effect of resource allocation on achievement of HIV/AIDS goals. This tool is designed to be used by a national, multidisciplinary team of government planners and civil society advocates addressing HIV/AIDS prevention and treatment.

The tool can be used to answer the following questions:	The tool addresses the following MDG targets:	The tool includes the following interventions:
▪ What is the impact of interventions on health MDGs? (limited to HIV/AIDS)	▪ Have halted by 2015 and begun to reverse the spread of HIV/AIDS (MDG 6)	▪ HIV/AIDS prevention and treatment
▪ What health MDGs can be achieved with available resources? (limited to HIV/AIDS)	▪ Achieve, by 2010, universal access to treatment for HIV/AIDS for all those who need (MDG 6)	

By prompting users for required information, this tool helps users see how different budgets will allow for varying levels of success with regards to HIV/AIDS objectives, a point from which the user can ultimately develop a budget which achieves the desired health impact.

2. Understanding the tool

This tool uses the impact of resource allocation on outcome as the conceptual framework. This model includes a built in production function which prompts users for the data, mostly country-specific, required by the model. At this point, the user has a choice of which specific interventions to include.

Table 10: List of Interventions Included in Goals Model

Supportive policy environment	Policy
	Human rights
	Stigma
	Community mobilization
	Mass media
Behavior change	VCT
	Social marketing
Vulnerable populations	Sex worker / high risk population
	MSM
	Harm reduction for IDUs
	Youth: in school
	Youth: out of school
Service delivery	Blood safety
	Condoms

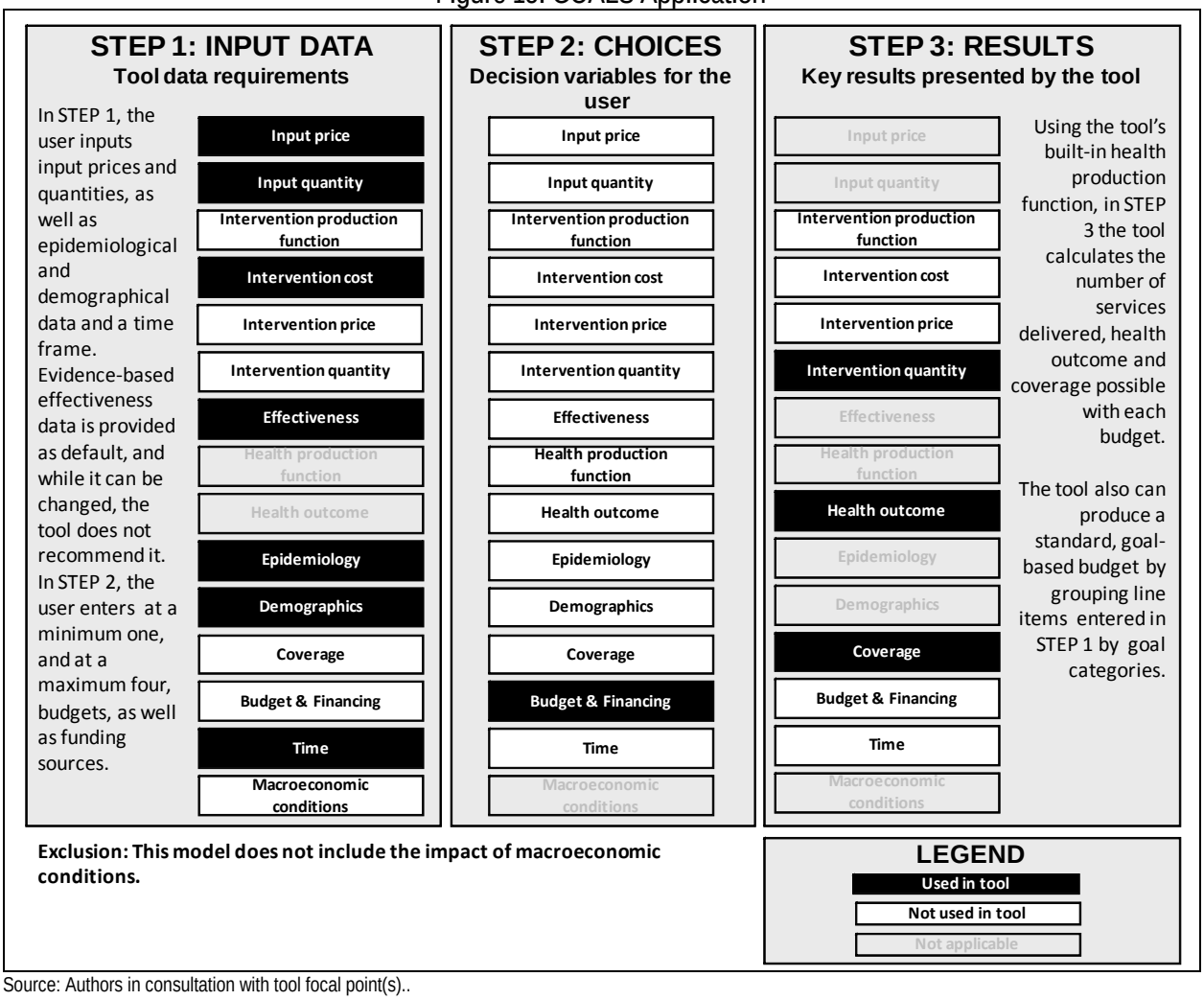
Table 10: List of Interventions Included in Goals Model

	STI treatment
	Workplace programs
	PMTCT
Care and treatment	Palliative care
	Treatment of OIs
	Prophylaxis of OIs
	ARV
	TB
Mitigation	Orphanage care
	Community support for OVC
	School support for orphans
Program support	Management and coordination
	Monitoring and evaluation
	Research
	Capacity building

Source: Goals Model For Estimating the Effects of Resource Allocation Decisions on the Achievement of the Goals of the HIV/AIDS Strategic Plan, Version 3.0, March 2003, John Stover, Lori Bollinger, Katharine Cooper-Arnold, The Futures Group International.

Some default data on impact values, cost-effectiveness interventions, HAART success rate and standard epidemiological data is built into the model, based on evidence-based studies and wide literature reviews. As such, the model suggests this data not be changed, although it is possible to change this data. The user must also provide some input (unit) prices and quantities, as well as intervention costs. The below figure highlights the information the model requires to be inputted in STEP 1. When entering specific interventions and activities, the user has the option of assigning these interventions and activities a program class. If assigned a program class, the tool will generate a form of a goal-based budget, with all input interventions and activities organized by class.

Figure 15: GOALS Application



Source: Authors in consultation with tool focal point(s)..

In STEP 2, the user inputs at a minimum one budget for the tool to use to calculate possible coverage and health outcome achievable with these funds, based on the tool's built-in production function. The user can input up to three additional budgets and thus see the impact of the change in resource allocation on coverage and health outcome (STEP 3). As an output, the tool also calculates the number of services delivered (intervention quantity).

This tool is unique is that decision-making is neither coverage- nor impact-guided, but purely driven by budgetary motives. The tool is designed for medium-term planning. While the user defines which treatments to include, the actual production function is built into the model. With input prices provided by the user, the tool assumes that the cost of inputs does not change over the years covered.

3. Formula Review

a. Conceptual Framework Analysis

- Tool Objective: "For estimating the effects of resource allocation decisions on the achievement of the goals of the HIV/AIDS strategic plan." (user manual)
- How: input "detailed information about the strategic plan to be analyzed, data regarding sexual behavior by risk group, demographic data, base year human capacity, and assumptions about types of care and mitigation activities that will be provided" (user manual p. 7) and tool will show the impact of interventions on measures of behavior change, and in turn, how these changes in behavior affect HIV prevalence and incidence (the final results of the model). An optional capacity sub-model estimates the training needs and costs associated with implementing the level of activities calculated by the rest of the model.
- Included: time horizon and currency, general demographic information, data regarding sexual behavior by risk group (including condom use), assumptions regarding epidemiological data (including the prevalence of HIV and STIs), data regarding unit costs for prevention activities, percent of the population covered by the public sector for both prevention and care activities, information about care and mitigation activities (including data and assumptions regarding levels of activities to be provided), assumption regarding the cost of providing different types of care, budgetary information, HAART success rates and standard assumptions based on scientific studies.
- Limitations and Exclusions: Does not incorporate macroeconomic conditions.
- Analysis: By outlining the formulas for the tool's main outputs, intervention cost and intervention quantity, and by following through one intervention as an example, we believe this tool's calculations are sound. Any costs excluded have been noted below.

b. Formulas Used to Calculate Tool's Outputs

This section evaluates the formulas used to calculate the tool's main outputs: health outcome, coverage and intervention quantity. To review the formulas in the tool, we follow through cell-by-cell all the formulas the tool uses for the intervention: Service delivery - condoms. Data used comes from the "Data_for_Goals" spreadsheet which accompanies the tool.

This section first presents a brief review of the generic formulas, is followed by the computations for the selected intervention, and concludes with an analysis of the overall review.

Health outcome, coverage and intervention quantity

Health outcome calculations are based on the model's built-in production function and are made using the country-, coverage- and budget-specific data provided by the user. The tool shows the achievable health outcomes given the chosen coverage and/or budget. Health outcome is expressed using a number of indicators, including HIV prevalence, HIV incidence, number of new STIs and infections averted. We present the general formulas[24] below:

[24] Formulas provided by tool developers.

$$\text{Prevalence}_t = \text{Prevalence}_{t-1} + \text{Incidence}_{t-1} - \frac{\text{Prevalence}_{t-1}}{\text{Survival period}}$$

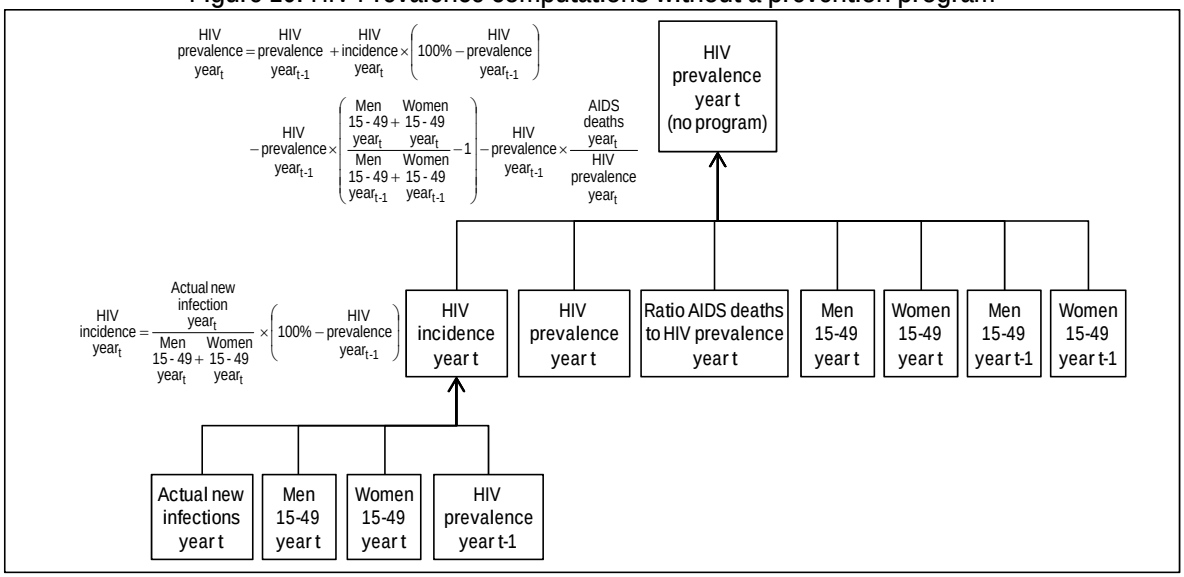
$$\text{Incidence}_t = \frac{\text{Total new infections}_t}{\text{Population}_t \times (1 - \text{Prevalence}_t)}$$

$$\text{Infections averted} = \text{New infections without a prevention program} - \text{New infections with a prevention program}$$

HIV prevalence is calculated as prevalence in the previous year plus HIV incidence minus AIDS deaths, where AIDS deaths are estimated as prevalence divided by the average time from infection to death. HIV incidence is equal to new HIV infections divided by the uninfected population. The computation of incidence incorporates a complex epidemiological model (see manual pages 89-94 for greater detail), where the probability of infection is calculated as a function of HIV prevalence in the partner population, the transmissibility of HIV, the impact of a sexually transmitted infection on HIV transmissibility, the proportion of the population with sexually transmitted infections, condom use, numbers of partners per year and number of sexual contacts with each partner. Finally, HIV infections averted is the difference between the number of new infections without a preventive program and the number of new infections with a prevention program.

The computations of health outcome are very complete, taking into account risk, population groups and the impact on incidence and prevalence of the program, making it a dynamic model. The following figures show in greater detail the computations the tool makes. Figure 16 shows the computation of HIV prevalence without a prevention program.

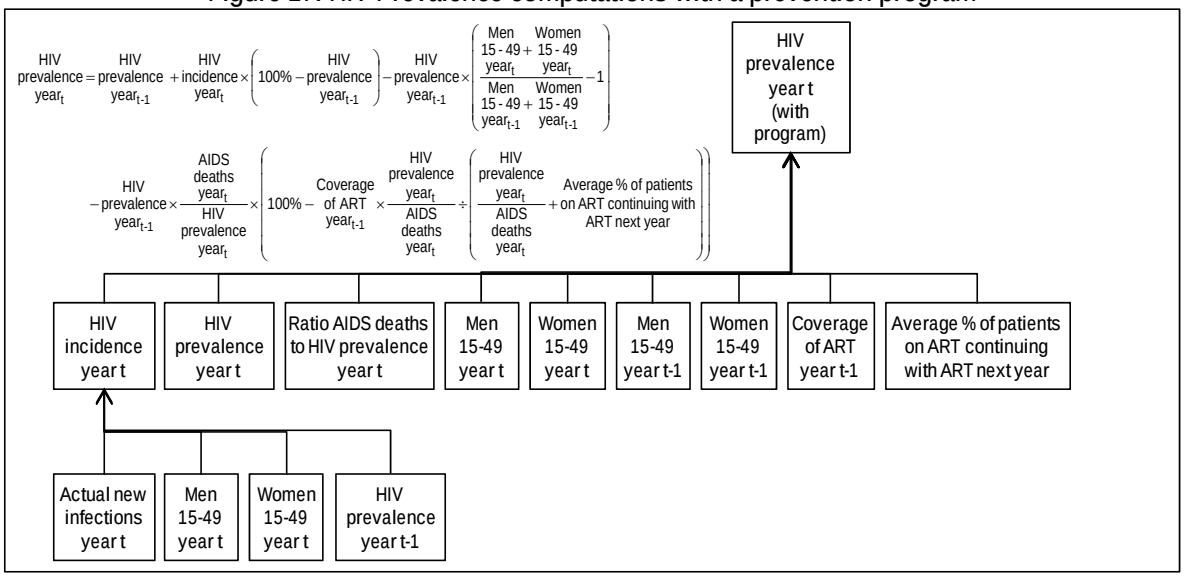
Figure 16: HIV Prevalence computations without a prevention program



Source: Authors based on tool worksheets.

Figure 17 shows HIV prevalence computations with a prevention program. This case considers the actions taken by the user and its impact on coverage.

Figure 17: HIV Prevalence computations with a prevention program



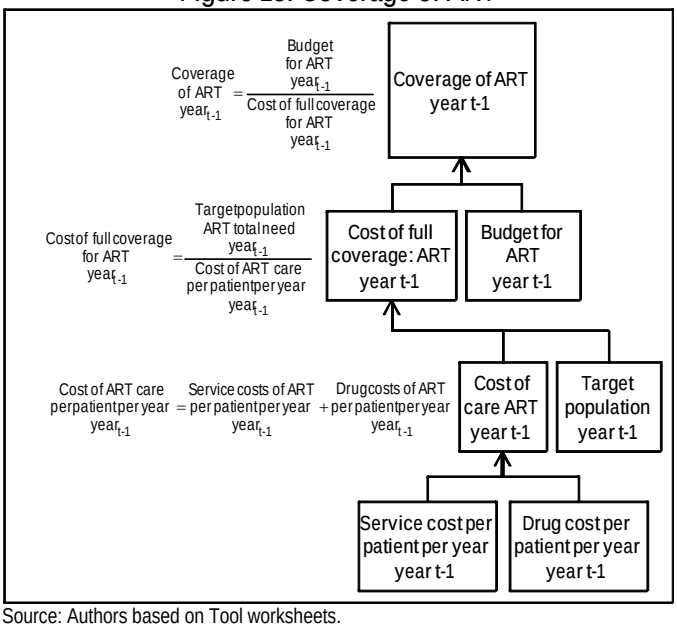
Source: Authors based on Tool worksheets.

This tool also calculates 14 different types of **coverage** relative to need, each slightly varied but built upon the following basic formula:

$$\text{Coverage} = \frac{\text{Funding available}}{\text{Unit costs}} \Big/ \text{Total need}$$

The first part of the computation, funding available divided by unit costs, gives the number of interventions that can be bought (**intervention quantity**). Note that the unit costs for many interventions include the costs of outreach, promotion and health education (which would include some demand creation). For those services that demand creation is not included (for example, most medical services like blood transfusions and palliative care), maximum coverage to limited to something less than 100%, in an effort to recognize demand limitations.

Figure 18: Coverage of ART



Source: Authors based on Tool worksheets.

Intervention: "Service delivery – Condoms"

"Condoms" are one of five types of "Service delivery" (the others being Blood safety, STI treatment, Workplace programs and PMTCT) to appear in this tool.

In the "Data_for_Goals" workbook, "Prevention unit costs" worksheet, the user enters the unit cost per male condom, unit cost per female condom, unit cost per male condom distributed and cost per female condom distributed. If local information on unit costs is available, the user enters it in the local currency column; if not, the tool will automatically use international costs, which the user can choose to change (Table 11).

Table 11: Unit Cost Inputs: Condoms

Unit Cost Inputs			
If local information on unit costs is available, enter it in the local currency column. If it is not available, leave the cell blank and the international costs will be used. You may edit the international costs if you wish.			
Unit costs Condoms	Dollars	Dollars	Display Currency
Cost per male condom	0.03		0.030
Cost per female condom	0.5		0.536
Cost per male condom distributed	0.1		0.1
Cost per female condom distributed	0.9		0.9

Source: Authors based on Tool worksheets.

In the "GOALS_Model_2006" workbook, "Indicators Table" worksheet, the tool calculates the number or condoms required under a strategic plan, and the number required if no plan is in place. In the "GOALS_Model_2006" workbook, "Cost of full coverage" worksheet, the tool calculates the cost of full coverage of "Condom social marketing."

In the "Data_for_Goals" workbook, "Funding" worksheet, the user also chooses what percentage of funding for "Condoms" is served by the public, private, and other sectors:

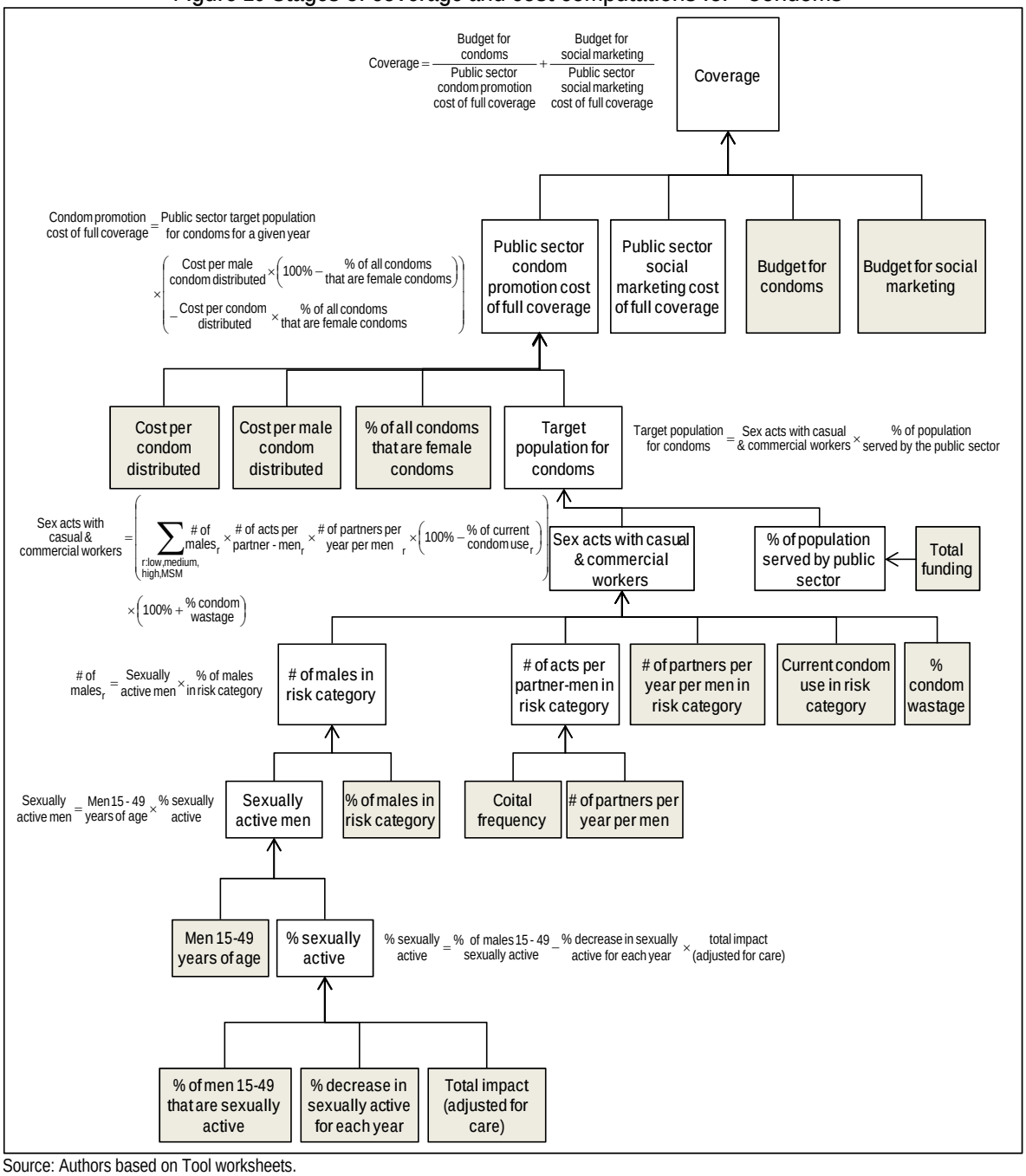
	Percent Served by Sector						
	Total	Public	Private	Donor	GFATM	WB Loan	ut-of-pock
Service delivery							
Blood safety	100%	100%	0%	0%	0%	0%	0%
Condoms	100%	80%	10%	10%	0%	0%	0%
STI treatment	100%	58%	42%	0%	0%	0%	0%
Workplace programs	100%	50%	50%	0%	0%	0%	0%
PMTCT	100%	84%	16%	0%	0%	0%	0%

In the "GOALS_Model_2006" workbook, "Target population" worksheet, the tool identifies the target population by year for "Condoms."

The tool computes coverage and costs for "Service delivery – condoms" following the steps shown in Figure 19. Notice that the user enters the budget available for this intervention. The tool computes the condom promotion cost of full coverage and the public sector social marketing cost of full coverage. The tool then computes total coverage using the below formula:

$$\text{Coverage} = \frac{\text{Budget for condoms}}{\text{Public sector condom promotion cost of full coverage}} + \frac{\text{Budget for social marketing}}{\text{Public sector social marketing cost of full coverage}}$$

Figure 19 Stages of coverage and cost computations for "Condoms"



Source: Authors based on Tool worksheets.

Since the budget for social marketing is zero, we trace only the computations made for condom promotion cost of full coverage. The computations for this cost use the following formulas:

$$\text{Condom promotion cost of full coverage} = \text{Public sector target population for condoms for a given year} \times \left(\text{Cost per male condom distributed} \times \left(100\% - \text{\% of all condoms that are female condoms}\right) - \text{Cost per condom distributed} \times \text{\% of all condoms that are female condoms}\right)$$

$$\text{Target population for condoms} = \text{Sex acts with casual \& commercial workers} \times \text{\% of population served by the public sector}$$

$$\text{Sex acts with casual \& commercial workers} = \left(\sum_{r:\text{low,medium, high,MSM}} \text{\# of males}_r \times \text{\# of acts per partner - men}_r \times \text{\# of partners per year per men}_r \times \left(100\% - \text{\% of current condom use}_r\right)\right) \times \left(100\% + \text{\% of condom wastage}\right)$$

$$\text{\# of males}_r = \text{Sexually active men} \times \text{\% of males in risk category}$$

$$\text{Sexually active men} = \text{Men 15 - 49 years of age} \times \text{\% sexually active}$$

$$\text{\% sexually active} = \text{\% of males 15 - 49 sexually active} - \text{\% decrease in sexually active for each year} \times \text{total impact (adjusted for care)}$$

The user enters data on coital frequency and number of partners per year-men to compute the number of acts per partner-men (Table 12) for 2009. Yet, the numbers of partners per year per men by risk category for 2009 is based on the impacts of intervention on behavior change, and are also provided in the table below.

Table 12: Data for computations by risk category

	High risk	Medium risk	Low risk	MSM
Coital frequency, 2005	40.0000	80.0000	80.0000	80.0000
Number of partners per year-men, 2005	5.0000	2.1920	1.1900	2.0000
Number of acts per partner-men, 2005 and 2009	8.0000	36.4964	67.2269	40.0000
Number of partners per year-men, 2009	5.0000	2.0745	1.1900	2.0000
% of males in risk category	6.3%	28.1%	65.1%	0.5%
Current condom use in risk category 2005	30.0%	30.0%	33.4%*	30.0%

*: This percentage is computed as the % of men in high risk category 2009 (6.3%) plus the % of men in medium risk category in 2009 (28.1%) minus the % of current condom use in low risk category in 2009 (3.1639%).

Source: Authors based on Tool's worksheet "Year0".

The computations by risk group are equivalent, except for the low risk group (see note in table above). It is unclear why this computation is different for the low risk group.

Given that the percentage of men between the ages of 15 and 49 that are sexually active is 70.8%, the percent decrease in sexually active for each year is 3.861% and the total impact adjusted for care is 0%, the percent sexually active is 70.8%, following the formula below:

$$\text{\% sexually active} = 70.8\% - 3.861\% \times 0 = 70.8\%$$

Since there are 20,488,660 men between 15 and 49 years of age, the number of sexually active men is 14,447,651. The percentage of condom wastage is 15%. Therefore, the number of sex acts with casual or commercial workers is computed as follows:

$$\text{High risk}: 912{,}092 \times 8 \times 5 \times (100\% - 30.0\%) = 25{,}538{,}577$$

$$\text{Medium risk}: 4{,}068{,}220 \times 36.4964 \times 2.07448 \times (100\% - 30.0\%) = 215{,}606{,}175$$

$$\text{Low risk}: 9{,}424{,}951 \times 67.22689 \times 1.19 \times (6.3\% + 28.1\% - 3.1639\%) = 235{,}518{,}925$$

$$\text{MSM}: \frac{72{,}388}{2} \times 40 \times 2 \times (100\% - 30.0\%) = 2{,}026{,}871$$

$$\text{\% of condom wastage} = 15\%$$

$$\text{Sex acts with casual \& commercial workers} = (25{,}538{,}577 + 215{,}606{,}175 + 235{,}518{,}925 + 2{,}026{,}871) \times (100\% + 15\%) = 550{,}494{,}130$$

The tool uses the term "target population for condoms" but actually refers to the number of condoms needed. In fact, the percent of population served by the public sector is actually linked to the "Percent served by sector: Total" (which is 100%), and not to the public sector total (which is 80%). Therefore, the tool computes the target population for condoms as:

$$\text{Target population for condoms} = 550{,}494{,}130 \times 100\% = 550{,}494{,}130$$

Given that we have the target population for condoms, and considering the unit cost per condom, the cost per female condom and the percent of all condoms that are female condoms provided by the user, condom promotion cost of full coverage is:

$$\text{Cost per male condom distributed} = \$0.13$$

$$\text{Cost per condom distributed} = \$0.8974$$

$$\text{\% of all condoms that are female condoms} = 1.0\%$$

$$\text{Condom promotion cost of full coverage} = 550{,}494{,}130 \times (\$0.13 \times (100\% - 1\%) - \$0.8974 \times 1\%) = 75{,}788{,}927$$

Finally, coverage is computed as follows:

$$\text{Coverage} = \frac{50{,}000{,}000}{75{,}788{,}927} + \frac{0}{75{,}788{,}927} = 66\%$$

c. Conclusions

This tool uses a top-down costing framework combined with a detailed method to compute target population and need for any intervention. Although within the tool some figures are mislabeled, final computations appear to be sound.

4. Experience using the tool[25]

This tool consists of two Excel workbooks; the workbook "Data_for_Goals" contains 23 spreadsheets, while the "GOALS_Model_2006" workbook contains 36 spreadsheets. A

[25] Information included in this section is based on information provided by the tool's developers and the reviewers' experiences.

Capacity sub-model is included in the workbooks and can be run separately or as part of the larger model. This tool assists the user in navigating through the large number of spreadsheets by indicating on the "Data_for_Goals" spreadsheet with colored boxes which data must be input and which data is provided as a default, but can be changed. However, the multiple languages listed on each worksheet of the tool can be confusing. This tool is accompanied by a 129 page user manual which provides graphic, step-by-step examples and formulas to accompany written instructions. Several days of training are required prior to using the tool, and the manual indicates that it takes users two weeks to set up the tool and get results from it. To properly use the tool, users should have knowledge of program statistics, goals, unit costs and epidemiology.

This tool has been applied in various countries, including China (Yunan and Guangxi provinces), Ethiopia, Ghana, Honduras, Kenya, Mexico, Mozambique, Namibia, South Africa, Thailand, Uganda, Vietnam and Zambia. The tool is freely available on the internet and thus other applications are possible. More information is available on the tool's website, http://www.futuresinstitute.org/pages/resources.aspx.

F. Planning, Costing and Budgeting Framework (PCBF) Developed by MSH – August 2007

1. Tool description and overview

The Planning, Costing and Budgeting Framework (PCBF) is a template which allows users to translate strategic program goals into costs and budgets in a logical way. The tool was originally developed for HIV/AIDS planning but can be used for any health intervention or health MDG. PCBF's target audience is national and sub-national policy makers and planners, program-specific technical staff, as well as technical assistance agencies and NGOs.

The tool can be used to answer the following questions:	Depending on the user's strategic plan, the tool could potentially address the following MDG targets:	Depending on the user's strategic plan, this tool could potentially include the following interventions:
▪ What is the cost of scaling up health services relevant to the health MDGs? ▪ What is the impact of interventions on health MDGs? ▪ What health MDGs can be achieved with available resources?	▪ Reduce the prevalence of underweight children under five years of age (MDG 1) ▪ Reduce by two-thirds, between 1990 and 2015, the under-five mortality rate (MDG 4) ▪ Reduce by three-quarters, between 1990 and 2015, the maternal mortality ratio (MDG 5) ▪ Achieve, by 2015, universal access to reproductive health (MDG 5) ▪ Have halted by 2015 and begun to reverse the spread of HIV/AIDS (MDG 6) ▪ Achieve, by 2010, universal access to treatment for HIV/AIDS for all those who need (MDG 6) ▪ Have halted by 2015 and begun to reverse the incidence of malaria and other major diseases (MDG 6)	▪ Child and adult immunizations ▪ Child health interventions ▪ Family planning ▪ General health system improvements ▪ HIV/AIDS prevention and treatment ▪ Malaria prevention and treatment ▪ Maternal health interventions ▪ TB prevention and treatment

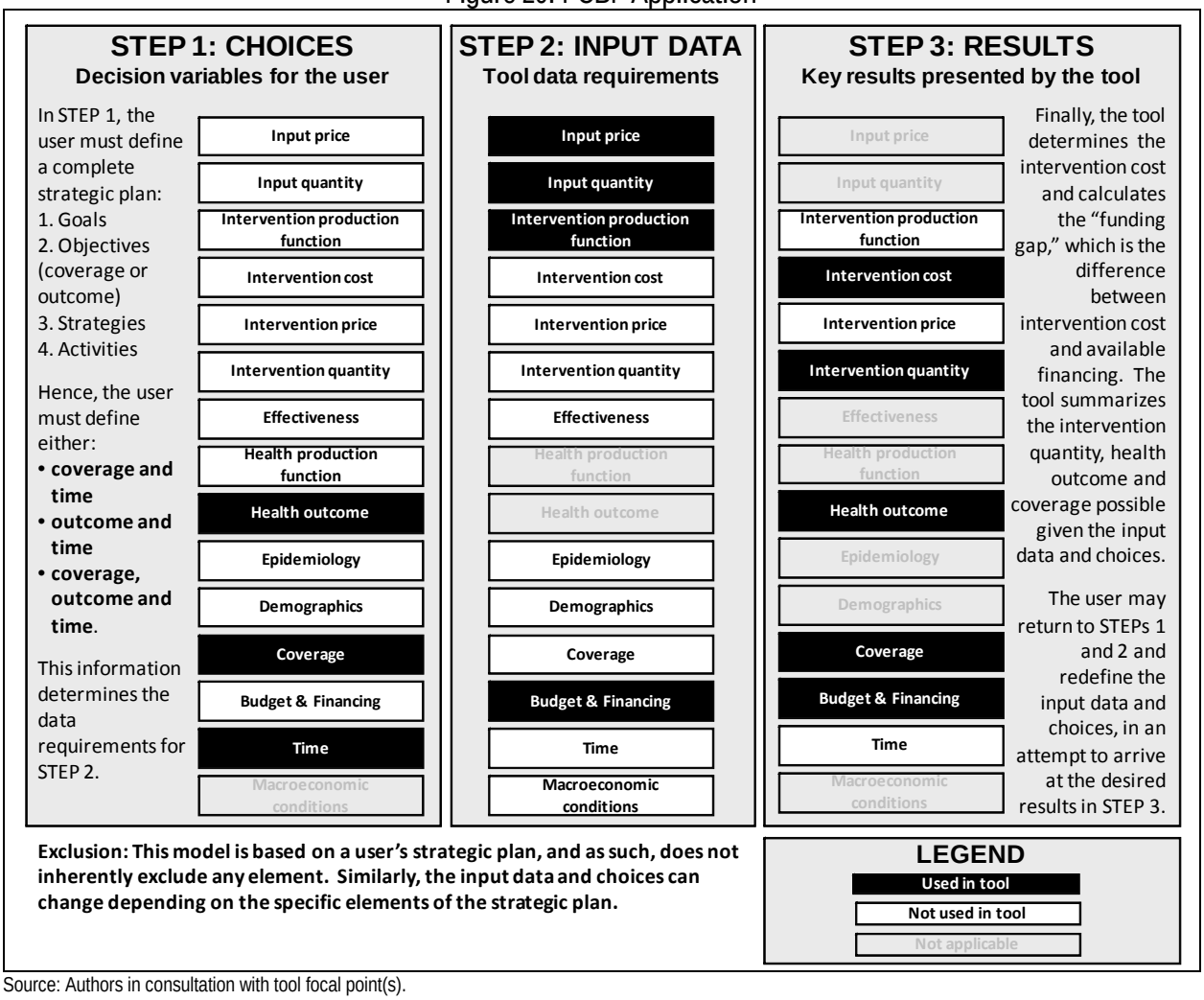
Much of the value of this tool is in forcing the user through a process of developing a strategic plan and assigning a corresponding budget, although the burden is on the user to provide all the information the tool requires as no default (built in) data values are included in the tool.

2. Understanding the tool

This tool assumes the user has a pre-formulated strategic plan with a chosen target coverage, timeframe and/or health outcome in mind.[26] After inputting this information (STEP 1), the user is obligated by the model to input the corresponding input prices and quantities, as well as identify the intervention production function (STEP 2). The user can also choose to identify available funding for this strategic plan. The below figure illustrates these first two steps in the tool's application.

[26] The user enters their comprehensive strategic plan formatted as a set of planning levels, starting from the most general goal, moving through the specific objectives, strategies and specific activities required to achieve this goal. The authors of the PCBF credit the South African National Department of Health for this planning hierarchy. The full planning hierarchy can be seen in "Guidelines for District Planning and Reporting," April 2003 and in Annex 1 of the tool's user manual, page 13.

Figure 20: PCBF Application



Source: Authors in consultation with tool focal point(s).

With this information, the tool assists the user in calculating the total cost for each activity (intervention cost), and comparing this cost with the available financing to show the funding gap. Once costs and financing are matched and financing has been committed, the figures can be converted into a budget. These results are seen in STEP 3. The tool will also summarize the achievable health outcome and coverage. As the user chooses data to be included, based on a strategic plan, this tool does not inherently exclude anything from its analysis, but allows the user to include and exclude data as they see fit. The user can return to STEPs 1 and 2 to modify both the input data and choices as necessary, in an attempt to achieve the desired budgeting and financing results. In this way, elements which were originally inputs may become choices, and vice versa.

Depending on the user's goals, this tool can be driven by impact- or coverage-guided decision making, both with budget constraint. It can be used for short-, medium- and long-term planning, depending on the elements in the user's strategic plan. Because the PCBF is driven by user's goals, this model does not include a built in production function. The user must define the production function. Health impact calculations are simply the input quantities provided by the

user. The user defines how to incorporate demographic, epidemiological, costing (including systems) and financing components, as they so desire.

3. Formula Review

a. Conceptual Framework Analysis

- Tool Objective: To overcome the "lack of clear linkages between activities, strategies, objectives and goals" and provide "a methodology for setting out elements of a plan and for translating these into costs and budgets in a clear and logical way." (user manual p. 4)
- How: Excel framework template allows users to input the activities and inputs needed to achieve the users' strategies and goals.
- Included: User must supply all data from their strategic plan. Formulas for calculating intervention cost and quantity are built-in. The spreadsheet automatically calculates the funding gap based on the financing information entered by the user. Inflation is also built-in.
- Limitations and Exclusions: This tool is a template, and it must be analyzed as such. The strength of the tool lies on the users' ability to link activities, strategies, objectives and goals. This may also be seen as the tool's limitation.
- Analysis: By outlining the formulas for the tool's main outputs, intervention cost and budget & financing (in the form of a funding gap), and by following through one intervention as an example, we believe this tool's calculations are sound. Any costs excluded have been noted below.

b. Formulas Used to Calculate Tool's Outputs

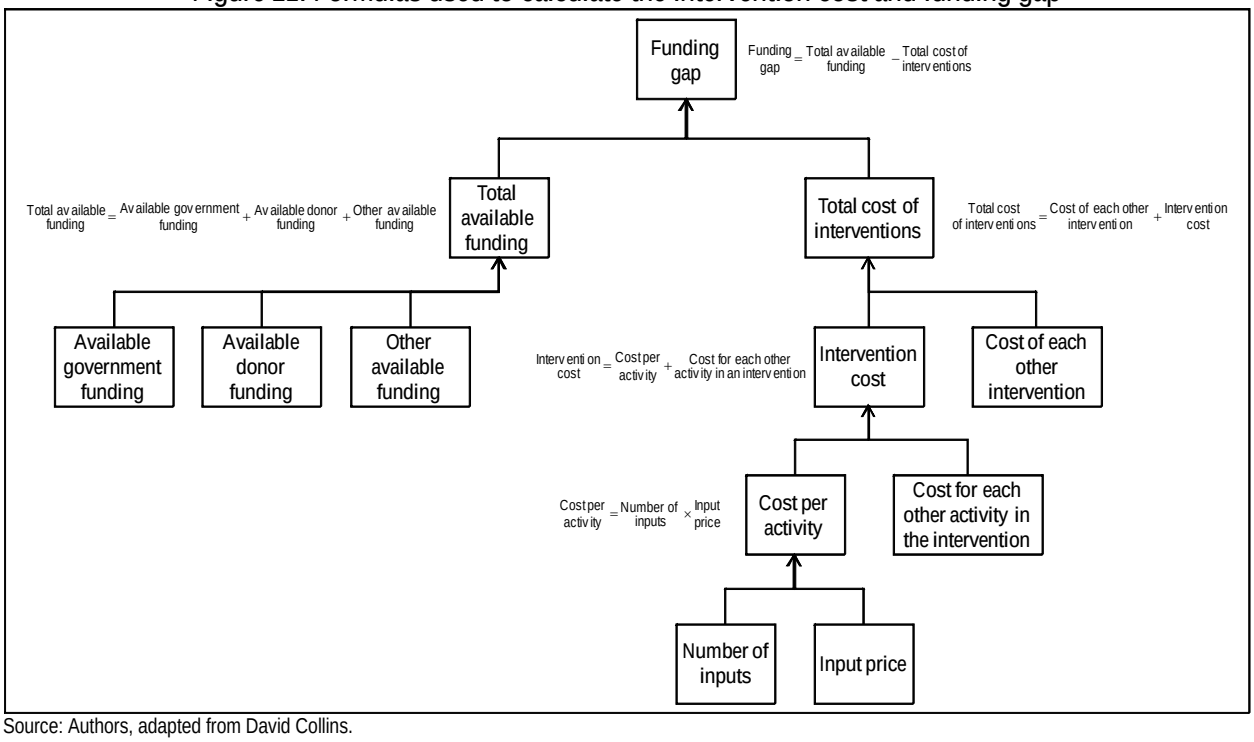
This section evaluates the formulas used to calculate the tool's main outputs: intervention cost and budget & financing, in the form of a funding gap. To review the formulas in the tool, we follow through cell-by-cell all the formulas the tool would use for two hypothetical interventions: Procure and distribute male condoms (one activity listed under objective 2- "Increase the proportion of sexually active adults (15-49) years who use condoms correctly and consistently from 30% to 70%" and strategy S2.1- "S2.1. Increase accessibility to quality male and female condoms from 30% to 70% of sexually active adults"), and Test all persons at risk, one activity listed under Objective 1- "Make voluntary counseling and testing services available to all sexually active persons at risk (30%)," Strategy 1.1- "Expand VCT services to all PHC facilities." These examples come from the "Example Plan" worksheet in the "Planning, Cost & Budgeting Framework – Workbook 7Aug07" file. The time period is five years.

This section begins with a subsection with brief review of the generic formulas, the two next subsections present the computations for the selected interventions, and the final subsection presents the overall review.

Intervention cost and funding gap

This tool calculates both intervention cost and the funding gap (see manual p. 12-13). By adjusting the plan and cost to match the committed funding the user can convert them into a budget. The formulas used in the tool are shown in Figure 21.

Figure 21: Formulas used to calculate the intervention cost and funding gap



Source: Authors, adapted from David Collins.

The tool multiplies the input prices and input quantities to arrive at a cost for each activity in the strategic plan. The cost for each activity under an intervention is then added to arrive at the cost for the intervention, and the intervention costs are added together to arrive at the cost for the strategy.

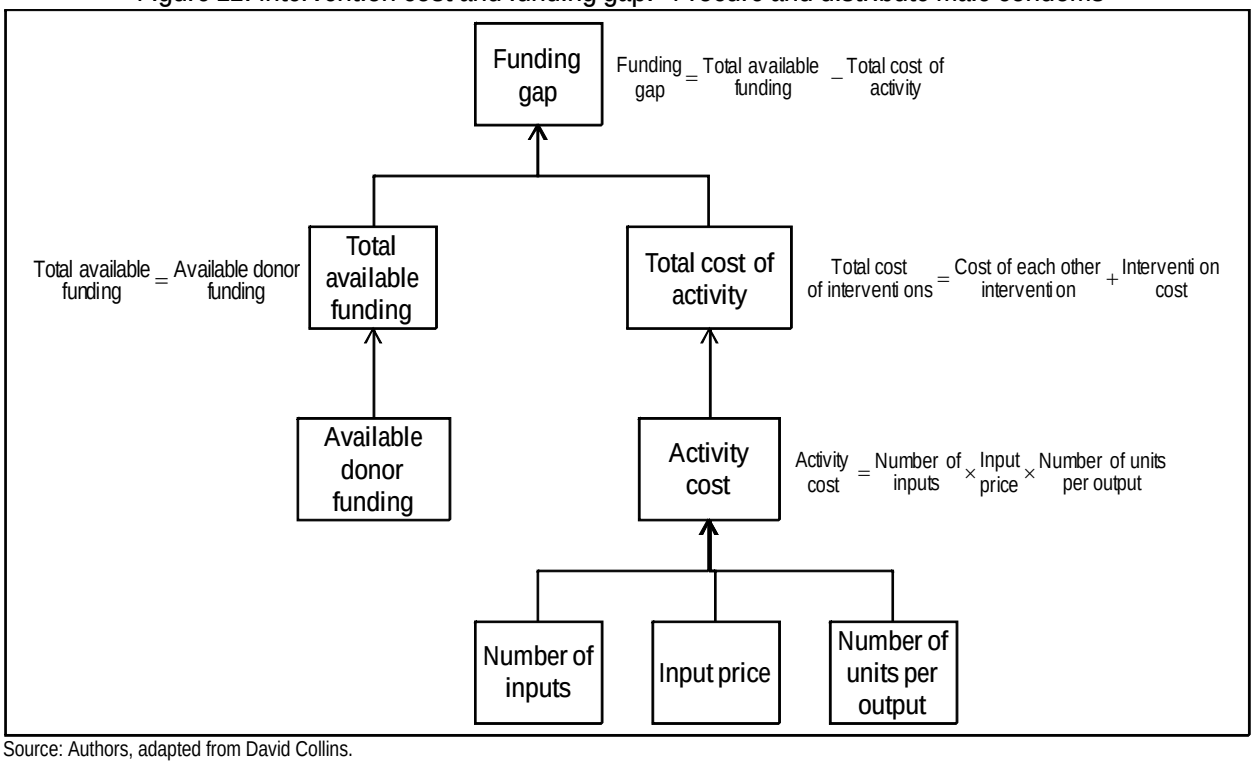
The key assumptions being made in cost computations are that the cost of inputs does not change over the years covered by the plan, although inflation is built into the model and taken into account. The user can define whether to included fixed costs, variable costs and depreciation.

To calculate the finding gap, the tool adds the different types of funding and then deducts the total funding from the costs. This can be done at the level of each activity, intervention and for the strategy as a whole.

Intervention: "Procure and distribute male condoms"

Because of how this tool is set up, the intervention we chose to trace, "procure and distribute male condoms," is one activity part of a larger strategy made up of multiple activities. Therefore, where the formula indicates a sum of multiple activities or interventions, we will look solely at the activity "procure and distribute male condoms," significantly simplifying the figure:

Figure 22: Intervention cost and funding gap: "Procure and distribute male condoms"



Source: Authors, adapted from David Collins.

The total cost of the activity is calculated for each of the five years included in the costing exercise. To calculate the total cost to procure and distribute male condoms in year one, the tool multiples the unit price by the number of sexually active males using condoms properly (number of inputs) by the number of units per output, as seen below:

$$\text{Activity cost} = \text{Unitprice} \times \text{Number of inputs} \times \text{Number of units per output}$$

$$\text{Total cost} = \$0.04 \times 784{,}000 \times 23 = \$721{,}280$$

Note that 784,000 in year one for number of inputs is a 30.66% increase from 600,000 in year 0. This formula is not built into the excel spreadsheet but it appears to have been obtained based on a formula.

The tool makes similar calculations for the five years included in the costing exercise, incorporating a 5% yearly inflation rate, to come up with a total intervention cost of $125,151,895 for the five years.

The funding gap in calculated for the five years as a whole and is the total available funding minus the total cost of the activity (for five years). In this case, there is excess funding available when compared to the cost of the activity, so the "gap" is positive (indicating a funding surplus):

$$\text{Funding gap} = \text{Donor funding} \times \text{Total cost of activity}$$

$$\text{Funding gap} = \$5{,}386{,}280 - \$5{,}220{,}316 = \$165{,}964$$

c. Conclusions

The tool is really a framework for translating elements of a strategic plan into costs and budgets in a simple way. The tool performs well based on a top-down costing framework. Input data requirements include year to year projections. In the sample input data, the information is provided as a value, and yet the projections appear to come from specific formulas. For the sake of transparency it should be suggested to users to maintain the formulas in the input sheet or to reference the source.

4. Ease of use[27]

This tool consists of one Excel workbook with two blank spreadsheets, "Blank Background Data" and "Blank Plan," as well as two examples of partially completed spreadsheets. A 17 page user manual is available in English. Typically, two days of small group training are suggested prior to using the tool, and users should possess prior knowledge of planning, epidemiology and spreadsheets.

PCBF is available on MSH's website at http://erc.msh.org/mainpage.cfm?file=9.33.htm&module=toolkit&language=English. To date this framework been used in Cambodia and Nigeria.

[27] Information included in this section is based on information provided by the tool's developers and the reviewers' experiences.

G. CORE Plus Developed by MSH - Version 1, September 2007

1. Tool description and overview

This tool estimates the costs of individual interventions (services) and packages of interventions as part of the cost of integrated primary health care facilities. The tool was designed to be used by planners and managers of government, private and NGO primary health care services.

The tool can be used to answer the following questions:	The tool addresses the following MDG targets (at the primary health care facility level only):	The tool includes the following interventions (provided through primary health care facilities):
▪ What is the cost of scaling up health services relevant to the health MDGs?	▪ Reduce the prevalence of underweight children under five years of age (MDG 1) ▪ Reduce by two-thirds, between 1990 and 2015, the under-five mortality rate (MDG 4) ▪ Reduce by three-quarters, between 1990 and 2015, the maternal mortality ratio (MDG 5) ▪ Achieve, by 2015, universal access to reproductive health (MDG 5) ▪ Have halted by 2015 and begun to reverse the spread of HIV/AIDS (MDG 6) ▪ Achieve, by 2010, universal access to treatment for HIV/AIDS for all those who need (MDG 6) ▪ Have halted by 2015 and begun to reverse the incidence of malaria and other major diseases (MDG 6)	▪ Child and adult immunizations ▪ Child health interventions ▪ Family planning ▪ General health systems improvements ▪ HIV/AIDS prevention and treatment ▪ Maternal health interventions ▪ TB prevention and treatment

This tool can estimate the expected number of each type of intervention provided through a primary health care facility, based on the catchment population and using disease prevalence and incidence rates and service delivery norms. It can then cost each of those interventions and the total package of interventions and can also be used to produce a budget. Fees and other revenue sources can be entered for each intervention and compared with individual intervention and total facility costs.

2. Understanding the tool

In STEP 1, the user sets up the model by entering basic data that is common to the type of facility. Firstly, the user determines the interventions to be included in the costing. The tool defines the intervention production function by allowing the user to choose from five possible service and costing scenarios:

Scenario A: Actual services and actual costs;

Scenario B: Actual services and normative costs;

Scenario C: Needed services and normative costs;

Scenario D: Projected services and normative costs;

Scenario E: Projected services and ideal staffing.

These should be all the interventions provided by the facility but they can be aggregated or separated as required. For example, family planning interventions can be combined as one intervention or can be separated into the different types of family planning interventions. The tool comes with some of the common interventions already entered as examples, but these can be changed or removed and other interventions can be added. Table 13 shows the example of interventions already entered.

Table 13: List of Common Interventions Entered as Examples in CORE Plus

Reproductive health services (at dispensary, health center, community and hospital levels)	Prenatal consultation
	Delivery and post-partum
	Postnatal consultant
	Post-abortion care
	Family planning
	Responsible sexuality: youth
	Responsible sexuality: men
	STI/AIDS
Child survival health services (at dispensary, health center, community and hospital levels)	Newborn consultation/complications
	Newborn conjunctivitis
	Well-child visits/monitoring
	Acute respiratory infection
	Severe fever
	Fever of unknown origin
	Mild malnutrition
	Severe malnutrition (with or without complications)
	Severe dehydration with complications
	Mild diarrhea, dehydration
	Persistent diarrhea, dehydration
	Pulmonary TB
	Other illnesses (with or without complications)

Source: CORE Plus, Version 1, September 2007, Elizabeth Lewis, Thomas McMennamin, David Collins, Management Sciences for Health.

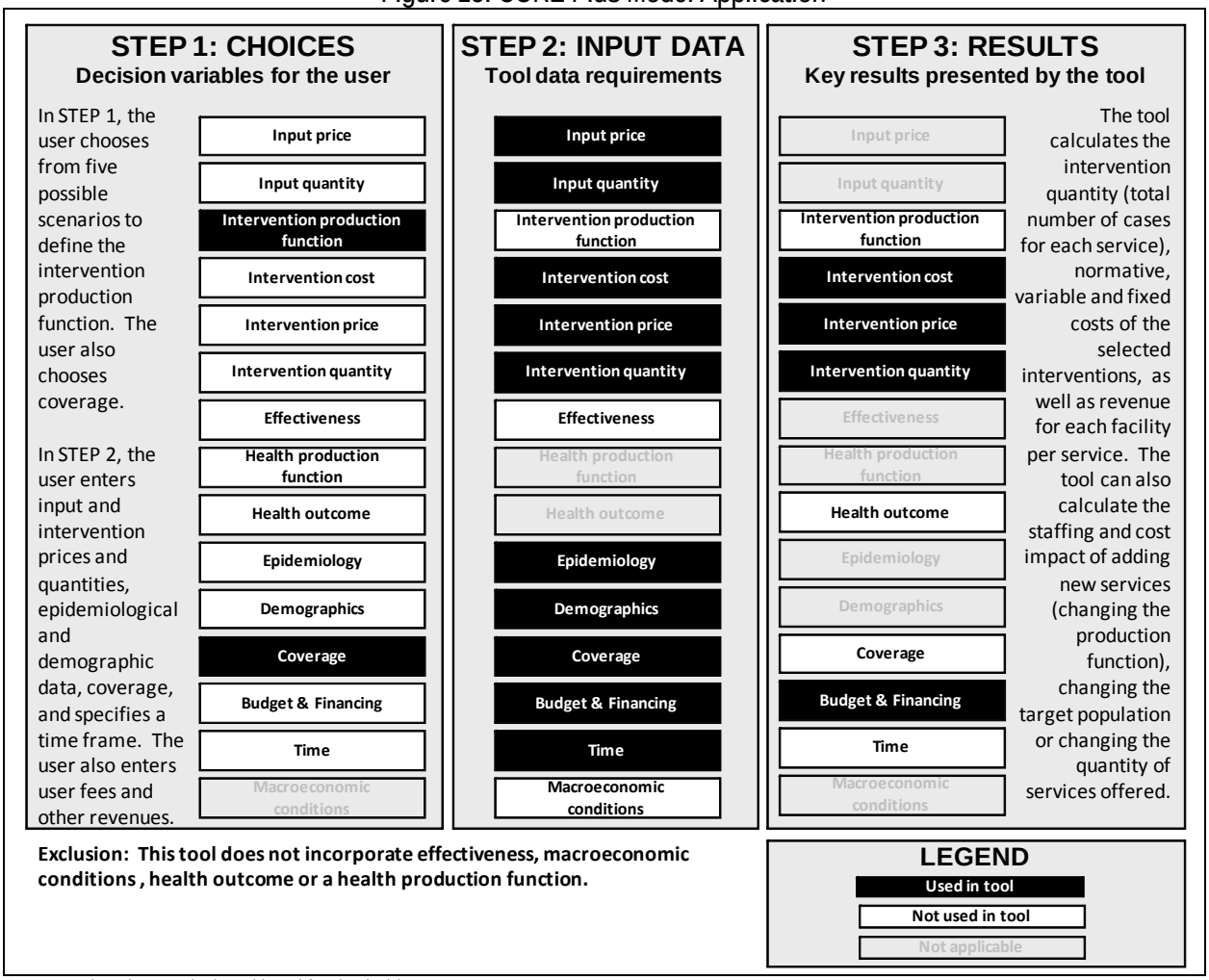
In STEP 2, the user will also enter input and intervention prices and quantities for facility operating expenses, including drugs, services, overhead expenses and staffing, and fees. The user also provides demographic information, epidemiological data (such as incidence and prevalence rates), coverage (catchment population for the facility), and a time period. If the tool is being used to analyze actual costs, the user can input the actual number of interventions provided, as well as the intervention price and fees.

In STEP 3, the tool uses demographical data, epidemiological data and coverage (catchment population) to calculate the total number of cases for each service (intervention quantity). The tool also computes the normative, variable and fixed costs of the selected interventions, allocating indirect costs across the selected interventions. If the user has not

entered fees in STEP 2, the tool can automatically calculate the intervention price (fee) based on the input costs plus a mark-up. By multiplying input price by the quantity of services, the tool is able to compute the total revenue per facility per service (budget & financing). The tool can also calculate the necessary staffing and the cost impact of changing the intervention production function (i.e. adding new services, or significantly changing the quantity of services offered) or of changing the target population.

This tool does not incorporate the following elements: effectiveness, health outcome, health production function, or macroeconomic conditions. The below figure summarizes how the various elements of costing are incorporated by this tool.

Figure 23: CORE Plus Model Application



Source: Authors in consultation with tool focal point(s)..

Because the user can choose between actual, needed or projected services and costs, this tool is driven by coverage-guided decision making with budget constraint. This tool is designed for short-, medium-, or long-term planning at the health facility level. This model includes a built-in production function determined by the scenario chosen. This tool does not compute health outcome.

3. Formula Review

a. Conceptual Framework Analysis

- Tool Objective: "To estimate the cost of each type of service in a facility that provides an integrated priority service package." (user manual p. 5)
- How: Uses standard costing approach, based on normative costs. However, built-in scenarios can be adjusted to see actual costs, actual services, needed services, projected services and ideal staff.
- Included: assumptions on population and facilities, service provision by facility and staffing need/cost for each service, fixed costs, total costs and revenue.
- Limitations and Exclusions: Because different countries and regions have their own definitions of what services are included in a "basic package," the tool may need to be modified prior to use to include the necessary services.
- Analysis: By outlining the formulas for the tool's main outputs, intervention cost and intervention quantity, and by following through one intervention as an example, we believe this tool's calculations are sound. Any costs excluded have been noted below.

b. Formulas Used to Calculate Tool's Outputs

This section evaluates the formulas used to calculate the tool's main outputs: intervention cost, intervention price and intervention quantity. To review the formulas in the tool, we follow through cell-by-cell all the formulas the tool uses for the intervention "Responsible Sexuality: Men (health center level)." Data used comes from the sample distributed with the tool, entitled "CORE_Plus_Sample_v_1_EN_5Sep07."

This section begins with a subsection with brief review of the generic formulas. The proceeding subsection presents the computations for the selected intervention, and the final subsection presents the overall review.

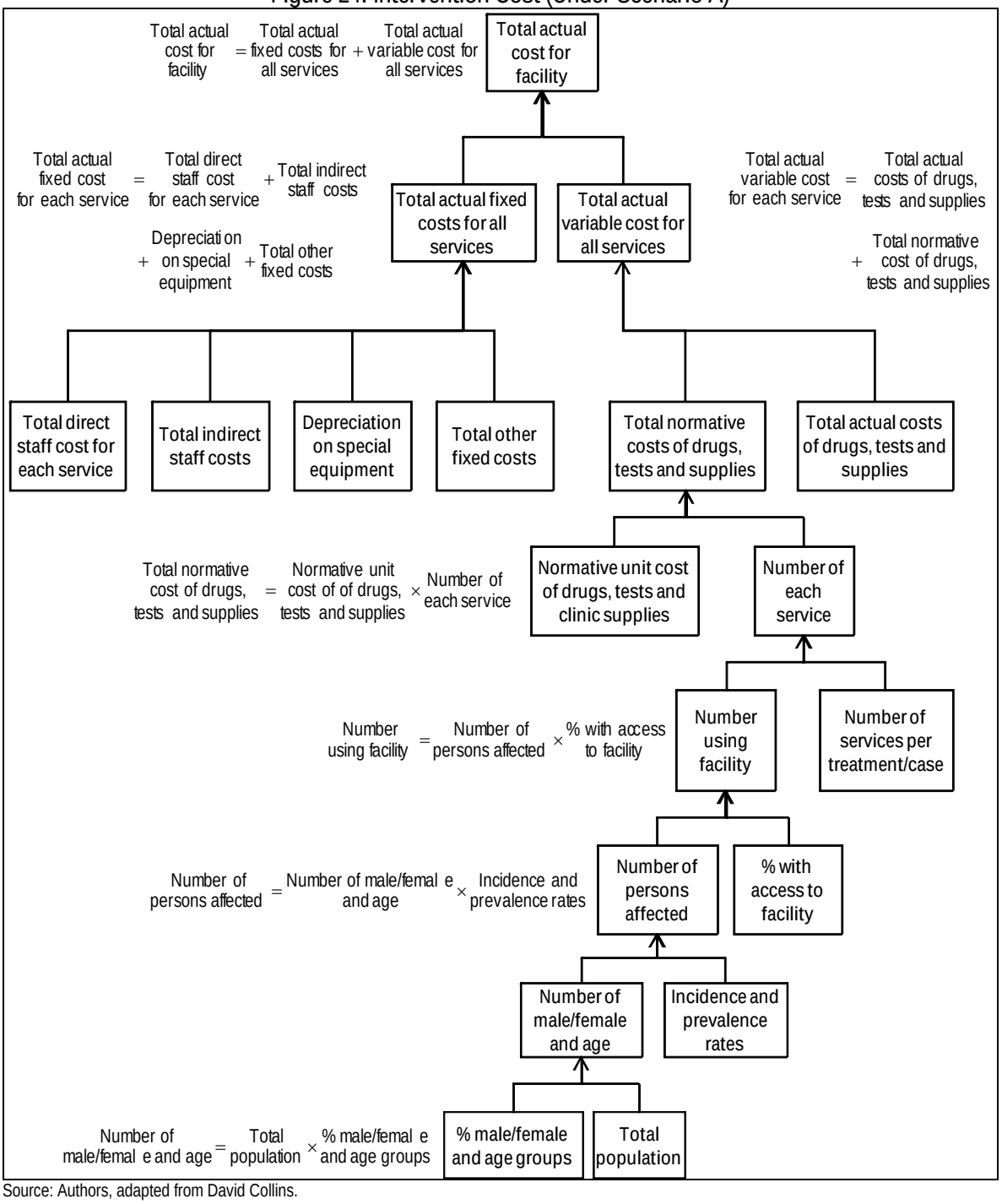
Intervention cost, intervention price and intervention quantity

This tool calculates intervention cost, intervention price and intervention quantity. Many functions are involved and they depend to some degree on the scenario selected; this explanation will focus on scenario A (actual services and actual costs), although four other scenarios exist.[28]

The below figure outlines how the tool calculates intervention cost, intervention price and intervention quantity under this scenario.

[28] The selection of a scenario determines the access and utilization figures included in the calculation of intervention quantity; scenarios A and B are run with actual numbers of services, C with the needed numbers, and D and E with target numbers. For scenario C, it is important for the user to realize that actual utilization is almost always less than possible access and the tool's estimation of facility utilization, based on (a) disease incidence rates, (b) percent of people that would (could possibly) access a facility (eg uninsured), and (c) (estimated) number of visits per disease, should be overridden, whenever possible and appropriate, with actual utilization rates, to account for the fact that access is not equivalent to utilization because undoubtedly a percentage of those with access to services may choose not to use them, for whatever reason. For Scenarios D and E, the user can adjust the target utilization figures to reflect the fact that projected utilization can be less than need.

Figure 24: Intervention Cost (Under Scenario A)



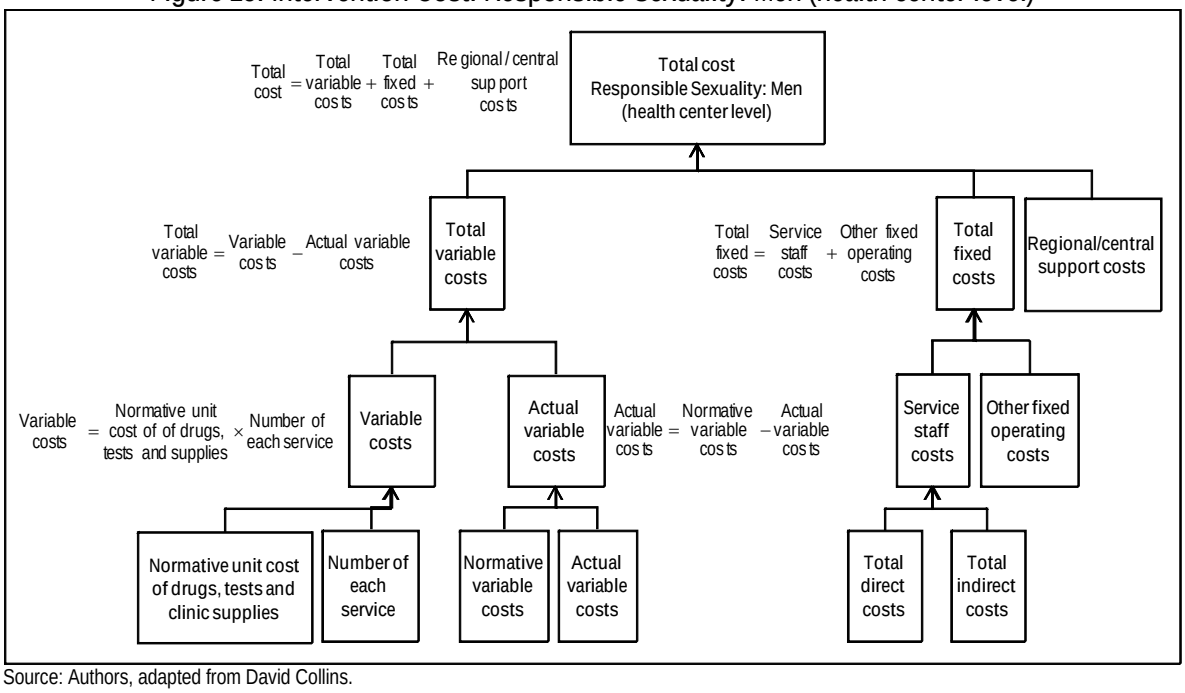
Source: Authors, adapted from David Collins.

The tool has a complex set of functions that calculate the required numbers of staff and the staff cost per service. Direct and indirect human resources costs are included, based on normative or standard times to be spent on each intervention. Capital costs are not included, although it is possible to include depreciation. The tool calculates the cost of the individual intervention as well as the cost of the health facility.

Intervention: "Responsible Sexuality: Men (health center level)"

The intervention cost for "Responsible Sexuality: Men" at the health center level includes the cost of a condom. Figure 25 shows the flow of computations for this intervention.

Figure 25: Intervention Cost: Responsible Sexuality: Men (health center level)



Source: Authors, adapted from David Collins.

The sample intervention cost is a weighted average cost per treatment. The tool provides space for entering a number of variable costs per service, including commission (% of gross revenue), x-rays, medicine used, lab tests and clinical supplies used. For this intervention, the "medicine used" (condom) is the only variable cost included, and the variable cost per service is calculated as follows:

$$\text{Variable cost per service} = \text{Total actual cost of drugs, tests and supplies} + \text{Total normative cost of drugs, tests and supplies}$$

$$\text{Variable cost per service} = \text{Total units} \times (\text{Unit cost} + 8\% \text{ additional cost})$$

$$\text{Variable cost per service} = \text{Dosage} \times \text{Units per dose} \times (1.16 + 0.09)$$

$$\text{Variable cost per service} = 16 \times 1 \times (1.16 + 0.09)$$

$$\text{Variable cost per service} = \$19.96$$

The variable cost per service includes an 8% additional cost. The tool does not specify how the 8% was estimated and what it is meant to cover.

The total cost is determined by multiplying quantity of services (from the "B_Need" worksheet), by the variable cost per service:

$$\text{Total actual variable cost} = \text{Quantity of services} \times \text{Variable cost per service}$$

$$\text{Total actual variable cost} = \text{Service quantities used in this scenario} \times \text{Variable cost per service}$$

$$\text{Total actual variable cost} = 12 \times 19.96$$

$$\text{Variable cost per service} = \$240$$

The tool also provides space for entering the following fixed costs: direct service staff costs, indirect service staff costs, depreciation of special equipment and other fixed operating costs. In the case of this intervention, both direct and indirect service staff costs are included for a general practitioner, professional nurse and clerk. In total, this intervention requires $440 in direct and indirect service staff costs.

Additionally, each service is allocated a proportion of total fixed operating costs, based on its proportion of variable costs and direct service staff costs. This intervention, that allocation totals $179. Regional/central support costs are allocated based on each service's proportion of fixed costs; because this intervention's fixed costs account for less than one thousandth of the total fixed costs, zero regional/central support costs apply.

The normative variable cost (computed above to be $240) is then corrected to show the actual variable costs (computed to be $10). Therefore, the total cost for this intervention is calculated as follows (note the tool rounds to the nearest whole dollar):

$$\text{Total cost} = \text{Total variable costs} + \text{Total fixed costs}$$

$$\text{Total cost} = \$10 + \$619$$

$$\text{Total cost} = \$628$$

The intervention price for this tool is entered by the user; in this case, the fee per health service is set at $40, times the number of services (12), providing a total gross revenue per health service of $480. Additional anticipated revenue per health service is estimated using the estimated income of the ancillary services, by applying the mark-ups entered in another part of the tool ("A_Assumptions" page). In our example, a 2% markup was entered, and using the $19.96 variable cost per service estimate, thus it is estimated that $20 will be paid at the pharmacy.

c. Conclusions

The tool estimates the cost of different services at different service provision levels. The tool performs well in that it includes both variable and fixed costs, as well as indirect and direct costs.

4. Experience using the tool[29]

This tool is a single Excel workbook with multiple spreadsheets. A user manual walks the user through the tool using examples and screen-shots from the tool. To assist users, the cells used for entering data are shaded green (e.g., facility name, catchment population). The other parts of the workbooks that are not shaded green contain formulas or pre-set calculations. The user manual indicates users should not erase or change cells in these parts of the tool.

Typically, three days of small group training are suggested prior to using the tool, and users should possess skills in epidemiology, service delivery standards and spreadsheet use. One user from Bangladesh reported that a time commitment of three days was required to use the tool. This user reported that the tool was easy to navigate, the user manual was helpful and easy to understand, and it was possible to adapt the tool to local conditions. This user also reported being satisfied with the results, which were accurate and useful.

This tool has been used in costing exercises in Haiti and Rwanda, and a previous version of the tool, CORE, has been used in Afghanistan, Bangladesh, Bolivia, Ethiopia, Guatemala, Haiti, Honduras, Kenya, Madagascar, Mexico, Nicaragua, Rwanda, Senegal, South Africa, Tanzania, the United States and Zimbabwe. CORE has mostly been used by NGOs that provide primary health care services, although in some cases the tool has also been used to cost government service packages. CORE has the same basic costing platform as CORE Plus but does not have the population driver, the look-up table for drugs and test, and does not allow for the selection of preset scenarios.

The tool is available on the MSH website at http://erc.msh.org/mainpage.cfm?file=9.33.htm&module=toolkit&language=English.

[29] Information included in this section is based on information provided by the tool's developers, the reviewers' experiences, and the experience of one user from Bangladesh.

H. cMYP Costing and Financing Tool Developed by WHO – Version 1.3, December 2005 (manual developed March 2006)

1. Tool description and overview

As a companion to the 2005 joint WHO - UNICEF guidelines for preparing a strategic multi-year plan for immunization**,** the cMYP tool was developed to make projections of future costs, future resources requirements, future financing needs to achieve program objectives, and analyze the corresponding financing gaps. This tool was designed to be used by national immunization program managers and planners at the country level, and can help countries align with regional and global immunization strategies (ex: GIVS). The tool is primarily targeted for low-income countries which do not have existing systems in place for this.

The tool can be used to answer the following questions:	The tool addresses the following MDG targets:	The tool includes the following interventions:
▪ What is the cost of scaling up health services relevant to the health MDGs? ▪ What is the impact of interventions on health MDGs?	▪ Reduce by two-thirds, between 1990 and 2015, the under-five mortality rate (MDG 4)	▪ Child and adult immunizations ▪ TB prevention and treatment

This tool was designed for strategic planning for immunization to help determine the cost and resource requirements of attaining the health MDGs, identify funding gaps and determine what health MDGs can be achieved with available resources.

2. Understanding the tool

To estimate the past expenditures and financing of immunization, and to make projections of future expenditure needs, the user first defines the intervention production function by choosing which immunizations to include, and also selects a time frame and desired coverage (STEP 1). The tool is build around 3 specific immunization strategies: routine fix site delivery, outreach activities and supplemental immunization campaigns, and the specific immunizations included in the model are seen below:

Table 14: List of Immunizations included in cMYP

Routine immunizations	Traditional vaccines	BCG
		DTP
		Tetanus Toxoid (TT)
		Measles
		OPV
		Measles 2nd dose
		Other vaccines (can specify up to 3)
	Underused and new vaccines	Yellow fever
		DTP-Heb B-Hib
		DTP-Heb B
		DTP-Hib
		Hep B
		Hep B Uniject (or other vaccine not requiring injection equipment)
		Hib
		MMR
		JE
		Other vaccines (can specify up to 2)
Campaigns		Polio
		Measles
		Yellow Fever
		MNT campaigns
		Up to 3 other campaigns
		Outbreaks

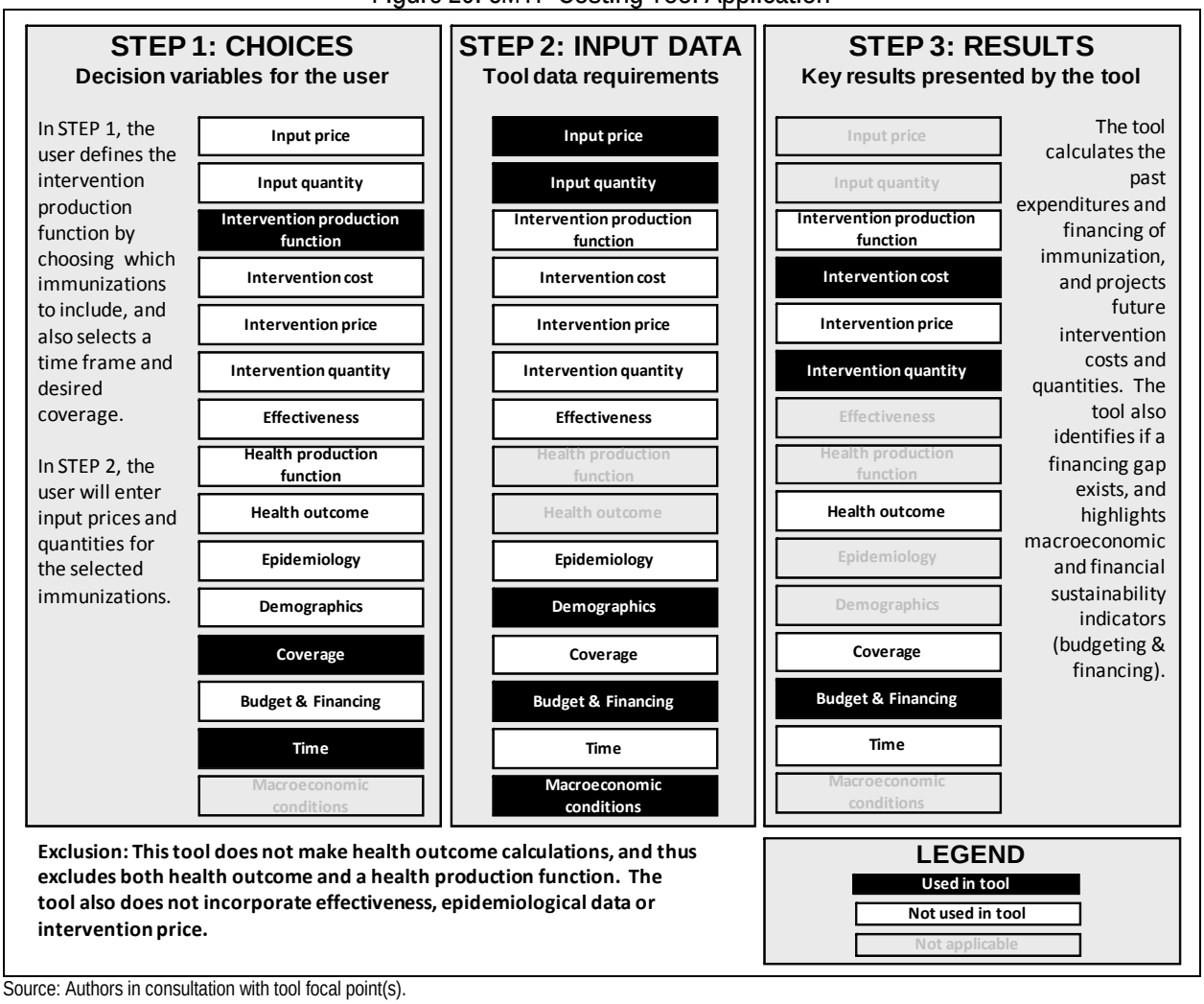
Source: Immunization Costing and Financing: A Tool and User Guide for comprehensive Multi-Year Planning (cMYP), World Health Organization, 2006.

In STEP 2, the user will enter input prices and quantities for the selected immunizations, as well as provide demographic data.

In STEP 3, the tool calculates immunization expenditure and financing needs, and projects future intervention costs and quantities. The tool also produces a summary of the funding sources and financing gaps, and highlights macroeconomic and financial sustainability indicators. The costs are broken down in cost categories for budgeting immunization which are compatible with the needs for GAVI Fund proposal purposes.

This tool does not make health impact computations, and thus excludes both health outcome and health production function. Neither effectiveness nor epidemiological data are incorporated by this model. Because the global WHO policy is that childhood immunization should be free, this model does not include intervention price.

Figure 26: cMYP Costing Tool Application



Source: Authors in consultation with tool focal point(s).

This tool is driven by coverage-guided decision making with budget constraint. It has a medium-term focus and produces results for up to five years.

3. Formula Review

a. Conceptual Framework Analysis

- Tool Objective: "To help undertake the costing and financing elements of a comprehensive multi-year plans for immunization (cMYP), a Microsoft Excel-based tool was developed — the cMYP Costing and Financing Tool — to make it easy to estimate past costs and financing for immunization, to aid in making future projections of resource requirements and financing, and for analyzing the corresponding financing gaps in reaching immunization program objectives." (introduction to user manual)
- How: users enter information on vaccines, injection supplies, personnel, vehicles and transport, cold chain and maintenance, supplemental immunization activities, other recurrent and capital costs, as well as past and future funding, into an Excel-based

spreadsheet; tool generates a summary table of costs, future resource requirements, financing and gaps needed for complete financial diagnosis of the cMYP.

- Included: all immunization-specific inputs and activities are included, and shared inputs (personnel, transportation, buildings, etc.) and activities are optional, although the user manual strong recommends including these costs in order to produce a more accurate costing exercise.
- Limitations and Exclusions: this tool is not designed for cost-effectiveness analysis and does not automatically factor in any economies of scale resulting from increasing the size of immunization interventions. Shared inputs (personnel, transportation, buildings, etc.) and activities are optional.
- Analysis: By outlining the formulas for the tool's main outputs, intervention cost and intervention quantity, and by following through one intervention as an example, we believe this tool's calculations are sound. Any costs excluded have been noted below.

b. Formulas Used to Calculate Tool's Outputs

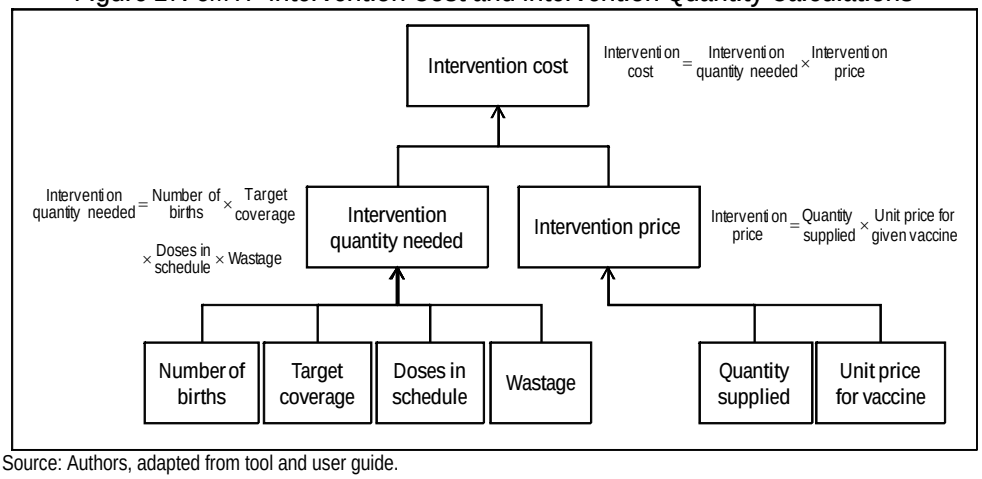
This section evaluates the formulas used to calculate the tool's main outputs: intervention cost and intervention quantity. The tool also calculates the funding gap but because the funding gap is not vaccine-specific but rather is calculated as a single funding gap for the cost of all immunizations, we will not discuss it here. To review the formulas for intervention cost and intervention quantity in the tool, we follow through cell-by-cell all the formulas the tool uses for one intervention: the BCG immunization.

This section begins with a subsection with brief review of the generic formulas, the two next subsections present the computations for the selected intervention, and the final subsection presents the overall review.

Intervention cost and intervention quantity

This tool calculates intervention cost and intervention quantity. The cost of vaccines is calculated by multiplying the quantities supplied by the unit price for a given vaccine. The intervention quantity, which in this tool is the forecast future vaccine requirement, is based on coverage targets, wastage rate targets, unit prices and the size of the target population.

Figure 27: cMYP Intervention Cost and Intervention Quantity Calculations



Source: Authors, adapted from tool and user guide.

After choosing which interventions (vaccinations) to include, the user inputs vaccines and injection supplies; personnel costs; vehicles and transport costs; cold chain equipment, maintenance and overhead; operational costs of campaigns; program activities; other recurring costs and surveillance; other equipment needs and capital costs; and building and building overhead.

Cost computations made by the tool are made using a mix of three different methods:

- The *ingredients approach*, where the value of an input is based on quantities, unit prices and percentage used for immunization. This bottom-up approach is used for the 5 categories of costs that account for over 80% of total costs (vaccines, human resources, vehicles, transportation and cold chain equipment).
- Costs associated with injection supplies, cold chain and vehicle maintenance are calculated based on some *agreed rules-of-thumb.* For example, injection supplies are based on doses of vaccines and immunization practice; maintenance of vehicles is based on a % of fuel costs and cold chain is based on a % of the value of the equipment.
- For other categories of inputs and activities which are not the major cost drivers for immunization, such as training and surveillance, cost approximations are made using the *budgeting approach.*

Costs include inflation, and the inclusion of shared input costs is optional but recommended. The tool uses depreciated capital equipment costs, and includes selected recurrent costs (such as transport, maintenance and overhead). Economies of scale can be entered manually.

Prices are held constant in cost projections, which can be interpreted as real costs.

Intervention: "BCG Vaccine"

This tool provides two methods for computing the cost of BCG and other vaccines. One method is prospective costing and other method is for future projections. However, in our example we are only calculating costs for 2005.

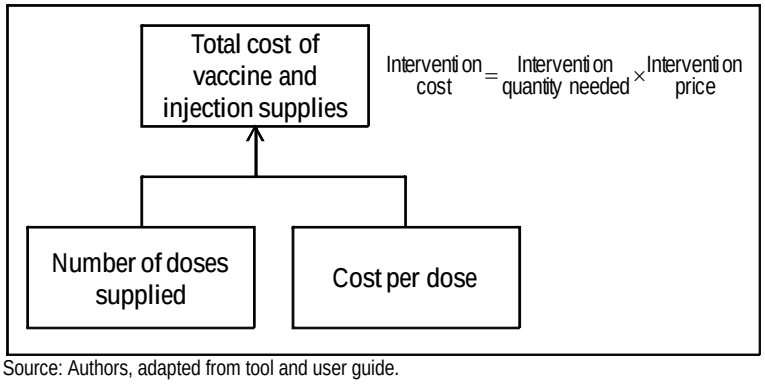
The tool provides as default data the price per dose (tool notes that this price is including freight, and presumably it is including all supplies as well) for all vaccines, including BCG ($0.100, rounded to nearest hundredth). The source for this information is the UNICEF Supplies Division website (http://www.unicef.org/supply). This price per dose is constant over the years costed (2007-2011). Other information required by the tool to calculate intervention cost, intervention price and the funding gap is not provided as default, and for the purpose of tracing this intervention, we have used fictional data:

Doses per schedule	10
Vial size	0.05 ml
Doses supplied (2005)	70,000,000
Doses administered (2005)	60,000

Based on past expenditures, the tool calculates an average wastage rate of 14%.

The tool calculates the total cost of vaccine and injection supplies for 2005 to be $7,030,800, which is the number of doses supplied, multiplied by the cost per dose:

Figure 28: cMYP Intervention Cost and Intervention Quantity Calculations for the BCG Vaccine



Source: Authors, adapted from tool and user guide.

$$\text{Total cost of vaccine and injection supplies} = \text{Number of doses supplied} \times \text{Cost per dose}$$

$$\text{Total cost of vaccine and injection supplies} = 70{,}000{,}000 \times 0.10044$$

$$= \$7{,}030{,}800$$

c. Conclusions

We found this tool to perform well in estimating intervention cost and intervention quantity for the intervention we selected, the BCG vaccine.

4. Experience using the tool[30]

This tool is a single Excel spreadsheet with 8 total worksheets, only 2 of which require data input. At the beginning of the tool, some instructions are available to guide users. Additionally, there is a color scheme to indicate which cells require data. The cells which display calculations do not always indicate how the calculation was reached, although this information can be seen by unprotecting the tool. Typically, one day of hands-on training in a workshop setting with specific computer exercises or one to four days of self teaching (depending on experience) are required prior to using the tool. Additionally, users should possess good excel skills and knowledge of immunization, as well as some experience with costing, financing, planning and budgeting.

This tool has been used in at least 48 countries to date. Please see Annex 4: for a full listing of countries in which the tool has been used. Additionally, some 50 countries also applied the Financial Sustainability Plan (FSP) tool, which was the same model used for the GAVI fund.

More information about the tool can be found on the tool's website, http://www.who.int/immunization_financing/tools/cmyp/.

[30] Information included in this section is based on information provided by the tool's developers and the reviewers' experiences.

I. Integrated Health Model Developed by the UNDP – Version 2.0, November 2007

1. Tool description and overview

This tool focuses on the scale-up costs of the health system as a whole and helps planners ensure the capacity to deliver integrated packages of health services, rather than addressing individual health interventions in isolation.

The tool can be used to answer the following questions:	The tool addresses the following MDG targets:	The tool includes the following interventions:
▪ What is the cost of scaling up health services relevant to the health MDGs?	▪ Reduce the prevalence of underweight children under five years of age (MDG 1) ▪ Reduce by two-thirds, between 1990 and 2015, the under-five mortality rate (MDG 4) ▪ Reduce by three-quarters, between 1990 and 2015, the maternal mortality ratio (MDG 5) ▪ Achieve, by 2015, universal access to reproductive health (MDG 5) ▪ Have halted by 2015 and begun to reverse the spread of HIV/AIDS (MDG 6) ▪ Achieve, by 2010, universal access to treatment for HIV/AIDS for all those who need (MDG 6) ▪ Have halted by 2015 and begun to reverse the incidence of malaria and other major diseases (MDG 6)	▪ Child and adult immunizations ▪ Child health interventions ▪ Family planning ▪ General health systems improvements ▪ HIV/AIDS prevention and treatment ▪ Malaria prevention and treatment ▪ Maternal health interventions ▪ TB prevention and treatment

This tool can be used to determine if the scale-up of the health system differs from the population coverage targets established by the user. Additionally, the tool can be used for planning purposes to identify potential human resource capacity constraints.

2. Understanding the tool

This tool includes a large number of health interventions for users to choose from, along with the ability of users to add their own interventions. STEPs 1 and 2 occur almost simultaneously, as the tool requires input prices and quantities for the chosen interventions. The interventions included are as follows:

Table 15: List of Interventions in Integrated Health Model

Health systems- facilities & HR	Human resources		
	Facilities and equipment		
Commodity supply systems	Facilities (storage and central supervising office)		
	Vehicles for transportation of goods		
	Equipment for monitoring and communications		
	Human resources for transport and monitoring		
HIV treatment	ARV treatment		
	Lab tests associated with ARV treatment		
HIV/AIDS care and support	Treatment of OIs and HIV-related illnesses		
	Nutritional support		
	Homebased care (HBC)		
	Palliative care		
	Support for orphans and vulnerable children		
	Other programs to support PLHIV		
Maternal and reproductive health	Family planning- short- and long-term methods		
	Antenatal care (including IPT for malaria)		
	Skilled attendance at birth- delivery		
	Postpartum care		
	Prolonged labor (> 18 hours)		
	Forceps or vacuum-assisted delivery		
	Cesarean section		
	Postpartum hemorrhage		
	Maternal puerperal sepsis		
	Hypertensive disorder of pregnancy (eclampsia & pre-ecl.)		
	Postabortion complications		
	Obstetric fistula		
	Urinary tract infection		
	Mastitis		
	Prevention of mother-to-child transmission of HIV		
	Chlamydia		
	Gonorrhea		
	Syphilis		
	Trichomonas		
	Pelvic inflammatory disease		
Malaria prevention	Insecticide treated bednets		
Malaria treatment	Rapid diagnostic testing		
	Treatment of uncomplicated malaria		
	Treatment of severe/complicated malaria, no blood transfusion		
	Treatment of severe/complicated malaria, blood transfusion		
Tuberculosis			
Child Health	Primary care	Children less than 2 months old	Bacterial infection
			Diarrhea
			Feeding problems, low birth weight
		Children greater than 2 months old	Acute respiratory infection
			Fever (non-malarious, non-measles)
			Measles
			Ear infection

Table 15: List of Interventions in Integrated Health Model

			Malnutrition
			Anemia
			Diarrhea
		Children less than 2 months old	Pneumonia
			Sepsis
			Meningitis
			Ophtalmia Neonatorum
			Severe dehydration
			Severe dysentery
			Severe persistent diarrhea
	Referral care	Children greater than 2 months old	Severe pneumonia
			Very severe pneumonia/disease
			Pleura effusion and empyema
			Severe asthma
			Viral coup
			Diphtheria
			Pertussis
			Heart failure
			Severe dehydration
			Severe persistent diarrhea
			Severe dysentery
			Meningitis
			Septicemia
			Typhoid fever
			Urinary tract infection
			Septic arthritis
			Dengue hemorrhagic fever
			Severe malnutrition
			Severe anemia
	Childhood immunization and nutrient supplementation and growth monitoring		DPT 1,2,3
			Polio 1,2,3
			Hepatitis B 1,2,3
			Measles
			BCG
			Yellow Fever
			Hib
			Vitamin A
			Zinc
			Iodine
			Growth monitoring
HIV/AIDS enabling environment	Review/develop/amend intellectual property laws to allow the application of TRIPS safeguards and flexibilities (for WTO member developing countries only)		
	Review/develop/amend policies and legislations that ensure confidentiality and quality counseling/testing/treatment/care, and that protect the rights of people living with HIV		
	Review/develop/amend policies and legislations that discriminate against vulnerable populations including women, sex workers and MSM		
	Review/develop/amend policies and legislations that enable harm reduction activities for IDUs including needle exchange and drug substitutions		
	Monitor human rights violations against people living with HIV and their family members		
	Implement programs to reduce stigma and discrimination		
	Carry out advocacy events to raise awareness on HIV		
	Build capacity of key stakeholders		

Table 15: List of Interventions in Integrated Health Model

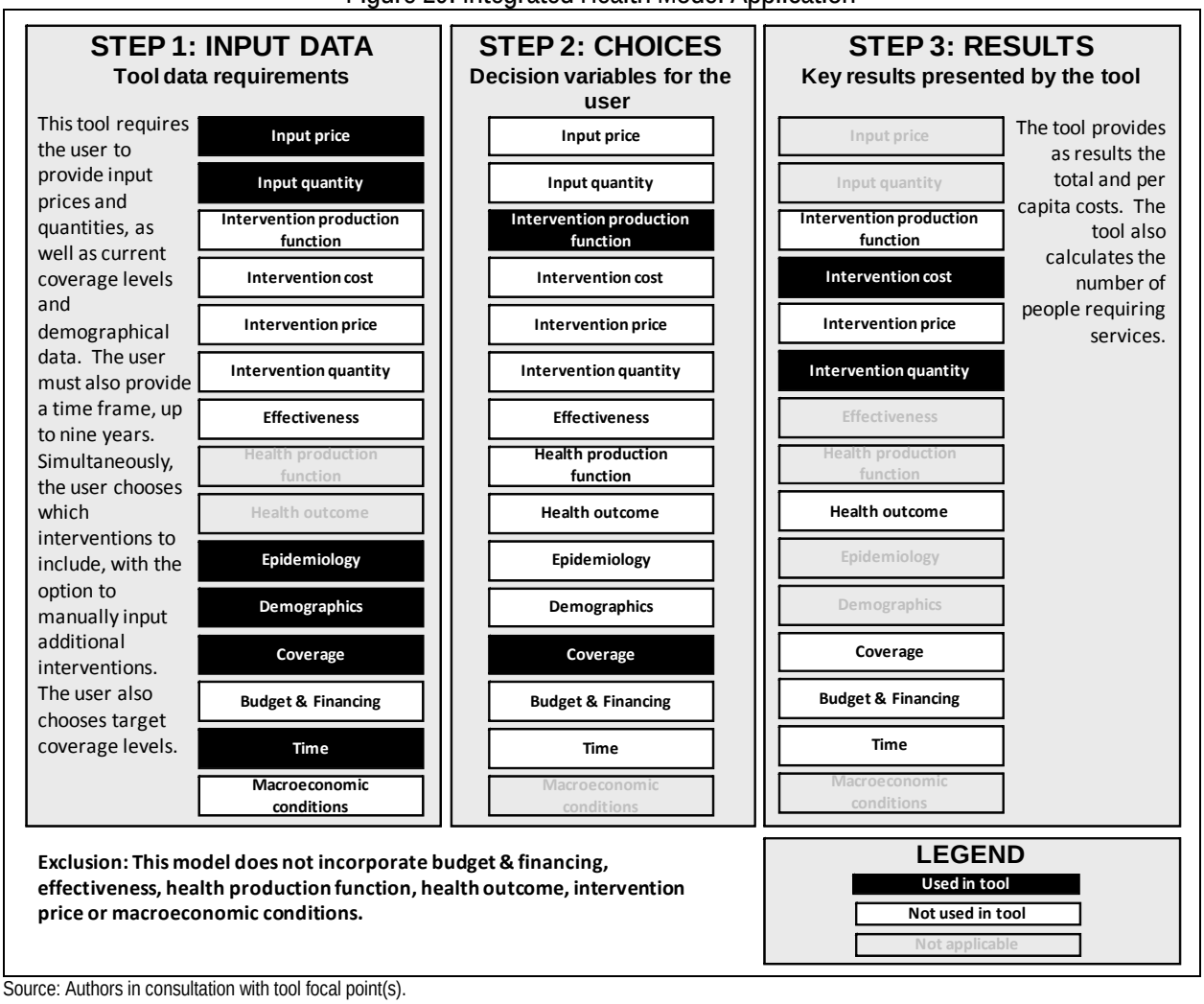
	HIV/AIDS training for law enforcement officials and judges
	Other training and sensitization programs
	Research and analysis
	Conduct research to collect epidemiological and BSS data related to HIV and provide evidence for optimal decision-making and resource prioritization
	Support the empowerment and capacity building of self-help groups/networks among vulnerable populations (PLHIV, sex workers, IDUs, MSM, etc.)
	Provide affordable legal support for PLHIV
	Other programs
HIV prevention	HIV prevention among sex workers
	HIV prevention among MSM
	HIV prevention among IDUs
	HIV prevention among migrant workers
	HIV prevention among seafarers
	HIV prevention among other vulnerable populations (up to 3)
	Workplace programs
	Condom provision
	VCT
	Mass media campaign
	Blood safety
	Post-exposure prophylaxis
	Safe medical injection
	Youth education of HIV/AIDS
	Treatment of STIs
	Prevention of parent-to-child transmission (PPTCT-Plus)

Source: Integrated Health Model, Version 2.0, MDG Support Team, United Nations Development Program, November 5, 2007.

The tool also requires input epidemiological data, as well as current coverage levels and demographical data. The model has some demographics data built-in, taken from the UNFPA database, although this data can be changed by the user. The user must also define a time frame, up to nine years. The tool provides as results the total and per capita costs in two major areas: health systems and specific health interventions.

The below figure summarizes this tool's logic. It should be noted that this model does not incorporate the following costing elements: budget & financing, effectiveness, health outcome, health production function, and macroeconomic conditions.

Figure 29: Integrated Health Model Application



Source: Authors in consultation with tool focal point(s).

This tool incorporates coverage-guided decision making and can be used for medium- and long-term planning, up to nine years. The model includes a built in production function, although the user can choose which interventions to include and can add interventions as well. This model does not calculate health impact.

3. Formula Review

a. Conceptual Framework Analysis

- Tool Objective: "to help governments estimate the total resources—human, infrastructural, commodities, financial—that are required to meet the health-related MDGs." (user manual, chapter 1)
- How: Excel-based tool uses unit costing approach and user-defined coverage to estimate resources delivered by the health system, broken into major cost categories- ex. child health.

- Included: Health Systems Facilities, Equipment, Human resources and Commodity Supply Chain; Child Health: Acute respiratory infection, Diarrhea, Treatment for malnutrition, Nutrient supplementation and immunization; Maternal and Reproductive Health: Short- and long-term contraceptives, Skilled birth attendance, Basic and comprehensive emergency obstetric care, Treatment for sexually transmitted infections and repair of obstetric fistula; HIV/AIDS: Prevention measures, Anti-retroviral therapy and associated laboratory tests, Care and support (such as treatment of opportunistic infections) and enabling environment interventions; Malaria prevention via insecticide-treated bed nets, rapid diagnostic testing and treatment (including artemisinin combination therapy); Tuberculosis treatment per Directly Observed Therapy Shortcourse (DOTS); Demand-side interventions; Additional facility-based services, such as services for chronic conditions (e.g., diabetes, cardiovascular disease, etc.), as well as independent health programs as defined by the user.
- Limitations and Exclusions: Model does not automatically account for synergies between interventions but users may make these adjustments manually.
- Analysis: By outlining the formulas for the tool's main outputs, intervention cost and intervention quantity, and by following through one intervention as an example, we believe this tool's calculations are sound. Any costs excluded have been noted below.

b. Formulas Used to Calculate Tool's Outputs

This section evaluates the formulas used to calculate the tool's main outputs: intervention cost and intervention quantity. To review the formulas in the tool, we follow through cell-by-cell all the formulas the tool uses for one intervention: Condom Provision (a form of HIV Prevention). Reviewers used fictional data for this review.

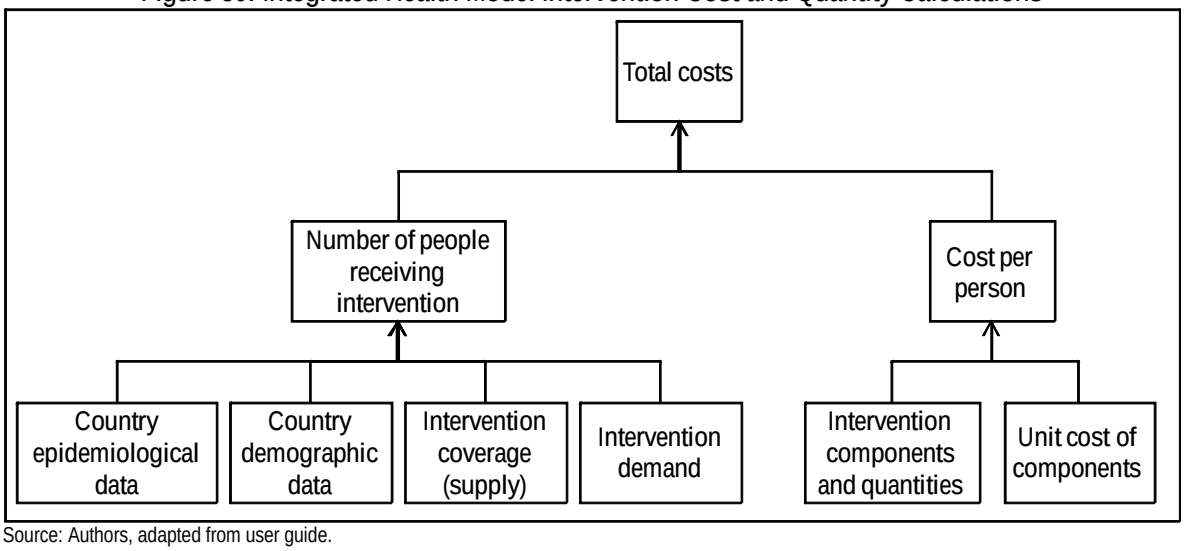
This section begins with a subsection with brief review of the generic formulas, the two next subsections present the computations for the selected intervention, and the final subsection presents the overall review.

Intervention quantity and funding gap

The Integrated Health Model calculates costs of both individual health services/interventions and overall health systems, as well as the number of people requiring services. Although exact formulas for these outputs are not included in this tool's user guide, a unit cost approach is used to calculate both total and per capita costs, which includes recurrent/operating costs as well as capital costs. Intervention cost is the number of people receiving the intervention multiplied by the cost of intervention per case or person receiving the intervention.

The intervention quantity calculation encompasses country epidemiological data, demographic data, intervention coverage rates as well as taking into consideration demand. The below figure depicts the tool's general logic used to compute the elements involved in the cost and quantity calculations:

Figure 30: Integrated Health Model Intervention Cost and Quantity Calculations



Source: Authors, adapted from user guide.

It should be noted that the cost per case includes only those drugs, supplies and other items that are consumed on a per case basis and, therefore, does not include the cost of human resources, since human resources deliver multiple packages of services. The model costs human resources (in terms of pre-service training, in-service training and salaries) separate from the interventions, on the health systems worksheets.

Intervention: "HIV Prevention – Condom Provision"

"Condom provision" is one HIV Prevention strategy to appear in this tool. "Condom provision" appears in the following areas of the tool:

On the "HIV Prevention" worksheet, the user enters population data as well as start year and target year coverage information and the unit cost per male condom. All data except the unit cost per male condom can be taken from databases linked to the tool (however, for our example we used entirely fictional data not taken from any database). As results, the tool calculates the following intervention quantities and costs:

Table 16: Condom provision: Intervention Quantities and Costs

Results
Condoms needed for sex acts for males in partnerships
Condoms needed for sex acts for males having casual relationships
Condoms provided for sex acts for males in partnerships
Condoms provided for sex acts for males having casual relationships
Costs
Condoms provided for sex acts for males in partnerships
Condoms provided for sex acts for males having casual relationships
Total costs

Source: Authors based on Tool worksheets.

There is a note of caution in this part of the tool against double-counting interventions which include condom distribution: "If condom provision is included in different sections such as sex workers and work place interventions that should not be double counted. In other words, this section should only include condom provision to those who are not included in other interventions." It was difficult to see where else in the tool condom provision was found.

We will provide an example using fictional data, setting population factors as follows:

Adult male population, year 2007 (start year)	6,000,000 with 2% yearly growth
Adult female population, year 2007 (start year)	6,056,046 with 2% yearly growth
% Males 15-49 in partnerships	50%
% 15-49 males reporting casual relationships	30%
Number of sex acts for casual relationships per year	15
Number of sex acts with partners per year	25
Condom wastage during storage and distribution	10%
Percent of condoms distributed through social marketing	75%

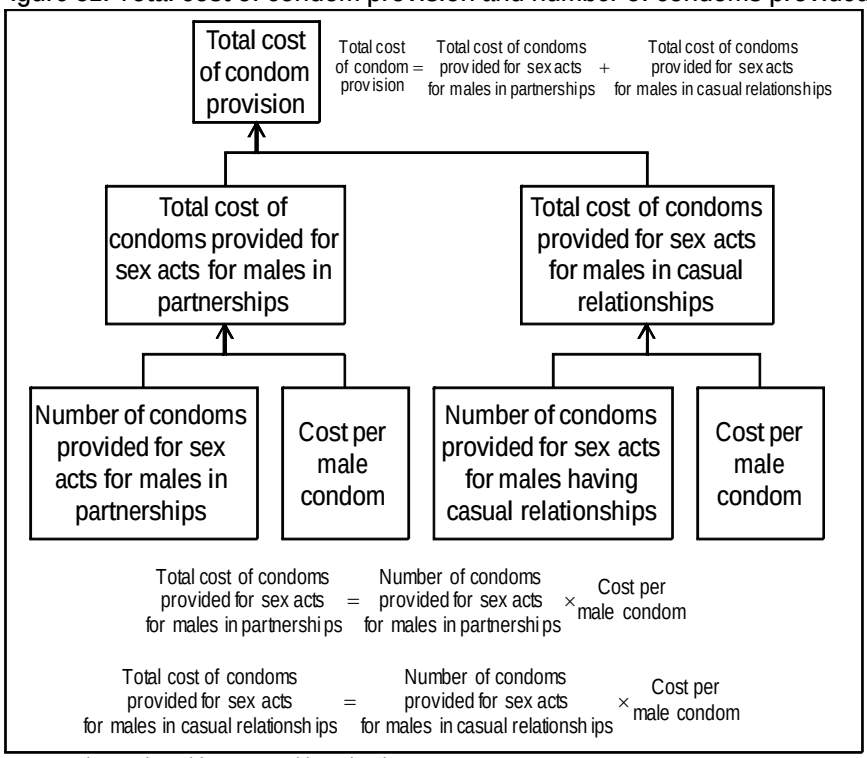
Start and target year coverage was set as follows (fictional data):

	Start year (2007)	Target year
% of casual sex acts covered with condoms	45%	70%
% of married with casual partners using condoms in marital sex	45%	70%

The user specifies the cost per male condom, set at $0.15 in our fictional example.

As results, the tool calculates intervention cost in the form of total cost of condom provision, and intervention quantity in the form of number of condoms provided. Both are separated between sex acts for males in partnerships and sex acts for males having casual relationships, as follows.

Figure 31: Total cost of condom provision and number of condoms provided

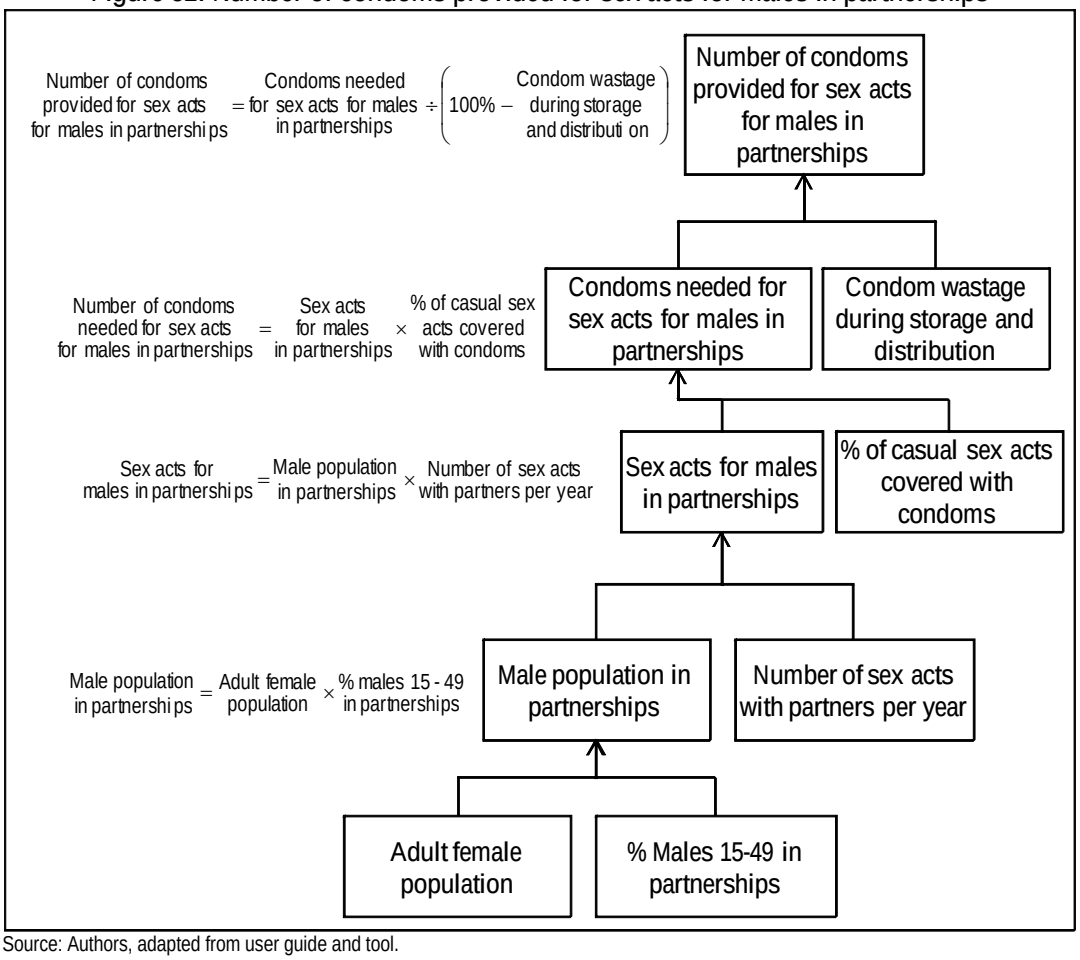


Source: Authors, adapted from user guide and tool.

For sex acts for males in partnerships, the calculations are as follows (for year 2007): [31]

[31] Note: to compute the male population in partnerships the tool uses female adult population.

Figure 32: Number of condoms provided for sex acts for males in partnerships



Source: Authors, adapted from user guide and tool.

Therefore, the number of condoms provided for sex acts for males in partnerships, and the associated cost, is as follows:

$$\text{Number of condoms provided for sex acts for males in partnerships} = \frac{\text{Condoms needed for sex acts for males in partnerships}}{\left(100\% - \text{Condom wastage during storage and distribution}\right)}$$

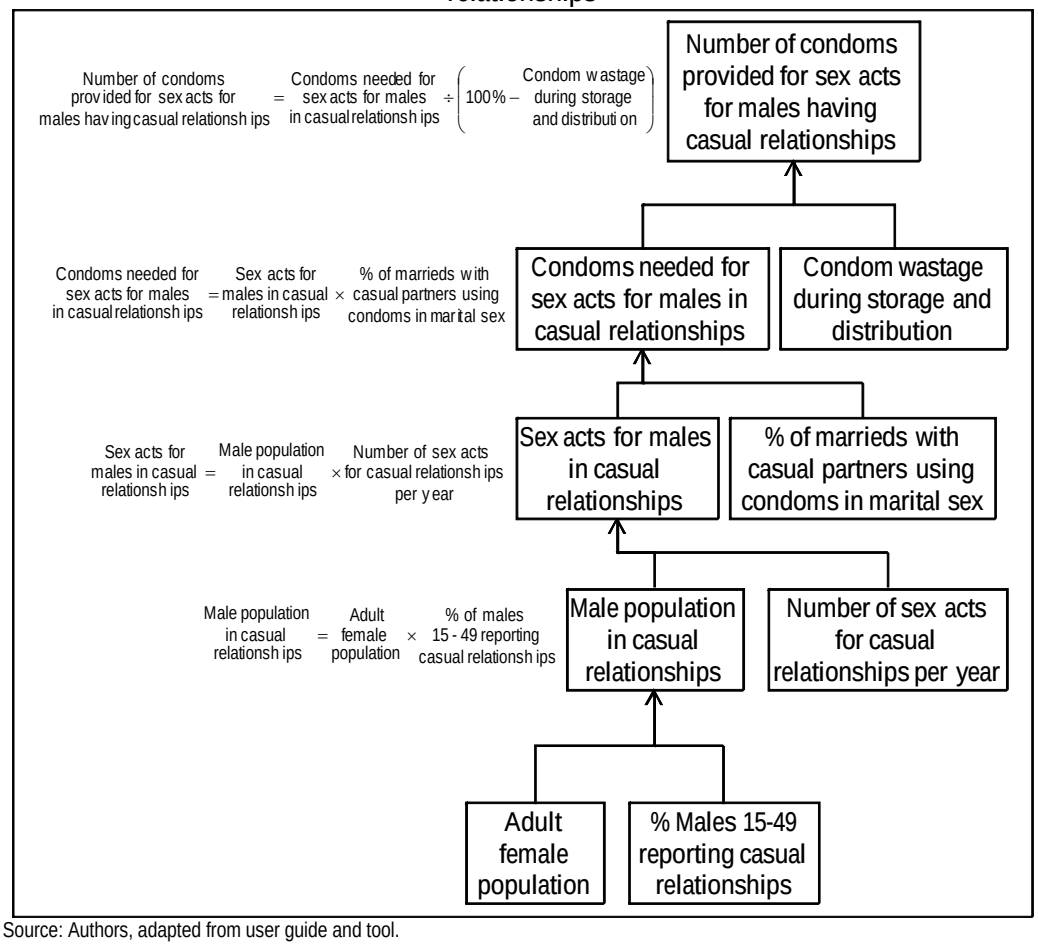
$$\text{Number of condoms provided for sex acts for males in partnerships} = \frac{34{,}065{,}259}{(1-10\%)} = 37{,}850{,}288$$

$$\text{Total cost of condoms provided for sex acts for males in partnerships} = \text{Number of condoms provided for sex acts for males in partnerships} \times \text{Cost per male condom}$$

$$\text{Total cost of condoms provided for sex acts for males in partnerships} = 37{,}850{,}288 \times \$0.15 = \$5{,}677{,}543$$

For sex acts for males in casual relationships, the calculations are as follows (for year 2007):

Figure 33: Number of condoms provided for sex acts for males having casual relationships



Source: Authors, adapted from user guide and tool.

Inputting the values we obtain:

$$\text{Number of condoms provided for sex acts for males having casual relationships} = \frac{\text{Condoms needed for sex acts for males in casual relationships}}{\left(100\% - \text{Condom wastage during storage and distribution}\right)}$$

$$\text{Number of condoms provided for sex acts for males having casual relationships} = \frac{8{,}175{,}662}{(100\% - 10\%)} = 9{,}084{,}069$$

$$\begin{array}{c}\text{Total cost of condoms}\\ \text{provided for sex acts}\\ \text{for males in casual relationships}\end{array} = \begin{array}{c}\text{Number of condoms}\\ \text{provided for sex acts}\\ \text{for males in casual relationships}\end{array} \times \begin{array}{c}\text{Cost per}\\ \text{male condom}\end{array}$$

$$\begin{array}{c}\text{Total cost of condoms}\\ \text{provided for sex acts}\\ \text{for males in casual relationships}\end{array} = 8{,}175{,}662 \times \$0.15 = \$1{,}362{,}610$$

For future years, calculations are made using a linear population growth rate of 2% per year. The unit cost per condom remains $0.15 per year. Scale-up from 45% to 70% target coverage is linear.

In a separate part of the tool, facilities, human resources, equipment, health systems and other shared costs are calculated.

c. Conclusions

We found this tool to perform well in estimating intervention cost and intervention quantity for the intervention we selected. We used the tool without macros enabled and calculations were transparent and simple to follow. The tool claims to help governments estimate the total resources required to meet the health-related MDGs; yet, there is no support in the tool or its documentation of how the interventions included are tied to specific MDG targets.

4. Experience using the tool[32]

This tool is an Excel workbook with multiple spreadsheets. For navigation this tool has a toolbar and a color scheme is used to indicate that the user must input data into the yellow cells marked with red font, and verify the yellow cells marked in blue font as the tool provides this data as default or as an interim calculation of the model. One to two days of interactive workshop training with structured exercises should be sufficient training for users prior to using the tool. Skills required to use the tool include familiarity with Excel, basic epidemiological parameters and basic math. Users can refer to a manual for assistance, although specific formulas for the tool's calculations are not listed in this manual.

This tool has been used in Haiti, Nigeria, Rwanda and Uganda, along with a number of other countries in West and Central Africa and South Asia and the Pacific. A dozen countries have also been trained on the tool but have yet to use it in a costing exercise.

More information is available on the tool's website, http://www.undp.org/poverty/tools.htm#nact.

[32] Information included in this section is based on information provided by the tool's developers and the reviewers' experiences.

J. Planning & Budgeting for TB Control Developed by WHO – Version 1.5.19[33]

1. Tool description and overview

This tool is designed to help countries to develop comprehensive plans and budgets for TB control (i.e. covering all recommended interventions) within the framework provided by the WHO's Stop TB Strategy and the Stop TB Partnership's Global Plan to Stop TB, 2006-2015.. This tool was designed to be used by TB program planners at the country level, who can apply the tool at either the national or sub-national level.

The tool can be used to answer the following questions:	The tool addresses the following MDG targets:	The tool includes the following interventions:
▪ What is the cost of scaling up health services relevant to the health MDGs? ▪ What health MDGs can be achieved with available resources?	▪ Have halted by 2015 and begun to reverse the incidence of malaria and other major diseases (MDG 6)	▪ General health system improvements ▪ HIV/AIDS prevention and treatment (only interventions that need to be implemented jointly between TB and HIV programs) ▪ TB prevention and treatment

The tool is structured according to the major components and subcomponents of the Stop TB Strategy and includes default values that are consistent with the targets set in the Global Plan. It is also consistent with the Global Fund's definition of Service Delivery Areas. It produces a standard set of summary tables and figures, including summary tables that are needed for Global Fund proposals.

2. Understanding the tool

In STEP 1 (CHOICES), this tool allows users to choose their country from the list of 212 built into the tool and select which interventions to include in the costing exercise. The list of built-in interventions is seen in the below table, and each intervention corresponds to a worksheet in the tool:

[33] Version 1.5.19 is also referred to as Version 5.19 in the tool itself and as Version 2 on the website where the tool is made available to users.

Table 17: Built-in Interventions in the Planning and Budgeting for TB Control Tool

- DOTS treatment for new smear-positive TB cases (using short-course chemotherapy for 6 or 8 months) (e.g. first-line drugs, Public-Private Public-Public Mix (PPM), Community involvement (CTBC))
- DOTS treatment for new smear-negative/extrapulmonary TB cases (using short-course chemotherapy for 6 or 8 months)
- Treatment for MDR/XDR-TB using both first and second-line drugs
- HIV testing and counseling for TB patients
- CPT for HIV-positive TB patients
- HIV prevention services for TB patients
- IPT for 6 months for HIV+ people without active TB
- Screening for TB among HIV-positive people newly diagnosed or attending HIV care services
- Practical Approach to Lung Health (PAL)
- ART for HIV-positive TB patients during period when TB and ART treatment overlap (maximum 6 months)

Source: Comments from Andrea Pantoja, January 5, 2008 (email correspondence).

The user can also choose to include additional interventions which are not built-into the tool. For each intervention, the user needs to choose the method that they will use to calculate the cost of the intervention. There are two options: "quick estimate" or "detailed method." Within a given worksheet, it is only possible to use one of these two alternative methods, although across the tool as a whole it is possible to use a mixture of the two approaches (e.g. quick method to cost first-line drugs, detailed method to cost treatment for MDR-TB). The quick estimate is a top-down approach using default budget or cost values that are country specific. These default values come from data reported by countries to WHO/STB annually and from the Global Plan to Stop TB, 2006-2015. In the quick estimate, the user does not need to enter any price or quantity data (hence the term "quick estimate"). In the detailed method, a bottom-up approach to costing is used. This requires users to input data on quantities and prices, and it is the method which users are encouraged to choose. If users choose the detailed method, they need to input quantities and prices for each activity. In some cases, within the detailed method there are default values for prices or quantities which users can choose to use as input variables. The user must specify what funding is available for each intervention and what time period to cost. Categories to use for sources of funding are also specified. However, users can change the default values or the names of the funding categories if they have more appropriate ones for their own country. The sources of information for the default values include the Global TB control report, the Global Plan to Stop TB 2006-2015, UNAIDS and WHO/EIP.

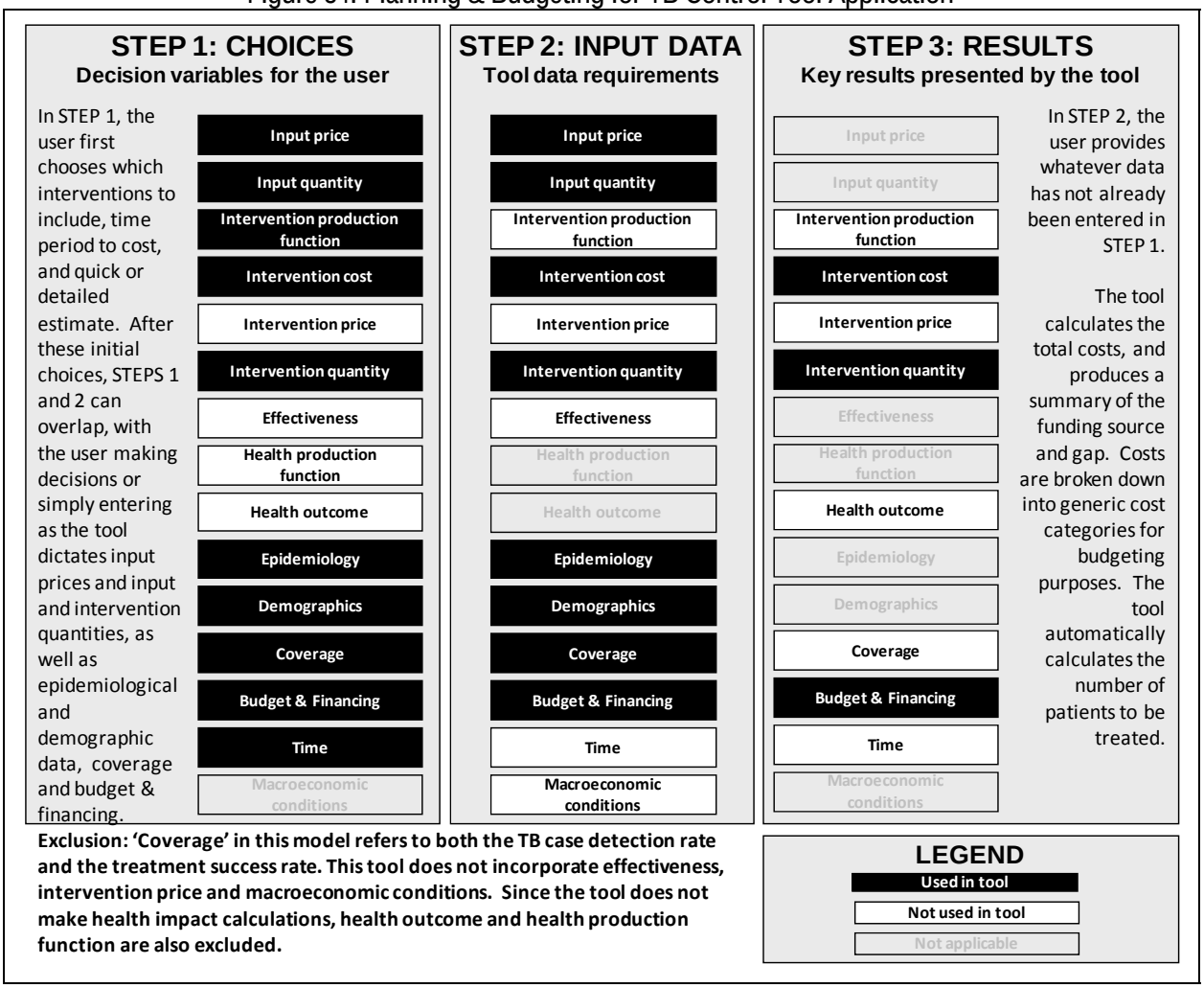
After these initial choices, the user can make further choices about input price, input quantity, intervention cost, intervention quantity, epidemiology, demographics, coverage and budget & financing, or simply input this data as dictated by the tool. Because of this overlap between STEPS 1 and 2, whatever data has not been provided in STEP 1 should be entered in STEP 2. The two choices the user has with regards to coverage are: a) the percentage of all estimated TB cases to be detected (case detection rate) and b) the percentage of TB patients (=detected cases) to be successfully treated (treatment success rate). It should be noted that demographics data are included as default, but the user can override the existing data and input their own population data at this point. Country-specific values included in the tool as default are estimated based on various sources such as the Global Plan to Stop TB, 2006-2015, the annual WHO TB control report, UNAIDS and WHO/EIP.

In STEP 3 (RESULTS), the tool calculates the total costs of the selected interventions, and produces a summary of the funding sources and gaps. In summary tables and graphs, the

tool summarizes costs by line item and funding source, for each year for which the user has entered data (from one year up to 10 years). The tables include summaries according to the service delivery areas and generic cost categories that are used by the Global Fund, and the summaries that are required for reporting of the financial data that WHO requests from all countries each year. The tool automatically calculates the number of patients to be treated, based on the coverage targets set by the user, country-specific demographic and epidemiological data that are already provided for users within the tool (e.g. population projections, TB incidence and notified cases up to 2006), and regional projections of trends in TB incidence from 2006 to 2015 for the region of which the country is a part.

This model does not explicitly make health impact computations and thus both health impact and health production function are excluded from Figure 32: Planning & Budgeting for TB Control Tool Application. However, users are asked to set targets for treatment success rates for TB patients and the model is based on projections of incidence from The Global Plan to Stop TB, 2006-2015, and if users plan according to the default targets (set out in the tool), the health outcome targets included in the Global Plan are projected to be achieved. Additionally, effectiveness and macroeconomic conditions are excluded. Intervention price is also excluded from this tool because TB treatment is provided free of charge in almost all countries and thus intervention price is not relevant. However, the tool has the flexibility to include user fees (intervention) should the user wish to do so. The below figure indicates how the remaining elements of costing are incorporated in this tool.

Figure 34: Planning & Budgeting for TB Control Tool Application



Source: Authors in consultation with tool focal point(s).

This tool is driven by both coverage- and impact-guided decision making, with budget constraint. It can be used for short-, medium- and long-term planning. The model includes a built in production function, although the user can optionally add additional interventions and costs.

3. Formula Review

a. Conceptual Framework Analysis

- Tool Objective: to provide a single forum to help countries develop comprehensive plans and budgets for TB control within the framework provided by the WHO and the Stop TB Partnership's Global Plan to Stop TB (2006-2015).
- How: Excel-based tool which uses the ingredients approach.
- Included: allows the user to choose between a detailed costing exercise or a quick cost estimate for TB programs. Provides a list of likely inputs and activities to consider (one

worksheet for each major component of TB control) as well as default values, based on experience from a variety of countries. This tool uses UNPD population projects.

- Limitations and Exclusions: Developers do not provide a comprehensive user's manual, although the tool has a built-in user guide and accompanying documentation, such as troubleshooting tips and Excel assistance, to assist users.
- Analysis: By outlining the formulas for the tool's main outputs, intervention cost, intervention quantity and budget & financing (funding gap), and by following through one intervention as an example, we believe this tool's calculations are sound. Any costs excluded have been noted below.

b. Formulas Used to Calculate Tool's Outputs

This section evaluates the formulas used to calculate the tool's main outputs: intervention cost and intervention quantity. To review the formulas in the tool, we follow through cell-by-cell all the formulas the tool uses for one intervention: ART (and CPT) for HIV+ patients, per 6 person months. Data built-into the tool for the country of Philippines was used to trace the intervention and in the example calculations which follow.

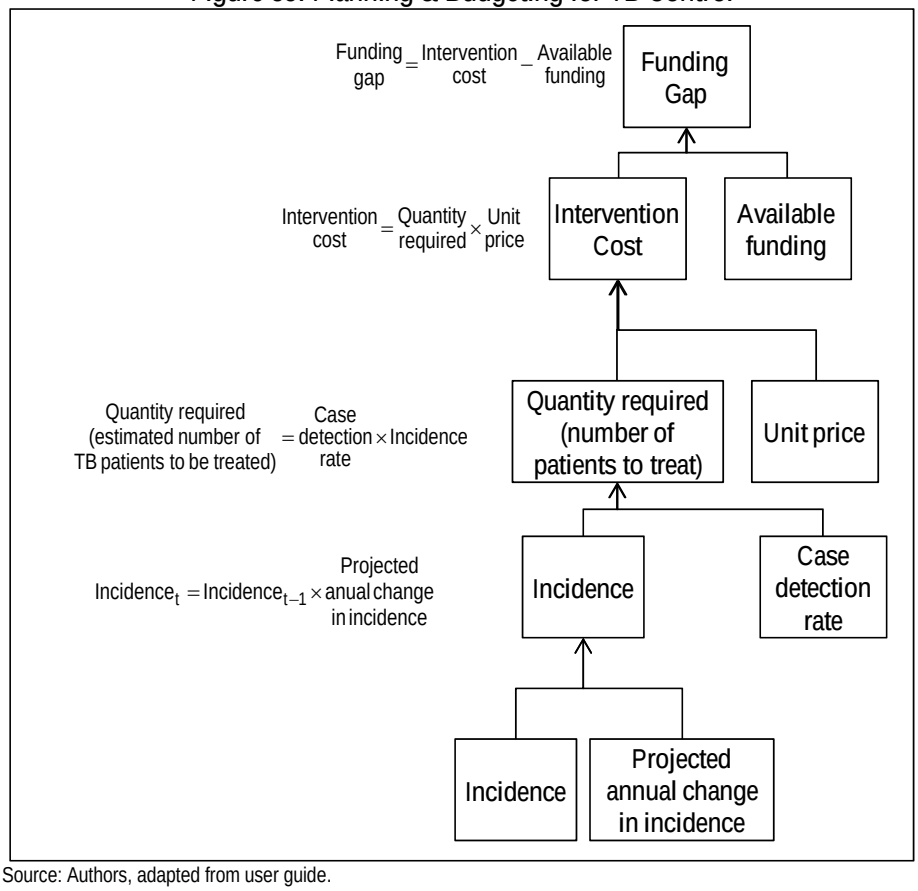
This section begins with a subsection with brief review of the generic formulas, the two next subsections present the computations for the selected intervention, and the final subsection presents the overall review.

Intervention cost, intervention quantity and funding gap

This tool calculates intervention cost, intervention quantity (in the form of number of patients to be treated in coming years, the size of the population covered, and the number of total people reached) and the funding gap. Costs are calculated following an ingredients approach, where quantities are multiplied by the unit prices. For some inputs, the tool provides default values for prices, which can be changed by the users, but in general users enter their own prices.

The generic formulas used to estimate the intervention cost and the number of TB patients to be treated in coming years are seen below:

Figure 35: Planning & Budgeting for TB Control



Source: Authors, adapted from user guide.

To calculate the estimated number of patients to treat in the coming years, users need to input the target case detection rate. Case detection rate is used to measure the performance of TB control programs. It measures the number of TB patients detected in the TB country program with respect to the estimated number of people with TB in that country.

In the projection of cases the tool includes a parameter for projected annual change in incidence. This is an important part of the computation of future incidence since TB is a transmittable disease whose transmission can be reduced by prompt treatment using recommended drug regimens.

The funding gap is calculated by subtracting total available funding (from central, provincial and local government, as well as loans, The Global Fund to Fight AIDS, Tuberculosis and Malaria and other grants) from the total cost.

The tool includes a sheet for costing general health services costs as well.

Intervention: "ART (and CPT) for HIV+ TB patients, per 6 person months"

This section will trace the intervention "ART (and CPT) for HIV+ patients, per 6 person months," listed as an activity to decrease the burden of HIV/AIDS in TB patients ("TBHIV" worksheet), to examine how the tool calculates intervention cost, intervention quantity and funding gap. Data used is for the country of Philippines and was built-into the tool. Specific

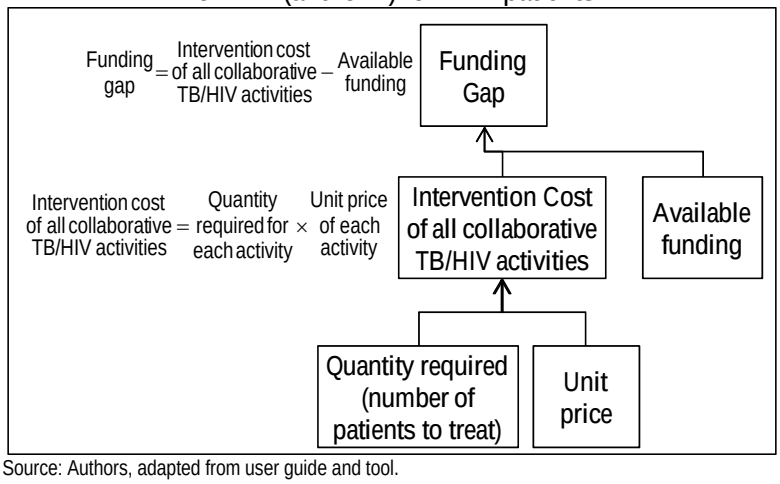
sources are cited when noted in the tool. The costing exercise is done for years 2006-2015 using the quick costing method.

The tool provides a unit cost of $5,868 for antiretroviral therapy and cotrimoxazole preventive therapy for HIV+ patients, per 6 person months. This is a reference value calculated by UNAIDS for Philippines, and a note in the tool explains that this value reflects all necessary inputs for the activity (including training, drugs, and/or clinical revisions). If better values are available the tool suggests overriding the default data. This cost is held constant over the ten years of the costing exercise. For this particular intervention, intervention quantity is also provided as default.

In the "quick method" of costing, the tool does not calculate the intervention cost of individual activities like ART and CPT, (although this could easily be done by multiplying the unit price by the intervention quantity), but rather calculates the total cost of the five activities (one of which is ART/CPT, the others being HIV testing and counseling for TB patients, HIV prevention, care and support for HIV+ TB patients and CPT for HIV+ patients) to decrease the burden of HIV/AIDS in TB patients. This cost is calculated by year by summing the product of the intervention quantity per year by the unit price per year. Using the "detailed method," however, the tool calculates the cost of individual subcomponents of the main intervention.

The tool then totals the intervention cost for all collaborative TB/HIV activities (eleven categories) and compares the total intervention cost with total available funding (entered by the user) to automatically determine the funding gap.

Figure 36: Intervention cost, intervention quantity and funding gap for ART (and CPT) for HIV+ patients



Source: Authors, adapted from user guide and tool.

As an example, for ART (and CPT) for HIV+ patients, the intervention cost in year 2006 is as follows:

$$\text{Intervention cost (year 2006)} = \text{Cost of ART (and CPT) for HIV/TB+ patients} \times \text{Estimated number of TB/HIV+ patients enrolled on ART(+CPT)}$$

$$\text{Intervention cost (year 2006)} = \$5{,}868 \times \$64 = \$375{,}552$$

The total intervention cost for activities to decrease the HIV/AIDS burden in TB patients is $1,637,820 for 2006; the total intervention cost for all collaborative TB/HIV activities is $1,752,789 (quick estimate). This amount is automatically transferred to the worksheet "STBScomp," where the components of The Stop TB Strategy are laid out and the tool correlates these components with costs generated in other parts of the tool.

Using this estimate of total intervention cost for all collaborative TB/HIV activities, using fictional financing data of $300,000 from the national government, $100,000 from provincial government, $100,000 from local/district government, $400,000 in loans, $200,000 from The Global Fund and $100,000 in other loans, the funding gap for 2006 for collaborative TB/HIV activities would be as follows:

$$\text{Funding gap for collaborative TB/HIV activities (year 2006)} = \text{Total intervention cost of collaborative TB/HIV activities (2006)} - \text{Available funding for collaborative TB/HIV activities (2006)}$$

$$\text{Funding gap for collaborative TV/HIV activities (year 2006)} = \$1{,}752{,}789 - 1{,}200{,}000 = \$552{,}789$$

c. Conclusions

We found this tool to perform well in estimating intervention cost, intervention quantity and the funding gap for the intervention we selected. This tool is very flexible in terms of its use, with the option of choosing quick estimates or detailed costing, and presents a summary of results as National TB Program Budgets and sources of funding; Stop TB Strategy costs by sources of funding; and total cost by generic cost categories of the Global Fund.

4. Experience using the tool[34]

This tool is available in English, French, Russian and Spanish and is an Excel workbook with 41 total worksheets, 18 of which require data input. There is a color scheme to indicate which cells require data input. Three days of training are sufficient to know and be able to use the tool. However, to complete the tool, one to three full-time weeks of work are suggested, and users indeed reported needing 7 to 15 days to use the tool. Although there is no comprehensive user's manual (based on user feedback, developers did not feel it was needed), the tool user guidance built into the Excel spreadsheet and the tool comes with accompanying documentation, such as troubleshooting tips and Excel advice, to assist users. Users found the built-in user guide "helpful, useful, easy to use and understand," and the tool contains a switchboard to guide users through the tool. A help desk is available, and four of the five users reported needed technical assistance (in addition to training) to use the tool. It is useful for users to have knowledge on TB epidemiology and on TB control situation and activities at country level, as well as basic skills in Excel.

Users reported the tool to be user friendly and easy to navigate. Four of the five users were able to adapt the tool to their local circumstances. All users deemed the costing exercise with this tool "successful," with results "informative, defendable." One user would like the tool

[34] Information included in this section is based on information provided by the tool's developers, the reviewers' experiences, and the experiences of five users from Ethiopia, Malawi, Mozambique, Tanzania and Uganda.

to go beyond costing and look at cost effectiveness, another user wanted the tool to show the source of funding for each service delivery area, and another user would like to have unit costs available as default data since providing this information in an integrated health system is challenging. In response to this last comment, developers suggested this comment might be "misleading" because "the tool includes a lot of default unit cost data" (April 2008).

The tool has been used by 35 countries in Africa, plus at least 2 in SE Asia, 3 in the W. Pacific region, 5 in the Eastern Mediterranean region, 1 in Europe and more than 5 in Latin America. Costing exercises using the tool have been completed by Democratic Republic of Congo, Gabon, Kenya, Malawi, Nigeria, South Africa, Uzbekistan and Zambia. Several other countries are in the process of using the tool, including Congo, Ethiopia, Mali, Namibia, Philippines and Senegal.

More information about the tool is available at http://www.who.int/tb/dots/planning_budgeting_tool/en/index.html.

K. Resource Needs Model HIV/AIDS Developed by Constella Futures/Futures Institute – October 2005

1. Tool description and overview

This tool calculates the total resources needed for prevention, care, and orphan support for HIV/AIDS on a national level. This tool was designed to be used by a national, multidisciplinary team.

The tool can be used to answer the following questions:	The tool addresses the following MDG targets:	The tool includes the following interventions:
▪ What is the cost of scaling up health services relevant to the health MDGs?	▪ Have halted by 2015 and begun to reverse the spread of HIV/AIDS (MDG 6) ▪ Achieve, by 2010, universal access to treatment for HIV/AIDS for all those who need (MDG 6)	▪ HIV/AIDS prevention and treatment ▪ TB prevention and treatment

This tool helps users determine the resources needed to achieve their HIV/AIDS goals, and is designed to be help users arrive at achievable, affordable coverage. The tool can be used to first show the intervention cost of full coverage; if a funding gap exists when compared against funding available, the user can adjust coverage goals until resources required match resources available.

2. Understanding the tool

This tool includes three sub-models: prevention, care and treatment, and orphan support. The list of interventions included in each sub-model is listed below:

Table 18: List of Interventions Included in Resource Needs Model

Prevention	Priority populations	Youth focused interventions
		Sex workers and clients
		Workplace
		IDUs
		MSM
		Other vulnerable populations (up to 5)
	Service delivery	Condom provision
		STI management
		VCT
		PMTCT
		Mass media
	Health care	Blood safety
		Post-exposure prophylaxis
		Safe injection
		Universal precautions
Care and treatment services	Home-based care	
	Palliative care	
	Diagnostic testing	
	Treatment of OIs	
	OI prophylaxis	
	Lab HAART	
	ARV therapy	
	Training	
	Nutritional support	
	TB	
Mitigation		
Program support		

Source: Resource Needs for HIV/AIDS: Model for Estimating Resource Needs for Prevention, Care, and Mitigation. John Stover and Lori Bollinger, The Futures Group International and Stefano Bertozzi and Juan Pablo Gutierrez, Instituto Nacional de Salud Publica. October 2005.

For all three sub-models, the user provides intervention prices and quantities. While the tool provides some default data from published studies on the cost of prevention and care programs, users are free to change data in dark blue boxes if they have more accurate information. The user also inputs national data such as HIV prevalence information (denoted as epidemiology in the below figure), demographics and current coverage data. The tool suggests using Spectrum[35] to obtain national-level data required by the tool.

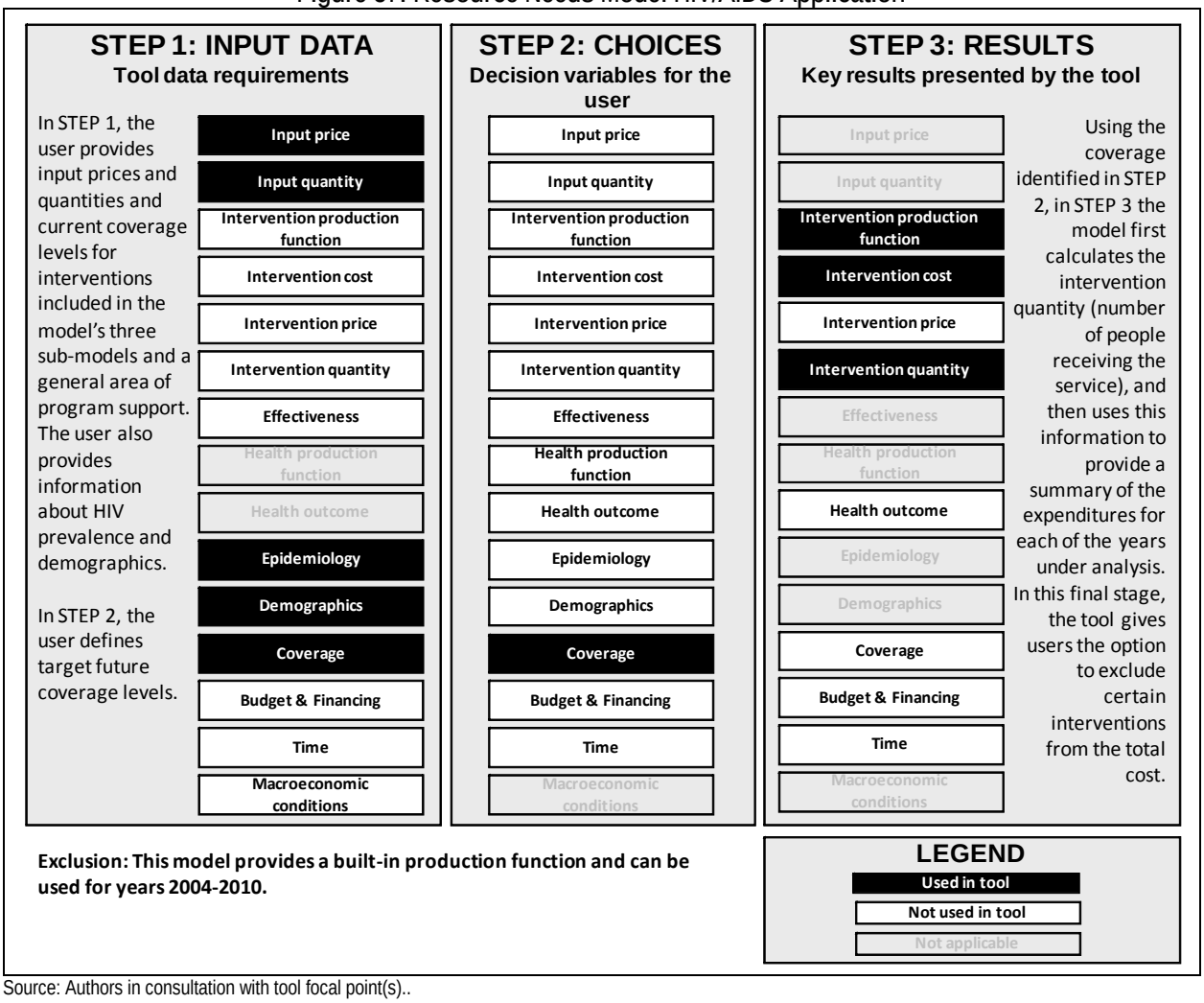
In STEP 2, the user decides future coverage goals to allow the model to calculate the resources needed to scale-up to the goal. As results (STEP 3), the tool provides a summary of the expenditures on each of the prevention, care, and orphan support activities for each of the years under analysis. At this point, the user has the option to exclude individual interventions from the total cost.

The below figure summarizes the tool's logic and shows that the tool does not incorporate effectiveness (except to the extent that users may manually prioritize the most effective interventions for maximum coverage levels), health outcome or macroeconomic

[35] For an explanation of Spectrum, please see section IV, part D of this report.

conditions (except to the unit that they are reflected in unit costs). While the tool is designed to help users identify the coverage level they can achieve with available funds, the budgeting and financing element is not specifically included in the model and thus comparisons of the intervention cost and available funds must be made outside the model. However, the intervention costs calculated by the model can be used to develop a budget.

Figure 37: Resource Needs Model HIV/AIDS Application



Source: Authors in consultation with tool focal point(s)..

This tool is driven by coverage-guided decision making. It can be used for medium-term planning. The model includes a built in production function, automatically defining the elements of the three sub-models. This model does not make health outcome calculations.

3. Formula Review

a. Conceptual Framework Analysis

- Tool Objective: to calculate the "total resources needed for prevention, care, and orphan support for HIV/AIDS on a national level." (user manual p.3)

- How: Excel-based tool estimates the number of people receiving each service (prevention, care and orphan support) by multiplying the number of people needing the service by the coverage (the percent of those needing the service that actually use it). The cost of each intervention is estimated by multiplying the number of people getting the service by the unit cost. (user manual p.11)
- Included: prevention interventions, care and treatment programs, and orphan support, as well as program support (estimated as a percent of total direct program resources).
- Limitations and Exclusions: The tool does not incorporate effectiveness, and hence cannot provide health outcomes for the interventions included in the tool. The does not take into consideration macroeconomic conditions. The tool requires data and suggests using Spectrum to obtain it, which may require users to learn two tools.
- Analysis: By outlining the formulas for the tool's main outputs, intervention cost and intervention quantity, and by following through one intervention as an example, we believe this tool's calculations are sound. Any costs excluded have been noted below.

b. Formulas Used to Calculate Tool's Outputs

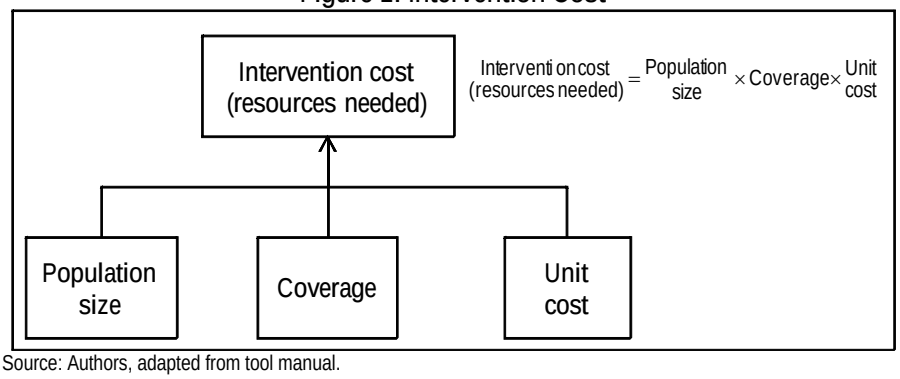
This section evaluates the formulas used to calculate the tool's main outputs: intervention cost and intervention quantity. To review the formulas in the tool, we follow through, cell-by-cell, all the formulas the tool uses for the intervention "Condom provision."

This section begins with a brief review of the generic formulas, followed by a presentation of the computations for the selected intervention. This section concludes with an analysis of the overall review.

Intervention cost and intervention quantity

This model's main outputs are intervention cost and intervention quantity. Intervention cost is calculated as follows:

Figure 1: Intervention Cost



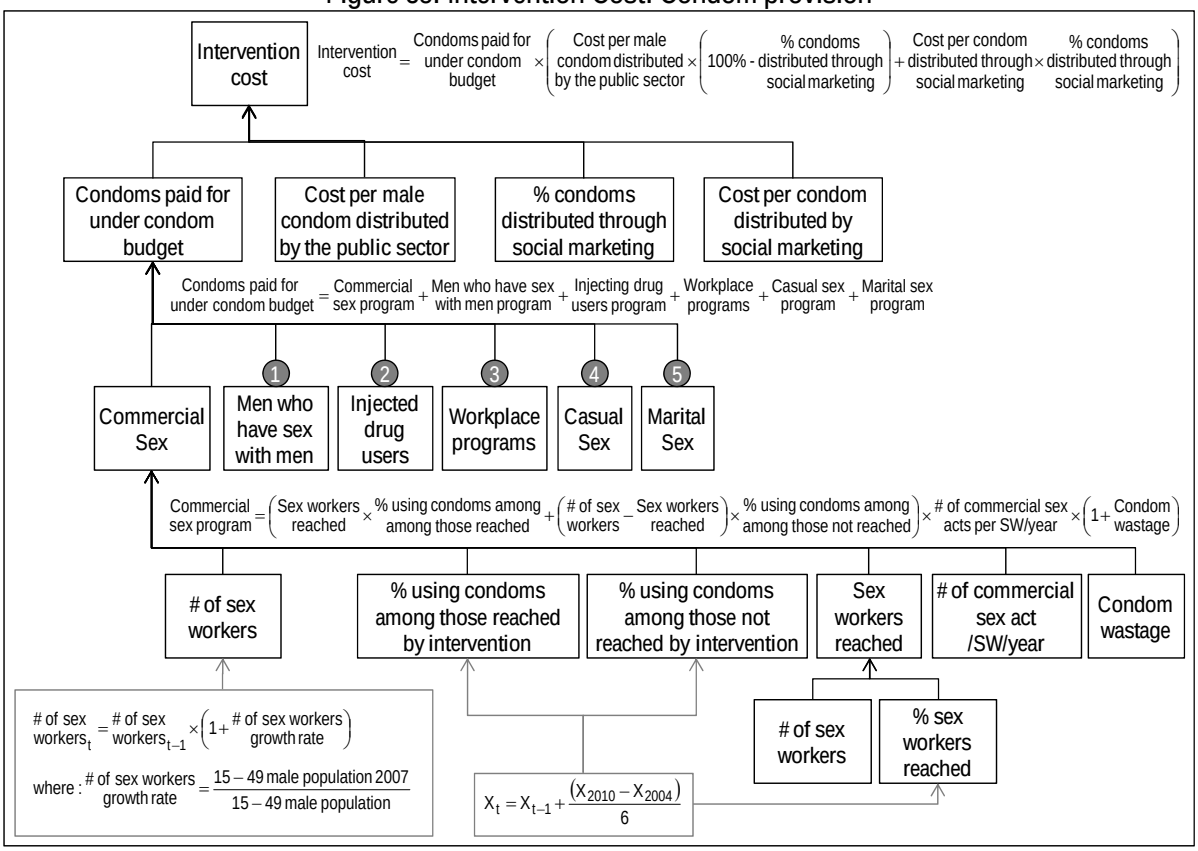
Source: Authors, adapted from tool manual.

In this way, population and coverage determine the quantity of interventions. Cost calculations are made using unit costs, which the manual defines as program costs, or the expenditure required by the program to implement the intervention, and not the total economic cost, which would include the value of donated commodities and volunteer labor, as examples. Total intervention costs are generally calculated by multiplying the intervention quantity by the coverage by the intervention price.

Intervention: Condom Provision

The figures below provide a detailed flow chart of all formulas used by the tool for "condom provision". Notice that it includes six different programs of condom provision (Figure 38). These programs provide the number of condoms required per program.

Figure 38: Intervention Cost: Condom provision



Source: Authors, adapted from tool's spreadsheets.

To trace this tool's computations of intervention cost we begin with the number of condoms required by the commercial sex program. The formulas used in this program are as follows (also shown in the figure above):

$$\text{Commercial sex program} = \left(\text{Sex workers reached} \times \text{\% using condoms among among those reached} + \left(\text{\# of sex workers} - \text{Sex workers reached}\right) \times \text{\% using condoms among among those not reached}\right)$$

$$\times \text{\# of commercial sex acts per SW/year} \times \left(1 + \text{Condom wastage}\right)$$

$$\text{\# of sex workers}_t = \text{\# of sex workers}_{t-1} \times \left(1 + \text{\# of sex workers growth rate}\right)$$

$$\text{\# of sex workers growth rate} = \frac{15-49 \text{ male population 2007}}{15-49 \text{ male population}}$$

$$\text{Sex workers reached} = \text{\# of sex workers}_t \times \text{\% of sex workers reached by intervention}_t$$

In 2006, the following values were used:

$$\text{\# of sex workers}_{2005} = 20{,}751$$

$$\text{\# of sex workers growth rate} = 3.01\%$$

$$\text{\# of sex workers}_{2006} = 20{,}751 \times (1 + 3.01\%) = 21{,}376$$

$$\text{\% of sex workers reached by intervention}_{2006} = 34.\overline{6}\%$$

$$\text{Sex workers reached} = 21{,}376 \times 34.\overline{6}\% = 7{,}410$$

$$\text{\# of commercial sex acts per SW/year} = 200$$

$$\text{\% using condoms among among those reached} = 37.\overline{3}\%$$

$$\text{\% using condoms among among those not reached} = 11.0\%$$

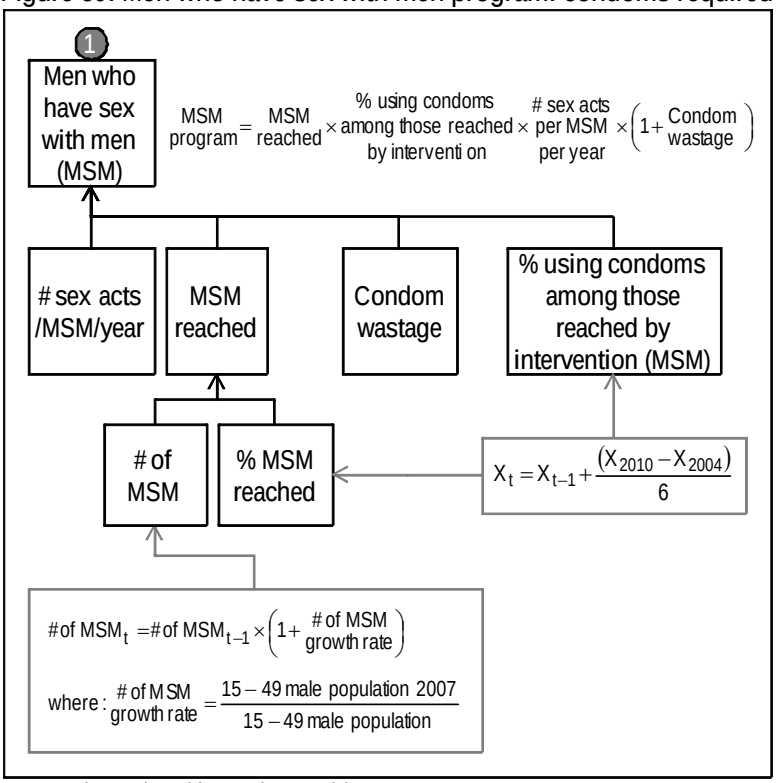
$$\text{Condom wastage} = 10\%$$

Using these values, the estimated number of condoms required for the commercial sex program in 2006 is 946,604, as seen below:

$$\text{Commercial sex program} = \left(7{,}410 \times 37.\overline{3}\% + (21{,}376 - 7{,}410) \times 11.0\%\right) \times 200 \times (1 + 10\%) = 946{,}604$$

Figure 39 shows the computations made in determining the condoms required for the men who have sex with men program.

Figure 39: Men who have sex with men program: condoms required



Source: Authors, adapted from tool's spreadsheets.

The formulas used are:

$$\text{MSM program} = \text{MSM reached} \times \text{\% using condoms among those reached by intervention} \times \text{\# sex acts per MSM per year} \times \left(1 + \text{Condom wastage}\right)$$

$$\text{MSM reached} = \text{\# of MSM}_t \times \text{\% of MSM reached by intervention}_t$$

The computations are:

$$\text{\# of MSM}_{2006} = 66{,}999$$

$$\text{\% of MSM reached by intervention}_{2006} = 37.\overline{3}\%$$

$$\text{MSM reached} = 66{,}999 \times 37.\overline{3}\% = 25{,}013$$

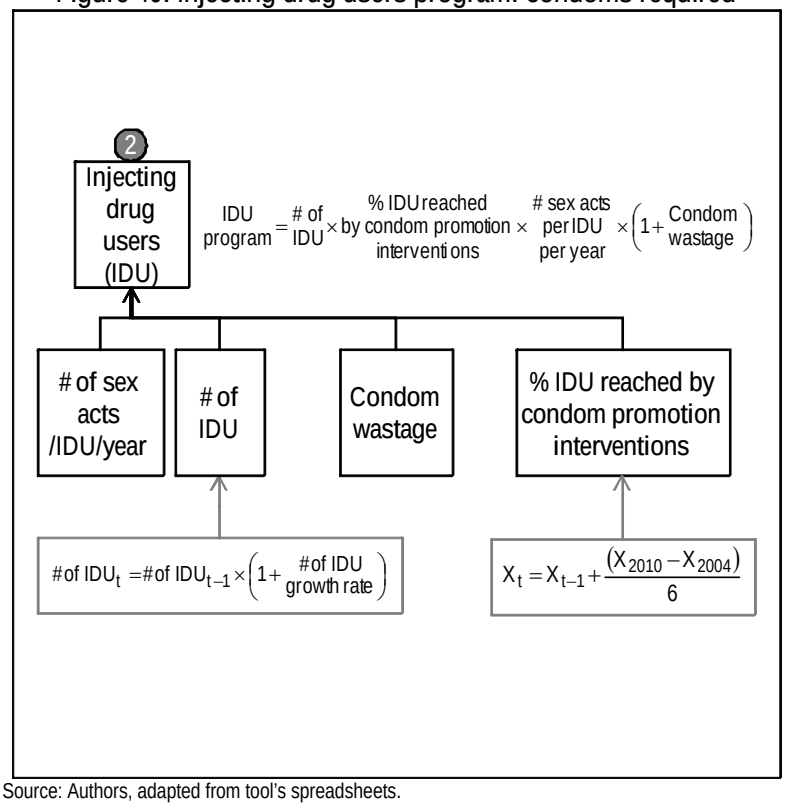
$$\text{\% using condoms among those reached by intervention} = 37.\overline{3}\%$$

$$\text{\# sex acts per MSM per year} = 46$$

$$\text{MSM program} = 25{,}013 \times 37.\overline{3}\% \times 46 \times (1 + 10\%) = 472{,}509$$

Figure 40 shows the computations for the number of condoms required for the injecting drug users program.

Figure 40: Injecting drug users program: condoms required



Source: Authors, adapted from tool's spreadsheets.

The formulas used are:

$$\text{IDU program} = \text{\# of IDU} \times \text{\% IDU reached by condom promotion interventions} \times \text{\# sex acts per IDU per year} \times \left(1 + \text{Condom wastage}\right)$$

Total number of condoms required for IDU program is 415,820 and the computations are:

$$\text{\# of IDU} = 42{,}002$$

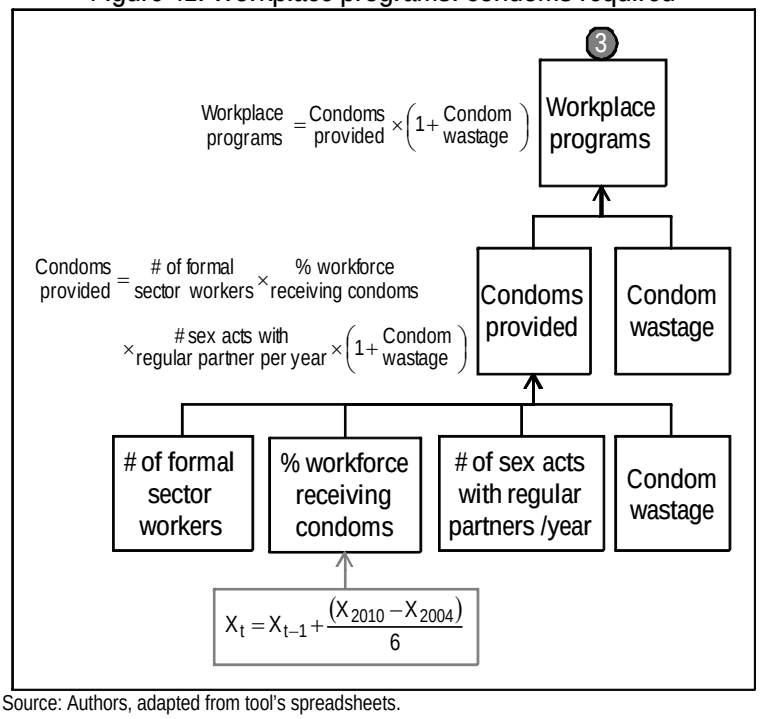
$$\text{\% IDU reached by condom promotion interventions} = 30\%$$

$$\text{\# sex acts per IDU per year} = 30$$

$$\text{IDU program} = 42{,}002 \times 30\% \times 30 \times (1 + 10\%) = 415{,}820$$

Figure 41 shows the computations for the number of condoms required for the workplace program.

Figure 41: Workplace programs: condoms required



Source: Authors, adapted from tool's spreadsheets.

The formulas used are:

$$\text{Workplace programs} = \text{Condoms provided} \times \left(1 + \text{Condom wastage}\right)$$

$$\text{Condoms provided} = \text{\# of formal sector workers} \times \text{\% workforce receiving condoms} \times \text{\# sex acts with regular partner per year} \times \left(1 + \text{Condom wastage}\right)$$

The computations are:

$$\text{\# of formal sector workers} = 2{,}116{,}011$$

$$\text{\% workforce receiving condoms} = 20\%$$

$$\text{\# sex acts with regular partner per year} = 66$$

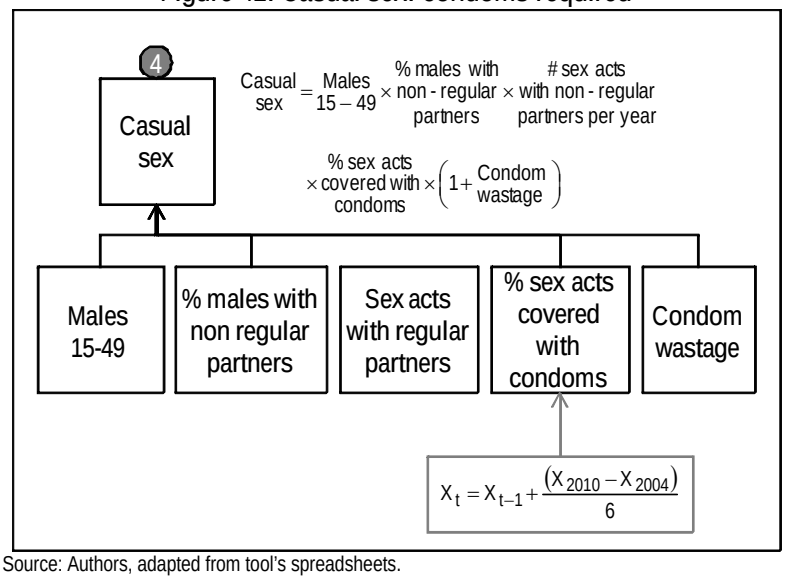
$$\text{Condoms provided} = 2{,}116{,}011 \times 20\% \times 66 \times (1 + 10\%) = 30{,}724{,}485$$

$$\text{Workplace programs} = 30{,}724{,}485 \times (1 + 10\%) = 33{,}796{,}933$$

Total number of condoms required for workplace programs is 33,796,933. Notice that there is a mistake in the computations, because condom wastage is being considered twice. The number of condoms provided already includes condom wastage and it should not be considered again to compute total workplace program condom requirement.

Figure 42 shows the computations for the number of condoms required for the casual sex program.

Figure 42: Casual sex: condoms required



Source: Authors, adapted from tool's spreadsheets.

The formula used is:

$$\text{Casual sex} = \text{Males}_{15-49} \times \text{\% males with non-regular partners} \times \text{\# sex acts with non-regular partners per year} \times \text{\% sex acts covered with condoms} \times \left(1 + \text{Condom wastage}\right)$$

The total number of condoms required for the casual sex program is 7,893,142 and the computations are:

$$\text{Males}_{15-49} = 3{,}435{,}708$$

$$\text{\% males with non-regular partners} = 12.91875\%$$

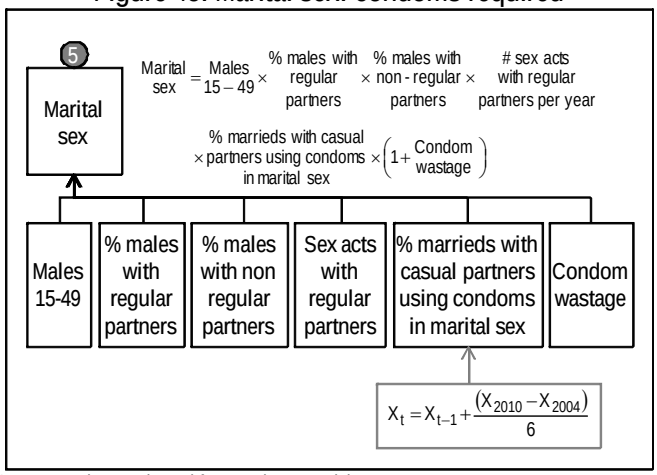
$$\text{\# sex acts with non-regular partners per year} = 25$$

$$\text{\% sex acts covered with condoms} = 64.\bar{6}\%$$

$$\text{Casual sex} = 3{,}435{,}708 \times 12.91875\% \times 25 \times 64.\bar{6}\% \times (1 + 10\%) = 7{,}893{,}142$$

Finally, Figure 43 shows the computations for the number of condoms required for the marital sex program.

Figure 43: Marital sex: condoms required



Source: Authors, adapted from tool's spreadsheets.

The formula used is:

$$\text{Marital sex} = \text{Males } 15-49 \times \text{\% males with regular partners} \times \text{\% males with non - regular partners} \times \text{\# sex acts with regular partners per year} \times \text{\% marrieds with casual partners using condoms in marital sex} \times \left(1 + \text{Condom wastage}\right)$$

The total number of condoms required for the casual sex program is 7,893,142 and the computations are:

$$\text{\% males with regular partners} = 80\%$$

$$\text{\# sex acts with regular partners per year} = 66$$

$$\text{\% marrieds with casual partners using condoms in marital sex} = 61.\overline{3}\%$$

$$\text{Marital sex} = 3{,}435{,}708 \times 80\% \times 12.91875\% \times 66 \times 61.\overline{3}\% \times (1 + 10\%) = 15{,}811{,}021$$

By adding the condoms required for all programs, total condom requirement adds up to 59,336,030 condoms paid for under condom budget. Following the intervention cost formula in Figure 38 (presented below) and given the user inputs of the cost per male condom distributed by the public sector (US$ 0.10) and by social marketing (US$ 0.18), and the percentage of condoms distributed through social marketing (15%), the cost of condom provision isUS$6,645,635 in 2006.

¡Error! No se pueden crear objetos modificando códigos de campo.

c. Conclusions

The RNM contains default values from published studies for many of the variables used by the tool. Yet the tool is also designed to allow the user to adapt it to local conditions. The tool

uses a bottom up costing method that is nicely organized into three general programs: prevention, care and treatment and mitigation.

4. Experience using the tool[36]

This tool is Excel-based, composed of three sub-models totaling 21 worksheets in a single Excel spreadsheet. Five worksheets require data input and the cells in which data is required are indicated using a color scheme. A user manual walks the user through the tool step-by-step and indicates formulas for calculations, although a one day training is still necessary in order to use this tool. One user from Rwanda reported it took two weeks to use the tool and get results. Users should have knowledge of program statistics, goals and unit costs.

One user from Thailand reported the tool to be easy to navigate (although a step by step description on the first worksheet about tool usage would be helpful) and the user manual to be helpful and easy to follow. The tool was adapted to local circumstances. The same user from Thailand reported being partially satisfied with the costing exercise and would have been more satisfied if the details of the cost structure had been available. Without these details, the user reported being unsure if the results were accurate.

This model has been applied in China, Ethiopia, Ghana, Haiti, Honduras, Indonesia, Kenya, Malaysia, Mali, Mozambique, Philippines, Rwanda, Tanzania, Thailand, Uganda and Zambia. More information is available on the tool's website, http://www.futuresinstitute.org/pages/resources.aspx.

[36] Information included in this section is based on information provided by the tool's developers, the reviewers' experiences, and the experiences of two users from Rwanda and Thailand.

L. Malaria Cost Estimation Tool (part of CHOICE) Developed by WHO – Version 1.2, April 2006

1. Tool description and overview

This tool can be used to determine the resource requirements of the prioritized malaria interventions. This tool was designed to be used by malaria control program managers, decision and policy makers, general malaria control program staff and other individuals working in the field of malaria. This tool is part of CHOICE.

The tool can be used to answer the following questions:	The tool addresses the following MDG targets:	The tool includes the following interventions:
▪ What is the cost of scaling up health services relevant to the health MDGs?	▪ Have halted by 2015 and begun to reverse the incidence of malaria and other major diseases (MDG 6)	▪ Malaria prevention and treatment

Based on a review of costing studies and extensive consultation with malaria experts, this tool includes all activities and interventions to determine the cost of achieving target coverage.

2. Understanding the tool

Built-into this tool are all activities and interventions to be included in a costing exercise; therefore, in STEP 1, the user defines the intervention production function by simply choosing which of the eight preventive, case management and other interventions to include, as well as health systems costs. The interventions included in the model are:

Table 19: List of Interventions Included in Malaria Cost Estimation Tool

Preventive and curative interventions	Insecticide-treated nets (ITN)
	Targeted indoor residual spraying (IRS)
	Source reduction
	Intermittent preventive treatment (IPT)
	Antimalarial case management
	Community/home-based antimalarial treatment
	Treatment of complicated malaria
	Refugees and internally displaced persons
Health systems costs	Operational research
	Monitoring and evaluating
	Storage
	Deployment/transport
	Strategic communication
	Advocacy
	Program management
	Human resources and facilities
	Training
	Laboratory equipment

Source: The Malaria Cost Estimation Tool User Manual (Preliminary Version Prepared for the Malaria Cost Estimation Tool Version 1.2, April 2006).

The user also selects a time frame, decides which health system administrative levels to include (national, province, district, other) and defines target coverage levels. Effectiveness is

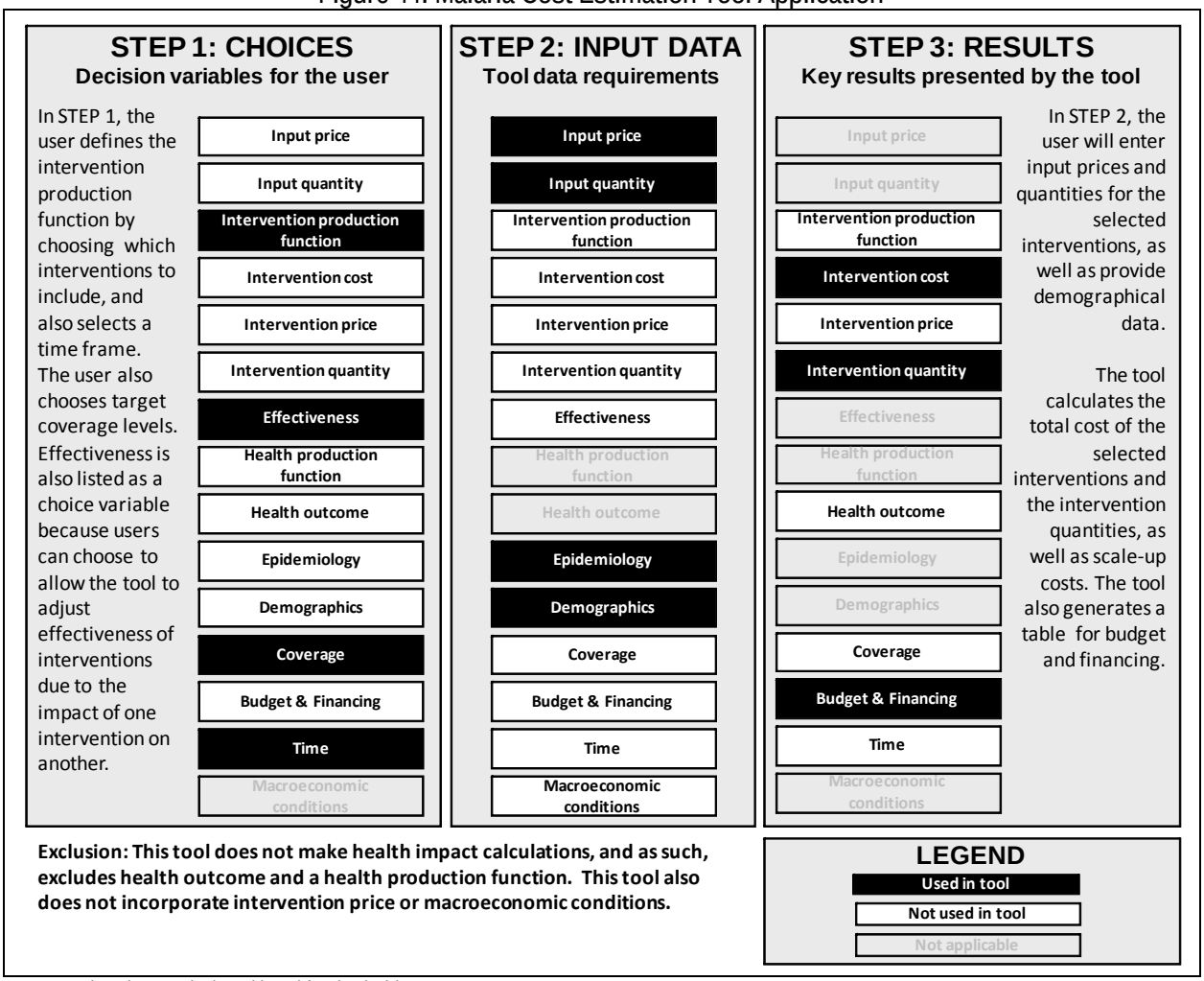
also listed as a choice variable because users can choose to allow the tool to adjust population in need because of interaction of interventions.

In STEP 2, the user will enter input prices and quantities for the selected interventions, as well as demographics and epidemiological data. The model includes some default data (such as the UN Population Division projections from the year 2002) to help users with STEP 2.

As results, the tool automatically produces summary cost reports for the selected interventions, which include both the total and scale-up costs (by intervention), as well as the commodities costs, systems costs and costs per capita. The tool also calculates the total intervention quantities. Because the tool generates a table of funds to be requested from The Global Fund, budget & financing is also a result.

This model does not make health impact calculations, and as such, does not incorporate health outcome or health production function. This tool also excludes intervention price and macroeconomic conditions. The below figure shows how the tool incorporates the other elements of costing.

Figure 44: Malaria Cost Estimation Tool Application



Source: Authors in consultation with tool focal point(s)..

This tool is driven by coverage- and impact-guided decision making. It was designed for medium-term planning, although the user defines the time frame to be analyzed. The model includes a built in production function with all activities and interventions to be included in the costing exercise. This tool does not make health impact calculations.

3. Formula Review

a. Conceptual Framework Analysis

- Tool Objective: "The Malaria Cost Estimation Tool is a tool for estimating the resource requirements of proven malaria interventions (preventive and curative) over a period of time." (user manual p. 7)
- How: this Excel-based tool was developed based on a review of costing studies and an extensive consultation with malaria experts and uses country or regional-specific data for a more accurate costing exercise.
- Included: preventive and curative interventions, as well as the following costs: operational research, monitoring and evaluation, storage, deployment/transport, strategic communication, advocacy, program management, human resources and facilities, training and laboratory equipment.
- Limitations and Exclusions: this model cannot be used to determine if new health care workers will need to be employed.
- Analysis: By outlining the formulas for the tool's main outputs, intervention cost and intervention quantity, and by following through one intervention as an example, we believe this tool's calculations are sound. Any costs excluded have been noted below.

b. Formulas Used to Calculate Tool's Outputs

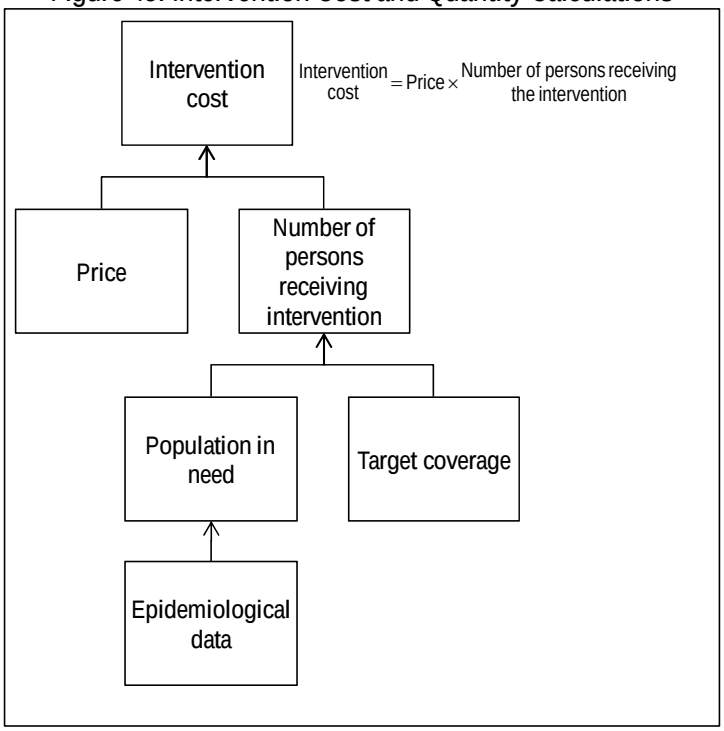
This section evaluates the formulas used to calculate the tool's main outputs: intervention cost and intervention quantity. To review the formulas in the tool, we follow through cell-by-cell all the formulas the tool uses for one intervention: Insecticide treated nets, a malaria prevention intervention. Data used in our example is for Angola and comes directly from the tool.

This section starts with a brief review of the generic formulas, then presents the computations for the selected intervention, and finally concludes with the overall assessment.

Intervention cost, quantity and funding gap

Costs are calculated using an ingredients approach of price times quantity. The tool does not use a unit costing approach. The methodology for determining costs was done based on review of costing studies and extensive consultations with malaria experts. Costs are calculated by health system administrative levels, with all levels' costs summed up to obtain the total cost of the intervention. The tool includes some default prices, such as the median available price worldwide for malaria prices, also established based on a review of costing studies and extensive consultations with malaria experts. Various support activities and costs are included in this costing exercise.

Figure 45: Intervention Cost and Quantity Calculations



Source: Authors, adapted from user guide.

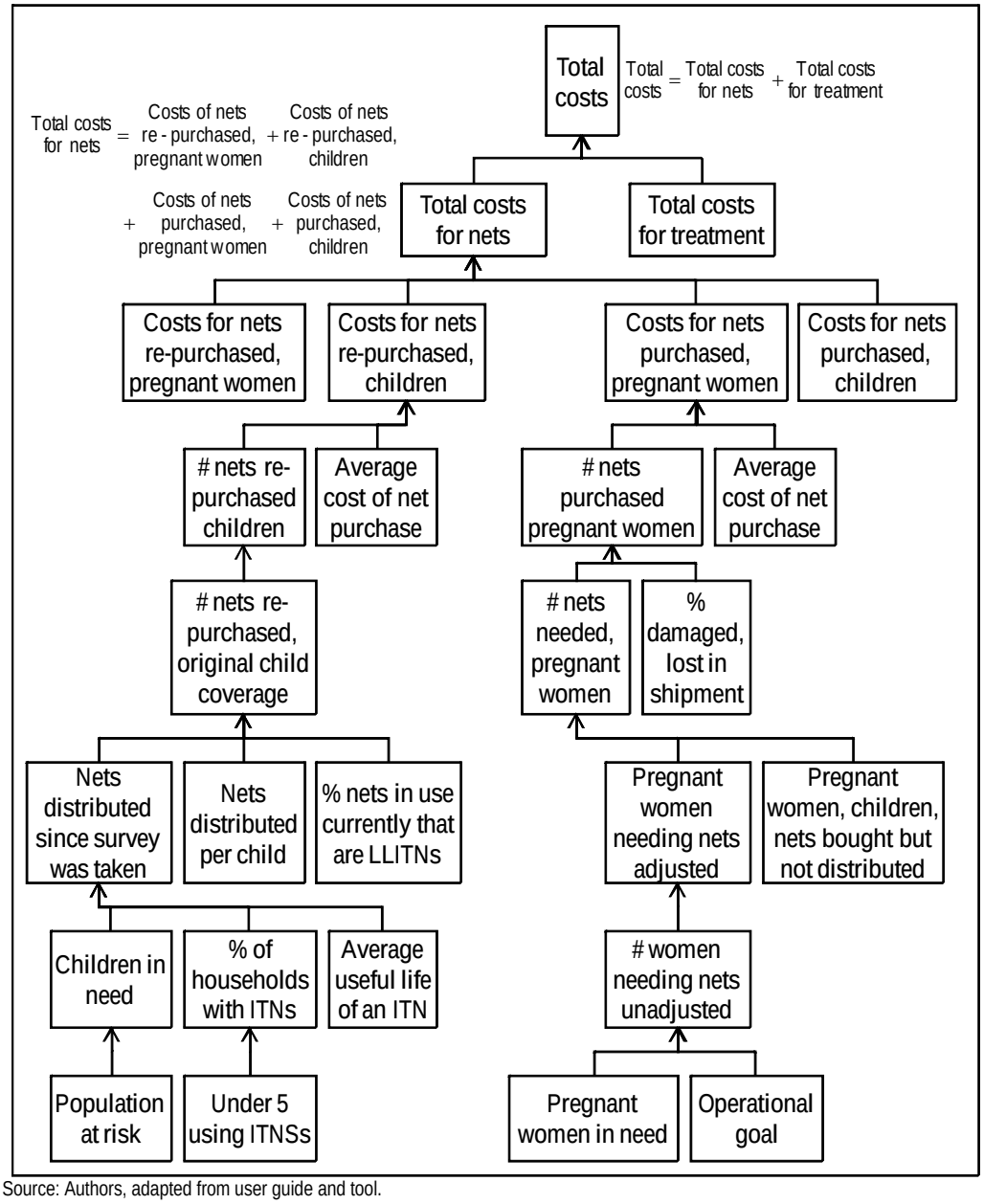
The population in need is defined by the epidemiology data, for example the number of fevers per child per year in endemic areas. The number of persons receiving the intervention (or number of interventions delivered) is calculated by multiplying the population in need times target coverage (target utilization). It is important to note that the tool also incorporates current utilization to calculate a starting coverage and this is what is used to differentiate between total and incremental costs.

Intervention: "Insecticide Treated Nets"

Figure 46 below shows computations for the intervention "insecticide treated nets" for 2009, considering the following set up: 1) the user chose to establish goals only for the public sector and jointly for urban and rural areas; and 2) ITNs include long lasting insecticide treated nets (LLITNs), without calculating nets needed per household and including pregnant women.

Total costs of ITNs are the sum of total costs for nets and total costs for treatment. In this case, total costs for treatment are zero, so we only trace the total cost for nets.

Figure 46: Intervention cost and intervention quantity of long lasting insecticide treated nets



Source: Authors, adapted from user guide and tool.

The total cost for nets is the sum of four components as given by the formula below:

$$\text{Total costs for nets} = \text{Costs of nets re-purchased, pregnant women} + \text{Costs of nets re-purchased, children} + \text{Costs of nets purchased, pregnant women} + \text{Costs of nets purchased, children}$$

The costs of nets re-purchased for pregnant women and the cost of nets purchased for children are both zero. We concentrate our computations on the other two components. The cost for nets re-purchased for children is computed following the formulas below:

$$\text{Cost for nets re-purchased, children} = \text{\# of nets re-purchased, children} \times \text{Average cost of net purchase}$$

$$\text{Average cost of net purchase, public} = \text{\% of ITNs} \times \text{Cost of ITNs} + \text{\% of LLITNs} \times \text{Cost of LLITNs}$$

$$\text{\% of ITNs} = \left(100\% - \text{\% of LLITNs}\right)$$

$$\text{\# of nets re-purchased, children (total public)} = \text{\# of nets re-purchased, children, ITNs} + \text{\# of nets re-purchased, women, ITNs} + \text{\# of nets re-purchased, original child coverage, ITNs \& LLITNs} + \text{\# of nets re-purchased, children, LLITNs} + \text{\# of nets re-purchased, women, LLITNs}$$

$$\text{\# of nets re-purchased, original child coverage, ITNs \& LLITNs} = \frac{\text{\# of nets distributed since survey was taken by year}}{\text{\# of nets distributed per child}} \times \left(100\% - \text{\% of nets in use currently that are LLITNs}\right) + \frac{\text{\# of nets distributed since survey was taken by year}}{\text{\# of nets distributed per child}} \times \text{\% of nets in use currently that are LLITNs}$$

$$\text{\# of nets distributed since survey was taken by year} = \text{Children in need} \times \text{\% of households with ITNs} \div \text{Average useful life of an ITN}$$

$$\text{\% of households with ITNs} = \text{\% of children under 5 using ITNs} \times 2$$

$$\text{Children in need} = \text{Population at risk between 0 - 5 years}$$

The tool assumes all nets currently being used are LLITNs and provides as default data the commodity cost of LLITNs ($5.44) and regular ITNs ($2.625). Hence, the average cost of net purchased is also $5.44, as shown in the below computations:

$$\text{\% of LLITNs} = 100\%$$

$$\text{\% of ITNs} = (100\% - 100\%) = 0\%$$

$$\text{Cost of LLITNs} = \$5.44$$

$$\text{Cost of ITNs} = \$2.625$$

$$\text{Average cost of net purchase, public} = 0\% \times \$2.625 + 100\% \times \$5.44 = \$5.44$$

The number of nets re-purchased for children by the public sector is the sum of five components (see formulas above). Yet, only the number of nets re-purchased, based on original child coverage for both ITNs and LLITNs, has a value greater than zero. The tool provides the population at risk between 0-5 through the projection of the current population given a population growth rate. This total number of nets is computed based on user input regarding the percentage of children under five using ITNs (2.3%), the average useful life of an ITN (4 years) and number of nets distributed per child (2):

$$\text{Children in need} = \text{Population at risk between 0 - 5 years} = 3{,}162{,}139$$

$$\text{\% of children under 5 using ITNs} = 2.3\%$$

$$\text{\% of households with ITNs} = 2.3\% \times 2 = 4.6\%$$

$$\text{Average useful life of an ITN} = 4$$

$$\text{\# of nets distributed since survey was taken by year} = 3{,}162{,}139 \times 4.6\% \div 4 = 36{,}365$$

$$\text{\# of nets distributed per child} = 2$$

$$\text{\# of nets re - purchased, original child coverage, ITNs \& LLITNs} = \frac{36{,}365}{2} \times (100\% - 100\%) + \frac{36{,}365}{2} \times 100\% = 18{,}182$$

$$\text{\# of nets re - purchased, children (total public)} = 0 + 0 + 18{,}182 + 0 + 0 = 18{,}182$$

Using the formula for the cost for nets re-purchased for children, the cost is $98,912:

$$\text{Cost for nets re - purchased, children} = 18{,}182 \times \$5.44 = \$98{,}912$$

The cost for nets re-purchased for pregnant women is computed according to the below formulas:

$$\text{Cost for nets purchased, pregnant women} = \text{\# of nets purchased, pregnant women} \times \text{Average cost of net purchase}$$

$$\text{\# of nets purchased, pregnant women} = \text{\# of nets needed, pregnant women} \times \left(100\% + \text{\% damaged, lost in shipment}\right)$$

$$\text{\# of nets needed, pregnant women} = \text{\# of women needing nets, adjusted} - \text{Pregnant women, children nets bought but not distributed}$$

$$\text{\# of women needing nets, adjusted} = \text{Pregnant women in need} \times 2 \times \text{Coverage \% pregnant women, final}$$

$$\text{\# of women needing nets, unadjusted} = \text{Pregnant women in need} \times \text{Operational goal}$$

$$\text{Pregnant women in need} = \text{Estimated \# or pregnant women in endemic areas} + \text{Estimated \# or pregnant women in epidemic areas}$$

The computations are:

$$\text{Estimated \# or pregnant women in endemic areas} = 801{,}703$$

$$\text{Estimated \# or pregnant women in epidemic areas} = 44{,}539$$

$$\text{Pregnant women in need} = 801{,}703 + 44{,}539 = 846{,}242$$

$$\text{Operational goal} = 70\%$$

$$\text{\# of women needing nets, unadjusted} = 846{,}242 \times 70\% = 592{,}369$$

$$\text{\# of women needing nets, adjusted} = 592{,}369 \times 2 \times 100\% = 1{,}184{,}738$$

$$\text{Pregnant women, children nets bought but not distributed} = 0$$

$$\text{\# of nets needed, pregnant women} = 1{,}184{,}738 - 0 = 1{,}184{,}738$$

$$\text{\# of nets purchased, pregnant women} = 1{,}184{,}738 \times (100\% + 1\%) = 1{,}196{,}586$$

Finally, the cost for nets purchased for pregnant women is:

$$\text{Cost for nets purchased, pregnant women} = 1{,}196{,}586 \times \$5.44 = \$6{,}509{,}427$$

And the total cost of nets in 2009 is:

$$\text{Total costs for nets} = 0 + 98{,}912 + 6{,}509{,}427 + 0 = \$6{,}608{,}338$$

c. Conclusions

The tool's goal to compute resource needs for a comprehensive malaria program is reached with a bottom-up costing approach. It includes four preventive interventions and three treatment interventions. It has a very user-friendly set up in terms of navigating through the tool, a clear step-by-step interface with choices regarding how detailed the outputs should be computed. The tool generates its calculations in hidden sheets. This protects the tool, and maintains its stability at the price of lower transparency for the average user.

4. Experience using the tool[37]

This tool includes 54 worksheets in single Excel spreadsheet. The number of sheets which require data entry depends on the interventions chosen by the user, and the options available on the tool's switchboard automatically update with the chosen interventions. In any case, no more than 22 worksheets will require data entry, and cells requiring data are indicated using a color scheme. Additionally, the tool allows for users to indicate whether data entry for different sections is partially or fully completed and this changes the color of the buttons on the switchboard.

There is a user's manual which accompanies the tool, which walks users through the tool with screenshots from the tool. An e-mail address is also provided for users who need technical assistance. Developers suggest that no formal training is necessary prior to using the tool, although one user from Mozambique said training was necessary. A switchboard helps users navigate through the tool, although the user from Mozambique reported that the tool was "not user friendly." Tool developers suggest that degrees in epidemiology, economics and statistics would be useful but not necessary to have to use this tool. However, it is essential that users have a familiarity with local epidemiology of malaria and programmatic considerations, plus the ability to use spreadsheets

This tool has been used in Zambia, and partially applied in Angola and Mozambique. However, it can be downloaded from the internet at http://www.rollbackmalaria.org/consensusdocuments.html, so applications in other countries are possible.

[37] Information included in this section is based on information provided by the tool's developers, the reviewers' experiences, and the experiences of one user from Mozambique.

M. Child Health Cost Estimation Tool (part of CHOICE) Developed by WHO – August 2007 Draft

1. Tool description and overview

This tool can be used to determine the financial requirements associated with scenarios for scaling up a package of child health interventions at specified levels of coverage. This tool was designed to be used by national policy makers and planners, child health program staff, and any other individuals working in the field of child health. This tool is part of CHOICE.

The tool can be used to answer the following questions:	The tool addresses the following MDG targets:	The tool includes the following interventions:
▪ What is the cost of scaling up health services relevant to the health MDGs?	▪ Reduce the prevalence of underweight children under five years of age (MDG 1) ▪ Reduce by two-thirds, between 1990 and 2015, the under-five mortality rate (MDG 4) ▪ Have halted by 2015 and begun to reverse the incidence of malaria and other major diseases (MDG 6)	▪ Child health interventions ▪ Malaria prevention and treatment

Based on global price tag exercise undertaken for the World Health Report 2005 Make Every Mother and Child Count (costs of scaling up priority child health interventions) and revisions, this tool is part of a set of tools developed by the WHO to help managers and planners estimate the financial costs of providing priority public health interventions; the similar methodology used in WHO tools allows for comparability of cost estimates for different programs.

2. Understanding the tool

In STEP 1, the user can choose which of the tool's fifteen preventive and curative interventions (all aimed at countering morbidity and mortality in children under 5) to include in the costing study, while also defining the time frame and indicating which administrative levels to include in the exercise. The specific interventions to choose from are as follows:

Table 20: List of Interventions Included in Child Health Cost Estimation Tool[38]

Preventive Interventions	Newborn care and prevention
	Counseling to promote exclusive and continued breastfeeding
	Counseling to improve complementary feeding
	Vitamin A supplementation
	Long lasting insecticide treated bed nets
	Well child visits

[38] The current version of the tool deliberately excludes immunizations because these costs are included in the cMYP tool.

Table 20: List of Interventions Included in Child Health Cost Estimation Tool[38]

Curative Interventions	Management of low birth weight
	Case management of neonatal infections
	Case management of pneumonia
	Case management of diarrhea
	Case management of severe malnutrition
	Treatment of measles
	Deworming
	Management of dengue fever
	Malaria case management
Programmatic Investments	General program management
	Human resources for child health
	Training
	Supervision
	Advocacy
	Laws, policy and regulation
	Communication, media and outreach
	Infrastructure and equipment
	Monitoring and evaluation
	Transport
	Technical assistance

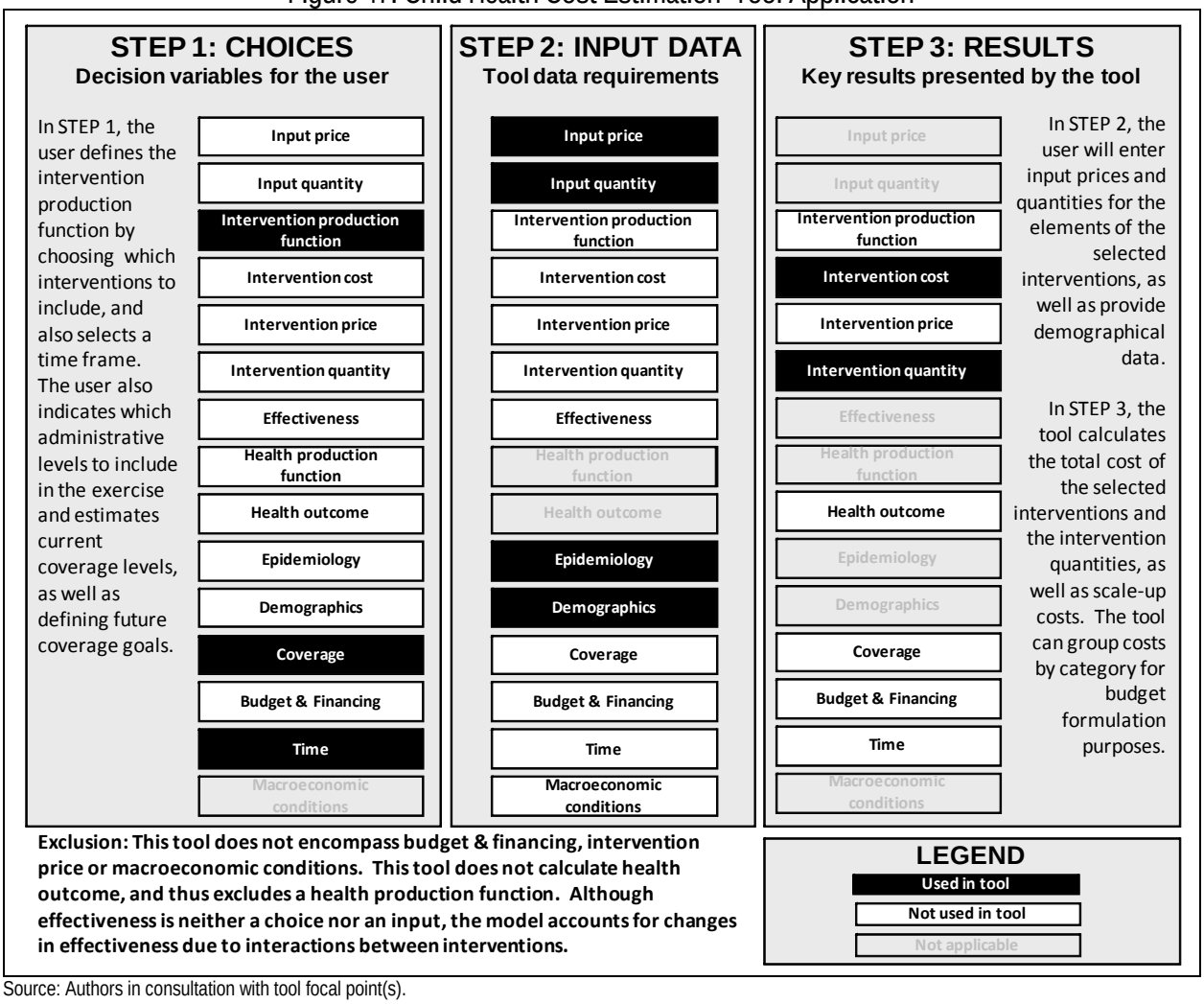
Source: Draft user manual: WHO Child Health Cost Estimation Tool (October 2007), sections 1.3.2 and 1.3.4.

The user must also estimate current coverage levels and establish future coverage goals. In STEP 2, the tool requires the user to input country-specific demographics and epidemiological data (some default values are available, which update automatically depending on the country chosen), and provide input prices and quantities. If the user does not want to build the intervention price bottom up using these input prices and quantities, the user also has the option to directly input an intervention cost.

As results (STEP 3), the tool calculates both the estimated intervention quantities as well as the total and incremental costs for child health programs as a whole. More specifically, the tool calculates the scale up costs of commodities, cost of referral, scale up number of care-seeking events (outpatient and inpatient visits) and costs per year for planned programmatic investments for child health. The tool can group costs by general categories, helpful for budget formulation. The tool automatically produces summary cost reports for the selected interventions. Although coverage is listed as an input, one output produced by the tool is the graphical representation of the coverage projects entered in STEP 1.

This model does not calculate health impact, and as such, the model does not incorporate a health production function. Budget & financing, intervention price and macroeconomic conditions are also excluded. Effectiveness is incorporated to the extent that the model has built-in the impact of interactions between interventions (when possible). A summary of the tool's logic and how the tool incorporates the other costing elements is seen in the below figure.

Figure 47: Child Health Cost Estimation Tool Application



Source: Authors in consultation with tool focal point(s).

This tool uses a needs-based approach and is thus driven by coverage- or impact-guided decision making. It was designed for medium-term (up to ten years) planning. The model includes a built in production function, with the inputs and activities included based on a review of documented program experiences and costing studies and on consultations with child health experts. The tool uses standard WHO methodology for assessing costs, based on an ingredients approach (PXQ) and bottom-up costing. This tool does not include health systems costs but can cost programmatic interventions such as training and supervising of health workers, etc.

3. Formula Review

a. Conceptual Framework Analysis

- Tool Objective: "to forecast the financial resource requirements of scaling up provision of priority interventions." (user manual, p. 9)
- How: Excel-based tool uses a needs-based approach and standard WHO costing methodology (ingredients approach and bottom-up costing) to estimate the resource

requirements for providing health interventions to counter morbidity and mortality in children aged under five (U5) over a period of time (1-10 years).

- Included: Inputs and activities included in the tool are based on a review of documented program experiences, costing studies and consultations with child health experts. A full list of interventions included can be found in Table 20.
- Limitations and Exclusions: tool currently cannot be used to determine health system investments and should not be used for detailed budgeting.
- Analysis: By outlining the formulas for the tool's main outputs, intervention cost and intervention quantity, and by following through one intervention as an example, we believe this tool's calculations are sound. Any costs excluded have been noted below.

b. Formulas Used to Calculate Tool's Outputs

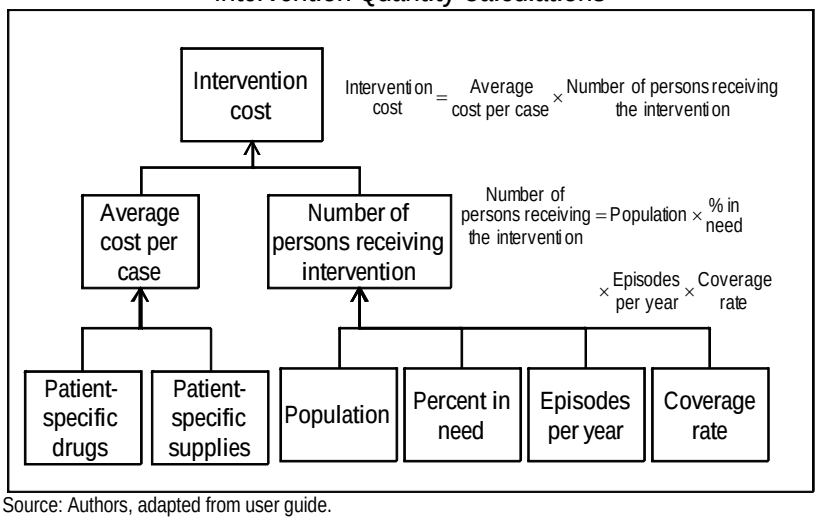
This section evaluates the formulas used to calculate the tool's main outputs: intervention cost and intervention quantity. To review the formulas in the tool, we follow through cell-by-cell all the formulas the tool uses for one intervention: Long lasting insecticide treated bednets. Data used in tracing this intervention was built-into the tool, unless otherwise noted.

This section begins by presenting the generic formulas used to compute the tool's main outputs, followed by a presentation of the computations for the selected intervention. Finally, we conclude with an overall assessment of the formulas.

Intervention cost and intervention quantity

The methodology used in this tool is taken from costing studies and consultations with child health experts. The tool uses standard WHO methodology for assessing costs, based on an ingredients approach (P X Q) and bottom-up costing, and costs both clinical interventions and programmatic activities. Intervention cost is calculated using an average cost per case formula. The cost includes patient-specific direct costs such as drugs and supplies required. Intervention quantity is calculated by multiplying population by percent of population in need by episodes by the coverage rate, all for a given year.

Figure 48: Child Health Cost Estimation Tool Intervention Cost and Intervention Quantity Calculations



Source: Authors, adapted from user guide.

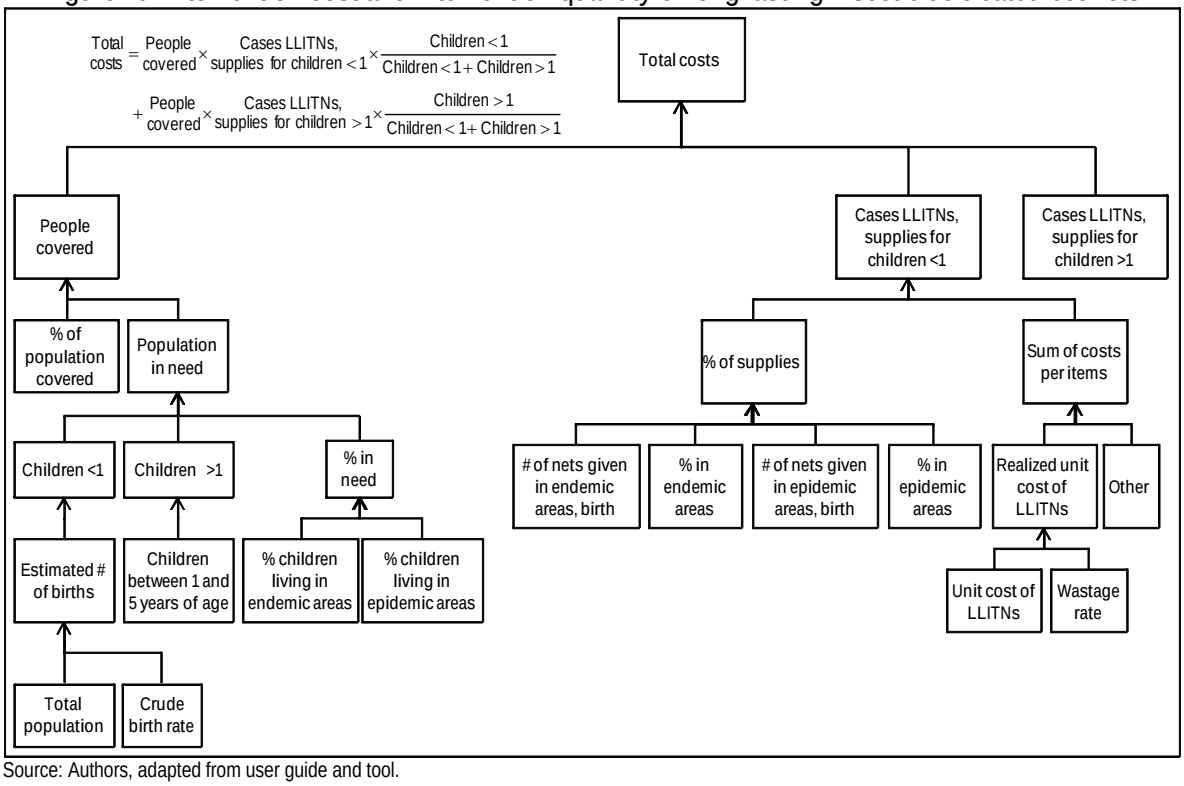
Human resource and service delivery costs are shared costs and thus are not incorporated in the intervention cost but rather are presented separately. It is important to note though, that these shared or fixed costs are included in the tool. Program support activities are also calculated separately using a standard quantity times price calculation, with the need for quantity determined individually by each user.

Intervention: "Long lasting Insecticide treated bednets"

Some data comes built-in to this tool and is used in the following example. For example, built-into the tool is the cost of each long lasting insecticide treated bednet (LLITN) ($2.63). The tool also has a disbursement schedule of 2 nets given at birth in endemic areas, 2 nets given at birth in epidemic areas, and 1 net given at age 4 in endemic areas. In our example, 13% of children live in endemic areas and 0% of children live in epidemic areas. The time period included is 2006-2015.

With this information, the tool calculates the intervention cost for LLITNs, as seen in Figure 49.

Figure 49: Intervention cost and intervention quantity of long lasting insecticide treated bednets



Source: Authors, adapted from user guide and tool.

For 2008, the cost of long lasting insecticide treated bednets distributed is computed as follows:

$$\text{Total costs} = \text{People covered} \times \text{Cases LLITNs, supplies for children} < 1 \times \frac{\text{Children} < 1}{\text{Children} < 1 + \text{Children} > 1}$$

$$+ \text{People covered} \times \text{Cases LLITNs, supplies for children} > 1 \times \frac{\text{Children} > 1}{\text{Children} < 1 + \text{Children} > 1}$$

Following the steps, the number of people covered is computed using the following formulas:

$$\text{People covered} = \text{\% of population covered} \times \text{Number of people in need}$$

$$\text{Number of people in need} = \left(\text{Children} < 1 + \text{Children} > 1\right) \times \text{\% in need}$$

$$\text{Children} < 1 = \text{Estimated \# of births} = \text{Total population} \times \text{Crude birth rate per 1,000} \div 1{,}000$$

$$\text{Children} > 1 = \text{Children between 1 and 5}$$

$$\text{\% in need} = \text{\% of children living in in endemic areas} + \text{\% of children living in in epidemic areas}$$

Using the values provided by the user and the tool, the number of people covered is 110,656 and is computed as follows:

$$\text{People covered} = 29.83\% \times 370{,}955 = 110{,}656$$

$$\text{Number of people in need} = \left(617{,}278 + 2{,}236{,}220\right) \times 13\% = 370{,}955$$

$$\text{Children} < 1 = 15{,}888{,}741 \times 38.85 \div 1{,}000 = 617{,}278$$

$$\text{Children} > 1 = \text{Children between 1 and 5} = 2{,}236{,}220$$

$$\text{\% in need} = 13\% + 0\% = 13\%$$

This number is then used in the computation of the costs of LLITN supplies, specifically in the calculation of “Cases LLITNs, supplies for children <1” and “Cases LLITNs, supplies for children >1” (refer to figure). The formulas used to compute these costs are:

$$\text{Cases LLITNs, supplies for children} < 1 = \text{\% of supplies} \times \text{Sum of costs per item}$$

$$\text{\% of supplies} = \text{\# of nets given in endemic areas, birth} \times \frac{\text{\% in endemic areas}}{\text{\% in endemic areas} + \text{\% in epidemic areas}} + \text{\# of nets given in epidemic areas, birth} \times \frac{\text{\% in epidemic areas}}{\text{\% in endemic areas} + \text{\% in epidemic areas}}$$

$$\text{Sum of costs per item} = \text{Realized unit cost of LLITNs} + \text{Realized unit cost of other supplies}$$

$$\text{Realized unit cost of LLITNs} = \text{Unit cost of LLITNs} \times \left(1 + \text{Wastage rate}\right)$$

The computations made are as follows:

$$\text{Cases LLITNs, supplies for children} < 1 = 200\% \times \$2.63 = \$5.26$$

$$\text{\% of supplies} = 2 \times \frac{13\%}{13\% + 0\%} + 2 \times \frac{0\%}{13\% + 0\%} = 200\%$$

$$\text{Sum of costs per item} = \$2.63 + \$0 = \$2.63$$

$$\text{Realized unit cost of LLITNs} = \$2.63 \times (1 + 0\%) = \$2.63$$

For children >1, the computations follow the same formulas and they are presented below:

$$\text{Cases LLITNs, supplies for children} > 1 = 25\% \times \$2.63 = \$0.6575$$

$$\text{\% of supplies} = \frac{1}{4} \times \frac{13\%}{13\% + 0\%} + \frac{0}{4} \times \frac{0\%}{13\% + 0\%} = 25\%$$

$$\text{Sum of costs per item} = \$2.63 + \$0 = \$2.63$$

$$\text{Realized unit cost of LLITNs} = \$2.63 \times (1 + 0\%) = \$2.63$$

In sum, the total costs of LLITNs are:

$$\text{Total costs} = 110{,}656 \times 5.63 \times \frac{617{,}278}{617{,}278 + 2{,}236{,}220} + 110{,}656 \times 0.6575 \times \frac{2{,}236{,}220}{617{,}278 + 2{,}236{,}220}$$

$$\text{Total costs} = 182{,}928$$

c. Conclusions

The tool's goal to compute resource needs for a comprehensive child health program is reached with a bottom-up costing approach. The tool provides a method to scale up coverage. It includes a total of 15 interventions. The tool generates its calculations in hidden sheets. This

protects the tool, and maintains its stability but it becomes less transparent (for the average user) with regards to its computations.

4. Experience using the tool[39]

This tool includes more than 60 worksheets in single Excel spreadsheet. The number of sheets which require data entry depends on the interventions chosen by the user, and the options available on the tool's switchboard automatically update with the chosen interventions. In any case, no more than 30 worksheets will require data entry, and cells requiring data are indicated using a color scheme. Additionally, the tool allows for users to indicate whether data entry for different sections is partially or fully completed and this changes the color of the buttons on the switchboard. A thorough user manual provides a step-by-step walk through the tool with screen shots from the tool to assist users. The user manual also has a list of commonly asked questions, and their answers, a list of all sheets in the tool and what the user should do on each sheet, and a list of interventions included in the tool.

Typically, no formal training is necessary prior to using the tool. However, basic computer skills and familiarity with Excel is required. Experience with strategic planning and familiarity with ingredients based costing is useful but not essential. Users must have access to and be able to interpret information on local epidemiology, coverage data, and clinical guidelines, and to be able to think strategically about programmatic activities required to implement the program(s) and to scale up interventions as envisioned. Familiarity with the tool using examples and the user guide may take 1-3 days. From data entry to receiving results from the tool, the time commitment required is one to two (plus) weeks, depending on the number of interventions and activities costed and the number of years for which targets are entered.

This tool has been applied in Cambodia, Mozambique and Uganda.

For more information about the tool, please visit http://www.who.int/child_adolescent_health.

[39] Information included in this section is based on information provided by the tool's developers and the reviewers' experiences.

V. Stage 3: Tools taxonomy

During this technical review, we recognized it was not enough to simply summarize each tool. The number and size of the tools can be overwhelming, especially when all tools are considered in a single group. In an effort to assist users in deciding which tool best suits their needs and fits within their constraints, we wanted to classify the tools according to various dimensions related to their scope, ease of use, size and linearity. This section presents the tools' taxonomy that we developed.

A. Scope measures

It is important to remember that some tools were developed for a specific program, and are meant to have a narrower scope. Other tools were developed with a broader scope in mind. The below table outlines this classification:

Table 21: Tools developed for a specific program vs. tools with a broader scope

Tools developed for a specific program	Tools with a broader scope
RH Costing Tool	MBB
Spectrum: PMTCT	iHTP
Goals	PCBF
cMYP Immunization	CORE Plus
Planning & Budgeting for TB Control	Integrated Health Model
Resource Needs Model HIV/AIDS	
Malaria Cost Estimation Tool	
Child Health Cost Estimation Tool	

Source: Authors.

We identified two ways to measure the tools' scope: how many MDGs each tool addresses and how many interventions are included in the tool.

As a starting point, the below list shows which health MDGs are addressed by which tools. This list is designed to be used by a user who wants to achieve a certain MDG and would like to see which costing tools address the specific MDG.

Table 22: Tools which address the health-related MDGs

MDG	Tool
Eradicate extreme hunger and poverty (MDG 1) - Reduce the prevalence of underweight children under five years of age	MBB
	iHTP Simulation Tool
	PCBF
	CORE Plus
	Integrated Health Model
	Child Health Cost Estimation Tool (CHOICE)
Reduce child mortality (MDG 4) - Reduce by two-thirds, between 1990 and 2015, the under-five mortality rate	MBB
	iHTP Simulation Tool
	PCBF
	CORE Plus
	cMYP- Immunizations
	Integrated Health Model
	Child Health Cost Estimation Tool (CHOICE)
Improve maternal health (MDG 5) - Reduce by three-quarters, between 1990 and 2015, the maternal mortality ratio - Achieve, by 2015, universal access to reproductive health	MBB
	RH Costing Tool
	iHTP Simulation Tool
	PCBF
	CORE Plus
	Integrated Health Model
Combat HIV/AIDS, malaria and other diseases (MDG 6) - Have halted by 2015 and begun to reverse the spread of HIV/AIDS - Achieve, by 2010, universal access to treatment for HIV/AIDS for all those who need - Have halted by 2015 and begun to reverse the incidence of malaria and other major diseases	MBB
	iHTP Simulation Tool
	Spectrum: PMTCT Cost Effectiveness
	GOALS
	PCBF
	CORE Plus
	Integrated Health Model
	Planning & Budgeting for TB Control
	Resource Needs Model HIV/AIDS
	Malaria Cost Estimation Tool
	Child Health Cost Estimation Tool

Source: Authors in consultation with tool focal point(s).

Once a user has narrowed down the list of potential costing tools to those which address the MDG he or she is attempting to meet, we wanted to assist potential users in choosing which tool would help them achieve their target MDG, based on the interventions required to achieve the MDG. The list of interventions contained in the below table should not be confused with the interventions mentioned in other sections of this report (child and adult immunizations, child health interventions, family planning, general health systems improvements, HIV/AIDS prevention and treatment, malaria prevention and treatment, maternal health interventions, tuberculosis prevention and treatment). Rather, the interventions listed in the below table have been specifically identified as interventions which are evidence-based and effective for reaching the health MDGs. The sources for evidence-based interventions, effective for reaching the MDGs, are "Millennium Development Goals for Health: What Will It Take to Accelerate Progress?" from *Disease Control Priorities in Developing Countries (2nd Edition)* by Adam Wagstaff, Mariam Claeson, Robert M. Hecht, Pablo Gottret, and Qiu Fang (2006) and "No.5 Reproductive Health Interventions: Which Ones Work and What Do They Cost?" by Varuni Dayaratna, William Winfrey, Karen Hardee, Janet Smith, Elizabeth Mumford, William

McGreevey, Jeff Sine, and Ruth Berg at the POLICY Project (February 2000). It is important to note that there are other sources from which to choose evidence-based effective interventions– including the Lancet Series on Child Health, British Medical Journal and others– yet it was not the scope of this review to develop a comprehensive list of these interventions. Hence, the list of interventions used in this review is limited to MDG-specific evidence-based, effective interventions from the two sources mentioned above and must be considered only as a first reference.

Table 23 shows the results of the scope measures.

Table 23: Scope measures

Tool Name	Number of MDGs targets addressed	Number of MDG interventions included[40]
MBB	7	40
RH Costing Tool	2	12
iHTP Simulation Tool	7	28
Spectrum: PMTCT Cost Effectiveness	2	10
Goals Model	2	13
PCBF	Potentially all	Potentially all
CORE Plus	7	36
cMYP Immunization	1	2
Integrated Health Model	7	18
Planning & Budgeting for TB Control	1	4
Resource Needs Model HIV/AIDS	2	9
Malaria Cost Estimation Tool (CHOICE)	1	8
Child Health Cost Estimation Tool (CHOICE)	3	8

Source: Authors

It should also be noted that some tools include interventions not listed in the below table, which could have an impact on the health-related MDGs, although we did not find specific reference with empirical evidence linking other interventions to health MDGs. Additionally, some tools (Integrated Health Model and others) have deliberately excluded certain interventions because these interventions are included in other costing tools.

The tables below provide a general idea of each tool's scope based on the number of interventions included in the tool. According to this single indicator, the MBB toolkit has the largest scope because it includes 40 interventions, while cMYP Immunization has the smallest scope, with only 2 interventions. PCBF does not include any built-in interventions, although this tool could potentially be used for all interventions and could be applicable to all MDGs and MDG targets.

[40] Refers to the interventions from Tables 25 and 26 which have been specifically identified as interventions to reach the MDGs, and are taken from two data sources which incorporate only evidence-based effective (for reaching the MDGs) interventions. Some tools may include more interventions which could have an impact on the health-related MDGs but have not been captured here. More detailed lists of specific interventions may be included in individual tool descriptions.

Table 24: List of Health MDG Interventions Included by Tool

	Tool Name	MBB	RH Costing Tool	iHTP Simulation Tool	Spectrum: PMTCT Cost Effectiveness	Goals Model	PCBF	CORE Plus **	cMYP - Immuni-zation	Integrated Health Model *	Planning & Budgeting for TB Control	Resource Needs Model HIV/AIDS	Malaria Cost Estimation Tool (CHOICE)	Child Health Cost Estimation Tool (CHOICE)
	Developer	UNICEF / World Bank	UNFPA	WHO / MRC	Constella Futures/Futures Institute	Constella Futures/Futures Institute	MSH	MSH	WHO	UNDP	WHO	Constella Futures/Futures Institute	WHO	WHO
Eradicate Extreme Poverty and Hunger (MDG 1)	Exclusive breastfeeding for 6 months	X			X			X						X
	Appropriate complementary child feeding for next 6-24 months	X			X			X						X
	Iron and folic acid supplementation for children	X						X						X
	Improved hygiene and sanitation	X		X										X
	Improved dietary intake of pregnant and lactating women	X		X				X						
	Micronutrient supplementation for prevention of anemia and vitamin A deficiency for mothers and children	X		X				X						X
	Anthelmintic treatment in school-age children							X						X
	Appropriate feeding of sick child and oral rehydration therapy	X						X						X
	Control and timely treatment of infectious and parasitic diseases			X				X						X
	Treatment and monitoring of severely malnourished children	X						X		X				X
	High-dose treatment of clinical signs of vitamin A deficiency	X						X						
Reduce Child Mortality (MDG 4)	Breastfeeding	X		X	X	X		X						X
	Hand washing	X												X
	Safe disposal of stool													
	Latrine use	X												
	Safe preparation of weaning foods													X
	Use of insecticide-treated bednets	X		X									X	X
	Complementary feeding	X		X	X	X		X						X
	Immunization	X		X				X	X	X				
	Micronutrient supplementation (zinc and vitamin A)	X						X		X				X
	Prenatalcare, including steroids and tetanus toxoid	X	X	X	X			X		X				
	Antimalarial intermittent preventive treatment in pregnancy	X		X				X					X	
	Newborn temperature management	X		X				X						X
	Nevirapine and replacement feeding	X		X	X	X		X						X
	Antibiotics for premature rupture of membranes	X	X	X				X						
	Clean delivery	X		X				X						
	Case management with oral rehydration therapy for diarrhea	X						X		X				X
	Antibiotics for dysentery, pneumonia, and sepsis	X						X		X				X
	Antimalarials for malaria	X						X					X	X
	Newborn resuscitation	X	X					X						
	Complementary feeding during illness	X				X		X						X

Source: Table 9.1, Effective Interventions to Reduce Illness, Deaths, and Malnutrition, in Disease Control Priorities in Developing Countries, Adam Wagstaff, Mariam Claeson, Robert M. Hecht, and others; No.5 Reproductive Health Interventions: Which Ones Work and What Do They Cost? POLICY Project. Varuni Dayaratna, William Winfrey, Karen Hardee, Janet Smith, Elizabeth Mumford, William McGreevey, Jeff Sine, and Ruth Berg, February 2000. Available online at http://www.policyproject.com/abstract.cfm?ID=5.

Table 25: List of Health MDG Interventions Included by Tool

	Tool Name	MBB	RH Costing Tool	iHTP Simulation Tool	Spectrum: PMTCT Cost Effectiveness	Goals Model	PCBF	CORE Plus **	cMYP - Immuni-zation	Integrated Health Model *	Planning & Budgeting for TB Control	Resource Needs Model HIV/AIDS	Malaria Cost Estimation Tool (CHOICE)	Child Health Cost Estimation Tool (CHOICE)
	Developer	UNICEF / World Bank	UNFPA	WHO / MRC	Constella Futures/Future s Institute	Constella Futures/Future s Institute	MSH	MSH	WHO	UNDP	WHO	Constella Futures/Future s Institute	WHO	WHO
Improve Maternal Health (MDG 5)	Family planning (lifetime risk)	X	X	X	X	X		X		X		X		
	Intermittent malaria prophylaxis	X	X	X				X						
	Use of insecticide-treated bednets	X	X	X						X				
	Micronutrient supplementation (iron, folic acid, calcium for those who are deficient)	X	X	X				X						
	Antibiotics for preterm rupture of membranes	X	X	X				X						
	Skilled attendants (especially active management of third stage of labor)	X	X	X				X		X				
	Basic and emergency obstetric care	X	X	X				X		X				
	Safe motherhood	X	X	X	X			X						
	STD/HIV/AIDs prevention and treatment	X	X	X	X	X		X		X				
Combat HIV/AIDS, Malaria and Other Diseases (MDG 6)	Safe sex, including condom use	X	X	X	X	X		X		X		X		
	Unused needles for drug users									X		X		
	Treatment of sexually transmitted infections		X	X		X		X		X		X		
	Safe, screened blood supplies			X		X				X		X		
	Antiretrovirals in pregnancy to prevent maternal to child transmission and after occupational exposure	X	X	X	X	X		X		X	X	X		
	Treatment of opportunistic infections	X				X		X		X		X		
	Co-trimoxazole prophylaxis	X				X		X						
	Highly active antiretroviral therapy	X	X		X	X		X		X	X	X		
	Palliative care					X		X		X		X		
	Directly observed treatment of infectious cases to prevent transmission and emergence of drug-resistant strains and treatment of contacts	X						X			X			
	Bacillus Calmette-Guerin immunization	X		X				X	X					
	Directly observed treatment to cure, including early identification of tuberculosis symptomatic cases	X						X		X	X			
	Use of insecticide-treated bednets	X		X						X			X	
	Indoor residual spraying (in epidemic-prone areas)	X											X	
	Intermittent presumptive treatment of pregnant women	X		X				X					X	
	Rapid detection and early treatment of uncomplicated cases	X		X				X		X			X	
	Treatment of complicated cases(such as cerebral malaria and severe anemia)	X		X				X		X			X	
	Total number of interventions included in tool	**40**	**16**	**28**	**10**	**14**	**0**	**36**	**2**	**22**	**4**	**9**	**8**	**12**

Source: Table 9.1, Effective Interventions to Reduce Illness, Deaths, and Malnutrition, in Disease Control Priorities in Developing Countries, Adam Wagstaff, Mariam Claeson, Robert M. Hecht, and others; No.5 Reproductive Health Interventions: Which Ones Work and What Do They Cost? POLICY Project. Varuni Dayaratna, William Winfrey, Karen Hardee, Janet Smith, Elizabeth Mumford, William McGreevey, Jeff Sine, and Ruth Berg, February 2000. Available online at http://www.policyproject.com/abstract.cfm?ID=5.

B. Size measures

We measured the size of the tools based on the following criteria:[41]

- Size of the tool:
  - Number of total worksheets, including hidden worksheets, of the tool;
  - Total used range count computed with an Excel function indicating how many cells include some sort of text or data;
  - Number of worksheets that may require some sort of action by the user, whether it be input data or choices; and
  - Number of cells that can be used to input data / make choices.

The first group of measures attempts to give us an idea of the size of the tool. For example, most tools were developed in MS Excel. In the process of reviewing the tools, we found that the more worksheets a tool has, the more complex it was to handle it. At the same time, the number of worksheets could be misleading because a tool may have many worksheets, but the content of the worksheet may be a relatively small number of cells.

We also included a measure of the used range of the tool. The size of the range count could reflect the level at which costing is being done; tools which use a bottom-up costing approach may require more cells than tools which assume that higher level cost data are already available. Tools which display intermediate calculations, or include cells with instructions, figures, and other contents that may actually facilitate the use and navigation of the tool, may show a higher used range count. Furthermore, this measure includes some cells which may be not intended for use by the average user. In some tools, not all the worksheets in the tool are meant to be opened and worked on by the user. A high range count may indicate that the tool employs sophisticated programming and requires additional cells to provide background data. We recognize that complexity of programming and complexity to the average user may be different; the used range count may focus more on programming complexity, but we have included other measures which focus more on complexity for the user.

We included the number of worksheets that may require some sort of action by the user. To count these worksheets we considered those where the user must input data (including checking default data in the tool) and where the user enters choice variables. This measure attempts to provide insight about a tool's complexity in terms of size and time commitment for the user. This measure is complemented by the "time commitment required" measure presented in the "Ease of use" section.

We complemented the latter measure with the number of cells that can be used to input data or make choices (again, including checking default data in the tool). This measure attempts to provide insight about a tool's complexity in terms of size and time commitment for the user. The number of cells listed is the highest possible number of cells in which users could input data

[41] Several of the complexity indicators do not apply to the two program-based tools, the iHTP Simulation Tool and Spectrum: PMTCT Cost Effectiveness, because the indicators are Excel-specific. These instances are marked with "N.App." Other occurrences of "N.Av." in the below table refer to instances in which the data was not available.

or make choices; some tools will reduce the number of cells available to users for inputting data or making choices based on certain options selected in the tool. Additionally, a tool might have more cells if it requires the users to input unit prices rather than a single intervention cost. This tool might not be inherently more complex than a tool with fewer cells for input data or choices, and could even be more user friendly. This measure should be taken in conjunction with the time commitment required by the user, as presented in the "Ease of use" section.

These measures of "size" may also simply distinguish between tools that use a detailed bottom-up approach to costing, and those that use a top-down approach for which much cost data must already be available. Tools which include a longer time period may be larger in size but proportionally, in terms of size per year costed, not any larger than "smaller" tools. Therefore, these measures of size should be used in combination with other information found in this report. Table 26 shows the results of the size measures.

Table 26: Size measures

Tool Name	Format	Number of total worksheets (incl. hidden)	Total used range count	Number of worksheets that can be used to input data / make choices	Number of cells that can be used to input data / make choices
MBB	Spreadsheet	30	1,404,966	8	13,733
RH Costing Tool	Spreadsheet	117	485,195	65	6,800
iHTP Simulation Tool	Program	N.App.	N.App.	N.App.	N.App.
Spectrum: PMTCT Cost Effectiveness	Program	N.App.	N.App.	N.App.	N.App.
Goals Model	Spreadsheet	84	130,287	18	2,008
PCBF	Spreadsheet	2	9,008	2	Varies
CORE Plus	Spreadsheet	63	84,756	60	1,423
cMYP Immunization	Spreadsheet	8	254,615	2	2,154
Integrated Health Model	Spreadsheet	25	1,742,189	18	N.Av.
Planning & Budgeting for TB Control	Spreadsheet	41	2,920,328	18	23,925
Resource Needs Model HIV/AIDS	Spreadsheet	21	381,064	5	398
Malaria Cost Estimation Tool (CHOICE)	Spreadsheet	54	614,603	22	7,310
Child Health Cost Estimation Tool (CHOICE)	Spreadsheet	69	522,468	30	9,070

N.App.: Not applicable. N.Av.: Not available.
Source: Authors

Because the magnitudes of the measures are very different, we chose to normalize each measure as the difference relative to the mean and dividing by the standard deviation.[42] Hence,

[42] The formula for the normalization of each measure is:

$$x_{normalized} = \frac{(x_i - \bar{x})}{\sigma}$$

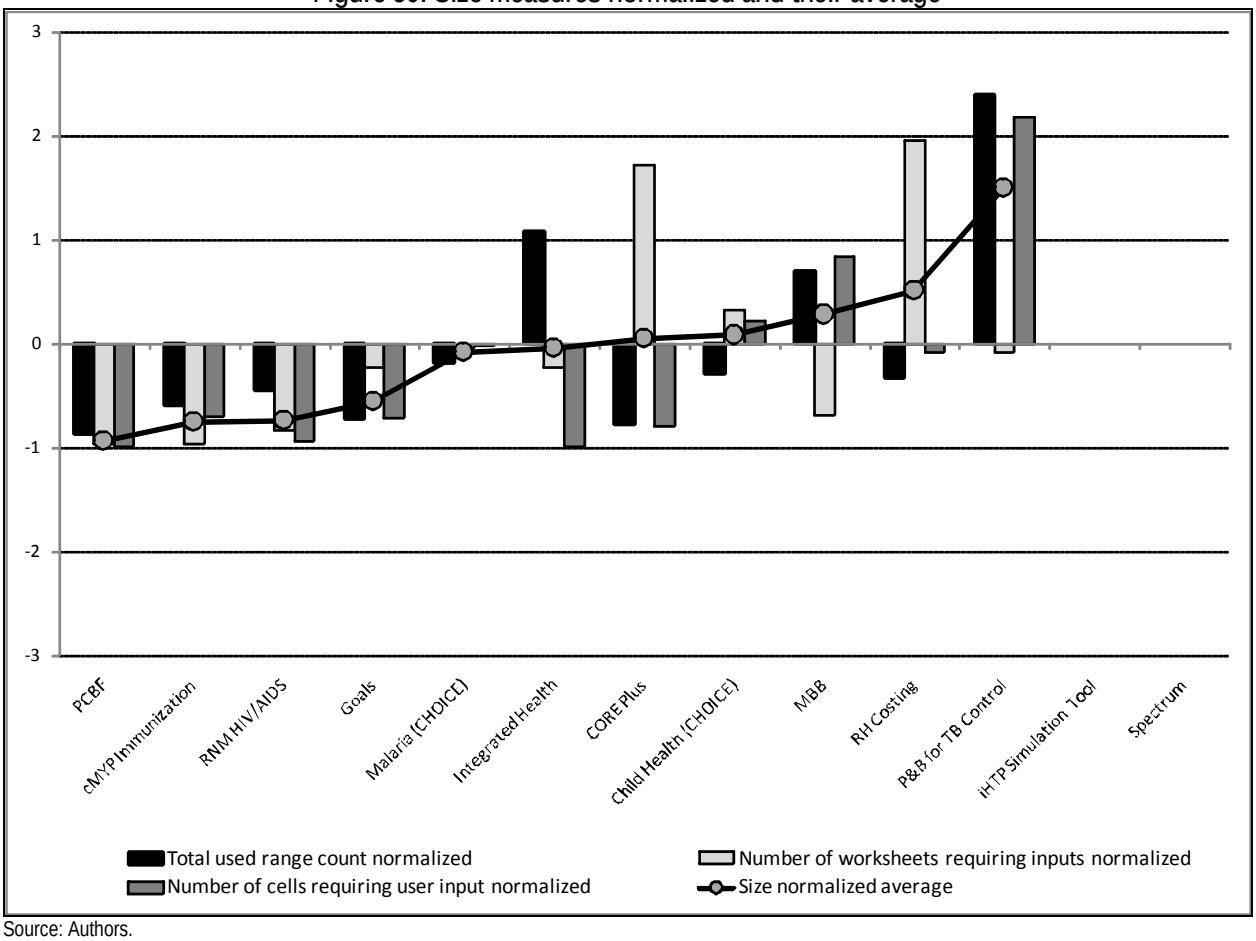
where :

$\bar{x}$: average

σ : standard deviation

any tool with a negative measure implies that it is below average, and any tool with a positive measure implies it is above average. Figure 50 shows three size measures normalized and the average of these normalized measures.

Figure 50: Size measures normalized and their average



Source: Authors.

Notice that the Integrated Health Model total used range count is above average, but the other two measures are below average. The high used range count may be because the tool includes columns for each year between 2007 and 2016, or because it includes many lines for the user to include country-specific information.

The case of the Planning & Budgeting for TB Control Tool is particularly surprising, since it is a tool that focuses solely on TB interventions, but the used range count and the number of cells requiring user inputs are over two times the average. Here it is important to note that the number of sheets requiring inputs is below average. The high number of used range count may explained because this tool has columns for each year between 2006 and 2015, lines for country-specific information, the tool uses a bottom-up costing approach which requires more input data for unit costs, and also because it includes a great detail for each intervention. For example, the staff worksheet includes sections for: staff at the national, intermediate, and peripheral level; "other" for country-specific definition; summary of costs; and sources of funding. This is only one of the 41 worksheets the tool has.

CORE Plus, on the other hand, has a low used range count and low number of cells requiring inputs, but the number of worksheets is over 1.5 standard deviations above average. CORE Plus includes 63 worksheets, and 60 of them require inputs.

C. Ease of use

One of the key features of any tool is its ease of use. This section contains information based on information provided by the tool developers, the reviewers' experiences, and the experiences of users (available for 6 of the 13 tools).

1. Developer feedback

Developer feedback includes time commitment required, the need for training/technical assistance, the availability of user manuals or other accompany tool documentation in various languages[43] and the presence of a help desk. Developer feedback was provided through email correspondence and extracted from user manuals.

[43] Two tools, iHTP and the Planning & Budgeting for TB Control tool, do not have formal user manuals. However, for this purpose of this assessment, the supporting documentation provided, whether it be in the form of the "help files" or other written documentation accompanying the tool, has been considered.

Table 27: Developer feedback on ease of use

Tool Name	Time commitment required	Need for training/ technical assistance	User manuals-languages	Help desk available
MBB	3-6 months	5 days	English	Yes
RH Costing Tool	1-2 weeks	1-4 days	English	Yes
iHTP Simulation Tool	3-6 months	3-5 days	English	Yes
Spectrum: PMTCT Cost Effectiveness	N. Av.	1 day	English	N. Av.
Goals Model	2 weeks	Several days	English, French, Spanish	Yes
PCBF	N. Av.	2 days	English	No
CORE Plus	1-5 days	3 days	English	No
cMYP Immunization	1 week	1-4 days	English, French, Russian	Yes
Integrated Health Model	N. Av.	1-2 days	English	N. Av.
Planning & Budgeting for TB Control	1-3 weeks	3 days	English	Yes
Resource Needs Model HIV/AIDS	N. Av.	1 day	English, French, Spanish, Russian	Yes
Malaria Cost Estimation Tool (CHOICE)	N. Av.	None	English	Yes (email)
Child Health Cost Estimation Tool (CHOICE)	1-2+ weeks	None	English	Yes

N.App.: Not applicable. N.Av.: Not available.
Source: User manuals or other accompanying tool documentation, as well as email correspondence with tool focal points.

2. User Feedback

User feedback includes time commitment required, need for technical assistance/training, ease of tool navigation, and helpfulness of user manual.[44] The user feedback included in this section comes from information provided by actual tool users through questionnaires distributed and collected by the Steering Committee.

[44] Two tools, iHTP and the Planning & Budgeting for TB Control tool, do not have formal user manuals. However, for this purpose of this assessment, the supporting documentation provided, whether it be in the form of the "help files" or other written documentation accompanying the tool, has been considered.

Table 28: User feedback on ease of use

Tool Name	Time commitment required	Need for training/ technical assistance	Ease of tool navigation	Helpfulness of user manual
MBB	N. Av.	N. Av.	N. Av.	N. Av.
RH Costing Tool	Up to 4 months[45]	Yes	Easy	Yes
iHTP Simulation Tool	1-8+ months	Yes	Easy	N. Av.
Spectrum: PMTCT Cost Effectiveness	N. Av.	N. Av.	N. Av.	N. Av.
Goals Model	N. Av.	N. Av.	N. Av.	N. Av.
PCBF	N. Av.	N. Av.	N. Av.	N. Av.
CORE Plus	3 days	N. Av.	Easy	Yes
cMYP Immunization	N. Av.	N. Av.	N. Av.	N. Av.
Integrated Health Model	N. Av.	N. Av.	N. Av.	N. Av.
Planning & Budgeting for TB Control	1-3 weeks	Yes	Easy	Yes
Resource Needs Model HIV/AIDS	2 weeks	N. Av.	Easy	Yes
Malaria Cost Estimation Tool (CHOICE)	N. Av.	Yes	Difficult	N. Av.
Child Health Cost Estimation Tool (CHOICE)	N. Av.	N. Av.	N. Av.	N. Av.

N.Av.: Not available.
Note: no user feedback was received for the following tools: MBB, Spectrum: PMTCT Cost Effectiveness, Goals, PCBF, cMYP Immunization, Integrated Health Model and Child Health Cost Estimation Tool. These rows are marked "N. Av."
Source: Survey results from users.

3. Reviewer assessment and feedback

Reviewer assessment and feedback includes ease of tool navigation, user manual transparency and program transparency. The reviewer assessment and feedback is made based on the reviewers' own experiences with using the tools, keeping in mind that the scope of this review did not include the actual implementation of the tool in a costing exercise (data collection, data entry, analysis of results). The reviewer assessment and feedback may differ from the user feedback because the reviewers did not receive any formal training in the use of the tools. Additionally, in rating the elements of ease of use, the reviewers were interested in different elements of ease of use than the users may have been.

For each tool, we have characterized the transparency as "low" (-1), "average" (0) or "high" (1). A tool was considered to be transparent if we had the ability to trace and replicate computations and if sheets and formulas were visible (without needing to use a manual). A tool's manual or other accompanying documentation[46] was considered transparent if it was clear regarding the tool's goals and objectives, scope and methods, if it provided examples and if it identified formulas used by the tool. We have characterized ease of navigation as "easy" (1), "average" (0) or "difficult" (-1) based on the number of files to open as part of the tool, how the sheets are laid out and presented (for Excel-based tools) and if a switchboard or menu helped guide users through multiple sheets.

[45] This exercise in Indonesia included costing for 19 provinces and should be considered a special case.
[46] Two tools, iHTP and the Planning & Budgeting for TB Control tool, do not have formal user manuals. However, for this purpose of this assessment, the supporting documentation provided, whether it be in the form of the "help files" or other written documentation accompanying the tool, has been considered.

Table 29: Reviewers feedback and assessment of ease of use

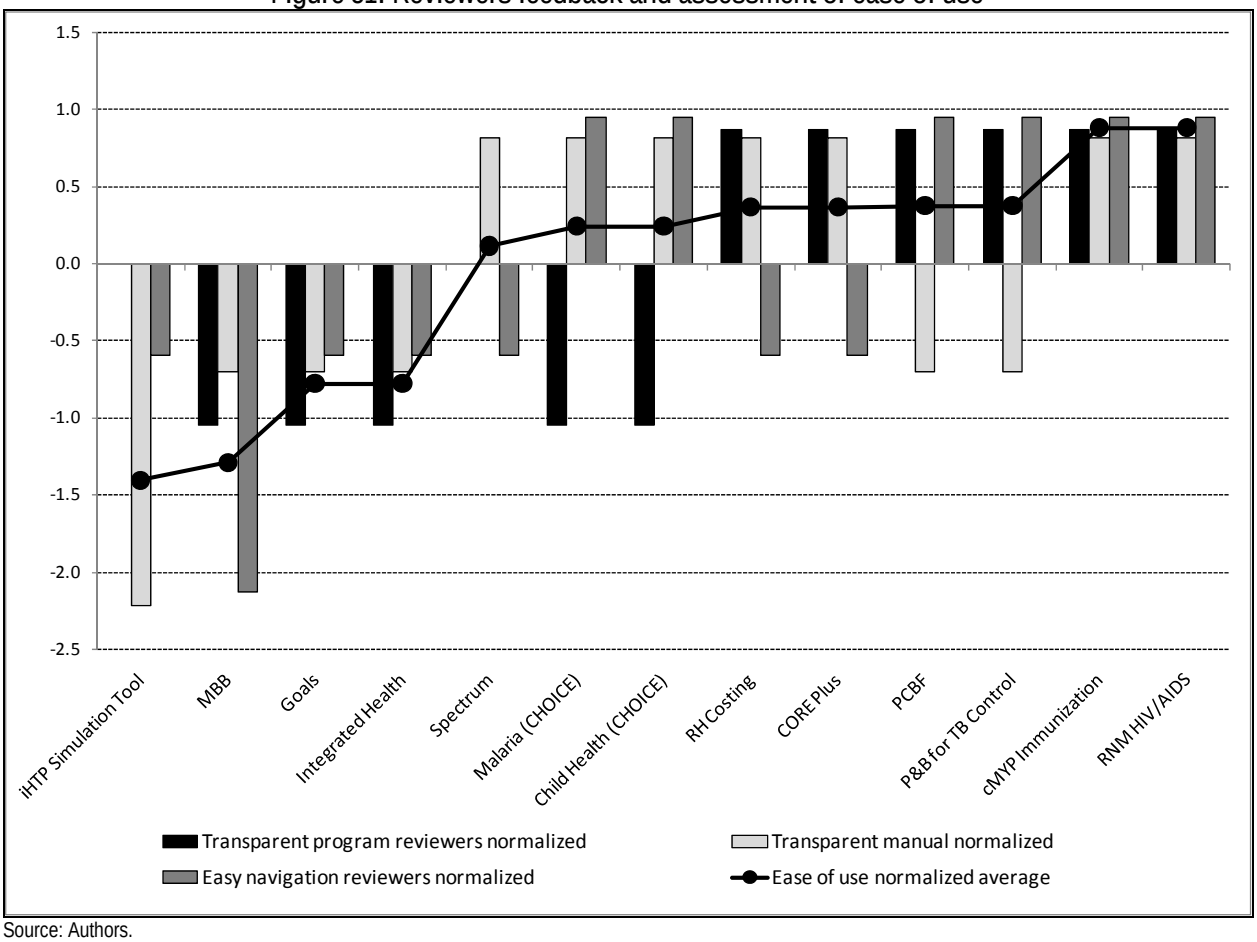
Tool Name	Ease of tool navigation	User manual transparency	Program transparency
MBB	-1	0	0
RH Costing Tool	0	1	1
iHTP Simulation Tool	0	-1	N. App.
Spectrum: PMTCT Cost Effectiveness	0	1	N. App.
Goals Model	0	0	0
PCBF	1	0	1
CORE Plus	0	1	1
cMYP Immunization	1	1	1
Integrated Health Model	0	0	0
Planning & Budgeting for TB Control	1	0	1
Resource Needs Model HIV/AIDS	1	1	1
Malaria Cost Estimation Tool (CHOICE)	1	1	0
Child Health Cost Estimation Tool (CHOICE)	1	1	0

N.App.: Not applicable. Reviewers could not rate program transparency of non-Excel based tools.
Note: reviewers received no training in the use of any of the costing tools in this review.
Source: Authors.

Figure 51 shows the three ease of use measures (presented in Table 29) normalized and their average. According to the reviewers assessment, iHTP and MBB are the least user friendly tool. In the case of iHTP, its weakest point is the manual, but it only has two measures (manual and navigation) because we could not evaluate the transparency of the program. In the case of MBB its weakest point is the navigation difficulty.

We found the Malaria and Child Health tools to be easy to navigate and with a complete user manual, but the program was not so transparent with key computation worksheets being accessible only through Visual Basic. Yet, users may not require this level of transparency in the program. Nevertheless, Spectrum provides a detailed manual that compensates for the tool's lack of transparency. In the case of the MBB, it is important to note that although it provides a comprehensive manual, it remains incomplete, particularly with regards to the formulas and computations the tool makes.

Figure 51: Reviewers feedback and assessment of ease of use



Source: Authors.

4. Summary of ease of use

This section combines the developer feedback, user feedback and the reviewers' feedback and assessment presented above to attempt to draw conclusions about tools' overall ease of use.

a. Ease of use according to reviewers vs. ease of use according to users

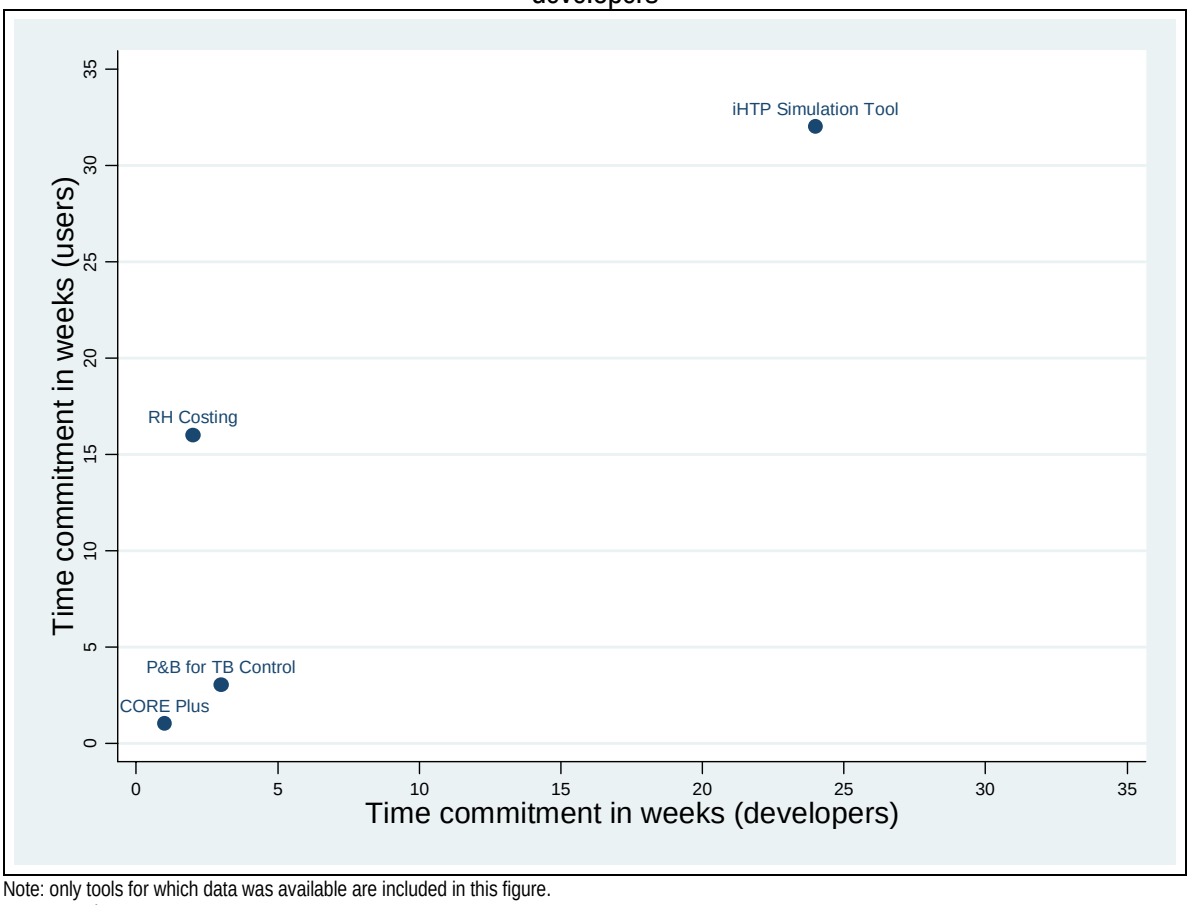
Due to the small number of responses to the Steering Committees questionnaire for user feedback and out of the 13 responses, five were for one tool (Planning and Budgeting for TB) we were not able to compare the user feedback on ease of use and the reviewers' assessment.

b. Time commitment required according to users vs. time commitment required according to developers

Figure 52 compares the time commitment (in weeks) required to use each tool, according to users, against the time commitment according to developers. This figure shows that for three of the four tools for which data was available, users validated that the amount of time they needed to use the tool was the amount of time the developers stated would be needed to use the

tool. The RH Costing Tool is the exception, with the one user providing feedback needing much more time to use the tool than developers stated.

Figure 52: Time commitment required according to users vs. time commitment required according to developers

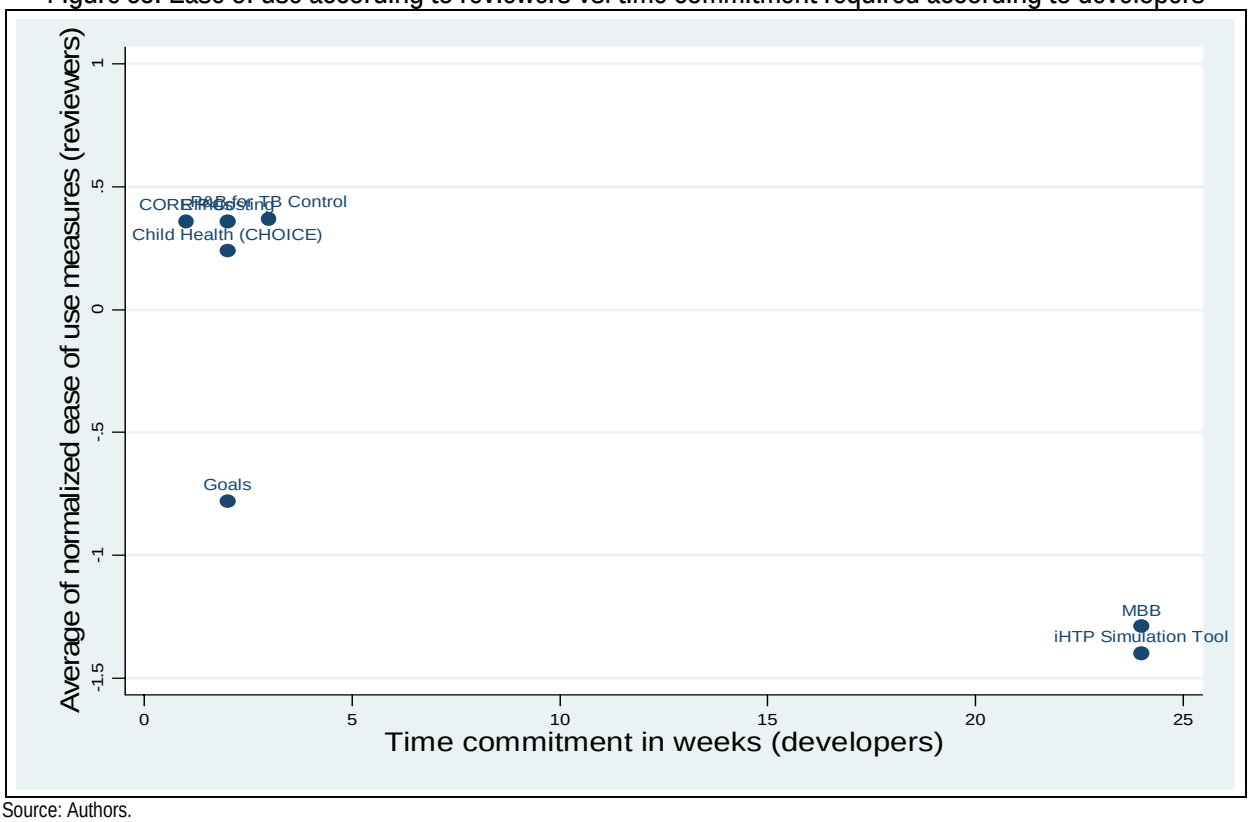


Note: only tools for which data was available are included in this figure.
Source: Authors

c. Ease of use according to reviewers vs. time commitment required according to developers

Figure 53 compares the average of normalized ease of use measures (reviewers' assessment and feedback) with the time commitment required to use the tool, in weeks, according to tool developers. This figure shows that the two tools which require a longer time commitment (MBB and iHTP) were rated by the reviewers as below average with regards to ease of use. On the other hand, the cluster of tools rated as above average with regards to ease of use, also require a shorter time commitment. The Goals Model, which rated below average with regards to ease of use, required a shorter time commitment according to developers, but there is no feedback on time commitment according to users.

Figure 53: Ease of use according to reviewers vs. time commitment required according to developers



Source: Authors.
Note: only tools for which data was available are included in this figure.

D. Linearity measures

We measured linearity of the formulas included in the tools in an attempt to gauge the sophistication of the tools' modeling. Linearity of the formulas in the tool is measured in two areas:[47]

- Population projections; and
- Need projections.

These measures are meant to show how a tool projects key values, in particular, population and need. The premise is that most tools can be used to obtain results for different periods and two key variables are population and need projections. Tools which use nonlinear population growth and/or nonlinear need, or adjust need for the impact of other inventions, may be more sophisticated than tools which use simple linearity. For example, a tool that uses population could either use current population growth and assume it remains constant (linear) in time, or it can incorporate that the programs included in the tool have an effect on population growth –for example, by reducing mortality– therefore including a nonlinear growth. In the case

[47] Several of the complexity indicators do not apply to the two program-based tools, the iHTP Simulation Tool and Spectrum: PMTCT Cost Effectiveness, because the indicators are Excel-specific. These instances are marked with "N.App." Other occurrences of "N.Av." in the below table refer to instances in which the data was not available.

of need, the criteria was whether incidence, prevalence, or other measure of need was held constant (linear).

Table 30 shows the results of the linearity measures. A simple 0-1 scale was used to rate each tool in each category; in population growth a "0" indicates the tool employs simple linear population growth, while a "1" indicates the tool uses more complex non-linear growth. For need, a "0" indicates linear need projections, while a "1" refers to non-linear need projections or projections which adjust given the impact of related interventions.

Table 30: Linearity measures

Tool Name	Population growth (1=nonlinear growth)	Need (1=nonlinear or incorporates changes in interventions)
MBB	0	0
RH Costing Tool	1	0
iHTP Simulation Tool	N.Av.	N.Av.
Spectrum: PMTCT Cost Effectiveness	1	1
Goals Model	1	0
PCBF	1	1
CORE Plus	N.App.	1
cMYP Immunization	0	0
Integrated Health Model	1	0
Planning & Budgeting for TB Control	1	1
Resource Needs Model HIV/AIDS	1	0
Malaria Cost Estimation Tool (CHOICE)	0	0
Child Health Cost Estimation Tool (CHOICE)	0	0

N.App.: Not applicable. N. Av.: Not available.
Source: Authors

Figure 54 shows the two linearity measures normalized[48] and the average of these normalized measures. Three clear groups are formed: a group that uses both population and need linearly, a group in which one projection is linear and the other is nonlinear (although this graph does not allow us to see which is which); and finally a group where both indicators use nonlinear projections.

[48] Because the magnitudes of the measures are different, we chose to normalize each measure as the difference relative to the mean and dividing by the standard deviation.[48] Hence, any tool with a negative measure implies that it is below average, and any tool with a positive measure implies it is above average. The formula for the normalization of each measure is:

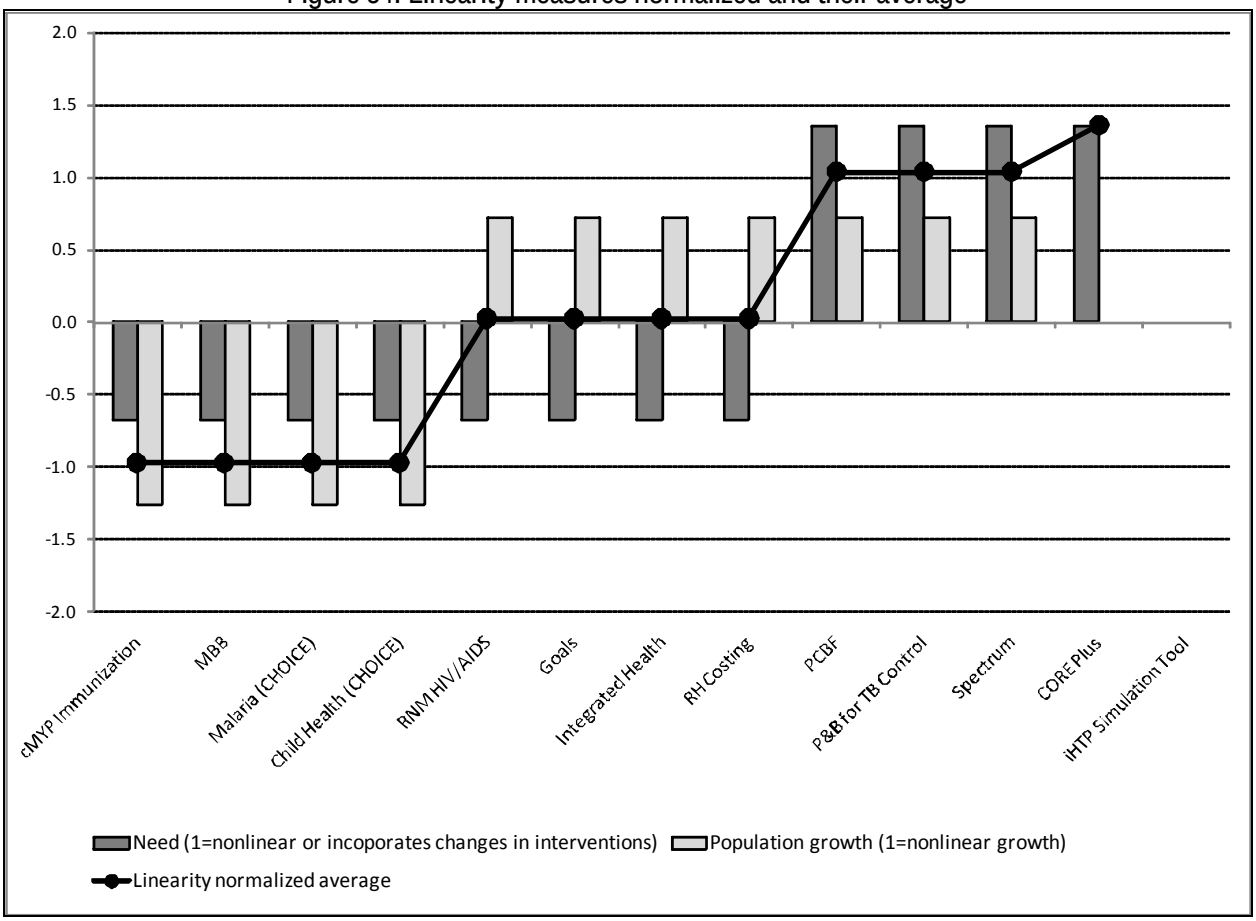
$$x_{normalized} = \frac{(x_i - \bar{x})}{\sigma}$$

where :

$\bar{x}$: average

σ : standard deviation

Figure 54: Linearity measures normalized and their average



Source: Authors.

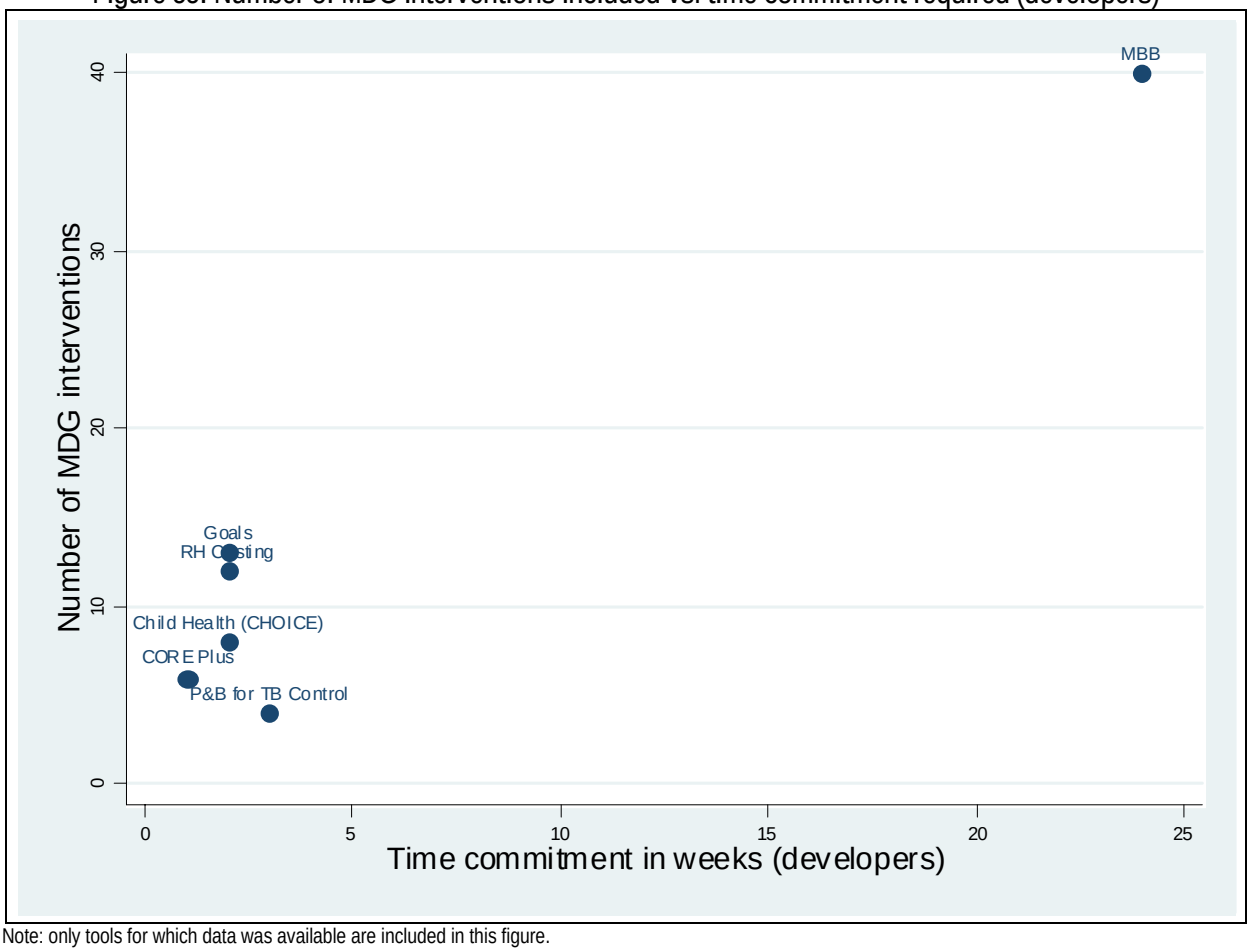
E. Tools taxonomy comparison

In this section, we combine the measures of scope, size, ease of use and linearity presented above. We present combinations of these measures in two-way graphs to get a better idea of the tools and the relationships of the measures.

1. Number of MDG interventions included vs. time commitment required according to developers

Figure 55 presents the number of MDG interventions against the time commitment in weeks required to use the tool, according to developers. This figure shows that a costing exercise can be completed in less than 3 weeks (according to developers) using tools which include less than 15 MDG interventions. For tools with more MDG interventions, however, like the MBB, much more time is required. The scope of this tool is broad and input data requirements are also very large, which may partially explain the time commitment required.

Figure 55: Number of MDG interventions included vs. time commitment required (developers)



Note: only tools for which data was available are included in this figure.
Source: Authors.

2. Number of MDG targets addressed vs. average of normalized size measures

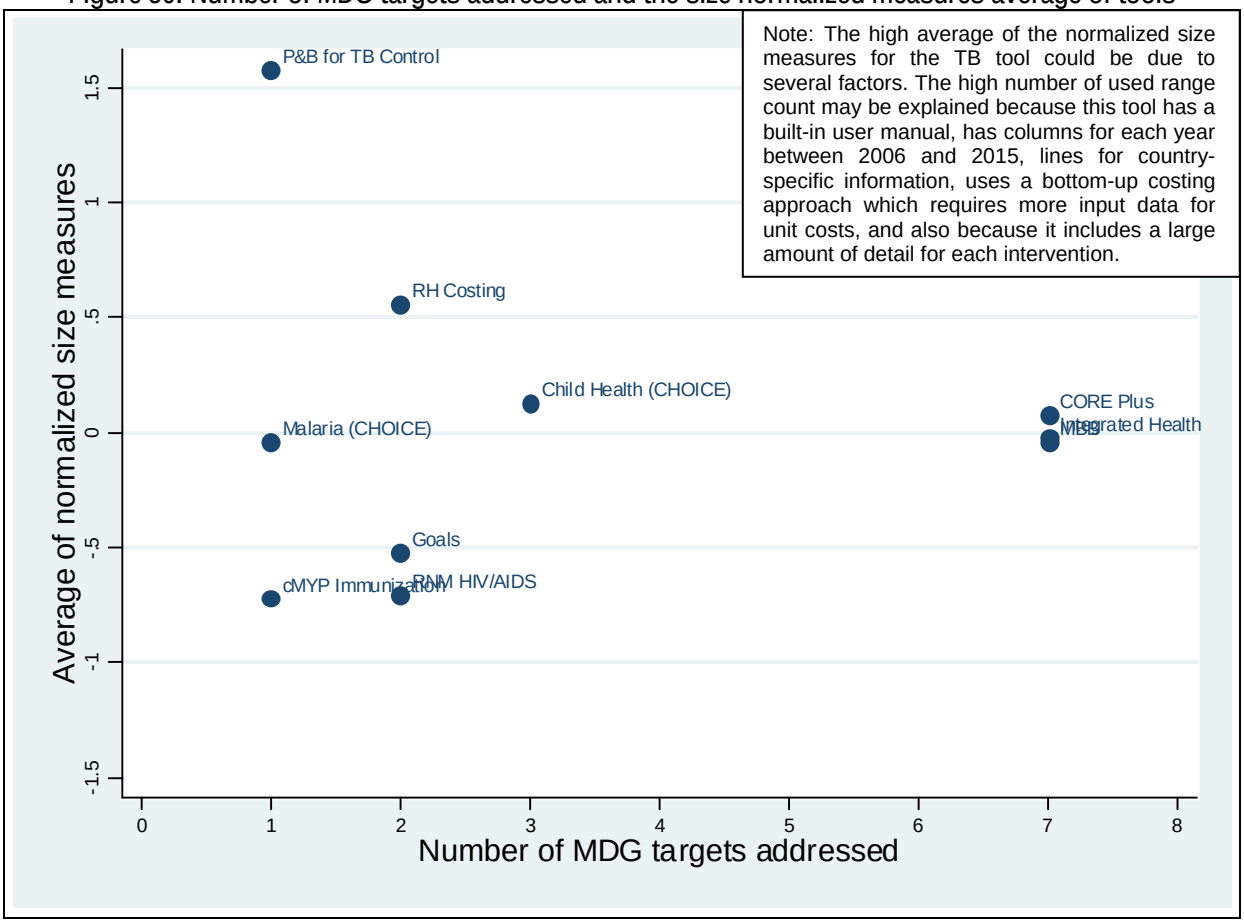
Figure 56 compares the number of MDG targets addressed against the size normalized measures average[49] (Figure 50). Looking at the tools which address a single MDG target, such as the cMYP, Malaria Cost Estimation Tool and Planning & Budgeting for TB Control, the large size of the Planning & Budgeting for TB Control tool is surprising. The high average of the normalized size measures for the TB tool could be due to several factors. The high number of used range count may be explained because this tool has a built-in user manual, has columns for each year between 2006 and 2015, lines for country-specific information, uses a bottom-up

[49] The size normalized measures average is the simple average of the three normalized measures: total used range count normalized, number of worksheets requiring inputs normalized and number of cells requiring user input/choices normalized.

costing approach which requires more input data for unit costs, and also because it includes a large amount of detail for each intervention.

Three tools address the most MDG targets: CORE Plus, MBB Toolkit and RH Costing Tool; however, these three tools are of medium size in comparison with other tools in the review, according to the size normalized measures average.

Figure 56: Number of MDG targets addressed and the size normalized measures average of tools



Source: Authors.

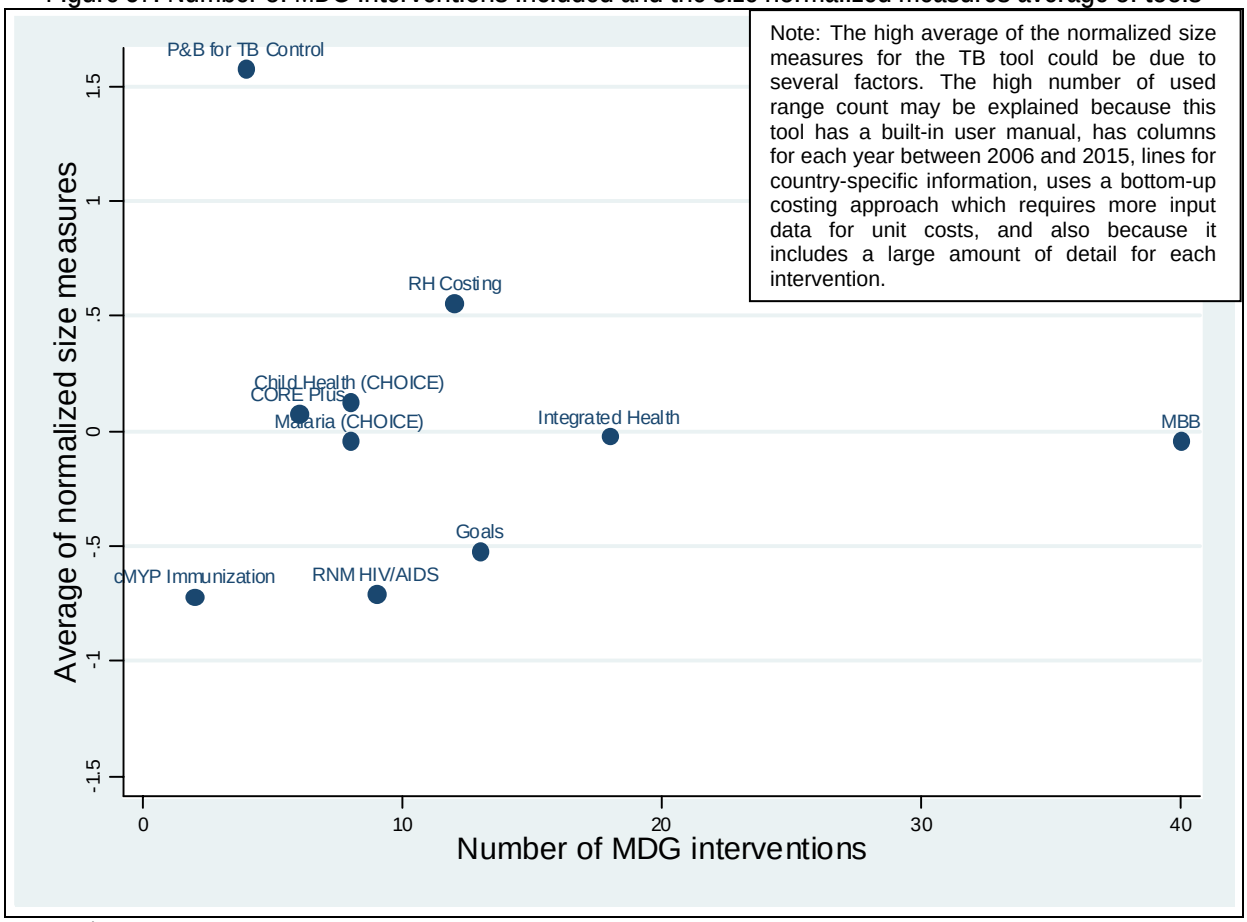
Note: Only tools for which data was available are included in this figure. PCBF is a framework which can include any and all information the user requires and hence all the MDGs, so it was excluded from the figure.

3. Number of MDG interventions included vs. average of normalized size measures

When comparing the number of MDG interventions included against the size normalized measures average of tools (Figure 57), one might expect that as the number of MDG interventions the tool includes increases, the size of the tool should also increase. The below graph reveals there is some tendency towards this premise, with tools including fewer MDG interventions generally having a smaller size. Again, the Planning & Budgeting for TB Control tool is an exception (for the same reasons noted in the previous section). Additionally, it is important to keep in mind that tools like CORE Plus allow the user to increase the number of interventions without requiring a proportional increase in the size of the tool (the tool already

incorporates cells for additional interventions). This would move CORE Plus towards the right of the graph.

Figure 57: Number of MDG interventions included and the size normalized measures average of tools



Source: Authors.

4. Comparison of tools' inputs, choices and results

We have also included a table summarizing the tool application figures, to help users easily see the input requirements, choices and results of all thirteen tools. This table shows that for inputs, all tools require input prices, and most require input quantities and demographics data. The most common choices offered are intervention production function, coverage, and time. For results, most tools calculate intervention cost and intervention quantity, with far fewer tools producing health outcome, budget & financing, coverage and intervention price.

Table 31: Tools' input data, choices and results

	Tool Name	MBB Toolkit	RH Costing Tool	iHTP Simulation Tool	Spectrum: PMTCT Cost Effective-ness	Goals Model	PCBF	CORE Plus	cMYP - Immuni-zation	Integrated Health Model	Planning & Budgeting for TB Control	Resource Needs Model HIV/AIDS	Malaria Cost Estimation Tool (CHOICE)	Child Health Costing Tool (CHOICE)
	Tool Developer	UNICEF / World Bank	UNFPA	WHO / MRC	Constella Futures/Futures Institute	Constella Futures/Futures Institute	MSH	MSH	WHO	UNDP	WHO	Constella Futures/ Futures Institute	WHO	WHO
Input Data	Input price	X	X	X	X	X	X	X	X	X	X	X	X	X
	Input quantity		X	X	X	X	X	X	X	X	X	X	X	X
	Intervention production function						X							
	Intervention cost					X		X			X			
	Intervention price				X			X						
	Intervention quantity				X			X			X			
	Effectiveness			X	X	X								
	Health production function													
	Health outcome													
	Epidemiology		X	X		X		X		X	X	X	X	X
	Demographics	X	X	X	X	X		X	X	X	X	X	X	X
	Coverage			X				X		X	X	X		
	Budget & Financing	X					X	X	X		X			
	Time			X		X		X		X				
	Macreconomic conditions	X							X					
Choices	Input price										X			
	Input quantity										X			
	Intervention production function	X	X	X	X			X	X	X	X		X	X
	Intervention cost										X			
	Intervention price													
	Intervention quantity										X			
	Effectiveness												X	
	Health production function													
	Health outcome						X							
	Epidemiology										X			
	Demographics										X			
	Coverage	X	X		X		X	X	X	X	X	X	X	X
	Budget & Financing					X					X			
	Time		X		X		X		X		X		X	X
	Macreconomic conditions													
Results	Input price													
	Input quantity													
	Intervention production function											X		
	Intervention cost	X	X	X	X		X	X	X	X	X	X	X	X
	Intervention price							X						
	Intervention quantity		X	X		X	X	X	X	X	X	X	X	X
	Effectiveness													
	Health production function													
	Health outcome	X			X	X	X							
	Epidemiology													
	Demographics													
	Coverage	X				X	X							
	Budget & Financing	X					X	X	X		X		X	
	Time			X										
	Macreconomic conditions													

Source: Authors in consultation with tool focal point(s)..

Users can also refer to the Tool Comparison Chart, Table 5, which provides a general summary of each tool. In this comparison chart we provide a summary of each tool with regards to focus, questions the tool can answer, methodology, interventions included, MDG targets addressed, outputs and ease of use. In this way, a potential user could compare several tools along these general areas.

F. Tools' value added

A thorough review of the thirteen costing tools in this study revealed that no one tool is inherently "better" than another. Nonetheless, we thought it was important to point out some "special features" that we encountered about certain tools. The below table summarizes what we found to be each tool's "value added," or most unique or useful feature.

Table 32: Special Features of Each Costing Tool

MBB Toolkit	Recognizing that one of the key problems health policymakers face when negotiating with the Ministry of Finance for additional resources is linking expenditures to health outcomes, the MBB tool is designed in part to assist policymakers in this process by including evidence-based effective interventions.
RH Cost	This tool was designed to help countries to quickly cost and create budgets for existing sector strategies and plans, such as Maternal Road Maps or RH action plans. This tool provides users wanting to scale up their reproductive health services with detailed drug and supply lists, complete with current international prices, for the provision of RH services. The tool also incorporates population dynamics so users can account for the impact family planning has on the demand for maternal and child health services.
iHTP Simulation Tool	This is the only tool in this study that assesses improvement of health service delivery with regards to both need and cost-effectiveness.
Spectrum: PMTCT Cost Effectiveness	This model is unique from many others in this study in that it calculates both costs and cost savings, as well as infections and infections averted. It also shows how making a change in one area of population dynamics (such as migration rates) may necessitate changes in a number of other areas (such as marriage rates, timing of childbearing, etc.). The tool prepares a list of what the user will need to implement the chosen strategy- number of HIV test kits needed, amount of extra formula required, number of extra C-sections required and number of counselors needed.
Goals Model	This model allows users to compare, at a single glance, the impact of up to four budgets on health outcome and coverage. Unlike other models, this tool does not hold incidence constant.
PCBF	This template provides a simple, generic format that can be used where a specific tool is not a good fit for a particular planning and costing exercise. Because of the tool's skeleton structure, the user can incorporate the desired elements without much difficulty.
CORE Plus	This tool is unique from other tools in that it can be used to analyze how much a primary care facility is, and should, be producing, enabling the user to determine and correct inefficiency and to compare results among facilities. It is also different in that it produces the cost of each intervention as part of the cost of a facility, and it also includes a revenue analysis feature.
cMYP	This tool identifies areas for cost sharing by integrating and consolidating activities with other health interventions and within the immunization program to solve shared problems. Additionally, this tool links included interventions (immunizations) to the broader health sector planning and budgeting processes.

Table 32: Special Features of Each Costing Tool

Integrated Health Model	Users can add up to 15 user-defined, additional interventions as well as design and estimate costs for other health programs, which may deliver a suite of interventions. This adds quite a bit of flexibility to the user in reflecting the design of the health system in the model. Another element of flexibility is that the Integrated Health Model can be used for broader health systems planning and budgeting; for example, users can estimate costs for vertical programs, such as malaria or HIV/AIDS, or include more expansive sets of interventions, such as treatment for chronic conditions or mental illness (i.e., an MDG+ scenario).
Planning & Budgeting for TB Control	This tool allows users to develop comprehensive plans and budgets for TB control that are in line with the WHO Stop TB Strategy and the Stop TB Partnership's Global Plan to Stop TB. It also allows users to calculate the available funding and funding gap by TB intervention, which is useful for advocacy and resource mobilization
Resource Needs Model	This model includes costing for up to five additional vulnerable populations, and includes orphan support.
Malaria Cost Estimation Tool	The Malaria Cost Estimation Tool calculates costs by health system administrative levels, which can help users improve health service delivery by revealing where the majority of the cost burden lies. As a part of CHOICE, the similar methodology used in all WHO tools allows for comparability of cost estimates for different programs.
Child Health Cost Estimation Tool	As a part of CHOICE, the similar methodology used in all WHO tools allows for comparability of cost estimates for different programs. Users can cost up to five scenarios, and the tool allows for costs to be estimated for different levels of service delivery.

Source: Authors in consultation with tool focal point(s)..

We hope that this single page summary of the one or two characteristics that make each tool unique from the others will be used in conjunction with the comparison chart (stage 1) and the other information from this taxonomy chapter (stage 3) to help potential users quickly and easily assess all 13 tools together.

VI. Stage 4: Benchmarking

To the extent that all tools cost interventions or health strategies, they should have similar results. Our original intention was to compare these results across tools by inputting a common data set into all tools, in particular, a data set of a single country. We expected this analysis would allow us to compare the data results of each tool and to analyze similarities and differences.

Our first attempt was to test this benchmarking effort by inputting a common data set into tools which addressed the same MDG targets and included the same interventions. Therefore, after separating the tools by MDG addressed and interventions included, we examined the inputs of three tools in the HIV/AIDS group to determine the input requirements. We did not expect all data input requirements to be the same, but we did expect to see significant overlap. However, we found that these tools, which supposedly cost the same interventions and focused on the same MDG, had very different input requirements. As an example, one tool required input data on "cost per sex worker reached." Another asked for "cost per sex worker targeted." Another did not address cost per sex worker at all. Because of the large differences in data requirements, the comparison of results would have been meaningless.

Our second attempt was to see if the benchmarking could be done by examining results. Yet, not only were inputs required by each tool different, but the results each tool produced were also not comparable. Although all tools compute intervention cost, one tool calculated the "net cost per total infections averted," while others divided the cost into interventions: supportive policy environment, behavior change, vulnerable populations, etc. One tool calculated "total infections averted," while others separated infections averted into "child HIV infections averted," "adult HIV infections averted" and "infections averted from 2006-2010." Some tools calculated "annual infections averted other than PMTCT" or "cumulative infections averted from all activities." Other tools looked not only at infections averted but new infections as well; one tool computes "additional maternal deaths," others "child HIV infections" or "new HIV infections" broken down into new male and female HIV infections. Because of the wide variation in results, these differences made the outputs impossible to compare. More information on this analysis can be found in Annexes 3 and 4.

Therefore, these exercises revealed that without similar starting points, it was impossible to reach the same results. Although there were some input requirements that overlapped, we found that the data similar across all or most tools had little or no impact on the intervention cost (for example, local currency name, required by all three tools or percent of all condoms that are female condoms), with too many other variables which differed between tools at play. While outputs tended to fall in similar areas, they were calculated and presented in different ways, making them impossible to compare.

VII. Conclusion

This technical review of costing tools has served a number of purposes. First, stages 1 and 2 of this review have produced a better understanding of what different costing tools are capable of doing. Specifically, these stages of the study have identified the questions each tool is designed to answer; provided a description of the tools' input requirements, user choices, and outputs; and examined and evaluated tools' methods and underlying assumptions.

After a thorough review of each individual tool, in stages 3 and 4 of this study we have compared related tools against one another to identify which tools can be used to help users achieve specific health-related MDGs. In comparing related tools against one another, we have attempted to identify which tool might be most appropriate for a specific costing exercise by identifying the interventions included in each tool and classifying the tools according to their scope, size, usability and linearity. It should be noted that at no point did this review include value judgments about which tool was inherently "better" than another. We recognize that each tool is unique and that it was developed to serve a specific purpose. This review has attempted to clarify the purpose of each tool and to give users the information they need to make an accurate assessment as to which tool best suits their needs. In some cases, potential tool users may find that many tools could meet their needs; in other cases, however, a potential user might find only one or two tools that fit their needs.

We conclude this technical review with some final remarks about costing tools in general. Tools should be as transparent as possible in three particular areas:

Purpose. It should be clear from the outset what questions the tool can help answer, and more specifically, what MDGs and interventions are included. The tool or manual should list the interventions included, as well as a list of specific data to be input, so the user can prepare the information ahead of time. The tool should also clearly state what outputs will be produced.

Structure. The tool's structure should be clear. A figure similar to the one we used to explain each tool's focus is helpful in showing not only how the tool works but what the tool does and does not do. In addition, tools should be as user friendly as possible (links, hidden sheets).

Methodology. Because different costing tools use different methodologies and formulas for calculating costs, coverage and health outcomes, users should have access to technical notes with formulas in order to understand how outcomes are computed. This point is particularly important for those tools which are program-based and the formulas are not readily accessible. Also, because costing can include so many different elements (i.e. staffing and equipment) as well as types of costs (ex. variable and fixed), tools should be clear on what elements are included in costs (hospitalization- food only or everything). Also, some tools use terminology to mean one thing, whereas the same word may have a completely different meaning in another tool. Terminology should be defined, and better yet, an attempt to use common terminology would be helpful to users of all costing tools and would assist users in being able to compare tools.

The thirteen costing tools we reviewed in this exercise meet these above criteria to varying extents. However, while usability is important, a potential tool user must look not only at usability but at each tool's individual focus. Costing tools may not estimate costs of all

actions undertaken by a country to reach the MDGs, and costing tools may also estimate the cost of actions not directly related to the MDGs. Even with their limitations, however, costing tools can be a powerful resource for countries to use as part of a larger strategy of reaching the health MDGs. If proper time is invested in choosing the right tool for the job, we are confident that the tools included in this technical review can help users work towards the MDGs. We hope that this final report has helped potential users in better understanding each tool's focus, so that ultimately the right tool can be chosen for each costing exercise.

Annex 1: List of Costing Tools Included in the Technical Review

Table 33: List of Costing Tools Included in the Technical Review

Tool name	Organization	Focal Point	Email	Tool Website
MBB Toolkit	UNICEF / World Bank	Agnes Soucat / Rudolf Knippenberg	asoucat@worldbank.org / rknippenberg@unicef.org	None
RH Costing Tool	UNFPA	Eva Weissman	weissman@unfpa.org	None
iHTP Simulation Tool	WHO / MRC	Peter Heimann / Matthews Matthai	heimannp@who.int / matthaim@who.int	http://www.ihtp.info/
Spectrum: PMTCT Cost Effectiveness Module	Constella Futures / Futures Institute	John Stover	jstover@futuresinstitute.org	http://www.futuresinstitute.org/pages/resources.aspx
Goals Model	Constella Futures / Futures Institute	John Stover	jstover@futuresinstitute.org	http://www.futuresinstitute.org/pages/resources.aspx
PCBF	MSH	David Collins	dcollins@msh.org	http://erc.msh.org/mainpage.cfm?file=9.33.htm&module=toolkit&language=English
CORE Plus	MSH	David Collins	dcollins@msh.org	http://erc.msh.org/mainpage.cfm?file=9.33.htm&module=toolkit&language=English
cMYP - Immunization	WHO	Patrick Lydon	lydonp@who.int	http://www.who.int/immunization_financing/tools/cmyp/en/index.html
Integrated Health Model	UNDP	Brian Lutz / Maha El-Adawy	brian.lutz@undp.org / maha.eladawy@undp.org	http://www.undp.org/poverty/tools.htm#nact
Planning & Budgeting for TB Control	WHO	Andrea Pantoja / Katherine Floyd	pantojaa@who.int / floydk@who.int	http://www.who.int/tb/dots/planning_budgeting_tool/en/index.html
Resource Needs Model HIV/AIDS	Constella Futures / Futures Institute	John Stover	jstover@futuresinstitute.org	http://www.futuresinstitute.org/pages/resources.aspx
Malaria Cost Estimation Tool (part of CHOICE)	WHO	Tessa Tan-Torres	tantorrest@who.int	http://www.rollbackmalaria.org/consensusdocuments.html
Child Health Costing Tool (part of CHOICE)	WHO	Karin Stenberg	stenbergk@who.int	http://www.who.int/child_adolescent_health

We are grateful to the tool focal points for their assistance and feedback during this technical review. In particular, we appreciate their availability to answer questions and validate certain parts of our review.

Annex 2: Glossary of Terms

Table 34: Glossary of Terms Included in the Technical Review

Term	Definition
Budget & Financing	Total sum of money available or needed for a purpose, as well as the financing available.
Coverage	Percentage of target population reached by intervention or percentage of target population using the intervention.
Coverage-guided decision making	User makes choices in tool with the goal of increasing coverage of interventions.
Demographics	Selected population characteristics, including total number of persons defined by groups or physical location.
Effectiveness	The ability to achieve an effect or an outcome under everyday or typical field conditions.
Epidemiology	Selected indicators to measure disease prevalence and incidence.
Health Outcome	Gain in health status arising from the delivery of the health intervention, given its effectiveness.
Health Production Function	Combination of interventions and effectiveness that produces health outcome.
Impact-guided decision making	The user's main concern is achieving a specified health outcome, and thus choices in the tool are made based on their impact on health outcome.
Ingredients approach	Method of making cost computations made where the value of an input is based on quantities, unit prices and percentage used for immunization.
Input Quantity	Quantities of equipment and labor required to produce a given intervention.
Input Price	Amount of money for which input is bought or sold.
Intervention	Activity or set of activities aimed at modifying the health status or producing a health outcome.
Intervention Cost	Monetary value of intervention, generally measured as the price of inputs multiplied by the quantity of inputs.
Intervention Price	Amount of money for which an intervention is bought or sold, generally referred to as the user fee.
Intervention Production Function	Combination of inputs and their quantities that produce an intervention.
Long-term planning	Refers to a planning time period of ten or more years.
Macroeconomic Conditions	A general measurement of a country's economic status.
Medium-term planning	Refers to a planning time period of one to ten years.
Short-term planning	Refers to a planning time period of one year or less.
Time	Period or duration.

Source: Authors.

Annex 3: List of Input Data Required for HIV/AIDS Costing Tools

With the costing tools broken into these smaller groups based on what MDG targets each tool addresses, we then tried to compare the tools within these groups. We recognized that a potential costing tool user would most likely not consider all 13 tools as possibilities for a costing exercise, but would rather start the search for a costing tool with a narrower list of possible tools, those which address a particular MDG, as an example.

We wondered if tools which address the same MDG would be comparable with regards to input data required and results produced. As an experiment, we chose four of the tools which address the HIV/AIDS component of MDG 6, and found that there was very little, if any, overlap with regards to inputs and outputs. This exercise showed that although tools claim to the do the same thing, each tool does it in a very different way, making it nearly impossible to compare the tools.

The results of our analysis of the inputs of four HIV/AIDS tools are seen below. The tools are listed across the top, and down the side are the input data requirements. An "X" indicates that the tool requires the input data listed on the left-hand side.

Table 35: List of Input Data Required for HIV/AIDS Costing Tools

	Tool Name	Spectrum: PMTCT Cost Effectiveness	Goals Model	Resource Needs Model HIV/AIDS
	Developer	Constella Futures/Futures Institute	Constella Futures/Futures Institute	Constella Futures/Futures Institute
Setup	First Year		X	X
	Summary scaling factor for currency		X	X
	Local currency name		X	X
	Currency to display			X
	Exchange rate, local currency per US dollar		X	X
	Existence of supportive policy environment		X	
	Percent population served by the public sector		X	
	Time			
	Inflation rate			
Demography	Total population		X	X
	% of population living in urban areas			X
	Number of men 15-49		X	
	Number of women 15-49		X	
	15-49 sexually active		X	X
	Males 15-49 in regular partnerships			X
	15-49 males reporting non-regular partnerships			X
	Average number of wives per husband		X	
	Number of youth		X	
	Population of youth in school		X	
	Primary school enrollment- gross- male			X
	Primary school enrollment- gross- female			X
	Primary pupil-teacher ratio			X
	Secondary school enrollment- gross- male			X
	Secondary school enrollment- gross- female			X
	Secondary pupil-teacher ratio			X
	Frequency of teacher re-training			X
	Number of primary teachers			X
	Number of secondary teachers			X
	Number of youth not in school			X
	Annual number of births		X	X
	Annual growth rate in SWs			X
	Number of sex workers			X
Students	Students reached per trained teacher		X	X
	% primary students with teachers trained in AIDS			X
	% secondary students with teachers trained in AIDS			X
	% out of school youth reached			X
	Cost per teacher trained in primary school education			X
	Cost per teacher trained in secondary school education			X
	Cost of peer educaiton for out of school youth			X
	Primary teachers trained			X
	Secondary teachers trained			X
	Out of school youth reached			X
	Resources required for primary teacher training			X
	Resources required for secondary teacher training			X
	Resources required for out of school youth			X
	Resources required			X
Workplace	Participation rate in formal workplace		X	
	Labor force participation rate- male			X
	Labor force participation rate- female			X
	% labor force in services and industry			X
	% labor force in wage employment in agriculture			X
	Number of formal sector employees			X
	% workforce receiving peer education			X
	% workfoce receiving STI treatment			X
	% workfoce receiving condoms			X
	Cost per person in employment reached (peer education)			X
	Cost per STI treated in workplace			X
	Workers reached with peer education			X
	STI cases treated			X
	Condoms provided (millions)			X
	Resources required			X

Table 35: List of Input Data Required for HIV/AIDS Costing Tools

	Tool Name	Spectrum: PMTCT Cost Effectiveness	Goals Model	Resource Needs Model HIV/AIDS
	Developer	Constella Futures/Futures Institute	Constella Futures/Futures Institute	Constella Futures/Futures Institute
Sexual Behavior	Number of MSMs			X
	Annual growth rate of number of MSMs			X
	Number of sex acts per MSM per year			X
	% MSMs reached by intervention per year			X
	% using condoms among those reached by intervention			X
	% using condoms among those not reached by intervention			X
	Cost per MSM targeted			X
	Cost per male condom distributed			X
	Cost per male condom distributed by the public sector			X
	Cost per condom distributed by social marketing			X
	MSMs meached			X
	Resources required			X
	Percentage of men in risk group category		X	
	Male coital frequency (acts per year)		X	
	Number of partners per year- men/women		X	
	Number of sex acts for casual non-regular partners per year			X
	Number of sex acts with regular partners per year			X
	Number of commerical sex acts-SW-per year			X
	Condom wastage during storage and distribution			X
	Number of condoms required			X
	% of casual sex acts covered with condoms			X
	% of marrieds with causl partners using condoms in marital sex			X
	Condoms provided (millions)			X
	Condoms provided for commercial sex (millions)			X
	Condoms provided for MSMs (millions)			X
	Condoms provided for IDUs (millions)			X
	Condoms provided via workplace programs (millions)			X
	Condoms provided for casual sex (millions)			X
	Condoms provided for marital sex (millions)			X
	Condoms paid for under condom budget (millions)			X
	Resources required for condoms			X
HIV/STI prevalence	HIV prevalence- male/female/total		X	
	Prevalence of ulcerative/non-ulcerative STIs		X	
	Pecent of STI cases treated		X	
	Prevalence among 15-49 year olds, no change		X	
	Ratio HIV Prevalence 15-24/15-49		X	
HIV/STI Care and Treatment	% sex workers reached by intervention per year			X
	% using condoms among those reached by intervention			X
	% using condoms among those not reached by intervention			X
	Cost per male condom distributed			X
	Cost per female condom distributed			X
	Sex workers reached			X
	Resources required			X
	Cost per male/female condom distributed by public sector/social		X	X
	Cost per STI case treated		X	
	Cost of VCT per session		X	
	Cost per youth reached by peer educator		X	
	Cost per teacher trained		X	
	Cost per sex worker reached		X	
	Cost per sex worker targeted			X
	Cost per person reached with mass media		X	
	Cost per employee reached in workplace programs		X	
	Cost per community worker trained		X	
	Cost per safe unit of blood		X	
	Cost per person reached (MSM)		X	
Maternal Health/Child Birth	% Public Sector Births	X		
	% Antenatal Visits	X		
	% Planned C-Section	X		
	% Breastfed for 6 Months	X		
	% Mixed Feeding	X		
	Increase in CMR	X		
	MMR (per 100,000)	X		

Table 35: List of Input Data Required for HIV/AIDS Costing Tools

	Tool Name	Spectrum: PMTCT Cost Effectiveness	Goals Model	Resource Needs Model HIV/AIDS
	Developer	Constella Futures/Futures Institute	Constella Futures/Futures Institute	Constella Futures/Futures Institute
Maternal Health/HIV	% Offered HIV Test	X		
	% Accepting HIV Test	X		
	% Receiving HIV Test Results	X		
	# Women Seen/Counselor	X		
	% Breastfeeding Spillover	X		
	Infections Averted/Woman	X		
	% Eligible for Treatment	X		
	% Offered Treatment	X		
	% Accepting Treatment	X		
	% Adhering to Treatment	X		
	% Elective C-Section	X		
	% HIV+Breastfeed for 6 Months	X		
	% HIV+Mixed Feeding	X		
	MMR Increase: C-Section	X		
Maternal Health/HIV Prevention, Care and Treatment	Cost of HIV Test	X	X	
	Pre-HIV Test VCT	X		
	Post-HIV Test VCT	X		
	User Fee: HIV VCT	X		
	Cost of C-Section Birth	X		
	Monthly Formula Costs	X	X	
	# Months Paid by Government	X	X	
	User Fee: Treatment	X		
	Total Child Treatment Costs	X		
	Total Adult Treatment Costs	X		
	Vertical Transmission Probability	X		
	Transmission: Intra-uterine	X		
	Transmission: Vaginal-delivery	X		
	Transmission: Cesarean-delivery	X		
	Transmission: Breastfeeding-exclusive	X		
	Transmission: Breastfeeding- mixed	X		
	Reduction	X		
	ARV Costs	X		
	ARV Costs for prevention of MTCT		X	
	PMTCT Intervention: Cost for all types of counseling		X	
	PMTCT Intervention: Cotrimoxazole		X	
	PMTCT Intervention: Vitamins		X	
	PMTCT Intervention: Proportion of women adopting replacement feeding		X	
Miscellaneous	People reached per community worker		X	
	Percent of all condoms that are female condoms		X	X
	Proportion of condoms distrubted by social marketing		X	
	Blood units required per 1000 people		X	
	Reduction in prevention effectiveness wih poor policy environment		X	
Care and mitigation	Paliative care service cost		X	
	OI treatment service cost		X	
	OI Prophylaxis service cost		X	
	ARV therapy service cost		X	
	% population in need with access to care		X	
	Number of HIV+ Adults		X	
	Number of new adult AIDS cases		X	
	Number of new child AIDS cases		X	
	Number of orphans		X	
	Reduction in prevention effectiveness in the absence of care		X	

Table 35: List of Input Data Required for HIV/AIDS Costing Tools

	Tool Name	Spectrum: PMTCT Cost Effectiveness	Goals Model	Resource Needs Model HIV/AIDS
	Developer	Constella Futures/Futures Institute	Constella Futures/Futures Institute	Constella Futures/Futures Institute
Budget	Budget		X	
	Financed by			
Orphans	Orphan costs		X	
HAART	HAART success		X	
Standard assumptions	Duration of infectiousness of untreated STI		X	
	Duration of infectiousness of treated STI		X	
	Condom efficacy		X	
	HIV transmission probabilities per contact		X	
	STI transmission probabilities per contact		X	
	MTC transmission rate (base)		X	
	MTC transmission rate (intervention of drug therapy alone)		X	
	MTC transmission rate (intervention of drug therapy and replacement feeding)		X	
	Maximum coverage for prevention interventions		X	
	Maximum coverage for care, treatment and support		X	
Strategic plan	Goals			
	Objectives			
	Strategies			
	Aims			
Drug Use	Number of IDUs			X
	Annual growth rate of number of IDUs			X
	Number of IDUs reached per counselor			X
	Number of sex acts per IDU per year			X
	Number of injections per IDU per year			X
	Number of needles and syringes required			X
	Number of condoms required			X
	% of IDUs receiving harm reduction intervention			X
	% of IDUs receiving counseling and testing			X
	% of IDUs receiving community outreach and peer education			X
	% of IDUs receiving needle and syringe exchange			X
	% of IDUs receiving drug substitution			X
	% of IDUs reached by condom promotion interventions			X
	Cost of harm reduction programs per person contacted			X
	Cost of counseling and testing per IDU targeted			X
	Cost of community outreach and peer educaiton per IDU target			X
	Cost per needle distrubted and destroyed			X
	Cost of drug substitution per IDU targeted			X
	Cost per condom			X
	Cost to train one counselor			X
	IDUs reached			X
	Counselors trained			X
	IDUs receiving counseling and testing			X
	IDUs receiving community outreach and peer education			X
	IDUs receiving NSEP			X
	IDUs receiving drug substitution			X
	Number of needles and syringes provided			X
	Number of condoms provided			X
	Resources required for counseling and testing			X
	Resources required for community outreach and peer education			X
	Resources required for needles and syrings (thousands)			X
	Resources required for drug subsitution			X
	Resources required for condoms			X
	Resources required for training counselors			X
	Resources required			X
	Other vulnerable populations (size, growth rate, coverage, unit costs, results)			X

Source: Authors.

Annex 4: Comparison of Outputs Produced by HIV/AIDS Costing Tools

With the costing tools broken into these smaller groups based on what MDG targets each tool addresses, we then tried to compare the tools within these groups. We recognized that a potential costing tool user would most likely not consider all 13 tools as possibilities for a costing exercise, but would rather start the search for a costing tool with a narrower list of possible tools, those which address a particular MDG, as an example.

We wondered if tools which address the same MDG would be comparable with regards to input data required and results produced. As an experiment, we chose four of the tools which address the HIV/AIDS component of MDG 6, and found that there was very little, if any, overlap with regards to inputs and outputs. This exercise showed that although tools claim to the do the same thing, each tool does it in a very different way, making it nearly impossible to compare the tools.

The results of our analysis of the outputs of four HIV/AIDS tools are seen below. The tools are listed across the top, and down the side are the outputs the tool produces. An "X" indicates that the tool produces the output listed on the left-hand side.

Table 36: Comparison of Outputs Produced by HIV/AIDS Costing Tools

	Tool Name	Spectrum: PMTCT Cost Effectiveness	GOALS	Resource needs model HIV/AIDS
	Developer	Constella Futures/Futures Institute	Constella Futures/Futures Institute	Constella Futures/Futures Institute
Costs	Child HIV treatment cost savings	X	X	
	Adult HIV treatment cost savings	X	X	
	Total HIV treatment cost savings	X		
	Total costs intervention (testing, counseling and ARV drug costs)	X		
	Total cost of all HIV/AIDS activities			X
	Net cost intervention (difference between total costs of the intervention, minus user fee if any, and the total treatment costs savings)	X		
	Benefit-cost ratio	X		
	Net cost per child death averted	X		
	Net cost per child infection averted	X		
	Net cost per total infections averted	X		
	Net cost per infection averted		X	
	Distribution of costs	X		
	Total cost of supportive policy environment (broken into policy, human rights, stigma, community mobilization and mass media)		X	
	Total cost of behavior change (broken into VCT and social marketing)		X	
	Total cost of vulnerable populations (broken into sex worker/high risk population, MSM, harm reduction for IDUs, youth: in school, youth: out of school)		X	
	Total cost of service delivery (broken into blood safety, condoms, STI treatment, workplace programs, PMTCT-> PMTCT broken down into HIV test, pre-test counseling, post-test counseling HIV-, post-test counseling HIV+, BF counseling for HIV+, ARV, Cotrimoxazole, nutrition, formula)		X	
	Prevention cost per infection averted		X	
	Total cost of care and treatment (broken into palliative care, treatment of Ois, prophylaxis of Ois, ARV, TB)		X	X
	Total cost of mitigation (broken itno orphanage care, community support for OVC, school support for orphans)		X	X
	Total cost of program support (broken into management and coordination, monitoring and evaluation, research and capacity building)		X	X
	Cost of condom distribution		X	X
	Cost of STI treatment		X	
	Cost of HIV prevention activities: STI management			X
	Future expenditures averted adult		x	
	Future expenditures averted child		X	
	Future expenditures averted total		X	
	Cost per life year gained		X	
	Total cost- activity			
	Total cost- stategy			
	Total cost- objective			
	Cost of youth focused prevention intereventions			X
	Cost of sex workers and clients prevention interventions			X
	Cost of workplace prevention interventions			X
	Cost of IDU prevention intereventions			X
	Cost of MSM prevention intereventions			X
	Cost of other vulnerable populations- prevention interventions			X
	Cost of blood safety prevention interevention			X
	Cost of post-exposure prophylaxis prevention interevention			X
	Cost of safe injection prevent interevention			X
	Cost of universal precautions prevention interevention			X
	Cost of home-based care			X
	Cost of pallative care			X
	Cost of diagnostic testing			X
	Cost of treatment of opportunistic infections			X
	Cost of OI prophylaxis			X
	Cost of lab HAART			X
	Cost of ARV therapy			X
	Cost of care and treatment training			X
	Cost of care and treatment nutritional support			X
	Cost of care and treatment of TB			X
	Cost of mitigation- orphan care			X
	Total cost of prevention-related activities			X

Table 36: Comparison of Outputs Produced by HIV/AIDS Costing Tools

	Tool Name	Spectrum: PMTCT Cost Effectiveness	GOALS	Resource needs model HIV/AIDS
	Developer	Constella Futures/Futures Institute	Constella Futures/Futures Institute	Constella Futures/Futures Institute
Coverage	Coverage of supportive policy environment (broken into policy, human rights, stigma, community mobilization and mass media)		X	
	Coverage of behavior change (broken into VCT and social marketing)		X	
	Coverage of vulnerable populations (broken into sex worker/high risk population, MSM, harm reduction for IDUs, youth: in school, youth: out of school)		X	
	Coverage of service delivery (broken into blood safety, condoms, STI treatment, workplace programs, PMTCT)		X	
	Coverage of care and treatment (broken into palliative care, treatment of Ois, prophylaxis of Ois, ARV, TB)		X	
	Coverage of mitigation (broken itno orphanage care, community support for OVC, school support for orphans)		X	
	Coverage of program support (broken into management and coordination, monitoring and evaluation, research and capacity building)		X	
	Coverage of blood transfusions		X	
Health Outcome	Child deaths averted	X		
	Child HIV infections	X		
	Child HIV infections averted	X	X	
	Adult HIV infections averted	X	X	
	Total HIV infections averted	X	X	
	Infections averted, activities continued from 2003		X	
	Annual infections averted other than PMTCT		X	
	Cumulative infections averted other than PMTCT		X	
	Cumulative infections averted- all activities		X	
	Total infections averted		X	
	Additional maternal deaths	X		
	Number of new infections 2006-2010		X	
	Infections averted 2006-2010		X	
	Prevalence in final year		X	
	Prevalence reduction in final year		X	
	Incidence in final year		X	
	New HIV infections, strategic plan, total		X	
	New HIV infections, strategic plan, male		X	
	New HIV infections, strategic plan, female		X	
	New HIV infections, no change, total		X	
	New HIV infections, no change, male		X	
	New HIV infections, no change, female		X	
	Year sof life gained with prevention, adult		X	
	Year sof life gained with prevention, child		X	
	Years of life gained with prevention, total		X	
	years of life gained care		X	
	Years of life gained care total		X	
	HIV prevalence by risk group- IDU, MSM, CSW, CSW clients, casual males, casual females, married males, married females		X	
	Number of new infections by risk group- IDU, MSM, Commercial sex, casual sex, marital sex, blood transfusions, medical injections, MTCT, total		X	
Quantities	Condoms required			
	Condoms required w/ strategic plan		X	
	Condoms required- no change	X	X	
	Number of HIV test kits needed	X		
	Amount of extra formula required	X		
	Number of extra C-sections required	X		
	Number of counselors needed	X		
	Policy environment score		X	
	Care coverage score		X	
	Reduction in prevention effectiveness		X	
	# partners- HR		X	
	# partners- MR		X	
	# partners- LR		X	
	Condoms- %- HR		X	
	Condoms- %- MR		X	
	Condoms- %- LR		X	
	STI Tx- %- HR		X	
	STI Tx- %- MR		X	
	STI Tx- %- LR		X	
	Sexually active- %		X	
	Prevalence among 15-49 year olds w/ strategic plan		X	
	Prevalence among 15-49 year olds- no change		X	
	Prevalence among 15-24 year olds w/ strategic plan		X	
	Prevalence among 15-25 year olds- no change		X	
	STI treatments required w/ strategic plan		X	
	STI treatments required- no change		X	
	Teachers newly trained in AIDS education		X	
	Stock of trained teachers		X	
	VCT clients		X	
	Blood screening		X	
	Women receiving ARV for PMTCT		X	
	Progression to AIDS: years since infection		X	
	Percent progressing to AIDS death- audlts		X	
	Percent progressing to AIDS death-children		X	
	Incidence with strategic plan		X	
	Incidence- no change			
	Quantity of outputs and inputs in plan years			
Other	Funding by source- public, private, donor, GFATM, WB loan, out of pocket, total		X	
	Financing source			
	Funding gap			
	Agency responsible for implementation			
	Budget			

Source: Authors.

Annex 5: Countries In Which Costing Tools Have Been Used in a Costing Exercise (as of December 2007)

Table 37: Countries In Which Costing Tools Have Been Used in a Costing Exercise

Name	MBB	RH Costing Tool *	iHTP Simulation Tool	Spectrum: PMTCT Cost Effectiveness	GOALS	PCBF	CORE Plus **	cMYP - Immuni-zation	Integrated Health Model	Planning & Budgeting for TB	Resource Needs Model HIV/AIDS	Malaria Cost Estimation Tool (CHOICE)	Child Health Cost Estimation Tool (CHOICE)	
Developer	UNICEF / World Bank	UNFPA	WHO / MRC	Constella Futures/Futures Institute	Constella Futures/Futures Institute	MSH	MSH	WHO	UNDP	WHO	Constella Futures/Futures Institute	WHO	WHO	Sum
Afghanistan							x	x						2
Angola	x											[X]		2
Armenia		X						x						2
Azerbaijan		X												1
Bangladesh							x	x						2
Benin	x							x						2
Bhutan								x						1
Bolivia							x							1
Burkina Faso	x							x						2
Burundi	x							x						2
Cambodia						X							X	2
Cameroon	x							x						2
Central African Republic								x						1
Chad								x						1
China			X		X						X			3
Congo								x		[X]				2
Comoros	x							x						2
Cote D'Ivoire	x							x						2
Democratic People's Republic of Korea								x						1
Democratic Republic of the Congo			x					x		x				3
Djibouti								x						1
Dominican Republic		X		X										2
Eritrea								x						1
Ethiopia	X	X			X		X	X		[X]	X			7
Gabon										X				1
Gambia								x						1
Georgia		X												1
Ghana	X	X			X						X			4
Guatemala							X							1
Guinea-Bissau	X							x						2
Guinea	X							x						2
Haiti							X		X		X			3
Honduras					X		X				X			3
India	X													1
Indonesia		X									X			2
Kenya					X		X	X		X	X			5
Kyrgyzstan			X					X						2
Lao PDR		X												1
Lesotho	X							X						2
Liberia	X							X						2
Madagascar	X						X	X						3
Malawi	X		X					X		X				4
Malaysia											X			1
Mali	X							X		[X]	X			4
Mauritania	X													1
Mexico			X	X	X		X							4
Republic of Moldova								X						1
Mongolia		X						X						2
Mozambique	X		X		X			X			X	[X]	X	7
Myanmar								X						1
Namibia			X		X					[X]				3
Nepal								X						1
Nicaragua							X							1
Niger	X							X						2
Nigeria	X					X		X	X	X				5
Pakistan								X						1
Panama				X										1
Philippines										[X]	X			2
Rwanda	X						X	X	X		X			5
Senegal							X	X		[X]				3
Sierra Leone	X							X						2
Solomon Islands								X						1
South Africa			X		X		X			X				4
Sri Lanka			X					X						2
Sudan								X						1
Swaziland	X													1
Tajikistan		X						X						2
Tanzania							X	X			X			3
Thailand					X						X			2
Togo								X						1
Turkey		X												1
Uganda	X	X			X			X	X		X		X	7
Ukraine			X											1
USA							X							1
Uzbekistan										X				1
Vietnam					X						X			2
Yemen		X						X						2
Zambia	x				X					x	X	X		5
Zimbabwe		x					x	X						3
TOTAL	**26**	**14**	**10**	**3**	**13**	**2**	**17**	**48**	**4**	**14**	**17**	**3**	**3**	

* Note: some countries listed as having applied the RH Costing Tool used previous versions of the RH Costing Tool which did not include the health systems component.

** This list includes 17 countries which used an earlier version of CORE Plus, CORE. CORE has mostly been used by NGOs that provide primary health care services, although in some cases the tool has also been used to cost government service packages. CORE has the same basic costing platform as CORE Plus but does not have the population driver, the look-up table for drugs and test, and does not allow for the selection of preset scenarios.

Source: Authors, in consultation with tool focal point(s), accurate as of December 2007.

Annex 6: Factual Revisions Incorporated in the February 1st Version of this Report

From	Comment	Response
Agnes Soucat (MBB)	No factual revisions submitted.	
Eva Weissman (RH Costing Tool) January 23, 2008	Table p.15, To be marked with an x: Determine cost of target coverage, Determine cost of multi-year strategic plan, Coverage-guided instead of impact guided decision making, Reduce MMR (Goal 5), Total Cost, Scale-up Cost.	Accepted. The following changes were made to Table 5 Tools' Features Comparison Chart: ▪ Determine cost of target coverage marked with an x ▪ Determine cost of multi-year strategic plan marked with an x ▪ Coverage-guided instead of impact guided decision making marked with an x ▪ Reduce MMR (Goal 5) marked with an x ▪ Total Cost marked with an x ▪ Scale-up Cost marked with an x
	Page 22, list of interventions The tool includes the following interventions: • Antenatal care • Child health interventions • Family planning • General health systems improvements • HIV/AIDS prevention • HIV/AIDS treatment • Malaria and TB prevention and treatment • Maternal health interventions This should be redesigned and only include the main interventions covered (the RH costing tool is not a tool to cost malaria, just because it includes treatment of malaria under antenatal care, or a tool to cost child health just because it contains a few newborn interventions). Child health interventions are limited to newborns, maybe just add under "maternal and newborn health interventions." There is some malaria and TB prevention, but only in the context of antenatal care. Health system improvements should be last. Antenatal care falls under maternal health interventions.	Although malaria and TB prevention are included in this tool, but only in the context of antenatal care, the intervention "malaria and TB prevention and treatment" was left in the body of the report. As noted on page 12, "if an intervention is mentioned, albeit it on one line, we have attempted to include it here. We identify the tool's main focus when we name the MDGs and MDG targets addressed, and use the interventions included to note all intervention areas the tool touches on. We did note that the child health interventions included in the tool are limited to newborns and that malaria and TB prevention and treatment are provided in the context of antenatal care. To the comment "health system improvements should be last," we listed all interventions in alphabetical order, not in order of prevalence or importance. Several other reviewers have pointed out that antenatal care falls under maternal health interventions, and so we will attempt to sort this out in the next version of the report.
	Page 24, "can be taken" sounds like a work-intensive process, could it be rephrased to say that the model provides country-specific suggested values for each of these inputs from a large database? I think this is one of the biggest assets of the tool so it would be nice if it could be mentioned. (especially since in the table on page 73 the model looks like quite the nightmare to use with 117 pages and 2,800 cells requiring input from the user…) STEP 2 is broken down into two parts: the first part of population data and various input prices and quantities for family and neonatal health incidence and prevalence data, and drug and this information can be taken from a database built into the tool,	Wording has been changed as suggested.
	Page 25, after levels.. in the context of existing national maternal or reproductive health plans or strategies. This tool is driven by coverage-guided decision makin long-term planning to help the user move from current covera levels. The time period 2007 to 2015 is built into the model,	Our description of the tool's decision making has been reworded to incorporate "in the context of existing national maternal or reproductive health plans or strategies."
	Page 27, Incidence rates can be changed to account for the impact of interventions (one of the built-in examples is the incidence of obstetric fistula which decreases as the availability of EmOC increase). rate represents the number of cases receiving the intervention. The only thing to keep in mind is that incidence remains constant and may not take into account that incidence may fall due to preventive interventions.	The ability to change incidence rates has been noted.
	Page 27, "or are otherwise unchangeable," replace with "or descriptions."	Wording has been changed as suggested.

From	Comment	Response
	Page 27, after "Three of which require data entry". Add: "The model is prefilled with country-specific values from a large database." The model is color-coded." This tool consists of four Excel workbooks, three of which require data entry. Red and blue cells can be changed. Black cells denote formulas or are otherwise unchangeable. Red font denotes an input that under all circumstances should be reviewed by the user and replaced with better or more recent local data where available. Blue cells contain more universal data and can be changed if desired, but likeliness of data having large impact on results is slim.	Change noted.
	Table 16, Page 71, the RH Costing Tool covers all the mentioned MDG5 interventions so there should be an x in all eth MDG 5 cells.	The table has been updated.
	Table 19, Page 78, I would see the main points as: Designed to help countries to quickly cost and create budgets for existing sector strategies and plans, such as Maternal Road Maps or RH action plans, detailed drug and supply lists for the provision of RH services and incorporation of population dynamics (e.g., the impact family planning has on the demand for maternal and child health services).	These main points have been incorporated in Table 19.
	Table 19, Page 79, RH tool mentioned a second time citing as its key feature "orphan support."	We did not find the source of this comment and thus no change has been made.
Peter Heimann (iHTP), January 28, 2008	Pages 15, 27 and others: Tool developer is listed as 'Constella Futures' which needs to be changed to 'WHO/MRC'.	The name of the tool developer has been changed from "Constella Futures" to "WHO / MRC" in multiple places in the report.
	Page 15: Under the section 'methodology', budget- and coverage-guided decision-making should be ticked for iHTP. Under the section 'Interventions included', 'Child and adult immunizations' can also be ticked. Under the section 'Output', the following items can be ticked: average cost per intervention, scale-up cost, funding gap, summary tables, graphs. Under 'Target audience', we can add 'facility managers'. Under 'ease of use', we can put 'yes' for all the sub-headings (help desk, user manuals – English and partially complete Russian and Spanish) but for the 'time commitment' cell, we should increase it to 3-6 months (at least).	All suggestions have been incorporated with the exception of changing the target audience to include "facility managers," since we are using standard target audience categories (see page 13, Table 3) in an attempt to make comparisons between tools as easy as possible.
	Page 27: The sentence should be modified to read "The Integrated Healthcare Technology Package (iHTP) Simulation Tool is a tool to help users improve health service delivery and resource planning by…..	The suggested change has been made.
	Page 28: The sentence should read "In addition to costing, this tool can help users determine if all required resources needed to deliver a defined set of interventions, services or packages are available. Along the same lines, the model can help users analyze if resources are being used rationally, and can identify the most optimal mix of inputs. The tool can also be used to determine the resource requirements for any mix of services for various level of care."	The suggested change has been made.
	Page 15: The 'input information' mentioned here should include: procedure duration, percentages for several decision possibilities, criticalities of resources/technologies, pharmaceutical dosages, human resource effectivity, technology constraints.	The suggested change has been incorporated in the body of the report.
	The calculation/formula review of the report seems to be incomplete – please see below.	Changes in formulas were also submitted by Paul Maree; this comment will be investigated further and addressed in the next version of this report.
	iHTP Simulation Tool Application - Figure 6, shade the "time" block in step 3 – step 2 time should remain shaded.	This comment will be investigated further and addressed in the next version of this report.
	Next, on page 28, the last part of the sentence 'As results in STEP 3, the tool identifies the most optimal mix or inputs from STEP 2, and thus calculates intervention cost and intervention quantity' should read 'resource type and quantity' as it is the type and quantity of resources being determined, not the quantity of the intervention itself.	This comment will be investigated further and in consultation with the tool focal point. Therefore, it will be addressed in the next version of this report.
	Page 28: 'The following elements are not included in this tool: budget & financing, health outcome, health production function, intervention price, macroeconomic conditions.' If budgeting is the process of translating planning and programming decisions into specific projected financial plans, then iHTP does cover this.	This comment will be investigated further and in consultation with the tool focal point. Therefore, it will be addressed in the next version of this report.
Paul Maree, January 18, 2008	I believe that the following items should also be ticked in "Table 4: Tools' Features Comparison Chart" (on page 15)? Please confirm: What are the most cost effective interventions? Child and adult immunizations. Average cost per intervention. Summary table. Graphs. Help desk available.	Changes made.

From	Comment	Response
	In the section called "Understanding the tool" (on page 28), the document says that iHTP does not output intervention prices, is this correct? If iHTP does calculate intervention prices, then "Figure 6: iHTP Simulation Tool Application" should also be updated.	Based on our understanding and through consultations with the tool developers prior to producing version 1 of this report, the iHTP tool does not calculate intervention price, and thus no change has been made to Figure 6.
	The calculations used in "Formula Review" appear to be incorrect, please see the attached document for the correct calculations.	Changes in formulas were also submitted by Peter Heimann; this comment will be investigated further and addressed in the next version of this report.
Matthews Mathei, January 7, 2008	Pages 15, 27 and others: Tool developer is listed as 'Constella Futures' which needs to be changed to 'WHO/MRC'.	The name of the tool developer has been changed from "Constella Futures" to "WHO / MRC" in multiple places in the report.
John Stover (Spectrum: PMTCT) January 8, 2008	The PMTCT model, Goals and Resource Needs Model are listed as developed by Constella Futures. There were developed at Constella Futures but are now updated and maintained by Futures Institute. I recommend changing to Futures Institute or using Constella Futures/Futures Institute.	Developer name changed for all three tools from "Constella Futures" to "Cosstella Futures/Futures Institute."
	Page 30. PMTCT. It would be better to say "Spectrum consolidates previous models …." PMTCT is a module within Spectrum.	Change made.
John Stover (GOALS Model), January 8, 2008	The PMTCT model, Goals and Resource Needs Model are listed as developed by Constella Futures. There were developed at Constella Futures but are now updated and maintained by Futures Institute. I recommend changing to Futures Institute or using Constella Futures/Futures Institute.	Developer name changed for all three tools from "Constella Futures" to "Constella Futures/Futures Institute."
	Table on page 15. Goals should have an "x" for "What is the most-cost effective strategy?", "Medium-term focus", no "X" for Long Term Focus, family planning or Malaria and TB prevention and treatment. The Resource Needs Model should not have an "X" for Impact Guided Decisionmaking, nor for Malaria and TB prevention. There is a help desk for Goals and RNM. The final section for RNM should be 2 weeks time commitment, User manuals in English, French, Spanish and Russian, No need for technical assistance, Help Desk, Provides default values and adaptability to local conditions.	Suggested changes have been incorporated.
	Page 34. Goals. First sentence, remove "…but also indirectly addresses TB". In the list of interventions in the tool remove "family planning" and "Malaria and TB treatment".	Suggested changes have been incorporated.
	Page 37. Goals Formula Review. The second half of the first paragraph starting with "The key assumption being made in health impact computations…" is incorrect. Goals assumes a constant effect of a given increment in coverage on behavior change, but the behavior change is used in an epidemiological model to calculate health impact. That calculation does not assume constant impact. It is a full epidemiological model so the impact of behavior change on infections averted will display herd immunity as other non-linearities.	This comment will be investigated further and addressed in the next version of this report.
	Bottom of page 37 and top of page 38. The unit costs for many interventions include the costs of outreach, promotion and health education, so they do include some demand creation. It is true that demand creation is not included for most medical services (blood transfusions, palliative care) but demand limitations are recognized by limiting maximum coverage to something less than 100%.	This comment will be investigated further and addressed in the next version of this report.
David Collins (PCBF), January 22, 2008	The following changes should be made for PCBF in the table entitled Stage 1. The following cells should also be checked off: scale-up cost, budget. The heading for target audience for PCBF should be the same as for CORE Plus. The language of the user manual is Eng.	The suggested changes have been made.
	"In Tool description and overview section, as well as Table 19: Would it [tool] be better to describe it as a template?"	The suggested change has been made.
	In Understanding the tool section, "what is available in the budget, if the user inputs budget information, the tool will show the funding gap between the cost of the intervention and available financing" should be replaced with "and comparing this cost with the available financing to show the funding gap. Once costs and financing are matched and financing has been committed the figures can be converted into a budget."	Suggested change has been incorporated.
	Regarding the last sentence of the Formula Review section, this should be a description of the financing element, not a reason for including it.	This comment will be investigated further and addressed in the next version of this report.
	In the Ease of use section, should read "two blank spreadsheets" instead of "two spreadsheets." Should insert: "two exmaples of partially completed spreadsheets" and note that user manual is available in English. Additionally, the tool has been used in Nigeria.	The suggested edits have been made.

From	Comment	Response
	In Annex 5, for PCBF please add Nigeria.	The suggested change has been made.
David Collins (CORE Plus), January 22, 2008	The following changes should be made for CORE Plus in the table entitled Stage 1. The following cells should be checked off: Determine cost of scale-up package of interventions, Coverage-guided decision making, Short term focus (1 year), All the MDG assessed cells should be checked off, Child and adult immunizations, General health system improvements, Malaria and TB prevention and treatment, Average cost per intervention, Scale up cost, Funding gap, Coverage, Budget, User manual language – English, Need for technical assistance – no. Help desk available – not yet, Adaptability to local conditions – Yes. The following cells should not be checked off: Impact-guided decision making.	The suggested edits have been made.
	In Tool description and overview section, first sentence should read "This tool estimates the costs of individual interventions (services) and packages of interventions as part of the cost of integrated primary health care facilities. The tool was designed to be used by planners and managers of government, private and NGO primary health care services." Regarding MDGs addressed, it should be noted that the tool addresses all the MDGs, but only at the primary health care facility level. The last sentence of that section should read "This tool can estimate the expected number each type of intervention provided through a primary health care facility, based on the catchment population and using disease prevalence and incidence rates and service delivery norms. It can then cost each of those interventions and the total package of interventions and can also be used to produce a budget. Revenue figures can be entered for each intervention and compared with individual intervention and total facility costs." Regarding interventions included, sentence should read "This tool covers all the interventions provided through primary health care facilities, which include the following:" and "Child and adult immunizations" and "General health systems improvements" should be added to the list of included interventions.	The suggested edits have been made.
	In Understanding the tool section, first two paragraphs should read "In STEP 1, the user sets up the model by entering basic data that is common to the type of facility. Firstly, the user determines the interventions to be included in the costing. These should be all the interventions provided by the facility but they can be aggregated or separated as required. For example, family planning interventions can be combined as one intervention or can be separated into the different types of family planning interventions. The user then enters the input prices and quantities for the drugs, medical supplies, tests and staffing times for each defined interventions. The user also enters the demographic information, incidence and prevalence rates and service provision norms. Finally, the user enters information on working hours, salaries and facility standard operating costs. Once this basic information has been entered, the tool can then be used for different facilities of the same type. The tool comes with some of the common interventions already entered as examples, but these can be changed or removed easily and other interventions can be added. Table 7 shows the example of interventions already entered." Title of Table 7 should be changed to read "List of common interventions entered as examples in CORE Plus."	The suggested edits have been made.

From	Comment	Response
	In Understanding the tool section, paragraphs after the figure should read "In STEP 2 the user adds the catchment population for the facility. If the tool is also used to analyse actual costs, the user also adds information, such as actual numbers of interventions provided and facility operating expenses, and, if applicable, revenue information. In STEP 3, the tool uses the catchment population, demographical data, incidence/prevalence rates and service delivery provision rates to calculate the total number of cases for each service (intervention quantity). The tool also computes the normative variable cost for each intervention and allocates indirect costs across the selected interventions. User fees (intervention price) can be entered manually in the tool, or can be calculated automatically based on the input cost plus a mark-up. By multiplying input price with the quantity of services, the tool is able to compute the total revenue per facility per service. The tool can also calculate the necessary staffing and the cost impact of changing the intervention production function (i.e. adding new services or changing the quantity of services offered) or of changing the target population. The tool defines the intervention production function by allowing the user to choose from five scenarios: Scenario A: Actual services and actual costs; Scenario B: Actual services and normative costs; Scenario C: Needed services and normative costs; Scenario D: Projected services and normative costs; Scenario E: Projected services and ideal staffing."	The suggested edits have been made.
	In Formula review section, the paragraph following Figure 12 is unclear and should be explained or removed.	This paragraph has been clarified in consultation with the tool focal point.
	In Ease of use section, second and third paragraphs should read "This tool has been used in costing exercises in Haiti and Rwanda, and a previous version of the tool, CORE, has been used in Afghanistan, Bangladesh, Ethiopia, Haiti, Kenya, Madagascar, Mexico, Rwanda, South Africa, Tanzania, Zimbabwe, Senegal, Guatemala, Bolivia, Honduras, Nicaragua and the USA. CORE has been used mostly by NGOs that provide primary health care services but in some cases has been used to cost government service packages. CORE has the same basic costing platform as CORE Plus but does not have the population driver, the look-up table for drugs and tests, and does not allow for the selection of preset scenarios."	The suggested edits have been incorporated.
	All of the cells under CORE Plus in Table 15 should be checked off, with the following exceptions. The reason is that all of these interventions can be costed in CORE Plus. A note can be added to say that CORE Plus can cost all elements of these interventions that are provided by a primary care facility. The exceptions are: Improved hygiene and sanitation, Hand washing, Safe disposal of stool, Latrine use, Safe preparation of weaning foods, Use of insecticide-treated bednets, Unused needles for drug users, Safe, screened blood supplies, Indoor residual spraying.	The additional interventions have been noted in Table 15 and the suggested note has also been included.
	In Figure 18, the following cells should also be checked off for CORE Plus. INPUT DATA: Intervention cost, Intervention price. Intervention quantity, Epidemiology. CHOICES: Coverage. RESULTS: Budget and financing.	Comment will be investigated further and consultation will be made with the tool focal point. Any necessary changes to the text and figure will therefore be incorporated in the next version of this report.
	Description in Table 19 should read "This tool is unique from other tools in that it can be used to analyze how much a primary care facility is, and should, be producing, enabling the user to determine and correct inefficiency and to compare results among facilities. It is also different in that it produces the cost of each intervention as part of the cost of a facility, and it also includes a revenue analysis feature."	The suggested change has been made.
	In Annex 5, for CORE Plus please add the countries where CORE has been used since CORE Plus is a newer version of CORE but the main part is the same. Please add a note to explain that. The countries are: Afghanistán, Bangladesh, Ethiopía, Haiti, Kenya, Madagascar, Mexico, Rwanda, South Africa, Tanzania, Zimbabwe, Senegal, Guatemala, Bolivia, Honduras, Nicaragua and the USA.	The additional countries where CORE has been used have been added to both the text and Annex 5.

From	Comment	Response
Patrick Lydon (cMYP), January 28, 2008	In Table 4, need to add for "Focus": Put an X for the line: Determine the cost of achieving target coverage or reword "Determine the cost of a MYP" to "Determine the cost of achieving programme objectives" and leave the X as is. For "Outputs," put an X on the line: Budget . Put an X on the line: Scale up costs since these can be determined (difference between current expenditures and future needs). For "Ease of use," replace the text in the line "Target audience" to "National programme managers, planners and policy makers." For "Time commitment": put in 1 week. For "User manuals": Yes (Eng, Fr and Ru). For "Help desk available": Yes. For "Provide default values": Yes (vaccine prices).	Suggested edits have been made.
	In Tool description and overview, first two paragraphs should read "As a companion to the 2005 joint WHO - UNICEF guidelines for preparing a strategic multi-year plan for immunization the cMYP tool was developed to make projections of future costs, future resources requirements, future financing needs to achieve programme objectives, and analyse the corresponding financing gaps. This tool was designed to be used by national immunization programme managers and planners at country level, and can help countries align with regional and global immunization strategies (ex: GIVS). The tool is primarily targeted for low-income countries which do not have existing systems in place for this."	Suggested edits have been made.
	Regarding which questions the tool can answer, suggest rewiring the two questions as such: What is the cost and resource requirements of attaining the health MDGs? What are the funding gaps and what health MDGs can be achieved with available resources?	Questions the tool can answer, listed on the comparison chart and in the "Tool description and overview" section of the tools' chapters are standardized for comparison purposes. Therefore, these suggestions to rewrite the questions have not been incorporated. However, the suggested text was incorporated in the last paragraph of the "Tool description and overview" section.
	In Tool description and overview, suggest deleting last sentence, "This exercise can be used to help users develop a multi-year strategic plan for immunization (a cMYP)."	Text has been deleted.
	In Understanding the tool section, suggest adding another sentence to the first paragraph: "The model is built around 3 specific immunization strategies. Namely routine fix site delivery, outreach activities and supplemental immunization campaigns."	Suggested text has been incorporated.
	In Table 8, Campaigns, delete "Year 1, up to 2 rounds" and second listing of "Other campaigns" and add to first "Other campaigns" "can specify up to 3."	Suggested changes have been made to Table 8 text.
	In Understanding the tool, add sentence to STEP 2 description to read "Demographic data is entered by the user."	Suggested edit has been made.
	In Understanding the tool, description of STEP 3, replace "expenditure" with "expenditure needs" and rewrite second sentence to read "The tool also identifies if a financing gap and produces a summary of the funding sources and gaps including where the gaps exist in immunization and highlights macroeconomic and financial sustainability indicators. The costs are broken down in cost categories for budgeting immunization which are compatible with the needs for GAVI Fund proposal purposes."	Suggested changes have been made.
	In Understanding the tool section, rewrite paragraph before figure to read "This model does not make health impact computations and thus excludes both health impact and health production function. Neither effectiveness nor epidemiological data are incorporated by this model. Because the global WHO policy is that childhood immunization should be free, this model does not include intervention price."	Suggested change has been made.
	Replace time of three to five years with "up to five years."	Time period has been changed to "up to five years."

From	Comment	Response
	In Formula review, delete "As such, the tool cannot ensure all costs are entered by the user" from paragraph after the formulas and "Past spending or budgeting approach is also used" from paragraph about the ingredients approach. To ingredients approach paragraph, add "This bottom-up approach is used for the 5 categories of costs that account for over 80% of total costs (vaccines, human resources, vehicles, transportation and cold chain equipment)." To agreed rules-of-thumb paragraph, add "(ex: injection supplies are based on doses of vaccines and immunization practice; maintenance of vehicles is based on a % of fuel costs and cold chain is based on a % of the value of the equipment…)." Last paragraph of that section should read "Costs include inflation and the inclusion of shared input costs is optional but recommended. The tool uses depreciated capital equipment costs, and includes selected recurrent costs (such as transport, maintenance and overhead). Economies of scale are entered manually."	Suggested changes have been made.
	Experience using the tool section should read "This tool is a single Excel spreadsheet with 8 total worksheets, only 2 of which require data input. There is a color scheme to indicate which cells require data input. This tool has been used in at least 48 countries to date. Please see Annex 4: for a full listing of countries in which the tool has been used. Some 50 countries also applied the FSP tool which was the same model used for the GAVI fund."	Suggested changes have been made.
Stan Bernstein (Integrated Health Model), January 4, 2008	Incorrect assessment of MDG scope. The report fails to mention that MDG 5 (maternal mortality) is included in the UNDP tool	Where MDGs and MDG targets are discussed in the report, the relevant sections have been updated to reflect that the Integrated Health Model addresses MDG 5 and its targets.
	Similarly, critical interventions have not been reported both in text (p.51) and appropriate tables (table 15) (e.g., (e.g., antenatal care, family planning, skilled birth attendance, emergency obstetric care, STI treatment) major intervention categories are available in the user guide and the detailed list in the health systems worksheet of the model itself.	Interventions in text were taken directly from the tool, and Table 15 already includes the specific interventions mentioned, with the possible exception of antenatal care. Therefore, no changes have been made at this time, but antenatal care interventions will be further researched and any necessary changes incorporated in the next version of this report.
	There should be a note added to Table 15 that indicates that some interventions that are important for good health were deliberately excluded from the UNDP tool and placed instead in other sector tools (e.g., hand washing and hygiene education appear in water and sanitation costing tool). This is because the integrated health model is only one of a suite of sector tools used to estimate the costs to achieve ALL of the MDGs.	A note has been added to Table 15 to incorporate the comment.
	It should be noted as well that one of the unique features of the UNDP tool is that users can add up to 15 user-defined, additional interventions as well as design and estimate costs for other health programs, which may deliver a suite of interventions. This adds quite a bit of flexibility to the user in reflecting the design of the health system in the model.	Table 19 has been updated to include these features of the Integrated Health Model.

From	Comment	Response
	Comment: Table 4 is incorrect. I would put Xs in the following: 'determine cost of scale up of package of services' 'determine cost of achieving target coverage' determine cost of multi year strategic plan' (this was exactly how the tool was used in Rwanda to cost the EDPRS) 'coverage guided decision-making' 'reduce maternal mortality by ¾' all interventions 'scale up cost' 'coverage' (the tool does actually calculate population coverage and utilization based on user defined scale-up of health system) 'graphs' (graphs are generated for HIV/AIDS results) target audience – International, national and subnational planners, policy makers, and development partners Time commitment – is this for training or use? Ease of navigation—navigation is easy and straightforward. There is even a navigation toolbar to help users move between worksheets. User manual—English, French soon Need for technical assistance—is this for after training? Provides default values—yes, but should be reviewed and can be modified by user Adaptability to local conditions—yes, easily There should be another row on hard-coded assumptions and assumption transparency	All corrections were made with the exception of time commitment and need for technical assistance, which will be clarified with the tool's focal point and incorporated in the next version of this report. Also in the next version of this report we will address the final item about hard-coded assumptions and assumption transparency.
	The term MDGs is used incorrectly many places when the accurate term should be MDG Targets (all assessments of scope for individual tools and table 17)	Terminology has been clarified to distinguish between the MDGs and the MDG targets.
Andrea Pantoja (Planning and Budgeting for TB Control), January 5, 2008	Page 15, Table 4. We would like to add the following X (meaning YES) to the TB planning and budgeting tool: Focus: determine cost of scale-up package, determine cost of multi-year strategic plan. Methodology: budget-guided decision making, coverage-guided decision making, impact-guided decision making, short-term focus. Interventions included: for the X on HIV/AIDS treatment and prevention, it needs to be noted that there is only partial coverage of the many HIV prevention and care interventions that exist - there are only those that need to be addressed by the TB and HIV programme. Should separate Malaria and TB. Output: average cost per intervention (it can be calculated even if it is not a specific output automatically), scale up cost, coverage and budget. Ease of use part: 1-2 weeks for time commitment, Yes for user manuals, Yes for technical assistance needed, Yes for help desk available, Yes for provides default values, Yes for adaptability to local conditions.	Changes made.
	Page 56, title: it is version 2, since now it is at the stage of practical application.	The version is listed as 5.19 to match the version number on the Excel spreadsheet and user manual.
	Page 56, third paragraph. Please add: ",,,can help countries align with the global Stop TB Strategy.."	This sentence is already included in "Tool description and overview" section, first paragraph, first sentence.
	Page 56, second bullet. "What health MDGs can be achieved with available resources?". Could you please explain the reason for this question being relevant in the tool? We think it is not relevant since the answer is: TB, the tool is only for TB.	We believe this question is relevant because the Planning and Budgeting for TB Control tool can help users judge whether they can achieve MDG 6 and its targets, albeit it only for TB. As such, we have kept it in the report as-is.
	Page 56, 5-6 bullets. As before, need to note that this is only those HIV prevention and care interventions that need to be implemented jointly by TB and HIV programmes.	Comment noted.
	Page 56, last bullet point. Should say only TB. The tool does not include malaria interventions.	In the present version of the report, TB and malaria are listed together, and as such, tools which include either TB or malaria will be listed as including "TB and malaria prevention and treatment." In a future version of the report we will work on addressing this, as it was mentioned by another reviewer as well.
	Page 56, fourth paragraph. Please add "….and generic cost categories used by the Global Fund…"	Text added as suggested.
	Page 57, table 10. The last three bullets are repetitive.	All previous bullets, including the repetitive ones, have been eliminated due to the changes suggested in comment 9 below.

From	Comment	Response
	Page 57, table 10. Would suggest to re-organize the TB interventions as follows: DOTS treatment for new smear-positive TB cases (using short-course chemotherapy for 6 or 8 months) (e.g. firs-line drugs, Public-Private Public-Public Mix (PPM), Community involvement (CTBC)), DOTS treatment for new smear-negative/extrapulmonary TB cases (using short-course chemotherapy for 6 or 8 months), Treatment for MDR/XDR-TB using both first and second-line drugs, HIV testing and counselling for TB patients, CPT for HIV-positive TB patients, ART for HIV-positive TB patients during period when TB and ART treatment overlap (maximum 6 months) , HIV prevention services for TB patients, IPT for 6 months for HIV+ people without active TB, Screening for TB among HIV-positive people newly diagnosed or attending HIV care services, Practical Approach to Lung Health (PAL), Programme costs	Table 10 text replaced with the suggested interventions.
	Page 57, first paragraph, third line. Please include: "…are included in each. The detailed approach is encouraged…."	Suggested edit has been incorporated.
	Page 57, first paragraph, third line. Please change "..The tool automatically inputs budgetary information…" to "…The tool includes default values for budgets…..". As this sentence is actually about default values we would suggest to move it to the second paragraph, which is discussing default values.	The suggested rewording has been incorporated but we have left the sentence in the paragraph about STEP 1 because the action occurs in STEP 1. Moving the text to the second paragraph would incorrectly imply that the action occurs in STEP 2.
	Page 57, second paragraph. Suggest to add also that users also need to specify what funding is available for each intervention and how much is the funding gap.	Comment will be investigated further and consultation will be made with the tool focal point. Any necessary changes to the text and figure will therefore be incorporated in the next version of this report.
	Page 57, fourth paragraph. About health impact computation, it should be noted that users are asked to set targets for treatment success rates for TB patients.	Change has been noted.
	Page 57, fourth paragraph. The text states that the tool excludes health impact. However, it should be noted that the model is based on projections of incidence from The Global Plan to Stop TB, 2006-2015. Besides, if users plan according to the default targets (set out in the tool), the impact (outcome) targets included in the Global Plan are projected to be achieved.	Suggestion has been incorporated in the text.
	Page 58, Figure 16. Step 1, the following should also be marked as decision variables: input price, input quantity, intervention cost/price, intervention quantity, epidemiology, demographics, coverage.	Comment will be investigated further and consultation will be made with the tool focal point. Any necessary changes to the text and figure will therefore be incorporated in the next version of this report.
	Page 58, Figure 16. Step 2, the following should also be marked as options to enter data: intervention cost/price, intervention quantity, epidemiology, budget & financing. For this figure, the definitions of the steps and of the possibilities overlap. For example, you can choose what you want to input, then step 1 and 2 are similar if not identical.	Comment will be investigated further and consultation will be made with the tool focal point. Any necessary changes to the text and figure will therefore be incorporated in the next version of this report.
	Page 58, first paragraph. Please adjust this paragraph according to our suggestion to page 15.	This change has been made as suggested.
	Page 59, first paragraph, second line. Please change "…input the estimated …" to "…input the target…."	This change has been made as suggested.
	Page 59, first paragraph, second sentence. Please change the sentence to: "Case detection rate is used to measure the performance of TB control programs. It measures the number of TB patients detected in the TB country program with respect to the estimated number of people with TB in the country."	The suggested text has been incorporated.
	Page 59, first paragraph, from the third sentence. "….Note that detection rate ….". The last sentences are not relevant in this context. These do not add information to the tool.	These sentences have been deleted from the report.
	Page 59, Experience using the tool. We count 18 pages that require data input.	This change has been made.
John Stover (Resource Needs Model HIV/AIDS), January 8, 2008	The PMTCT model, Goals and Resource Needs Model are listed as developed by Constella Futures. There were developed at Constella Futures but are now updated and maintained by Futures Institute. I recommend changing to Futures Institute or using Constella Futures/Futures Institute.	The developer name has been changed for all three tools from “Constella Futures” to “Constella Futures/Futures Institute.”
Malaria Cost Estimation Tool	No factual revisions were received specifically about the Malaria Cost Estimation Tool, although several comments about the Child Health Cost Estimation Tool received from Karin Stenberg are applicable to the Malaria Cost Estimation Tool. If changes were made which impacted the Malaria Cost Estimation Tool they are noted below in section M.	

From	Comment	Response
Karin Stenberg (Child Health Cost Estimation Tool), January 17, 2008	In general the tool should be referred to as the "child health cost estimation tool" - not the "child health costing tool" as is currently done. This to be consistent with the tool itself and the manual, and to underline the similarity with the malaria cost estimation tool.	Change made.
	Table 4 page 15 - on "Focus" the CHCET can be used for 1-3, not just the 2nd one.	Change made.
	Table 4 page 15 - on "Ease of Use" it would be safer to say that the CHCET would require 1-2 weeks as a time commitment	Change made.
	Table 13 could have further detail - particularly when comparing with the detail of Table 5 (p 17-19) and Table 6 (page 35). I would suggest to use the breakdown as shown in the CHCET tool, the User's guide section 1.3.2 and 1.3.4 lists these. See also the attached file for an example taken directly from the tool "Intervention" sheet in the introduction section.	Table included in December 31, 2007 version of the report has been replaced with table including the interventions from sections 1.3.2 and 1.3.4 of the user manual, which are the same included in the document Ms. Stenberg sent with her comments.
	Regarding how many sheets and cells the user needs to enter data into - here I would not use the wording " number of sheets that require data entry". I would rather suggest that you use "number of sheets that can be used to enter data". Note that there are default data in the tool and so data entry may not always be required.	Wording has been changed.
	Table 15 Page 71 - the tool includes many more interventions than those indicated. I would suggest that the following interventions be ticked: for nutrition the tool covers interventions 1,2,3,4,6,7,8,9,10. (currently only 1 and 6 shown). For child health the tool covers: 1,2,5,6, 7,9,12,13,16,17, 18, 20 (currently only 1 6, 7, 16, 17, 18, are shown). In addition work is ongoing to incorporate intervention 8: immunization. if you send me the excel file for this table then I can indicate in the table and provide specific comments on how these are addressed.	The additional interventions have been ticked on Table 20: List of Interventions Included in Child Health Cost Estimation Tool.
	Table 19 is very subjective and disappointing for the child health cost estimation tool . For the CHCET there seems to be little added value!! Here I would expect to see the user friendly interface, including comments 5 and 6 made above. The tool has a clear step-wise approach. Also, up to 5 scenarios can be costed. And finally, the tool allows for costs to be estimated for different levels of service delivery. This is something that is mentioned for the malaria tool but why not also for the child health tool? A lot of the features are similar for the two tools. In general the one-pagers give a better overview than this table.	The text in table 19 has been updated to include the points listed above, with the exception of the user-friendly interface, which has been incorporated in Table 4 under “Ease of navigation.”
	Annex 5 - why are some of the countries in parentheses? Is this to indicate field testing? If yes, then the CHCET countries should also be in parentheses. The table should clearly state a DATE since tools are continuously being applied (we will most likely apply CHCET in Mozambique next month)	A date has been added to the table. “X’s” in parenthesis refer to countries in the process of using the tool who have not yet successfully completed a costing exercise with the tool. We have listed the countries with “X’s” and “X’s” in parenthesis based on the information reported to us by the tool focal point.

Annex 7: Revisions Incorporated in the March 31st Version of this Report

General comments

From	Comment	Response
Eva Weissman, January 23, 2008	Overall, I am not a big fan of the methodology used to characterize the tools (the three columns with input data, choices, results). There must be a better way to differentiate the tools (costing tool vs. costing tools including impact, total vs. marginal cost, primary health are covered (in the current setup, every model seems to cover everything), cost of essential service provision vs. health systems cost, differentiation by depth of health system component costed, type of software/interface, etc.	The taxonomy section now includes additional ways of differentiating the tools.
	Table 17, Page 73: If you want to use this kind of table, there needs to be an estimate of required input points for the 3 models that actually DO require the most inputs which are the MBB, the IHM and IHTP. Just using a sheet count is probably not a good measure (half of the sheets of the RH tool, for instance, are reference sheets, databases, etc.) It is also probably more interesting how much the models squeeze onto the different sheets and how easy they are to print out (the MBB looks good, for instance, in this table with just 40 sheets but if one tried to print them out one would get about 2,000 pages – I tried it…). How about a column on size of the tool in MB? "leading one to believe that the MBB is the most complex…" I think there is general agreement, it does not need to be phrased that gingerly...	We have included used range count and number of cells that can be used to input data or make choices as measures of size, and have added new measures of complexity. Because the taxonomy section has been fully re-done and additional complexity criteria added, the comment about the MBB tool being the most complex has been removed.
Matthews Mathei, January 7, 2008	From the Introduction to the report, and the selection of interventions to include, why is ANC singled out as an intervention when it is part of maternal health interventions?	Antenatal care has been eliminated and is now included under "maternal health interventions."
	Among the interventions that have been addressed (pg 2), antenatal care has been singled out as a separate intervention when it is an essential part of maternal health interventions. I would like a clarification on the reason for this separation, and information on what is included under "maternal health interventions". Also other than family planning (and excluding maternal health), what are the interventions included under RH?	Antenatal care has been eliminated and is now included under "maternal health interventions."
	The list of health MDG interventions in Table 16 includes the following under MDG 5: Family planning (life time risk) Intermittent malaria prophylaxis Use of insecticide treated bed nets Micronutrient supplementation (iron, folic acid, calcium for those who are deficient) Antibiotics for preterm rupture of membranes Skilled attendant (especially active management of third stage of labor) Basic and emergency obstetric care Safe motherhood STD/HIV/AIDs prevention and treatment) The items listed are not clear - What is "safe motherhood"? Who provides basic and emergency obstetric care, if not a skilled attendant? Why single out antibiotics for preterm rupture of membranes. I would submit that the list of interventions used for MDG 5 is unsatisfactory and a better set of interventions should be used for comparing the tools. As an example, the maternal and newborn health module of iHTP includes most of the WHO recommended interventions for MNH available from the link below http://whqlibdoc.who.int/hq/2007/WHO_MPS_07.05_eng.pdf	These interventions have been specifically identified as interventions which are evidence-based and effective for reaching the health MDGs. It is important to note that there are other sources from which to choose evidence-based effective interventions– including the Lancet Series on Child Health, British Medical Journal, the WHO list cited and others– yet it was not the scope of this review to develop a comprehensive list of all evidence based, effective interventions. Therefore, we limited the interventions in the table to those interventions specifically noted as evidence based and effective in reaching the MDGs, and hope that the list of interventions used in this review can be considered only as a first reference.
John Stover, January 8, 2008	Table 1 on page 15. In several places the iHTP tool is listed as developed by Constella Futures. It should be WHO.	Change made.
	Page 79. Table 19. The title and source are incorrect. This is not the Child Health Costing Tool, but a summary of the key features of each tool.	Change made.
	Page 79, Table 19. I believe that Reproductive Health Model should be Resource Needs Model.	Change made.

From	Comment	Response
David Collins, January 22, 2008	Apart from factual corrections in individual tool descriptions a key need is for a simple summary stating what each tool does. Probably no more than 4 to 6 areas of description – something like….. What program(s) does the tool cost? What is the cost objective (the question that the costing is intended to answer)? Eg is it to determine most cost effective interventions or determine cost of selected interventions. Does it include all interventions and levels for those programmes or only some? Does it cost all resources (inputs) required? What platform it uses? Eg Excel or … Can the structure and format be modified by the user? How much training and TA required? E.g. little, some, a lot. Is a user manual available?	Refer to the comparison chart.
	From Executive Summary: "This technical review was designed to assess 13 costing tools selected by WHO, UNICEF, the World Bank, and UNFPA." – Reword to "Selected by the Steering Committee" and suggest name committee member organizations and individuals.	Steering Committee and member names and organizations have been incorporated.
	Regarding list of interventions (from introduction): "Some interventions may need to have description of areas included – eg nutrition, treatment of ARI and diarrhoea [referring to "antenatal care"].	In lieu of defining the intervention categories, we have provided, in the write-up of each tool, a list of the specific interventions included in each tool.
	Regarding list of interventions (from introduction): General health systems improvements- "If this is included will need to specify which areas are included in each tool."	In lieu of defining the intervention categories, we have provided, in the write-up of each tool, a list of the specific interventions included in each tool.
	From introduction: "Country demand for costing tools is based on their need to measure where they are in terms of reaching the MDGs, how much has been spent in programs to reach the MDGs, and more importantly, what are the immediate and future financial needs to reach the MDGs." - This sounds rather narrow. Explain that countries also require costing tools for other purposes, eg for allocating resources for the district health system and to health centres and hospitals, for setting fees, and for contracting out the delivery of services. Also explain the difference between vertical program costing and integrated service costing.	Suggested additions have been made.
	From introduction: Given this problem, this study will assess 13 costing tools selected by WHO, UNICEF, the World Bank, and UNFPA, as seen in the below table. - As stated previously the tools were selected by the Steering Committee.	Change made.
	From methodology section, Table 2 "Definition and examples of terms," "Budgeting & financing" should be separated. Determining the financing needed is different from allocating a budget. The first step is to compare the cost with available financing and to match them. Once that is done a budget can be produced.	Terminology has not been changed; definition has been clarified and we will make an effort when referring to this term to use the surrounding context to specify whether we are referring to the budgeting or the financing element of the definition, or both. The steps mentioned in the comment do not apply to all tools.
	From methodology section, Table 2 "Definition and examples of terms," suggest deleting "groups" from demographics definition.	Definition reworded to eliminate the inclusion of "groups."
	From methodology section, Table 2 "Definition and examples of terms" and subsequent written explanation, suggest removing intervention price as it is "not relevant in the context of these costings. Fees may be a part of financing of services but not via the direct link shown.	The inclusion of intervention price is necessary as it plays into revenue calculation and impacts "Budget & Financing."
	Note that our formula review does not assess whether the formula provided in the manual is correctly programmed into Microsoft Excel or the tool's software program." - I understand that the study should include this assessment."	We have noted that the formula review now assesses whether the formulas provided in the manual are correctly programmed into Microsoft Excel or the tool's software program.
	Table 3, Target Audiences, suggest dividing "technical assistance agencies and NGOs (private sector)" since NGOs can be split into TA and service providers.	NGOs can be split into TA and service providers, but both fall in the non-international, private sector category and we believe this is enough specification.
	"The majority of tools (8 of 13) are impact-guided, although 6 of 13 use coverage-guided decision making. Nearly all tools (12 of 13) have a medium-term focus of one to ten years." - From the conference presentations and discussions it appears that the majority are not impact-guided.	We have updated these figures and the way we classify decision-making.
	Table 17: Use different acronym for Not Applicable and Not Available. State also in Table which tools are spreadsheet and which are program-based.	Changes made.

From	Comment	Response
	Table 17: suggests changing PCBF text for number of cells requiring user to input data or make choice to "varies" and number of MDG interventions included to "Potentially all." Suggests changing CORE Plus text for number of MDG interventions included to "See list."	We have made the first two changes but did not incorporate the suggestion to change CORE Plus text to "See list." However, we have added a footnote that some tools include more interventions than listed and that more detailed lists of interventions may be included in the individual chapters.
	Figure 20: PCBF does not really fit in Figure 20 as the number of entries is variable. CORE Plus can also have different numbers of entries and only covers interventions at the primary care facility level, unlike some others that cover all levels. Also I think the RH Costing Tool only covers RH aspects of other interventions and is not comparable.	This section has been redone to take these comments into consideration.
	Figure 21 should be changed as CORE Plus can cover most of the MDG interventions without a proportional increase in the number of input cells.	This feature of the tool has been noted in the taxonomy section.
	From Tools' value added section, We need to also say if the tool calculates total costs or incremental (additional) costs. Table 19 seems to be more than a list of interventions as the Title states.	Costing categories are included in the comparison chart. Title has been corrected.
	From conclusion, "In tool after tool, usability was hampered due to a lack of transparency. The learning curve was steep to understanding the tool, and the challenge of understanding multiple tools and deciding which one would best serve a particular purpose was intimidating." It is not appropriate to generalize in this was since some tools are transparent and relatively easy to understand. The report should differentiate among the tools for these criteria.	The conclusion has been reworded to more accurately reflect the findings from the ease of use information gathered in Senegal.
	Annex 3 and 4: You should not include the PCBF in this comparison as it is a generic planning and costing tool, not an HIV/AIDS tool, and is very different from the other tools. It might be better to compare among 3 or 4 vertical program costing tools and use more generic types of input data.	PCBF has been removed from annexes 3 and 4. However, we have not modified these annexes further because we wanted to show the variety of input data and outputs produced by tools that supposedly cost the same programs (HIV/AIDS).
Patrick Lydon, January 28, 2008	Given such variability in the tools, finding a framework that allows a meaningful comparison across them meant finding the common denominator across the 13 tools. The approach used finds that common denominator. It has intuitive appeal and useful for a broad brush taxonomy of the tools which I think will be very useful for countries to demystify what each one does. That common denominator has the disadvantage that it tends to lose out on specificities. The report is a great description of tools but would find value in having more in-depth review and closer examination that would help answer some of the questions that were put on the table in terms of: does the tool do what it claims it does?….I was hoping to find more on this in the report.	This version of the report addresses in more detail the issue of whether the tools do what they claim to do.
	One aspect I kept struggling with is the difference between Step 1 (Input Data) and Step 2 (Choices) in the comparison chart. While I understand the logic of this, I'm not sure where the dimension of using tools for scenario building features in. On our end we've been promoting countries to develop multiple version of the tool to test out alternative scenarios for costing and financing. So while coverage is an input in the cMYP tool and correctly highlighted in the comparison chart of the report, it is also a choice if I read the definition of Step 2 on p.8 (what decision can the user make in this costing exercise?). Thus, if a tool is being used for scenario building, there is a blur between what constitutes an input and a choice and couldn't quite reconcile this in my mind.	In some tools the distinction between STEPs 1 and 2 is more profound than others.
	I'm wondering if there is a way to further group the tools by purpose. Some a clearly more upstream tools for evidence based decision making (ex: what are the costs and impact of interventions and scaling up?…) while others are more downstream tools (ex: once interventions are chosen, what are the resource needs, financing and gaps of implementing these?). These are two fundamentally different questions. While both are complementary, one is more about decision making, the other is more about implementing decisions - both requiring costing exercises. Currently, all 13 tools are compared without making this distinction more explicit.	The taxonomy section now includes additional ways of differentiating and comparing the tools.

From	Comment	Response
	For improving the clarity for the reader, it would be good to have a bit more information about what was the rational and justification of the key features of the tools and provide a better understand for what is meant by complex or not complex …etc. In reading the complexity measure section, I was entirely convinced about the approach. For instance, I'm sure that the number of cells requiring data inputs is a good measure of complexity. If I take the cMYP tool as an example, there are data input tables which can have a large number of cells where one can enter data. It doesn't mean that data needs to be entered in all the cells. Rather it tries to cover for the broadest range of possible answers, but usually 20-30% of the cells will require data inputs relevant in a particular country. Likewise, the total range count is a misleading measure of complexity.	This comment has been taken into consideration and is addressed in the redone taxonomy section and new measures of complexity.
	Going back to the rational for key features of tools, the time commitment can be a little misleading as well if it's the time commitment to enter data into the tool and use it. The way time commitment is defined, it could make it seem that it doesn't take very long for some tool. For some tools this will be the case if the data is available. If the data is not available, it can take months to do the costing exercise even for the simplest of tools. Most of the time being spend collecting information. It would be good for the complexity measure to factor in the time commitment of data collection or ease of getting the needed data. I would be in favour of rethinking this section and the figures presented on p75 and p76.	The definition of "time commitment" has been clarified where possible (when the tool focal points, users or user manuals specified).
	From the report, and from the vantage point of a developer, I was hoping to get more information about possible linkages and synergies between tools. I'm wondering from the review you've done whether there was scope to expand more on this.	This was an interesting point raised in Senegal but unfortunately it is beyond the scope of this report, as per the terms of reference.
Stan Bernstein, January 4, 2008	Analysis largely based on user guides—need to get into the details of the tool, see how formulas work and don't work, analyze assumptions, how data is provided (exogenous versus endogenous variables) and importantly get user feedback	These points have been incorporated in the modified report.
	Errors are noted in some tools, like MBB, but no guidance is given to users on what that means—is the tool still usable? Raises more questions than answers	Wording in the MBB Formula Review has been changed to note that the tool is still usable, although users should be aware of its limitations.
	The discussion of supply versus demand is unclear in the text probably because the terminology adopted as a framework for the analysis is different from that used in the tool. The distinction between supply and demand for health services is one of the unique features of the UNDP tool and resolves much of the ambiguity in terms used elsewhere in the report. The user guide should sufficiently describe these terms for clear inclusion in the report.	References to supply and demand have been deleted.
	Section on taxonomy seems to double or triple count certain interventions which artificially exaggerates the breadth of certain tools; also some tools recognize in their users guides that certain interventions are included in other costing tools and have been deliberately left out of the health models (e.g., UNDP tool)	The taxonomy section has been completely redone to address this concern.
	Section on complexity is incomplete and problematic—missing data points and need to do more detailed analysis	The taxonomy section has been completely redone to address this concern.
	Complexity needs to be complemented by assessments of usability and transparency	The taxonomy section has been completely redone to address this concern.
	It is unclear what the list of in-country applications means. Is that countries that have received training? Attempted a costing? Completed a costing? Used a costing to inform a strategy or budget? The answers to these questions could also give insight into the usability of the tools.	Clarification has been added to note that in-country application means countries that have used the tools for a costing exercise.
	Health system 'interventions' should be included in matrices and not just in text; these are important distinguishing characteristics for users!	If a tool includes specific health system interventions they have been included in the list of interventions in the write-up of the tool.
Andrea Pantoja, January 5, 2008	Executive summary, paragraph 3. How is Stage 3 (taxonomy) different from Stage 1 (comparison chart), it is not clear from the executive summary.	In Stage 1 and with the comparison chart, we attempt to describe and group all tools using the same terminology. In Stage 3, we offer an in-depth comparison and assessment.
	Executive summary, paragraph 4-5. MDG 6 addresses many diseases (HIV, TB, malaria, and others) as opposed to MDG 4 or 5 which focus more on one area. We would not expect similitudes between the ten tools related to MDG 6. Each tool might address different diseases and therefore there will be very little overlap with regards to inputs and outputs. We suggest to reconsider this type of comparison.	The wording in the Executive Summary has been changed to note that the MDG 6 tools comparison was attempted only with HIV/AIDS-specific tools.

From	Comment	Response
	Executive summary, paragraph 6. About new terminology to limit user's ability to maximize benefit of the tool. How much of the new terminology is "technical" terminology, which it would be reasonable to assume that users of that particular tool would understand, and how much is terminology which one would not expect a user of the tool to understand? For example, in the TB tool there is a lot of "technical" language which we would expect any user, who has some expertise/understanding of TB control, to readily understood.	We have reworded our comment about technical terminology and hope the point we were trying to make is now more clear.
	Executive summary. The final statement/ conclusion seems to be relatively weak.	The final statement in this section has been strengthened.
	Page1. In the targets for MDG 6, it should be explained that TB is one of the 'other major diseases' as the MDGs include indicators specifically for TB.	Change made.
	Page 2, first batch of bullet points. Last bullet point should specify that TB is included in the other major diseases.	Change made.
	Page 2, second batch of bullet points. Since TB and malaria have two different costing tools, it might be useful to separate the interventions into two. This would have an impact in page 10 also.	TB and malaria are now listed as separate interventions.
	Page 3, paragraph about the problem. It is stated that the sheer number of tools makes it difficult for a country to select what they need. We think that it depends on how many tools are available for a given disease. For example for TB and Malaria there is only one.	This is a general statement which attempts to refer to all tools and program areas. For TB and malaria there may be only one tool, but for HIV/AIDS there are multiple tools, and this presents a challenge to users. Also, when take as a group of thirteen tools, before separated into program areas or MDGs, the size of the group of tools is overwhelming
	Page 3, table 1. Would suggest to include a column to show the MDG or MDG component (TB, Malaria…) to which they are relevant. This would be very helpful to get a quick overview of the extent to which the different MDGs are covered by existing tools. It is not obvious from their names.	This information is included in Table 14.
	In the introduction, a summary table showing the number of countries where each tool has been used would be useful and informative.	This information is included in the descriptive section of each tool and collectively for all tools in Annex 5.
	Page 6, last paragraph. Suggest to change "fundamental elements" to "key…." or "main…".	Wording changed as suggested.
	Page 7, Figure 1, footnote. The term health impact is often used strictly to mean impact on prevalence, mortality and incidence. A health "outcome" does not have to be defined in these term, e.g. it could be "cured" for a treatment intervention.	Although a health “outcome” does not have to be defined in these terms, for this purpose we have defined it as such.
	Page 8, bullets of Steps. In the review of each tool (i.e. part IV) and in the following Figure 2 the order has been swapped between Step 1 and Step 2. Therefore, the definition in this page should be changed accordingly. Step 1: choices, Step 2: input.	Change made.
	Page 9, last paragraph. It is stated that the report contains a summary of the tool's ease of use. However, we think this should be based on the reports of the users, through the questionnaire or during the meeting.	As noted in earlier versions of the report, the ease of use information is largely drawn on user feedback from the Senegal meeting, now included in this version of the report.
	Page 10, last column of bullet points. Again, we think it would be useful to separate TB prevention and treatment from the Malaria.	TB and malaria are now listed as separate interventions.
	Page 10, definition of budget-guided decision making. We find this definition too restrictive. For a tool to be used for budget-guided decision-making it is not necessary that it is used primarily to achieve already-defined budget/financing goals or that it is used within a context of defined budget/financing constraints. For example, the TB tool can be used to establish what total budget is required to achieve epidemiological targets set for TB control, and what extra funding is needed in that context.	The idea of budget-guided decision making is now included as a subset of either coverage- or impact-guided decision making and has been reworded “budget constraint” to allow for more flexibility.
	Page 11, second paragraph (formula review). Why has it been considered important to list the formulas each tool uses? Each tool can have so many that listing them properly can be very extensive.	This was requested by the Steering Committee.
	Page 11, third paragraph (experience using the tool). The criteria to assess the ease of use, e.g. manual, default values and adaptable to local conditions, do not seem to us appropriate. How much does the existence of a manual would mean that the tool is easy to use?	The existence of a user manual is only one element of ease of use. We have attempted to make a judgment about the usefulness of the manual, and have further complemented this section with feedback from actual users.
	Page 11, third paragraph (experience using the tool). The time required for using the tool should be based on the reviewer's assessment as well as the developer's assessment.	Time required for using the tool is based on guidelines given in the user manual and user feedback.

<table>
<tr><th>From</th><th>Comment</th><th>Response</th></tr>
<tr><td></td><td>Page 11, fourth paragraph (experience using the tool). It is mentioned that the user's assessment will be included after the meeting in Senegal. What about the results from the questionnaires completed by users not at the meeting? How much time is there at the meeting for any further assessment of this issue (ease of use) by anyone other than those already familiar with the tool?</td><td>We have included feedback from all questionnaires distributed at the user's meeting and completed either at the meeting or handed in after. The meeting did not include time for further assessment of tools by those not already familiar with the tools.</td></tr>
<tr><td></td><td>Page 12, first paragraph. Suggest to use the word "limitations" instead of "caveats".</td><td>Wording changed as suggested.</td></tr>
<tr><td></td><td>Page 14, third bullet point. It is stated that HIV/AIDS, as well as malaria and TB occur most frequently. However, TB is only considered in one tool, isn't it? Same for malaria?</td><td>This point has been clarified to refer only to HIV/AIDS.</td></tr>
<tr><td></td><td>Page 15, Table 4. It is quite difficult to read and then constrains the value of it. Due to some elements being "Not applicable" for a tool it would be better to use the term NA rather than leaving blanks.</td><td>The comparison chart is now easier to read and "NA" has been noted where appropriate.</td></tr>
<tr><td></td><td>Experience using the tool. As mentioned before, a summary table showing the number of countries where each tool has been used would be useful and informative. This could be placed in the introduction section before tool-specific sections.</td><td>This information is included in the descriptive section of each tool and collectively for all tools in Annex 5.</td></tr>
<tr><td></td><td>Page 73, complexity measures. We do not agree with the measure chosen as proxy for complexity, these do not reflect complexity of a tool. Why the more sheets/cells to input the more complex? Could you please clarify? Besides these do not coincide with reality in the case of the TB tool</td><td>The taxonomy section has been completely redone to address this concern.</td></tr>
<tr><td>Tessa Tan-Torres, January 18, 2008</td><td>Overall, this report is just about the description of the tools. There is no analytic component, in particular with respect to the examination of the formulae. The TOR basically asked the evaluation to respond to the question: does the tool do what it claims to do (in a defensible way). To respond to this question of whether the results are defensible, one has to actually examine the tool, in particular, its conceptual framework as a test of face validity and the formulae that model the conceptual framework for its mathematical intergrity (whether the mathematical relationships of the different parameters in the conceptual framework are modelled as conceived in the conceptual framework).</td><td>The formula review section has been revamped to address the concerns mentioned in this comment.</td></tr>
<tr><td></td><td>This is a review of costing tools. The question is how to motivate impact assessment as an intrinsic part of costing and the authors attempt to do this by saying that costing consists of 2 production functions. This is not necessarily true. It would be more easily motivated using the table in page 10 where they talk about the different kinds of decision-making in costing:budget based, intervention based and outcome based costing. This deserves more highlighting as it actually able to justify impact assessment not as an extra to be used to justify costing after the costing has been done but as an intrinsic part of the third form of costing. I suggest that they move this table up front before they start talking about production functions and present figure 1. Having said this, I would actually that the budget constraint is actually a different axis of classification. Please see suggested reformulation of the table:
<table>
<tr><td></td><td>Intervention coverage based targets</td><td>Health outcome based targets</td></tr>
<tr><td>With budget constraint</td><td></td><td></td></tr>
<tr><td>No budget constraint</td><td></td><td></td></tr>
</table></td><td>Table reformulated and relocated as suggested.</td></tr>
<tr><td></td><td>As the other reviewers have said, it is important to clarify and justify the selection of which are the key features of a tool, how are they operationally defined and what is the judgement of the value of that parameter done; e.g. what is complex or not, what constitutes the use of epidemiology or not.</td><td>This section has been revised to incorporate this comment.</td></tr>
<tr><td></td><td>The evaluation has to defend 2 judgments that it makes: what it says are key parameters and how it makes a judgement on the appropriateness of the tool with regard to each parameter as operationally defined.</td><td>This section has been revised to incorporate this comment.</td></tr>
</table>

From	Comment	Response
	On selection of what is a key parameter when evaluating a costing tool: Again the focus is on what the tool claims that it does and zeroing in on results is important. For example, in costing, precision of estimates is an important parameter. Would it be possible that the more basic/gross or less detailed the costing, then perhaps the less suitable it is for annual budgeting; but a ballpark figure would be good enough for a tool that claims it is for medium term costing. In the calculation, would unit price of an intervention as the level of input be more suitable for the ballpark figure and would the ingredients approach that spit out line items (HR, commodities, capital, etc) be more appropriate for a tool that claims it does budgeting? In the conceptual framework, if the tool claims that it does malaria costing, how comprehensive is the scope of interventions?	The new formula review section addresses whether the tool does it what it claims to do.
	On making a judgement as to the appropriateness of the tool with regard to a key parameter as operationally defined: A Yes/no is a very basic evaluation as the key question is appropriateness, not presence or absence. E.g. it is not enough to say whether epi data is required but whether it is used appropriately in the formulae.	The formula review section has been revamped to address the concerns mentioned in this comment.
	Please separate malaria and tuberculosis. They are different diseases and deserve separation as was done with HIV. They are all in mdg6.	Malaria and TB are now listed as separate interventions.
	Why limit interventions as to those listed in 2 series. What is the basis of saying that there is limited empirical evidence for the other interventions? This is a particularly strong claim to make and was the subject of considerable discussion in the steering committee regarding a judgement of comprehensiveness of the interventions included in the tool- what would constitute the denominator for number of interventions that should be included when judging comprehensiveness?	We have added a statement in the report recognizing that there are other sources from which to choose evidence-based effective interventions– including the Lancet Series on Child Health, British Medical Journal and others– and yet it was not the scope of this review to develop a comprehensive list of these interventions. Hence, the list of interventions used in this review was chosen because the interventions are specifically tied to the health MDGs but should nonetheless be considered only as a first reference.
	In connection with comment 2, it is not useful to say that one tool has 40 interventions versus another tool which has 7 interventions. Again the key question is how comprehensive is the scope of interventions included for what the tool claims it does.Or that one tool is complex versus another based on number of cells. Again the question is the mathematical modelling of the conceptual framework of that tool is what is needed for the tool to do what it claims to do.	The taxonomy section has been completely redone to address this concern.
	Executive Summary: suggest changing "WHO, UNICEF, the World Bank, and UNFPA" to "Steering Committee"	Change made.
	Executive Summary, last full paragraph on page: because MDG 6 includes 3 separate diseases, suggest not presenting MDG 6 and the tools which reference MDG 6 as a single block	Change made.
	Introduction, table presenting MDG and targets: with references to MDG 5, new targets have been set for reproductive health	The new targets were already incorporated in earlier versions of this report.
	Introduction, list of interventions included in the technical review: separate malaria and tuberculosis	Malaria and TB are now listed as separate interventions.
	Introduction, "Moreover, it provides a transparent framework for budgeting of public expenditures to meet the MDGS." Comment about use of "public": "not necessarily"	"Public expenditures" has been removed.
	Introduction, paragraph on "Costing the MDGs: the use of costing tools." Suggest adding "potential" to following sentence: "They also use the tools to estimate the POTENTIAL health impact of those actions and, thus, the POTENTIAL progress towards reaching the MDGs."	Changes have been made as suggested.
	Introduction, paragraph on "Costing the MDGs: the use of costing tools." Question how costing tools can help countries "to measure where they are in terms of reaching the MDGs."	Statement has been removed.
	Methodology section, table 2 of definitions: unclear about how intervention price is generally referred to as the user fee.	Reference to the user fee has been removed.
	Methodology section, explanation of costing's two basic production functions. "Costing answers the question how much does it cost. Health impact assessment is different. Each one can be done separately and are different calculations. They can be linked optionally. But health impact assessment is not part of costing."	Costing and health impact assessment can be undertaken independently or jointly; since some tools calculate health impact, we thought it important to include both.
	Methodology section, figure 1 explaining "Elements for costing health interventions and health outcomes." Question title of figure.	Costing and health impact assessment can be undertaken independently or jointly; since some tools calculate health impact, we thought it important to include both.

From	Comment	Response
	Methodology section, paragraph on health outcome and use of Vitamin A supplementation as effective in reducing under 5 mortality in underweight infants. "Intervention not consistent with risk factor being addressed. Please cite empirical evidence of correlation between vit a deficiency and underweight."	This is an illustrative example and is not based on empirical evidence.
	Methodology section, Costing Tool Application figure: "What is the criteria to say that epi is being used or demographics. Some are not even appropriate for some columns; e.g. effectiveness is input data; not results. Macroeconomic conditions under results? They should be taken out or shaded over to indicate that they are not to be considered for these columns."	We have grayed out boxes deemed not appropriate selections in that particular column. As inputs, we have grayed out "heath production function" and "health outcome," recognizing that sometimes these elements are built-into the tool (like in the MBB) but it is outside the scope of a costing tool to allow the user to input these elements. As choices, "macroeconomic conditions" has been grayed out. As results, "input price," "input quantity," "effectiveness," "health production function," "epidemiology," "demographics: and "macroeconomic conditions" have been grayed out. However, we added a note saying that some tools do produce "epidemiological" results but are often designated as producing "coverage."
	Methodology section, tool description and overview discussion. Question the criteria used to discuss the tool ease of use.	Tool ease of use section has been revamped.
	Methodology section, presentation of the "Questions the tool can answer": Questions 1, 3 and 4 are not relevant; comment is that "These should be costing questions primarily. One will not use a costing tool to answer the questions highlighted in the column. E.g. costing, budgeting, cost-effectiveness, etc."	We believe that these are all important questions and having at least one tool answering each question is an indication to us that the questions are relevant and should be included.
	Methodology section, discussion of formula review. Comment: "Should be formula review of the tool itself."	The formula review section has been revamped to address this comment.
	Methodology section, discussion of experience using the tool. Want definition and criteria for scoring for elements of ease of use, including whether the tool is adaptable to local conditions.	Comment has been addressed in the body of the report.
	Stage 1, Key Features Comparison Chart: questions the difference between the different questions raised in "focus"- does the tool look mostly at scale-up costs, the cost of achieving a certain level of coverage, or the cost of a multi-year strategic plan?	Comment has been addressed in the body of the report.
	Stage 1, Key Features Comparison Chart: questions the criteria used to classify tools as "low" and "high."	Tool ease of use section has been revamped.
	Table 15, list of interventions: "Please defend why these are the only 2 sources. What about others? Cochrane, lancet series, BMJ MDG series, etc?"	We have added a statement in the report recognizing that there are other sources from which to choose evidence-based effective interventions– including the Lancet Series on Child Health, British Medical Journal and others– and yet it was not the scope of this review to develop a comprehensive list of these interventions. Hence, the list of interventions used in this review was chosen because the interventions are specifically tied to the health MDGs but should nonetheless be considered only as a first reference.
	Table 15, list of interventions, sentence "It should be noted that some tools include interventions not listed in the below table, which could have an impact on the health-related MDGs, although there does not appear to be empirical evidence available to support this." Comment: "please state which interventions do not have empirical evidence."	This comment refers to other interventions which may be evidence-based and effective, but have not specifically been deemed evidence-based and effective specifically for achieving the health MDGs.
Karin Stenberg, January 16, 2008	Suggest to group tools within the review into (a) programme-specific tools and (b) tools with a broader scope.	The new taxonomy section includes a measure of whether tools are program-specific or broader in scope.
	There should be more effort to clarify how the different tools link up and how they could potentially be used as a package or to feed into one another. It would be useful to at least have some suggestive thoughts on this.	This was an interesting point raised in Senegal but unfortunately it is beyond the scope of this report, as per the terms of reference.
	It should be noted that the tools are in constant development and that they will evolve beyond the versions reviewed here	Suggested text included as footnote.

From	Comment	Response
	The list of interventions used (p 2) - I would suggest to split "child health interventions" into "newborn health" and "child health". The actual grouping of interventions seems arbitrary. Why have HIV/AIDS prevention and treatment as two separate categories but TB and malaria as one and the same category?	Malaria and TB are now listed as separate interventions.
	Need to explain how the set of 13 tools were selected. There are other tools out there.	Explanation provided.
	I like the one-page structure that you handed out during the meeting which I feel is much more consistent across the different tools than the way the text is organized in the report. It seems to me as a reader that the selection of what is mentioned on the 4 pages/ per each tool is very subjective.	The content of the 4 pages per tool was approved by the Steering Committee.
	Last sentence on page 3: "Key to the study is the assessment we will make of the extent to which each costing tool appropriately answers the question(s) it was designed to address". From reading the report I do not feel that such an assessment is made.	The formula review section has been revamped to address this comment.
	Page 5, 3rd row - "These tools help countries estimate the health impact of their strategic plans, and, thus, the progress towards reaching the MDGs." -- it should probably say "costs", not "health impact"	This sentence has been removed.
	In general I do not understand the difference between "STEP 1 choices" and "STEP 2 input data" in the figures. In particular, why is "intervention production function" an input in the CORE plus model and a choice in the other models, when we seem to be using similar logic (quantity of input data, unit price , etc) ? There seems to be a lot of overlap between Inputs and Choices.	In some tools the distinction between STEPs 1 and 2 is more profound than others; overlap is possible.
	The type of questions that the tool can answer -- here I would advise to change the wording. The purpose of most tools is to assess "What is the cost of scaling up health services relevant to the health MDGs". It is not really, like stated in the report, "What is the cost of attaining the health MDGs". Perhaps a subtle difference, but still a difference.	Wording has been changed.
	Related to the previous comment, what does "partially" mean in terms of a tool addressing these questions - see IHTP tool, page 27	Partially was added per request of the developers.
	Also I would not say "the tool can answer the following questions" like is stated for each tool, but rather "the tool can be used to answer the following questions". A subtle but important issue. The tool does not do it automatically.	Wording has been changed.
	Ease of navigation - you say that you will rate this based on user's feedback but I would suggest that the reviewers also make an independent assessment. For example, which tools use buttons or a "switchboard" to navigate between sheets? Which tools include help texts? Note that some tools, like the CHCET tool, have had fewer users to date and while user feedback is important there should also be some independent assessment.	The ease of use section combines reviewer assessment and users' feedback.
	On the three categories for technical assistance (page 13) I would suggest to add a 4th category "technical support required for the process of tool application" which some tools seem to need.	The need for technical assistance refers to technical support required for the process of tool application, and we believe the three categories included in the first version of the report ("none," "basic telephone/email assistance" or "training seminar") are sufficient. In the write-up of each tool we have discussed in further detail the amount of technical assistance users report having needed.
	The use of different terminology is confusing: e.g., page 21 "investment costs"; page 62 "programme costs". Moreover on page 67 and page 63 the definition of "health systems costs" seem to be different. See my comment inserted on page 67 in the attachment. In the CHCET by Programme costs we refer to activities that support the child health programme but that are not directly linked to the number of patients seen. and by health systems costs we refer to general investments in Health Systems not specific to the child health programme and therefore excluded. See the CHCET User's Guide part One for more information.	We have tried to standardize terminology throughout the report.
	Page 50 on the cMYP the report states "As such, the tool cannot ensure all costs are entered by the user.". Well, which tool can ensure that!!??	This comment has been clarified to note that the tool does not provide specific guidance or prompts regarding which costs should be included, leaving this decision to the user, hence leaving the door open for exclusions.
	Figure 15 is very generic and appeals to all tools more or less.	This is taken directly from the tool's user manual.

From	Comment	Response
	Table 10. Please spell out all acronyms	Acronyms are spelled out in the "List of Acronyms," pages iii-iv.
	Page 61. Explain what is "Spectrum"	We have added a footnote to reference readers to the section of this report discussing Spectrum.
	It would be useful to - for each tool in "Understanding the tool" section - to explain the rationale used in selecting interventions for inclusion in the tool. See my comment inserted in the report for a rationale for CHCET intervention scope.	The list of interventions included in the write-up of each tool have been taken from the tool or the tool's user manual, or were provided by the tool focal point.
	In the tools taxonomy version, it should be noted that many tools are developed for a Programme rather than for an MDG. So ideally as a user I would like to see not just which MDG is addressed but how it is addressed (page 68)	It has been noted which tools are developed for a specific program and which have a broader scope.
	The complexity measure seems to measure Comprehensiveness rather than complexity. It is more of an assessment of the size and scope of the tool that how complex it is. More detail and more cells should ideally mean better accuracy. Also more cells should mean more explanations and more options, so a more user friendly tool that facilitates the understanding of the user, i.e. a less complex tool? Please define "complexity" here. I think you mean size and flexibility.	The taxonomy section has been redone and the new section addresses this comment.
	Figure 20. should have accompanying text explaining why there is variance in number of cells, i.e. that TB tool allows for more options etc.	A sentence has been added to indicate there may be variance in cells due to options available to the user.
	Another related issue here is whether the user is just assumed to enter unit costs per intervention and to get this data from somewhere, or whether he/she calculates them based on specific inputs. The latter option obviously requires more cells but may be more user friendly and require more cells for data entry.	A sentence has been added to address this comment.
	Table 19 is very subjective. For the CHCET see comments above.	The taxonomy section has been redone and this comment is addressed in the new section.
	Stage 4 Bench marking - why not also compare default values used in tools, and recommendations on data sources	When possible, it has been noted in the write-up of each tool whether default data is included and from where this data comes, or if the tool suggests data sources.
	The conclusion states that "In comparing related tools against one another, we have attempted to identify which tool might be most appropriate for a specific costing exercise by ..... summarizing each tool's usability." - This is not true. The usability has not been reviewed. To do this I would expect to see more on the Ease of Use.	As noted in earlier versions of the report, the Ease of Use sections have been amplified with information from the user's meeting.
	Why not add a measure of Transparency as discussed in the conclusion, in addition to the complexity/comprehensiveness.	We have added a measure of transparency.

Tool-specific comments

From	Comment	Response
Agnes Soucat (MBB), January 25, 2008	Bullets under "The tool can answer the following questions" reworded as follows: What are the main areas of health system which could benefit from additional resources if to improve health MDGs related indicators What are the incremental resources needed to progress on health MDGs related goals What is the expected impact of the strategies chosen by the country on health MDGs related goals?	To increase comparability between tools, we used standard questions for this section, and thus changes in wording and the insertion of entirely new questions were not accepted. However, the specific questions the tool can answer (as suggested) were incorporated further in the "Tool description and overview" section of the chapter.
	From the formula review: "This adjustment increases the impact of the increase in intervention coverage, without a clear argument, and it is incorrect."- Has this been answered by UNICEF epidemiologists?	We did not receive any response from UNICEF epidemiologists. No action required by reviewers.
	From the formula review: "The MBB also has a built-in model that is central to all computations... , it is unclear, though, whether there would be significant changes in results if the model did not link these determinants."- There is extensive empirical evidence that availability and access affect utilization. But indeed access and availability are independent. If this was not clear in the technical notes it should be corrected.	The technical review does not reference the extensive empirical evidence but we do acknowledge it exists, and suggest that this point be further emphasized and clarified in the technical notes.

Eva Weissman (RH Costing Tool), January 23, 2008	Page 26: Rewrite in more logical order (as in the formula): number of married women of reproductive age x contraceptive prevalence rate (% using contraceptives) x percentage using the pill The condoms are added to each of the different methods that do not provide dual protection (against pregnancy and HIV transmission). In this context you should just mention the three different kinds of pills. Replace with: The tool provides two options to calculate personnel cost, either as a direct cost, in which case it only costs staff time spent specifically on the chosen interventions or as a fixed cost in the health system part of the model. I would take the reference to hospitalization costs out as it is more confusing than helpful. The hospitalization costs are similar to the personnel cost in that they can be calculated in two different ways depending on the objective of the cost study – in Part 1 as direct costs only or in Part 2 under overall health facility operation and maintenance costs. This paragraph should come at the end of this section since it applies to Part 2 of the model (the calculation of women requiring maternal health interventions should come after the FP calculations as it is part of Part 1). As a general comment, I would rearrange the order of the formula descriptions as it is more difficult to explain the FP interventions (and currently the description doesn't make much sense to me, so I assume someone who knows nothing about FP will have even more problems). I would recommend using one of maternal health interventions such as antenatal care or C-section as an example to describe the formula used. After that you could give an FP example. Also, the pill is probably the most complicated FP intervention, injectables or the IUD would be a lot easier to explain as one doesn't have to go into monophasic, etc. which probably is also difficult for the layman to understand.	This example has been removed from the report.
David Collins, January 22, 2008	Regarding interventions included in the RH Costing Tool, "As far as I understand this tool only covers part of these interventions and think this should be stated."	Intervention list was confirmed by developers.
	From the RH Costing Tool chapter, "Experience using the tool" section (though applicable to all tools), "I think this section should state if it has been applied by consultants or government/NGO staff for all the tools."	If this information is known, it will be stated.
Peter Heimann (iHTP), January 28, 2008	The calculation/formula review of the report seems to be incomplete – please see below. <!--[if !supportLists]-->o <!--[endif]-->[Intervention operating cost = Total technology operating cost.] where technology includes facility, equipment, human resource and pharmaceuticals <!--[if !supportLists]-->o <!--[endif]-->[Total technology operating cost = Human resource operating cost + Medical device operating cost + Pharmaceutical operating cost + Facility operating cost.] <!--[if !supportLists]-->o <!--[endif]-->[Re-usable technology (i.e. human resources, re-usable devices and facilities) operating cost = Total no. of patients requiring intervention X Required time per patient in minutes (calculated using a dynamic scenario simulation calculation) X Technology cost per minute] <!--[if !supportLists]-->o <!--[endif]-->[Consumable technology (i.e. pharmaceuticals and disposable devices operating cost = Total no. of patients requiring intervention X Required quantity per patient (calculated using a dynamic scenario simulation calculation) X Technology cost per unit.] <!--[if !supportLists]-->o <!--[endif]-->[Technology cost per minute = Technology cost per year ÷ Technology available minutes per year (based on entered constraints and life cycles).] <!--[if !supportLists]-->o <!--[endif]-->[Technology cost per year = (Capital cost ÷ Life span in years) + Total yearly recurrent costs (e.g. maintenance costs, salaries, etc.).] <!--[if !supportLists]-->o <!--[endif]-->[Total no. of patients requiring intervention = Population indicator (e.g. total number of eclampsia cases) X Coverage rate (e.g. 60% coverage for eclampsia) X Percentage patients presenting at level (e.g. primary, tertiary, etc.).]	The formula review section has been redone to incorporate the additional formulas.

	iHTP Simulation Tool Application - Figure 6: Shade the "time" block in step 3 – step 2 time should remain shaded.	Time is now shaded in step 3 as well.
	Next, on page 28, the last part of the sentence 'As results in STEP 3, the tool identifies the most optimal mix or inputs from STEP 2, and thus calculates intervention cost and intervention quantity' should read 'resource type and quantity' as it is the type and quantity of resources being determined, not the quantity of the intervention itself.	Wording clarified as suggested.
	Page 28: 'The following elements are not included in this tool: budget & financing, health outcome, health production function, intervention price, macroeconomic conditions.' If budgeting is the process of translating planning and programming decisions into specific projected financial plans, then iHTP does cover this.	A note has been added to indicate that the tool can help users translate planning and programming decisions into specific projected financial plans.
Paul Maree	The calculations used in "Formula Review" appear to be incorrect, please see the attached document for the correct calculations.	Calculations have been reviewed and revised.
David Collins, January 22, 2008	Suggest removing the word "both" from the iHTP Simulation Tool chapter, "Tool description and overview" section, sentence "The Integrated Healthcare Technology Package (iHTP) Simulation Tool is a tool to help users improve health service delivery by demonstrating which health services are both necessary based on the target population demographics and disease profiles and cost-effectiveness" because "this word is confusing and maybe redundant."	Wording changed as suggested.
	From the iHTP Simulation Tool chapter, "Experience using the tool" section, suggest rewording "This tool is a program-based software" to "describe better - eg non-spreadsheet."	Wording changed as suggested
John Stover (Spectrum: PMTCT), January 8, 2008	No additional comments.	
John Stover (Goals Model), January 8, 2008	Page 37. Goals Formula Review. The second half of the first paragraph starting with "The key assumption being made in health impact computations…" is incorrect. Goals assumes a constant effect of a given increment in coverage on behavior change, but the behavior change is used in an epidemiological model to calculate health impact. That calculation does not assume constant impact. It is a full epidemiological model so the impact of behavior change on infections averted will display herd immunity as other non-linearities.	The formula review section has been redone and it incorporates this comment.
	Bottom of page 37 and top of page 38. The unit costs for many interventions include the costs of outreach, promotion and health education, so they do include some demand creation. It is true that demand creation is not included for most medical services (blood transfusions, palliative care) but demand limitations are recognized by limiting maximum coverage to something less than 100%.	The formula review section has been redone and it incorporates this comment.
David Collins (PCBF), January 22, 2008	Regarding the last sentence of the Formula Review section, this should be a description of the financing element, not a reason for including it.	Change incorporated.
David Collins (CORE Plus), January 22, 208	In Figure 18, suggests checking off the following cells: INPUT DATA: Intervention cost, Intervention price. Intervention quantity, Epidemiology. CHOICES: Coverage. RESULTS: Budget and financing.	Changes made as suggested.
	Requests clarification or removal of comment from formula review section (following Figure 12): "Yet, there appears to be a conceptual error when the manual claims that the number using facility is equal to the number of persons affected times percent with access to facility. If access is measured based on utilization, then this is correct. If access is measured as actual access then it is computing number of persons with a health problem that have access to the facility. In general utilization is less than or equal to access. Using an access measure would be an overestimation of the number of cases for the intervention."	Have clarified comment with developer and rewritten this part of the formula review.
Andrea Pantoja (Planning and Budgeting for TB Control), January 5, 2008	Page 57, second paragraph. Suggest to add also that users also need to specify what funding is available for each intervention and how much is the funding gap.	Suggested sentence added.

	Page 58, Figure 16. It is not clear the difference between intervention cost and intervention price.	Difference between intervention cost and intervention price is explained in the Methodology section.
	Page 58, Figure 16. The legend needs to stand out more or at the beginning of the figure to be able to understand the code.	We have attempted to make the legend more clear.
	Page 58, Figure 16. Step 1, the following should also be marked as decision variables: input price, input quantity, intervention cost/price, intervention quantity, epidemiology, demographics, coverage.	Changes made as suggested.
	Page 58, Figure 16. Step 2, the following should also be marked as options to enter data: intervention cost/price, intervention quantity, epidemiology, budget & financing. For this figure, the definitions of the steps and of the possibilities overlap. For example, you can choose what you want to input, then step 1 and 2 are similar if not identical.	Changes made as suggested.
	Page 58, Figure 16, footnote. Why is it written that the tool does not incorporate intervention price? Could you please explain?	Explanation has been added.
	Page 59, part of Experience using the tool. We hope this would be largely complemented with the answers provided by users in the user's questionnaire.	Section has been complemented with information from user's meeting.
Tessa Tan Torres (Malaria Cost Estimation Tool), January 23, 2008	Regarding list of interventions included, tool has no TB interventions.	Malaria and TB are now listed as separate interventions.
	Regarding discussion of effectiveness, suggests replacing "to adjust effectiveness of interventions due to the impact of one intervention on another" with "to adjust population in need because of interaction of interventions."	Wording changed as suggested.
	Regarding elements excluded, questions how we judge that the tool excludes budget & financing and intervention price.	Budget & financing has been included as a result because the tool generates a request for funds from The Global Fund. However, we did not see that the tool incorporates intervention price (usually in the form of a cost to the patient/user fee), so this element remains listed as excluded.
	Page 65. Formula used to calculate number of persons receiving the intervention: "Sorry, this is an error. I checked the formulae in the tool. (Please check formulae as well). Current demand as manifested in current utilization is used to calculate starting coverage and this is what is used to differentiate between total and incremental costs."	The figure and text have been correct to clarify that current demand as manifested in current utilization is used to calculate starting coverage.
	Experience using the tool: "There is a users manual. There is an e-mail address in case of questions/bugs."	Comments added to experience using the tool section.
	Table 19, value added: question the inclusion of "cost-effectiveness" as something the tool can help users improve.	Reference to cost-effectiveness removed.
Karin Stenberg (Child Health Cost Estimation Tool), January 16, 2008	Also note that the number of sheets that need to be used depends on how many intervention the user decides to include. Moreover, have you noted that the tool automatically adjusts the number of input and output sheets on the switchboard in line with what interventions are selected for costing? For example is newborn care is deselected then it disappears from the switchboard menu This is a feature of the tool that minimizes the amount of sheets that the user has to enter data into/check assumptions for. I think that this is probably unique to this particular model as well as the malaria tool? I would suggest that this feature should be taken into account in the section 4 "experience using the tool" as well as in the section on the "complexity" measure. I think that the malaria and child health tools having a switchboard is a unique feature for user friendliness. Moreover have you noted that the tool allows for users to indicate whether data entry for different sections is partially or fully completed and this changes the color of the buttons on the switchboard? I feel that there are a lot of aspects of user friendliness that are being missed here. Perhaps some of these aspects are more evident in the October 2007 model which we also shared with the PMNCH in late October.	These usability features have been noted in the "ease of use" section.

	In general I feel that the way the 4 pages on the CHCET (pages 65-68) are written is lacking a standardization with the other tool descriptions. For example the Step 2 description for the Reprod health tool is very similar to the CHCET. And for the iHTP tool, section 3, the last paragraph on how intervention quantity is based on need also applies to the CHCET - particularly with allowing for costs to be estimated at different levels of health service delivery. And the statement for the PMTCT tool that public policy decisions should have been made prior to using the tool is true for most tools - including the CHCET. The section devoted to formula review is very long and detailed for the RH tool and short for the CHCET. There is a lot of inconsistency and variation in detail and the reasons for this are not clear.	Tool write-ups all follow the same format, as presented in the methodology section of the report, and information included may vary depend on availability of this information (from the tool itself, the user manual, the tool focal point, tool users, etc.).

Annex 8: Revisions Incorporated in the April 22nd Version of this Report

From	Comment	Response
Eva Weissman and Stan Bernstein, March 25/April 10, 2008	We went on the assumption that the expanded formula section would replace section 3 of the RH tool review in the main report and that the other sections would remain. Please let us know if that is not the case.	The expanded formula review section has replaced the original section 3 (formula review) for all tools.
	The RH tool interventions detailed in the review are condom use and ARV. These are not the most central or elaborated interventions in the model. (It would be like discussing MBB based on a review of its family planning analysis; an admitted "incomplete work in progress" that UNFPA is collaborating with UNICEF/World Bank to redress.) Since the RH model is heavily oriented to maternal and reproductive health it would be much more informative and useful if the review analyzed an actual maternal health intervention such as delivery care or an emergency obstetric care intervention such as C-section.	At the request of the Steering Committee, and as explained in the methodology section, we chose interventions most common to the greatest number of tools, so comparisons could be made between different tools as to how they treat the same intervention.
	There is essentially no mention of the RH tool's Part 2 (the health system part) which is an integral part of the model and complements Part 1 which focuses on to the direct and variable costs of providing RH interventions. The reviewers should either add a sentence in the formula review saying that that file was not looked at or add a short description of the formula's in Part 2 at the end of the review.	As requested, we have included a reference to Part 2 but noted that we did not review the formulas in Part 2.
	The structure of the discussion does not do justice to the models. The analytic frame concerning Choices vs Inputs and the various "production functions" does not make sense for most of the models and particularly for the RH Costing model. This point was raised in Saly Portudal and in earlier communications but the time and work load constraints clearly did not allow this conceptual format to be adjusted.	The Steering Committee approved this framework in November 2007.
	For the RH tool the columns actually reversed with Choices coming before Data Inputs which actually seems more intuitive but why would this apply only to the RH tool? Should all models have these two columns reversed?	As discussed in the methodology section, the order of the STEPS depends on the tool.
	The number of cells requiring input data or choices as presented in Figure 21 appears to suggest that there are fewer such actions needed for MBB than for a number of other tools (including the RH costing tool). However the table that contains the estimated numbers (Table 17) states for MBB that the number is "NA". It is hard to believe that the true number would be smaller than that for the CHOICE modules and the RH costing tool (and possibly even the P&B for TB control).	The number of cells requiring input data or choices was marked "NA" for the MBB because this figure was not readily available.
	The number of cells that can be used for input data is an extremely poor measure of a tool's complexity and needs to be qualified some more. Does the model provide default values, do all these "input" cells actually need to be filled in, is the user really required to provide inputs for 7,310 (malaria tool) or 23,925 cells (TB tools)?	The complexity measures have been expanded; recognizing that no one measure is perfect, these measures should be taken together for the most accurate assessment.
	A point we had made earlier and which was supported by several reviewers was that antenatal care is part of maternal health interventions. It is not quite clear why it is listed separately.	In the previous version of this report, antenatal care was eliminated as it was assumed to be included under maternal health interventions.
	On page 79 (special features), the first two sentences should be switched around for the RH Costing Tool.	The order of the two sentences has been reversed.
Andrei Issakov, April 11, 2008	iHTP-related pieces are fine, and we don't have any comments.	No action required.
	Only two minor errors: in the table 27 on page 134, it is still Constella Future as iHTP developer - so, it needs to be corrected to WHO / MRC	Change made.
	In the Annex 1 on page 139, the focal point is Matthews Matthai which is not correct since finally the overall iHTP tool was reviewed rather than its MPS module - so the focal point should be either replaced by Peter Heimann (heimannp@who.int) or Peter should be added to Matthews but in the first place - Peter Heimann / Matthews Matthai (heimannp@who.int / matthaim@who.int).	Change made.

From	Comment	Response
John Stover, April 4, 2008	The model [Spectrum: PMTCT] has been revised since the Senegal workshop. The treatment options are now, Single dose Nevirapine, Dual prevention ART, Triple prevention ART, None, and up to four user-specified other options.	Revised treatment options have been noted.
	The model [Spectrum: PMTCT] does include the long-term costs of treatment (the report says that it does not). The costs of treatment for both adults and children are inputs and are used to calculate the savings in averted treatment costs.	The sentence referring to the model not including long-term costs has been removed.
	The last paragraph states that the tool [Spectrum: PMTCT] has not been updated. We have now updated it so that paragraph should be revised to say that it was updated to currently available PMTCT options in January 2008.	A note has been made that the tool and its treatment options have been revised.
David Collins, April 3, 2008	Table 4 – PCBF – Time commitment should be 2 days (as noted on P68).	Change made.
	Footnote 11 (P17) should be removed since the info has presumably been included now?	Footnote removed.
	Section F.4. (P68). Change to "PCBF is available on MSH's web site on the internet at http….."	Change made.
	Section G.1. Last paragraph – first sentence should be "number of each type". Last sentence – better to say "Fees can also be entered…."	Changes made as suggested.
	Section G.2. Third paragraph – first sentence should say "In STEP 2 …….. and staffing, and fees. Last sentence change "any other revenue sources" to "fees".	Changes made as suggested.
	Secton G.2. Fourth paragraph – change "user fees" in two places to "fees".	Changes made.
	Section G.3.b. Footnote 25 – second sentence – change to "For Scenario C it is important….". (In Scenarios D and E the user can adjust the target utilization figures to reflect the fact that projected utilization can be less than need.)	Footnote has been reworded as suggested.
	Section G.3.b. Fifth paragraph – last sentence – change "cost to the health facility" to "cost of the health facility".	Typo corrected.
	Section G.4. Fifth paragraph – change to "The tool is available on the MSH web site at "http….."	Change made.
	Annex 6 (P 153) David Collins – PCBF – 4th comment – it seems that the change was incorporated.	Noted.
	Annex 6 (P155) David Collins – CORE Plus – 5th comment – if my change 7 above is included then the Response is "The suggested edits have been incorporated."	Noted.
Patrick Lydon, January 28, 2008	p. 79, Formula review section: The formulas are available once to tool is unprotected. The password to unprotected the tool is given in both the tool (first spreadsheet) and in the user guide. Once unprotected all the formulas can be viewed.	We have noted that the formulas are available once the tool is unprotected.
	p. 79, Formula review section, part B, second sentence: "I didn't understand this sentence. I'm not sure what is meant by a single funding gap for all cost of immunization. On of the results spreadsheets breaks down the funding gap into its components (vaccines, supplies, human resources....). The methodology for the funding gap is the same as what was described for the PCBF tool. Not sure what this cannot be explained here."	On the "5. Gaps & indicators" sheet, the composition of the funding gap includes all immunizations, making it impossible to know which part of the funding gap corresponds specifically to the BCG vaccine.
	p. 79, Formula review section, part B: correct typo from "BDG" to "BCG"	Typo corrected.
	p. 80, Formula review section, part B, sentence beginning with "Although the user chooses which intervention...": This sentence is not clear to me. There is a framework for which costs to include in the tool. Can this be clarified?	This sentence has been removed.
	p. 80, Formula review section, BCG vaccine intervention, first sentence about price: It is based on UNICEF as per the source on the price table.	Source noted.
	p. 80, Formula review section, BCG vaccine intervention, calculation of wastage rate: Note that you tested the calculation based on past expenditures. The tool computes on retrospective year (in which case you can generate a wastage figure) and up to 5 prospective years (and where you need to input target wastage figures)	Clarification added about how wastage rate calculated.
	p. 81, Figure 26: Note that there are 2 methods for computing the cost of BCG and other vaccines. One method for the prospective costing and one method for the future projections. You have presented only one here which is a bit misleading.	This point has been clarified.
	p. 81, Experience using the tool section, comment on display of calculations: As mentioned, all is revealed if you unprotect the tool. How to do this in explained in the tool and in the user guide.	Noted.

From	Comment	Response
Brian Lutz, April 10, 2008	RH Costing Tool: On p. 38, the first paragraph states that the number of users is based on data from the UNDP Population Projections. I believe this is a typo. It should be UNPD (UN Population Division, not UN Development Programme). This error occurs later in the paragraph as well.	Typo corrected in both places.
	UNDP Integrated Health Model (this comment and all that follow): In Section 1 the information under the column heading "The tool includes the following interventions" is not comprehensive. Added to this list should be the following: HIV/AIDS care and support, HIV/AIDS enabling environment, sexual and reproductive health (as it is, STIs don't appear in the list thought they certainly appear in the model), commodity supply chain system, demand-side interventions.	These interventions are general intervention categories taken from the list presented in the methodology section.
	TB prevention should be removed from this section. The tool does not cost conventional TB prevention measures (apart from the effect of scaling up treatment on future incidence).	"TB prevention and treatment" left because treatment element is relevant.
	Curiously, Table 14 includes some of the missing elements from Section 1 above but then excludes others. For example, maternal and reproductive health (and the corresponding detailed interventions) and TB need to be added back in.	Maternal and reproductive health, as well as TB, interventions added.
	I have a very serious problem with bullet 4 under section 3. The authors make a strong comment about navigation in the tool being impossible. The user guide very clearly explains how to navigate in the tool, and most users find the navigation menu very easy to use as well as a nice way to keep the tool manageable and organized. I am strongly recommending that this comment be struck.	Comment struck.
	I also do not understand the point of bullet 3, which seems to rehash the same information that already appears in Sections 1 and 2.	Bullet 3 is meant to summarize the earlier sections.
	I appreciate the addition of Figure 28; that is a very helpful addition from the user guide.	No action required.
	On p. 87, there is a statement that has been retained regarding confusion between supply and demand in the model. I have responded to this point at least twice since January and am disappointed that it has not been resolved. It reinforces the fact that the user guide does not appear to have been ready satisfactorily.	This point has been clarified.
	Conclusion paragraph on p.92 refers to the macro problem again. Please see above for my comments on this already.	Comment clarified to note that we used the tool without problems, without macros enabled.
Katherine Floyd and Andrea Pantoja, April 14, 2008	As with the first report, we have serious concerns about the comparative assessment of the "complexity" and "ease of use" (pages 126-133) of the 13 tools being assessed. This is the part of the report that is most likely to be read by a general reader or potential user, and yet the assessment has major flaws. We are particularly concerned about the methods used to assess "complexity" (defined as "size" and "linearity of formulas"), and about the weight given to the presence or absence of a user manual. The presentation of findings and the main conclusions of the assessment of "complexity" remain focused on a) the number of cells in a tool that include data and b) the number of cells in which users have the option of entering data. Although it is not explicitly stated, the interpretation for most readers will be that a large number = "complex", even though the report authors acknowledge that a) could be due to features that make the tool more user-friendly. Moreover, there is no analysis or discussion of the fact that rather than characterizing complexity, these measures of "size" may simply distinguish between tools that use a detailed bottom-up approach to costing, and those that use a top-down approach for which much cost data must already be available. The analysis also heavily penalises tools without a formal user manual even when they have been assessed to be transparent and easy to navigate without a manual. Some useful measures of "complexity" or "user-friendliness" are not part of the formal assessment that is presented (e.g. feedback from end-users, time needed to complete the tool, level of assistance and skills in Excel needed to use a tool, even though all of these are discussed in the parts of the report that are specific to each tool). For the TB tool (at least), the results presented in this comparative section are misleading for potential users as a consequence of questionable methods. This section of the report needs major revision to make it an accurate assessment of the comparative complexity and ease of use of the 13 tools. The revisions that are needed include the actual measures used to assess user-friendliness, and the presentation and interpretation of findings. Recommendations are provided below.	These sections have been redone to take these comments, and comments from a conference call we had with Katherine and Andrea, into consideration.

From	Comment	Response
	Complexity measures: size of tool- Among the four measures used to assess "size", we agree that two (number of total worksheets, including hidden worksheets; and number of worksheets that require some action by the user) are useful to present (though not necessarily as a guide to user-friendliness). However, two of the other measures are problematic: these are a) "total used range count computed with an Excel function indicating how many cells include some sort of text of data" and b) "number of cells that can be used to input data/make choices".	We have further explained the total used range count and number of cells that can be used to input data/make choices measures and justified why they are important to the analysis of complexity.
	Complexity measures: size of tool- In the case of the total used range count, a high range count may be the result of tool features that are actually designed to make the tool user-friendly (less complex to use). The reviewers do actually acknowledge this in their report, but proceed to presenting findings which give a very different impression. It is not clear if the comparison among tools using this measure is fair. For example, some tools may have a high count because they cover several years (e.g. the TB tool covers 10 years). A fairer comparison would be a used range count per year. A high range count may indicate that the tool has used sophisticated programming and provides a lot of useful background data. Complexity of programming and the amount of "hidden" data are very different from complexity from a user perspective but this crucial distinction is not made by the reviewers.	We have incorporated these comments/explanations into our analysis.
	Complexity measures: size of tool- In the case of the "number of cells that can be used to input data/make choices", it is important to be assured that in the case of the TB tool the right cells have been counted. This would be all "yellow" cells within the tool. It is also important to note that it is not assumed that all cells would need to be filled in any given country. Ultimately, the "number of cells that can be used to input data/make choices" is really an attempt to assess how much time it will take a user to complete the tool. It would therefore be better to use the time taken to complete the tool as an indicator, and not to use the number of cells in which data should be entered.	For the TB tool, all yellow cells were counted. We have noted that this is the highest possible number of cells that could require input or choices, and have also noted that this measure should be taken in conjunction with the time commitment required measure.
	Complexity measures: size of tool- For both indicators, the size of the range count probably reflects the level at which costing is being done. For example, if a tool is designed for users to do "bottom-up" costing (e.g. TB tool), more cells will be needed than if the tool assumes that "higher level" cost data are already available. The reviewers actually illustrate this issue in the text in their comments on HIV tools, one of which requires users to input a "cost per sex worker reached" (see p136). The cost per sex worker reached is an output indicator, and to input such a cost into the tool requires that the cost has already been established by a separate and more detailed costing process. In contrast, the TB tool does not assume that such costs are already known but rather requires users to calculate them within the tool by entering the necessary input and quantity data.	We have incorporated these comments/explanations into our analysis.
	Complexity measures: size of tool- Such differences are important when comparing tools but are not highlighted or analysed by the reviewers. For example, in Table 23 p124, some tools include a wide range of health MDG interventions, but an important question is: In which way? Are the interventions costed using a bottom-up approach or is a top-down approach used e.g. there is one cell that requires the total costs for that intervention to be entered. It is important to make a clear distinction between the kind of costing approach and the requirements for what data are already available, to understand the differences among the tools.	We have incorporated these comments/explanations into our analysis.
	Complexity measures: linearity of formulae- It is not clear why this is important for measuring tool complexity, it is not possible to understand how important this issue is compared to the size of a tool, and it is measured on only two dimensions (use of population projections, and use of need projections). How much weight this issue should be given when assessing tool complexity is unclear.	We have noted that all measures should not be taken in isolation but rather in conjunction with other measures for the best and more accurate understanding of complexity.
	In the reviewers' comparative assessment of the user-friendliness of tools, the TB tool appears among the least user-friendly on the measures chosen. This is of major concern because it is the complete opposite of our own experience of using this tool with more than 50 countries, and is opposite to the feedback provided by tool users to the reviewers (some of the overall findings/comparisons are also contrary to our own knowledge of some of the other tools). One reason for misleading assessment is unfortunately, the feedback from users was not used in the reviewers' comparative analysis of the user-friendliness of tools.	User feedback is now presented in this section.

From	Comment	Response
	Another reason for misleading assessment is that the measures used to assess complexity and user-friendliness and that are presented in the graphs (and which therefore are noticed most by readers) are not the best or the right measures to use (see comments on "methods" above). Too much emphasis is given to "size" measures that either a) have nothing to do with user friendliness (total used cell range count) or b) may not have been properly standardized to allow fair comparisons (total cell count in which data can be entered by users) or c) may be inferior to other indicators of size (e.g. time taken to complete the tool; level of skills or technical assistance required to use the tool). In Figure 51, the presence or absence of a user guide has too much weight in the ranking of tools, especially when the other two measures assess whether the tool can be used "without a user manual".	Other measures have been added, including actual user feedback, to produce a more accurate assessment.
	An additional reason for the misleading assessment is that there is no explanation of why the TB tool has such a high total used range count or a high count for the number of cells in which data should be entered, compared to the other tools. There is no discussion of what the high counts mean - are they "good" or "bad" or do they "not make any difference to the user". If they are bad, then why? If they are good, then why? If they don't matter, then why are they presented at all? Any data analysis should always investigate the outliers. Presenting data without any interpretation/explanation of the outliers can lead to the wrong interpretation of data. Currently, the interpretation is likely to be that the TB tool is very complex and cumbersome compared to other tools. Based on our own experience of using the tool with a large number of countries, we think that this would be an inaccurate interpretation.	An explanation has been added to explain the TB outlier.
	In the section on "linearity", as a reader of the findings the feeling is "So what?". It is not clear how the findings help to distinguish tools or whether something is good, bad or doesn't matter. Did the reviewers want to evaluate the complexity of the modelling within the tool?	The sophistication of the modeling used within the tool is a means of measuring complexity. As in other parts of the report, we did not intend to make a value judgment, but rather to present the results.
	Table 27. There should be a X for Budget and financing in the Results section for the TB tool. There should also be a X for health outcome in "input" data.	“Budget & Financing” was already checked off as a result in the previous version of the report. Health outcome is not a valid option for input data and thus has not been marked.

From	Comment	Response
	Recommendation for improving this part of the report: Present a summary table that is designed to help readers understand how tools compare in terms of their ease of use for an end-user. In the table, characterize the main features of each tool (including the main feedback from users) that are useful for assessing ease of use. From the report and the comments above, our recommendation is that the features to be compared are: a. feedback from users (if there is none then state this clearly). Ultimately, this is the most important measure of whether a tool is user friendly or not. b. number of worksheets to be completed c. number of cells in which user must enter data (BUT it must be ensured that this is a fair comparison e.g. cells to be filled per year, so that tools that provide the option of costing for multiple years are not unfairly penalised in the assessment. Given the authors own comments on p129 in the context of the TB tool, it appears that such standardization has not been done). NB: the total number of cells in the tool with data is NOT a measure of user friendliness although it may well illustrate the amount of work that was needed to develop the tool and the quantity of background information or default values that are provided to the user. Contrary to a high measure here currently implying "complexity", it may indicate that the tool is "user friendly". d. whether the tool is based on detailed bottom-up costing or whether the tool can only be used if some "higher level" cost data (such as cost per output or cost per outcome indicators) are already available and can be used as inputs within the tool. This relates in particular to c) and will help to explain variation in c) among tools e. time required to complete the tool in weeks or days. This is actually a better measure of what (we assume) the reviewers were trying to measure by using the "size" indicator defined in c). f. whether or not training/technical assistance is needed and if so how much g. level of competency in Excel required h. user manual - availability and quality. It is not enough to say a user guide exists. It must be an easy to follow and helpful user guide. Is the assessment based on the reviewers' assessment or is it based on feedback from others who have used the tools? (NB Please ensure that the material available to assist users of the TB tool is correctly described. While there is not one official "user manual", there is a set of documentation to help users and the tool itself has an "inbuilt" user guide. The TB tool is being unfairly penalised in Figure 51 because it is assessed as not having a user manual. At the same time, it is assessed as being "easy to understand and to trace formulas without needing to use a manual". Surely if users find the tool user-friendly (user feedback),and if navigation and understanding the tool is possible without a manual (reviewers assessment), then the TB tool should not appear as though it is worse than other tools simply because they have an official user manual. Too much importance is given to the presence or absence of a manual in Figure 51). i. Ease of navigation as assessed by reviewers (make sure it is clear that this is not the assessment of users). If feedback from users is available, make sure that this is stated. j. Transparency as assessed by reviewers (make it clear that this is not the assessment of users). If feedback from users is available, make sure this is stated.	We have included the suggested items a-c, e-f and h-j in a single table in the “Ease of Use” section of the taxonomy section of the report. We did not feel item d was the best measure of ease of use, but have included this in the “Scope” section. Item g was not incorporated because nearly all tools required basic Excel skills, at least for the average user doing an average costing study, and because two tools were not Excel-based.
	Recommendation for improving this part of the report: Remove the misleading figures based on a few and not necessarily the best measures of complexity/user-friendliness i.e. remove Figure 49 and Figure 52. Figure 51 needs modification because it is too reliant on the presence of a user guide (especially as the other two measures identify if a tool is user-friendly without a manual) and takes no account of user feedback.	A footnote has been added to indicate that our assessment of user support documentation was made for all tools; for those tools without a formal user guide, the help files or other documents included to assist users were evaluated. User feedback has been incorporated in the overall analysis of ease of use. A text box has been added to the appropriate figures to explain the outliers.

From	Comment	Response
	Recommendation for improving this part of the report: When a tool is an "outlier" on any assessment, make sure that there is an explanation of a) why the tool is an outlier compared to other tools b) whether this is an accurate representation of the tool or not according to the measure being assessed c) what the implications are for that tool. If there are good arguments why showing the tool as an outlier is misleading, either make sure this is carefully explained in the text or decide that there is something wrong with the measure being used and drop it from the report.	Explanations have been added for any outliers.
	Recommendation for improving this part of the report: Our strong view is that it should be made extremely clear that the number of cells in which there are data has nothing to do with ease of use or complexity from the perspective of the end user. Any assessment of the total number of cell with data should be kept clearly separate from any analysis of the tool from the perspective of an end user. If the data are retained in the report, then any outliers should be explained e.g. a high count may reflect substantial efforts by the tool developers to make the tool user friendly.	The used range count has been included because it helps users better understand the size of the tool.
	Recommendation for improving this part of the report: The count of cells in which users must enter data should be dropped if there is a better measure to be used (feedback from users and time taken to complete tool in days/weeks are better ways of measuring the amount and difficulty of the work that the tool requires).	Additional measures of size and complexity have been added to complement the measure of number of cells in which users must enter data/make choices.
	Comments on Section J, pages 93-99: Heading: The correct version is 1.5.19, in the website where the tool is made available to users it is now called version 2. Please use one of these names.	Version has been corrected.
	Tool description: Suggest deleting existing text and replacing it with: "The tool is designed to help countries to develop comprehensive plans and budgets for TB control (i.e. covering all recommended interventions) within the framework provided by the WHO's Stop TB Strategy and the Stop TB Partnership's Global Plan to Stop TB, 2006-2015. The tool is structured according to the major components and subcomponents of the Stop TB Strategy and includes default values that are consistent with the targets set in the Global Plan. It is also consistent with the Global Fund's definition of Service Delivery Areas. It produces a standard set of summary tables and figures, including summary tables that are needed for Global Fund proposals".	Suggested text incorporated.
	Tool description: In the table in which the tool is described, the MDG target addressed by the tool is "To halt and reverse the incidence of TB by 2015" (MDG Target 6.C). In the list of interventions, please list the core TB interventions first, followed by HIV related interventions and then by general health systems improvements.	MDG target in earlier version of report was correct, per the list of MDGs and MDG targets included in the report, page 1. The list of interventions has not been reordered as requested because the interventions are listed in alphabetical order, as was done for all the tools.
	Understanding the tool: In this section, Table 16 should be completed. Please list the names of the worksheets in the tool and explain the interventions to which they relate. The current list is confusing since it does not link with the pages in tool, e.g. "Program costs" is listed but there is nothing labelled "Program costs" in the tool. Also, program costs are not an intervention as such.	For all tools, the list of interventions includes only interventions, not interventions and worksheets. Program costs has been deleted from this list.

From	Comment	Response
	Understanding the tool: The explanation of steps to be followed is misleading and inaccurate. Please replace the first four paragraphs with the following text: "In Step 1, the user selects their country from the list of 212 countries provided in a drop-down menu and decides which of the interventions they will need to cost. There is one worksheet per intervention. In Step 2, the user sets targets related to intervention coverage. These targets are a) the percentage of all estimated TB cases to be detected (case detection rate) and b) the percentage of TB patients (=detected cases) to be successfully treated (treatment success rate). Once these targets are set by the user, the tool automatically calculates the number of patients to be treated, based on the targets set by the user, country-specific demographic and epidemiological data that are already provided for users within the tool (e.g. population projections, TB incidence and notified cases up to 2006), and regional projections of trends in TB incidence from 2006 to 2015 for the region of which the country is a part. In Step 3, the user navigates to a page (worksheet) of the tool according to the intervention which they have chosen to cost (the user is expected to work through all relevant interventions identified in Step 1). This is done via an in-built and self-explanatory navigation system, which is also explained in the in-built user guide. In Step 4, the user needs to choose the method that they will use to calculate the cost of the intervention. There are two options: "quick estimate" or "detailed method". Within a given worksheet, it is only possible to use one of these two alternative methods, although across the tool as a whole it is possible to use a mixture of the two approaches (e.g. quick method to cost first-line drugs, detailed method to cost treatment for MDR-TB). The quick estimate is a top-down approach using default budget or cost values that are country specific. These default values come from data reported by countries to WHO/STB annually and from the Global Plan to Stop TB, 2006-2015. In the quick estimate, the user does not need to enter any price or quantity data (hence the term "quick estimate"). In the detailed method, a bottom-up approach to costing is used. This requires users to input data on quantities and prices, and it is the method which users are encouraged to choose. If users choose the detailed method, they need to input quantities and prices for each activity. In some cases, within the detailed method there are default values for prices or quantities which users can choose to use as input variables. In Step 5, and independent of the method chosen to cost the intervention, users need to input data on available funding (by major sources of funding). The funding gap is automatically calculated. All default values are provided within the tool and categories to use for sources of funding are also specified. However, users can change the default values or the names of the funding categories if they have more appropriate ones for their own country. The sources of information for the default values include the Global TB control report, the Global Plan to Stop TB 2006-2015, UNAIDS and WHO/EIP. As Steps 1 to 5 are completed, the tool automatically uses the data that are entered to produce summary tables and figures. These includes summaries of costs by line item and funding source, for each year for which the user has entered data (from one year up to 10 years). The tables include summaries according to the service delivery areas and generic cost categories that are used by the Global Fund, and the summaries that are required for reporting of the financial data that WHO requests from all countries each year."	Some of the suggested text has been incorporated into the Understanding the tool section as appropriate. The steps were not changed because we use the standardized 3 steps (input data, choices, and results).
	Understanding the tool: In the penultimate paragraph ("The model does not explicitly make health impact computations…"), please make sure that it is noted that "intervention cost" is assumed to be the same as "intervention price", since TB treatment is provided free-of-charge in almost all countries. This is also why "user fees" are not included as a funding category, since this is generally not relevant. However, the tool has the flexibility to include such a funding source if it was relevant.	We have noted that intervention price is excluded because it is not applicable when TB treatment is free, as is usually the case. We have also added a note that the tool has the flexibility o include intervention price if it were relevant in a particular country situation.
	Understanding the tool: In Figure 32, the text down the side of the figure is not at all clear and is somewhat misleading. It should be aligned with the explanation provided in italics above.	The figure text has been updated.

From	Comment	Response
	Formula review: The Tool Objective is not as stated. The objective as written suggests that the reviewers have not read the text on the first page of the tool nor have they read the text in the documentation that accompanies the tool. The objective of the tool is "To help countries to develop comprehensive plans and budgets for TB control (i.e. covering all recommended interventions) within the framework provided by the WHO's Stop TB Strategy and the Stop TB Partnership's Global Plan to Stop TB, 2006-2015, both of which are designed to achieve the MDG for TB".	The tool objective has been rewritten.
	Formula review: Population projections are from UNPD projections not dynamic modelling. The TB incidence projections were based on a dynamic model but this model is not part of the tool.	The source of population projections has been clarified.
	Formula review: In terms of limitations and exclusions, there is not a single document called a "user manual". However, it should be made clear that the tool has an in-built user guide and that accompanying documentation is available to help users understand the purpose of the tool and how to use it. This documentation includes trouble-shooting tips. The lack of a single user manual reflects the fact that use of the tool to date showed that with a short introduction and training, and with the documentation that already exists, a formal user guide was not needed. In addition, there is a help desk.	This clarification has been made.
	Formula review: n the Formulas used section, it is not clear why ART and CPT were selected for review. This should be justified.	This justification is made in the methodology section at the beginning of the report.
	Formula review: In the Formulas used section, intervention quantities are not only calculated in the form of the number of patients to be treated. It can also be the size of the population to be covered, or the number of people (not necessarily patients) reached.	Text has been clarified as suggested.
	Formula review: Page 97, Figure 33. The starting point for the calculations of TB patients to be treated in this is the estimated incidence. Please, leave only "incidence" in the first box at the bottom (delete "or estimated number of new TB cases of pervious year"). To clarify what incidence means, it could be written Incidence i.e. estimated total number of new cases of TB.	Figure clarified.
	Formula review: On p97, second paragraph. TB is not easily prevented by immunization. BCG is a relatively ineffective vaccine. The important point is that transmission can be reduced by prompt treatment using recommended drug regimens.	Text has been clarified as suggested.
	Formula review: In the Intervention subsection, it is ART and CPT for HIV+ TB patients, not HIV+ patients.	Typo has been corrected.
	Formula review: p98. Better to say that the tool "explains that this value reflects all necessary inputs…" not that it "says that". Please remove the statement that "there is no way to verify this". As the tool explains, the data come from UNAIDS and can thus be verified with UNAIDS. This also applies to the default values that come from WHO/HSS or WHO/STB databases.	Wording has been changed as suggested.
	Formula review: p98, second paragraph. It is NOT TRUE that "the tool does not calculate the intervention cost of individual activities like ART and CPT". The reviewers have unfortunately looked only at the "quick method" which does not calculate the cost of individual activities. However, the "detailed method" does calculate the cost of individual subcomponents of the main intervention (in this case ART and CPT are part of the intervention "collaborative TB/HIV activities"). The use of the "quick estimate" by the reviewers does not allow for a review of many formulae, as in the quick estimate no input data other than available funding are needed.	Note added to indicate our calculations were per the quick method, and that the detailed method does calculate the cost of individual subcomponents of the main intervention.
	Formula review: Figure 34 needs a multiplication sign between quantity required and unit price (not -).	Figure corrected.
	Formula review: In the third paragraph of p98, it needs to be clear that the user must enter the available funding - it is not automatically calculated. The funding gap is automatically calculated based on the total costs and the available funding.	Clarification incorporated in body of text.
	Formula review: p99. In the conclusions, the summary of total costs is not only according to generic cost categories used by the Global Fund. Please list the other summaries that are provided, especially as the summary according to the generic cost categories of the Global Fund is not the most important of the summaries.	We have listed other summaries provided.

From	Comment	Response
	Experience using the tool: SDA needs to be explained. It is likely that most tools would need some technical assistance as well as training, but this is only said for the TB tool because users provided feedback (5 of the 13 questionnaires), is there feedback from users on the other tools? This should be noted. The tool has been used by many more countries that those listed. There are 35 countries in Africa who have used the tool, plus at least 2 in SE Asia, 3 in the W. Pacific region, 5 in the Eastern Mediterranean region, 1 in Europe and more than 5 in Latin America. The comment that "one user would like to have unit costs available as default data" is misleading, because the tool includes a lot of default unit cost data.	SDA has been spelled out and additional countries in which tool has been used has been added. Developers' response to the comment about unit costs has been included in the report.
	Section E (Value added): P136, Table 28. The name of the tool is Planning and Budgeting for TB Control, not TB Budgeting and Control, please correct.	Name has been corrected.
	Section E (Value added): P136, Table 28. Please change the actual text to: "This tool allows users to develop comprehensive plans and budgets for TB control that are in line with the WHO Stop TB Strategy and the Stop TB Partnership's Global Plan to Stop TB. It also allows users to calculate the available funding and funding gap by TB intervention, which is useful for advocacy and resource mobilization. It has been widely used, especially in Africa, with very positive feedback from users."	Text has been changed as suggested, with the exception of the last sentence. The value added section is not the place to discuss where the tool has been used and with what success.
	Executive summary, p i., better to say that tools have different "approaches", not a different "logic". A "different logic" may imply that some tools are logical and others are not. Text also needs to be changed for the same reason in the second paragraph of p8.	Wording has been clarified to say "approaches and logic."
	Executive summary, pii: a) It is mentioned that the reviewers often had doubts about a tool and that many of these were clarified by tool focal points. There has been no discussion with the developers of the TB tool since we reviewed the first report, which is probably why there are still mistakes and why we still have major concerns with the review and presentation of data. b) it is commented that each tool has unique terminology which "may limit users' abilities to achieve the maximum benefit from these tools". It is important to note that the terminology in tools may be very familiar to the intended users, even if it was not familiar to Bitran. c) There is a statement that "we are confident that this final report will help potential users in determining which tools might best suit their costing needs". This will not be the case unless the comparative assessment towards the end of the report is improved. For example, we feel that the presentation of the TB tool (complexity and ease of use) is misleading.	The terminology refers to non-intervention, tool-specific terminology that we believe is not familiar to intended users.
	p2: Not clear why malaria and TB prevention and treatment are combined in the list of interventions when e.g. HIV/AIDS prevention and treatment are shown separately. Suggest separating malaria from TB in the list	Malaria and TB are listed as separate interventions, and HIV/AIDS prevention and HIV/AIDS treatment have been combined into a single intervention: "HIV/AIDS treatment and prevention."
	p5: The first example in Table 2 is not very good. The first statement should be about the budget that is required, not the funding that has been allocated by the MOH. Page 5, E.g. it be added that "The programme needs US$ 1,200,000 to implement the child immunization program (this is the budget)…." And at the end you could add: "Therefore there is a funding gap of US$ 200,000".	Example has been reworded as suggested.
	p11 (Formula review): It is not clear what was done for the TB tool. Text needs to be added to make it clear which intervention was reviewed for TB, and the justification for the choice of intervention (from later on in the report, it seems that ART and CPT were reviewed. The TB/HIV section of the TB tool is among the more complex and not the most important for TB programmes; consultation with tool developers might have led to a better choice being made).	A table has been added listing which interventions were traced for which tools.
	p12: Is noted that there were only 13 responses to the "useful" questionnaire sent to users. Of these, we know that five were for the TB tool. This needs to be highlighted, and more weight given to the user feedback from the TB tool in the review of the TB tool. It should be clearly stated for which tools user feedback is available, and from how many respondents. There must be several tools for which no feedback from users is available.	A table has been added listing how many questionnaire responses were received for each tool.
	Table 4 p16: For the TB tool, remove the X from "with budget constraint", it is the row below "Coverage-guided decision making" and "Impact-guided decision-making". The TB tool does not include a budget constraint feature. Add a X to the line for Coverage in the Outputs section. In terms of tool use, it should be noted somewhere that the tool is available in English, Spanish, French and Russian.	Because the tool includes "budgeting & financing," Table 4 includes an X for "with budget constraint." Coverage is not an output but rather a choice the user makes. It has been noted in the tool use section that the tool is available in multiple languages.

From	Comment	Response
Karin Stenberg, April 10, 2008	Page 2 - suggest to separate malaria and TB in bullets.	Malaria and TB separated.
	Table 4 page 16: Please make the following changes for the Child health tool (CHOICE): Change the intended user of to read the same as for the malaria tool: "National policy makers and planners, as well as program-specific technical staff" and change the time duration to read "1-2+ weeks."	Intended user and time commitment required changed.
	Page 17 footnote appears to be no longer valid.	Footnote removed.
	Page 108. Malaria Cost Estimation Tool (CHOICE) -- first paragraph of section 2 needs editing.	First paragraph edited.
	Page 112 Quote: "Consider the case where there are 100 persons who need care, demand is 50% and the target utilization coverage is 80%. The formula above computes the number of persons receiving care to be equal to 40 persons (100 x 80% x 50%)". I would not agree with this. The target utilization coverage is population-based, meaning that supply and demand should both be adjusted so that a target utilization of 80% is reached. The programme activities such as IEC, training health workers, improving storage and supplies etc., would be aimed at increasing demand and supply accordingly.	We have removed the example and simply noted that the target utilization coverage is population-based.
	Page 115: CH tool - please remove the word "all" from the last sentence of section 1. IHTP is a quite different WHO tool.	Word removed as suggested.
	For section 2 on the CH tool maybe you could add a sentence somewhere that "The current version of the tool deliberately excludes immunizations because these costs are included in the cMYP tool." thanks.	Text added as footnote.
	p.116 second last paragraph. quote: "While coverage is not listed as an output, the intervention quantity produced can be translated into achieved coverage, although the results are not presented as such.". Actually, coverage is an input, as shown in Figure 46. Consequently it is not an output, although one output produced by the tool is the graphical representation of the coverage projections entered into the cells.	Text has been clarified to note that one output produced by the tool is the graphical representation of the coverage projections entered in STEP 1.
	For the CH tool maybe it would be useful to mention somewhere that default values are available and when available by country (e.g. for epi and demography), updated automatically depending on the country chosen?	Suggested text incorporated into "Understanding the tool" section.
	Page 119: where you say "13% of children live in endemic areas and 0% of children live in epidemic areas." please adjust this to the following: "For the (random(???))country chosen for this exercise, the default assumption is that 13% of children live in endemic areas and 0% of children live in epidemic areas." - this assumptions is adjusted depending on the country selected.	We have noted that this is the data for our example only.
	Figure 48 appears to be missing, and the paragraph below the Figure is incomplete.	Figure and text has been added.
	p. 119: you have previously stated that there are 15 (not)14 interventions	Typo corrected.
	page 120: quote: "From data entry to receiving results from the tool, the time commitment required is one to ten days." Please adjust this to read instead: "From data entry to receiving results from the tool, the time commitment required is one to two weeks depending upon the number of interventions and activities costed and the number of years for which targets are entered". thanks.	Wording changed as suggested.
	p.126 quote: "We divided the following complexity measures into three general groups:" yet there are only two groups listed.	Typo has been corrected.
	Table 25, p.127. A potential additional column may be cells for which there are defaults provided (versus empty cells)	When possible, it has been noted in the write-up of each tool whether default data is included and from where this data comes, or if the tool suggests data sources. However, we were not able to count how the inclusion of default data changed the cell count.
	p.128 section C. suggest to include a reference to Figure 51. Moreover it is not clear to me how to interpret Figure 51. Did you give tools either a 0 or 1 scoring? Or did you score on a sliding scale? If so what was the basis for scoring? Could you present a table as well here with the results?	Scoring and criteria are shown in previous sections.

From	Comment	Response
	Have you received any feedback from potential users on how useful they find the Tools Taxonomy section? I'm just wondering what the average user will get out of a named range count. Using "number of MDG interventions or MDG targets " as an outcome measure on the graphs is also problematic since it does not take into account how fully the MDG interventions or MDG targets are costed. However I realize that it would be challenging to come up with another measure. Maybe an alternative value on the y-axis for figure 53 could be "time required" or ideally skills required (though the latter is even more difficult to measure of course).	Receiving feedback from potential users on the taxonomy section was not part of this review. We have incorporated a measure of time commitment required into the taxonomy section.
	Stage 4 Bench marking - why not also compare default values used in tools, and recommendations on data sources.	When possible, it has been noted in the write-up of each tool whether default data is included and from where this data comes, or if the tool suggests data sources.
	The conclusion states that " In comparing related tools against one another, we have attempted to identify which tool might be most appropriate for a specific costing exercise by ..... summarizing each tool's usability." -- I would suggest to rephrase as follows: "In comparing related tools against one another, we have attempted to identify which tool might be most appropriate for a specific costing exercise by ..... classifying them according to their scope, complexity and user friendly aspects."	Wording changed as suggested.

Annex 9: Revisions Incorporated in the June 10th Version of this Report

From	Comment	Response
Eva Weissman and Stan Bernstein, May 21, 2008	Time to complete an application has been mis-represented for the RH Costing model and comparatively for the MBB model: The RH costing model is reported as requiring 4 months for completion. However, the statistic comes from an application in Indonesia in which 19 provinces were implemented. This must be explicitly noted.	We have added a footnote indicating that the 4+ months required to use the tool in Indonesia should be considered a special case since 19 provinces were included in the exercise.
	The report must provide information on the number of cells in the MBB model. At the moment the relative model complexities are not properly represented. On page 139 of the report there is no estimate of the number of inputs cells required for MBB. Why not?	We have included the number of cells that can be used to input data / make choices for the MBB and updated the relevant figures.
	Add a footnote to clarify the use of the male population as the base for computing need.	The calculations for the male condom are rather confusing as married women of reproductive age are used as the multiplier which is technically correct. To ensure consistency among methods, women are used as proxies for couples needing protection.

Other comments from Eva Weissman and Stan Bernstein (May 21, 2008) and Andrea Pantoja and Katherine Floyd (May 9, 2008) were received after the report was finalized on April 22, 2008 and thus will be included in a separate annex to this report.

Technical Review of Marginal Budgeting for Bottleneck Tool (MBB) for the Health MDGS

Final Report submitted to WHO and the Partnership for Maternal, Newborn and Child Health

April 22, 2008

This review was performed by PATH and supported jointly by WHO, UNICEF, the World Bank, and UNFPA, in collaboration with the Partnership for Maternal, Newborn and Child Health (PMNCH) and the Government of Norway.

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Executive Summary

This report provides a summary and analysis of the Marginal Budgeting for Bottlenecks (MBB) costing tool, a tool that analyzes health system bottlenecks to implementing high-impact public health interventions in order to meet the Millennium Development Goals (MDGs). Users—potentially policymakers, planners, and program managers involved in planning and forecasting the cost and impact of investments in health—select interventions to analyze from a provided list or may also add new interventions. Bottleneck categories are pre-set in the tool and were defined based on global literature. It is ultimately aimed at stimulating discussion around decision-making on planning approaches to improved service delivery and estimating the cost and impact of interventions as well as resources needed to overcome systemic bottlenecks. Specifically, the objective of the MBB costing tool is to assist planners in addressing the following questions:

- Which high-impact interventions can be integrated into existing providers/service delivery arrangements to accelerate progress towards the health and nutrition MDGs?
- What are the major health systems bottlenecks hampering the delivery of health services, and what is the potential for their improvement?
- How much additional financial resources are needed for the expected results?
- How much can be achieved in health outcomes by removing the bottlenecks?
- How much financing could be mobilized and how should additional funding be allocated?

Analyses of the tool evaluated its worksheets, the user guide, available technical notes, and select related formulas, as well as three specific public health interventions included in the tool (vitamin A treatment for measles, antenatal care, and syphilis treatment and screening in preventive pregnancy care).

The MBB assesses the performance of the health system by identifying bottlenecks at specific points in the delivery system for a set of "evidence-based, high-impact interventions" for health from which the user can select. System bottlenecks are represented by six coverage determinants including the availability of essential commodities, the availability of human resources, physical access, utilization (initial and continuous), and effective quality coverage. Stakeholders analyze baseline and frontier coverage levels that will reduce the health system bottlenecks for a wide range of interventions, including family preventive services, family neonatal care, infant and child feeding, preventive pregnancy care, HIV/AIDS prevention, immunizations and vitamin supplementation, maternal and neonatal care, management of illnesses, and a range of basic and comprehensive obstetric care.

A highlight of the MBB costing tool is its novel approach in assessing the entire health system and the impact of removing critical bottlenecks that hamper the delivery of services. An interactive process takes place where policymakers and program planners analyze and discuss the critical bottlenecks hampering health systems, while technical staff enter key data

parameters and run the model to reflect multiple scenarios for estimating impact, costs, and resource needs.

The MBB costing tool organizes the model results extremely well, generating finance and budget output that reflects sub-national health programs and priorities. The worksheets for estimating impact are computationally clear and easy to follow, and the calculations for estimating frontier coverage levels when bottlenecks are removed are mathematically sound. But there is also room for improvement. Particular constraints include the generalization of bottlenecks and obstacles across interventions when, in reality, vertical programming and inequities in access to infrastructure among various public health interventions do not allow for such generalization. Given the uncertainty around key variables and the potential for introducing error into the measurement of costs and impacts, the model would benefit from simpler methods for conducting sensitivity analysis, including easier manipulation of key variables to specify the ranges and distributions. Users could also benefit from greater clarity describing default values in some worksheet fields.

The MBB costing tool is intended to be introduced into a country setting with extensive technical assistance over a period of several weeks or months. Since the MBB costing tool requires input data and some modification to assumptions for a large number of variables across 11 Excel worksheets, the ease of use and friendliness of this tool will depend on the technical skill of the user. Suggestions for improving the tool's user-friendliness for a wider audience are included in this report. Specifically, the user guide would benefit from additional sections that provide guidance on estimating costs over time for long-term projections and performing sensitivity analysis at the country level to account for variability in the key model parameters. Since the model is complex and includes hundreds of input and output variables, it may be useful to develop a variable naming convention that would further enhance the application of the model for the core analysis and subsequent scenario and sensitivity analysis. The technical guide that accompanies the Excel model could be strengthened by providing rationale for some key variable definitions and assumptions related to the estimation of human resource needs and their associated costs.

Peer review also is recommended, which would include convening a technical advisory group to review and update key assumptions, including clinical indicators of intervention efficacy to reflect the current literature.

To date, the MBB costing tool has been used widely and can offer valuable perspective in addressing health system constraints. Informed decision-making and realistic cost considerations regarding these issues are crucial for successful uptake of public health interventions. Continued refinement will help tools such as the MBB costing tool remain important resources for identifying and overcoming such obstacles to ultimately reach the MDGs.

Background

Over the past few years, there have been numerous costing tools developed to estimate the cost and impact of strategies to reach the Millennium Development Goals (MDGs). In an effort to harmonize the different approaches to costing and budgeting health sector plans and activities, The Partnership for Maternal, Newborn and Child Health, with support from various donors[1] requested the firm, Bitrán and Asociados (B&A), to conduct a technical review of 13 selected costing tools. The steering committee for this activity required a "second opinion" of the analysis of the Marginal Budgeting for Bottleneck (MBB) tool. The MBB estimates the potential impact, resource needs, and costs and budgeting implications of country strategies to remove implementation constraints of the health system. It estimates marginal (incremental) resources required for overcoming those constraints. This report provides a complimentary technical review of the MBB costing tool, using the methodological approach developed by B&A, and described in detail in their final report.[2] Since this review only covers one tool, the methodological approach is limited to the technical review methodology that characterizes each tool. In the following report, we provide a description and overview of the tool, focusing on what questions the tool can answer. We provide an overview of the tool's conceptual model and discuss the general value of the tool. The final section analyzes the Excel spreadsheets and formulas for key input and output worksheets, and recommendations are suggested for improving the tool and the ease of use.

Description and overview of tool

The MBB tool is intended to be used by government policymakers, planners, and program managers involved in planning and forecasting the cost and impact of investments to remove health system constraints toward increasing the coverage of highly effective interventions to meet the MDGs for child and maternal health, nutrition, malaria, and HIV/AIDS interventions (MDGs 1, 4, 5, and 6). The tool has been designed to answer the following questions:

- Which high impact interventions can be integrated into existing providers/service delivery arrangements to accelerate progress toward the health and nutrition MDGs?
- What are the major health system bottlenecks hampering the delivery of health services, and what is the potential for their improvement?
- How much additional financial resources are needed for the expected results?
- How much can be achieved in health outcomes by removing the bottlenecks?

[1] World Health Organization (WHO), United Nations Children's Fund (UNICEF), World Bank, and United Nations Population Fund (UNFPA), in collaboration with the Partnership for Maternal, Newborn and Child Health and the Government of Norway.

[2] Bitrán and Asociados. Final Report, Technical Review of Costing Tools for the Health MDGs, December 31, 2007.

- How much financing could be mobilized and how should additional funding be allocated?

The MBB assesses the performance of the health system by identifying bottlenecks at specific points in the delivery system for a set of "evidence-based high impact interventions" for health and health-related MDGs from which the user can select. The health system bottleneck analysis is conducted on 12 tracer interventions identified by the user for three modes of delivery service: household- and community-level, population-based preventive services, and individual-oriented clinical services. The range of interventions includes family preventive services, family neonatal care, infant and child feeding, preventive pregnancy care, HIV/AIDS prevention, immunizations, vitamin supplementation, maternal and neonatal care, management of illnesses, and a range of basic and comprehensive obstetric care. Health system improvements are measured through six key factors: the availability of commodities, the availability of human resources, physical accessibility, initial utilization, continuous utilization, and effective quality services. The user selects which interventions are included, enters data for baseline coverage, and helps to define the new coverage targets or frontiers by providing the proportion of the bottleneck removal which takes into consideration the current situation, the feasibility of removing bottlenecks, and the availability of existing resources. The increase in coverage resulting from the difference between new coverage targets and baseline is combined with established estimates of efficacy for interventions from global literature. The model estimates the additional costs needed to remove bottlenecks and improve the health system to achieve new coverage targets/frontiers as well as the return in terms of mortality reduction.

Understanding the tool

The conceptual framework for the MBB has theoretical and practical underpinnings. Economic theory guides the notion of a health outcomes production process whereby health outcomes are a function of health outputs and inputs. Health outputs are in turn produced by health inputs. Practically, MBB is organized around the elements of the results framework (or expanded log frame approach) where resource inputs are translated into outputs, outputs into outcomes, and outcomes into impact. The resulting conceptual framework disaggregates the health outcome production process into a service production function and health production function. The service production function captures how inputs are transformed into health services, and includes costing and coverage indicators. The health production translates the health services into health outcomes, focusing on the epidemiological process, and concentrates on mortality reduction or a decrease in disease prevalence. The structure of the Excel-based costing tool is organized around 27 worksheets organized into four categories that loosely follow the conceptual framework. There are input sheets, model impact sheets, and output sheets. Some, but not all, data references and assumptions are provided in a fourth set of reference sheets.

In addition to the user selecting from a choice of evidence-based interventions, the user must also enter or validate existing default data in the model for country-specific health system parameters, epidemiology, coverage, input prices and resource quantities, financing, and fiscal space. Figure 1 highlights the information that the model requires. The model can be used for medium- and long-term planning, allowing the user to define the duration of the

planning period for either a scenario with a fixed time frame of three or five years for the medium term expenditure frameworks (MTEFs) and health sector development programs or longer term planning periods of up to 10 and 20 years. The tool uses coverage-guided decisions to generate information on additional budget information required to remove bottlenecks and increase coverage, as well as information on impact.

The tool uses built-in functions to analyze system bottlenecks to estimate coverage, impact, and marginal cost, and to translate marginal cost into yearly budget figures and funding requirements. Marginal costing underlies the cost methods in the MBB tool. Typically, marginal cost is estimated using statistical techniques to estimate the change in cost for a one unit change in output when there are multiple time series or cross-sectional data. Since the MBB is applied to a single country or setting, the tool estimates the incremental cost of increasing coverage of health interventions selected in the model in a two-step process based on a built-in, two-layered production function. In step 1, the unit cost of each input (*i)* to produce a unit of output is estimated. In step 2, the resulting unit cost of output is used to calculate the cost of a unit of outcome for a population of 1 million and then applied to the population (*n*) to estimate the total cost for each input to achieve an outcome. The incremental cost for each input is derived by subtracting the existing baseline expenditure for that particular input. The total incremental costs are aggregated over all inputs and over all determinants of coverage for all service delivery modes to estimate the total cost of overcoming bottlenecks in the health system. Costs can be disaggregated by investment and recurrent costs, and are estimated to account for specific costs to one intervention and joint costs shared across multiple interventions. Costing is based on identifying all inputs for given cost centers called service production units (SPU).

The estimation of marginal costs rests on numerous assumptions at all levels of the analysis, starting with assumptions around the quantities of human and physical inputs used to deliver services to derive unit costs for each input. In some cases, the assumptions are clearly described in the technical notes, while others are not. A clear justification of the estimate is not always obvious. The I-Economics input sheet allows the unit cost to vary over time. The user enters the percentage increase between the new and baseline costs for each individual resource item. There are approximately 500 cost items and three phases (columns N,O,Q on the I-Economics input sheet) where information needs to be entered in the current version of the model. If the user does not enter this information, the default is set at 100%, and prices are then constant over time. Currently unit costs do not change with coverage, and the model assumes constant returns to labor and other inputs in producing an additional unit of health output. While it is common to assume constant returns to scale for scaling up health interventions, this is not necessarily the case. Average costs may increase or decrease depending on cost structure and how efficiently interventions are delivered.[3] Evidence shows that average unit costs do vary across provinces given geographic, spatial, and economic variation within a country, and the model does allow for regional estimates within a country. When the model is applied at the country level, average unit costs must be used for simplifying model calculations. Unit costs can vary across various levels of the health system

[3] Bishai D, McQuestion M, Chaudhry R, Wigton A. The costs of scaling vaccination in the world's poorest countries. *Health Affairs.* 2006; 25(2):348-56.

(primary, secondary, and tertiary health facilities) within a geographic region.[4] The model also allows the user to enter different unit costs at various levels of the system; however, a single distribution cost factor is used for all three levels, which likely does not capture differential transportation costs at these levels.

The MBB estimates impact based on epidemiological models developed for the Lancet Series on Newborn Health and other models developed by Johns Hopkins University and the Bellagio Group. The expected impact on disease-specific mortality is a function of efficacy, affected fraction, and the increase in effective coverage for each intervention. Measures of efficacy are taken from the literature and provided in the reference worksheets.

Value added

The focus of the MBB costing tool is on alleviating health system bottlenecks and implementing high impact interventions to meet the MDGs. Relative to other costing tools, the focus on health system bottlenecks is a novel approach. There is value in policymakers and program planners working together to identify the most critical bottlenecks hampering the system. The process of working with the MBB costing tool can help policymakers and program planners assess health system bottlenecks and carefully consider how new coverage frontiers can be achieved based on country policy, MDG targets, or sector-wide approach (SWAp) targets. In addition, the reporting format of the financial and budget output sheets is consistent with use in SWAp at the country level. Given the importance of the process, it would be beneficial to have an additional MBB document that provides explicit questions (such as an interview or workshop guide) that the facilitator uses with policymakers and key stakeholders.

Users can select from a list of high impact interventions determined by a group of public health experts, and new interventions can be added, if needed. Since users select the set of high impact interventions as an input in the tool, the tool answers the question of which of the high impact interventions is most likely to accelerate progress towards the health and nutrition MDGs. The health system bottleneck categories are pre-set and derived from the literature. Thus, the MBB answers the question, "To what degree are the pre-set bottlenecks hampering delivery of health services?" The tool is then limited to these bottlenecks even if there are others that a country would identify. This approach may be fine, provided that the users are aware of the scope of the tool and its associated outputs. Application of the MBB tool in a specific country setting stimulates discussion about innovative approaches to delivery services in a planning process and this allows countries to input new cost estimates for innovative delivery. The user would need to change the parameters of the tool to get new estimates of the types of inputs and costs of new delivery strategies, including those for shared resources such as labor, incentives, and investment in capital goods. This reflects the larger process of how to use the MBB tool and interactions between stakeholders/users at the country level.

[4] Brenzel L, Wolfson L, Fox-Rushby J, Miller M, Halsey N. Vaccine preventable diseases. In Jamison DT, Breman J, Measham A, Alleyne G, Claeson M, Evans D, Jha P, Mills A, Musgrove PH, eds. *Disease Control Priorities in Developing Countries: Second Edition.* Oxford, UK: Oxford University Press; 2006.

A major step of the MBB costing tool is to analyze the health system bottlenecks that hinder service delivery. System bottlenecks are represented by six coverage determinants including the availability of essential commodities, the availability of human resources, physical access, initial utilization, continuous utilization, and effective quality coverage. Stakeholders analyze baseline and frontier coverage levels that will reduce the health system bottlenecks. Once coverage levels are determined, the model estimates the marginal costs to overcome the bottlenecks and achieve new performance frontiers. A major caveat of the MBB costing tool, which would likely hold with any costing tool, is that there are other factors that are likely to constrain health systems that cannot be effectively captured in a cost model. For example, countries may not have the capacity to absorb existing resources, let alone new resources for implementing interventions. Often, countries have a tremendous problem spending the money within an allocated time and purpose. While the model allows for a progressive increase in the various determinants of coverage over time, other supportive activities (with their own costs) must occur to increase absorptive capacity. This may be related to changes in good governance, investing in roads and buildings, and recruiting and training health workers.

The MBB tool scenarios can cover up to ten years and include the building of human resources. The tool includes pre-service and refresher training as part of human resource cost estimates. However it is difficult to evaluate if the model is able to capture the full extent of the resources that are needed to train and retrain health workers. A Lancet editorial has just addressed the issue of human resources and the impact on health in Africa. More than 4 million health workers are needed worldwide, and the situation is most acute in Africa, with 25 percent of the world's disease burden.[5] The developers mention that in an application of the MBB tool in Ethiopia, planners identified the need to increase human resources and were able to increase the number of health extension workers from a few hundred to 14,000 in two years. It would be useful to validate the MBB model by comparing costs to increase the number of health extension workers in Ethiopia to model predictions. Developers note that most doctors in Africa are trained in five years. The Lancet editorial indicated that one in four doctors trained in Sub-Saharan Africa work in the developing world and the rest have migrated elsewhere. These are complex factors and difficult to capture in any costing model.

While physical accessibility is important, financial and social accessibility have a very strong influence on uptake as well. The MBB implicitly captures financial and social accessibility in estimating the bottleneck between physical access and utilization. Financial and social access is among the reasons for low utilization of services. During the stakeholder meetings at the country level, the bottleneck analysis explores the causes of low utilization in the country context and planners propose strategies to overcome the obstacle. Strategies to increase utilization include any action that alleviates the social and financial access obstacles identified by the local health planners. Currently, the Excel model allows for performance incentives, demand stimulation activities, and subsidies to the poor, such as conditional cash transfers which can help overcome financial and social access for some segments of the population. It is not sufficient to budget for demand incentives, since it may be the coordination and managed distribution of the subsidy which is the critical bottleneck in

[5] Editorial. Finding solutions to the human resources for health crisis. *The Lancet.* 2008; 371(9613):623.

increasing the continuous and timely use of services. To this end, the MBB tool does include costs associated with district health management at all levels of the system, but these may not include all the costs associated with implementing a national subsidy program or other nation-wide approaches. Finally, as mentioned above, it may also be expected that the marginal cost of reaching the remote, the poor, and the excluded is higher than the average cost for a specific intervention, or even for subsidies to reach the poor.

Analysis

This section is based on a systematic review of the worksheets, selected formula for key worksheets, and a review of three specific interventions across the MBB tool. Annex 1 provides details on the review of the worksheets. The three specific interventions reviewed in detail in Annex 2 are (1) vitamin A treatment for measles; (2) antenatal care and (3) screening and treatment of syphilis as part of preventive pregnancy care.

Systemic bottlenecks to coverage

Changes in the coverage of baseline and frontier coverage indicators for the 12 tracer interventions are the key drivers of the model for both impact and costs. The choice of the specific coverage indicator is critical to the model; therefore, the justification to support the selection of these bottlenecks and their respective indicators should be documented more strongly. On page 17 of the technical notes (version 4.0), the developers state "…a comprehensive review of the literature on elasticity has been conducted showing the importance of distance, price, availability, and quality." The review they refer to should be summarized as an annex.

The bottleneck analysis focuses on a single tracer intervention for each 12 sub-packages of intervention and assumes that the tracer intervention captures the same factors that would inhibit other interventions in that specific service delivery mode. This is an important simplifying assumption that is likely to be challenged empirically given the unequal access to infrastructure and goods and services across and within the same types and or level of service, as well as the abundance of vertical programming in countries and the lack of coordination across these programs. An example of how the choice of target intervention may affect the model results can be found in the example of the detection and management of syphilis in pregnancy under preventive pregnancy care for population oriented services. The tracer determinant used for antenatal care is the percentage of women who receive ANC3+ ANC1 in the first trimester during their pregnancy. Unfortunately, this is not highly correlated with syphilis screening and treatment. In areas where ANC coverage has increased substantially, syphilis screening is not occurring because of the lack of infrastructure and skilled laboratory staff to implement lab-based tests. Furthermore, even in situations where woman are successfully screened, they are not always treated if they fail to return for results and treatment (see Annex 2 for more details).

As part of the bottleneck analysis, two sources of variability (error) are likely to enter the model that influence the impact and costs results. The first, related to the above discussion, is whether or not the right indicators have been selected to represent each bottleneck, and the second is how indicators are measured and whether local data are available. Country research

groups work with experts to estimate some of the indicators, as well as for point estimates for key variables. There is likely to be a lot of variation around the estimates, in terms of accuracy. Ideally, sensitivity analysis would be used to evaluate the results. Given the large number of parameters in the model, we felt that sensitivity analysis could not easily be conducted for both baseline and objective results. Tool developers indicate that sensitivity analysis is systematically conducted at the country level. The technical notes and the user guide should provide a separate section indicating how to conduct sensitivity analysis to accommodate choices of indicators and variability in measurement error of the selected indicators. They should distinguish between running different scenarios and conducting sensitivity analysis on key parameter estimates that have specified ranges and distributions.

The frontier calculations for the tracer interventions are calculated for the six bottleneck determinants using sound mathematical equations. However, the assumptions about direct and indirect coverage increases are not referenced. The tool developers have based these calculations on literature on elasticities. This concept of elasticity that is used in the model should be better explained.[6] The technical notes could help the user understand the reference to what are being called elasticities in the model (i.e., what are the underlying calculations, and provide the explicit references). Direct and indirect increases resulting from removing bottlenecks only apply to access, utilization and timely continuous utilization, and effective quality coverage. It is not clear why there are no indirect increases for commodities and human resources that may result from increasing access or utilization. For example, in a district hospital in Srikakulum, India, where a new HIV testing program was recently implemented, a few key staff were initially hired to screen and treat HIV positive patients. In addition to these new hospital based services, the program provides health communications and behaviour change at the community-level to increase awareness and use of HIV testing and treatment services. Patient load started at a low number and over a relatively short time period gradually increased, putting an increased demand on testing and treatment supplies, resulting in a need for additional health worker personnel to meet demand.

Empirically, it is possible for increased demand for services to impact the demand for essential commodities and indirectly human resources. Developers indicate that the cost of demand for essential commodities is linked to utilization and not to availability. However, it is linked to both utilization and availability. The tool's developers indicate that for human resources, there is an extensive body of literature showing that the supply driven demand is the most important factor in raising utilization (i.e., the number of c-sections depends on number of obstetric surgeons, not on number of women). While this may be true for some clinical services, it does not hold for other referral or population based clinical services and community-based services. The model does not allow for new gaps in human and physical resources indirectly caused by changes in the other bottleneck determinants. This implies that supply drives demand, but that increased demand for services does not influence supply factors.

[6] The standard definition of demand elasticity is the rate of change in the quantity demanded given a change in price (or a change in income).

Estimating Impact

In general the Excel worksheets for estimating impact (M-MDG1, M-MDG4, and M-MDG 5) are computationally clear and easy to follow. The worksheet M-MDG 6 requires additional explanation, as a number of cells have a zero value and some cells have no formula.

In M-MDG-1, the indicator named "the relative attributable underweight reduction to percent under-five (U5) children moderate malnutrition" was not taken directly from the list of high impact interventions, but rather the tool used the data on estimated residual impact (MDG-4) resulting from implementing selected high impact interventions (i.e., family preventive—water/sanitation/hygiene (WASH), family neonatal care, infant and child feeding, preventive care for adolescents and adults, preventive pregnancy care, prevention of mother-to-child transmission of HIV [PMTCT], preventive infant and child care, skilled delivery care, antenatal steroids for preterm labor, and antibiotics for preterm premature rupture of membranes [PPROM]. The estimates assume that low birth weight will be reduced by the same level of impact on U5 mortality, which is referred to as morbidity in the tool (i.e., the intervention is equally effective in reducing mortality and malnutrition). See Annex 1, Table 1 for specific comments on the indicators for MDG1. In general, some of the links to the impact of some interventions in MDG 4 seem irrelevant to malnutrition, or capture indirect interactions that affect child malnutrition. The interventions listed as proven interventions by outcome category in Table 4 are related to mortality reduction, not malnutrition reduction per se. Some interventions had no data on efficacy (blank), but it was unclear to the user whether data was not available or that intervention had not been proven in contributing to the MDG -4 (estimated impact of U5 morbidity with a 0 value). Nonetheless, they were linked to the calculation for the MDG-1.

For M-MDG 4(to reduce child mortality), some interventions have no data on efficacy (blank), but the user does not know whether data is not available or whether the intervention has not been proven in contributing to the MDG-4. If the intervention is not associated with the disease or health outcome, the efficacy should have a default value of 0 (not blank) or that intervention should not be included in the impact calculation for that specific disease. As mentioned above, these interventions were also linked to the calculation for the MDG-1, which can be misleading.

Changing the order (rank) of individual intervention results in different residual impact values for each intervention, but the residual impact for the total package remains the same. Therefore, the existing calculation method serves the purpose in looking at the impact on the MDG at the package level (not individual intervention level). However, if some single interventions either contribute no impact on mortality reduction (efficacy is 0 or blank) or were not selected to be implemented, why then is the model estimated for the whole service package?

For M-MDG-5 (to improve maternal health), it is not clear why the impact and residual impact of other causes of maternal mortality rate (MMR) are not used in calculating the total MMR reduction. It is, however, used in calculating the impact on lifetime risk reduction.

Like M-MDG-4, for both M-MDG5 and M-MDG6, it is unclear why interventions are included with the disease or health outcome, but includes blank cell formulas where a value should exist. In addition, on M-MDG6, for the HIV incidence rates, the residual impact is not included in the cell formulas.

Estimating cost, resources, and financing requirement

Marginal costs estimated in the model are a function of the price and quantity of the resource associated with changes between the baseline and frontier coverage indicators. Input prices and some quantities of resources need to arrive at unit costs are listed in I-Economics. M-Cost models the marginal costs associated with changes between the baseline and frontier coverage indicators and links with I-Economics, I-Health System Design, I-Epidemiology, I-Intervention, I-Coverage, and O-Coverage.

The MBB considers the integrated costs of strengthening systems for three service delivery modes. While it is technically possible to manipulate the model to evaluate scaling up a single intervention, this is not the objective of the MBB tool and the tool was not designed for the purpose of evaluating a single intervention in isolation of a package of interventions. However, in an effort to better understand the cost components incorporated in the model, we did try to follow three separate interventions (mentioned above) through the spreadsheet model. (Annex 2)

For almost all interventions, there are specific costs corresponding to inputs linked to that particular intervention. Systems costs refer to all other inputs used by more than a single intervention, and these include human resources, health infrastructure and other activities related to demand incentives, and promotion. Both system and specific costs depend on the quantity of inputs defined for the SPUs. The SPUs are different across the three service delivery modes. The SPUs are defined in the technical notes, and examples of the SPUs for family-oriented, community-based services, and population oriented schedulable services can be found in Annex 2. While the SPU simplifies unit costing for health service delivery, it also prevents a transparent breakdown of costs for a single intervention. For instance, ‘availability of human resources’ at the family-oriented based services includes community health workers, at the population oriented schedulable services this includes auxiliary nurses and midwives, and at the clinic services it includes general practitioners at the first referral level and specialists at the second referral level. In practice, the SPU required to scale up health services at any level is likely to be considerably more complex, with overlap between different types of human resources from a mix of service delivery levels. For instance, in addition to community health workers, auxiliary nurses and midwives can play an important role at the community-level. Similarly, for some population-oriented services, such as syphilis screening or PMTCT, other technical staff may be needed to support these types of screening services.

Given the MBB objectives and design, it was difficult to fully evaluate the total marginal cost associated with increasing the coverage of a given intervention. This is mostly because of the way shared system costs are estimated, and the difficulty in allocating shared costs to a specific intervention. For instance, M-Cost organizes costs by service delivery mode. Within

each mode, costs are then organized by each bottleneck determinant (stock of essential commodity, human resources, physical access, initial utilization, timely continuous utilization, and effective quality coverage [supervisory staff]). M-Cost does provide information on which specific cost in M-Cost is linked to a specific intervention. However, this is only available for direct costs and not shared costs. For example, it is possible to link the quantity and cost of the specific supply stock for the intervention and estimate the costs of utilization (initial and timely continuous). However, it is not possible to associate human resources and geographic access costs with specific interventions, since most of the resources are considered shared systems costs. For example, for the case of vitamin A measles treatment, the only specific costs that we could identify were the additional costs of the vitamin A capsules for treatment (investment and recurrent costs) and incentives for families. It was not possible to tease out any additional labor, transport, incentives, promotions, or capital costs directly linked to this intervention. Therefore, it is difficult to evaluate the costing methodology for a single intervention in isolation of the system as a whole. We note that it is *not* the objective of the MBB to estimate the cost and impact of a single intervention, but rather to look at the collective costs of meeting the MDG goals through a selection of proven effective interventions.

The input and output sheets are not set up to evaluate an intervention in isolation. However, the MBB costing tool worksheets are organized extremely well to generate finance and budget output in such a way that country-level planners can evaluate budgets and impacts defined by national or sub-national health programs and priorities, MTEFs, and the MDGs.

The technical notes (section 3.2, page 16, MBB version 4.0) give the impression that the tracer interventions are only applied for the health system bottleneck, and that these do not affect other parts of the analysis. However the health system bottleneck analysis results in the new coverage rates for the frontier for each tracer coverage indicator. And, these tracer coverage indicators are used in calculating the marginal costs for all interventions. The marginal cost for each intervention is a function of the difference between the baseline and objective input quantity SPU per 1 million population. The baseline and objective service production unit per 1 million population includes an efficiency adjustment which is the ratio of the relevant tracer intervention coverage rates. For example, for estimating the availability of a drug or consumable supply, the ratio would be availability coverage to effective quality coverage. This captures the wastage from availability to effective quality coverage (page 113, MBB Version 4.0). The tracer intervention coverage indicators are applied to estimating the marginal costs for all other interventions and for the relevant sub-packages. For example, the efficiency adjustment for estimating the drug supply costs for vitamin A capsules was 2.25 at the community level; 2.0 at the population based clinic services; and 24 at the referral clinical care level. The high efficiency adjustment factor at the referral clinical care reflects indicators for the tracer intervention of basic emergency obstetric care (i.e., the ratio of percent B-EOC facilities without interruption in stock of essential supplies and drugs [oytocics, magnesium sulfate, antibiotics] for the last 6 months to the percent complicated pregnancy treated in quality B-EOC facility). While this may be the appropriate ratio for B-EOC, it does not seem like an appropriate “wastage” factor when applied to vitamin A for the treatment of measles. The indicators must be selected carefully given their use in estimating costs as well as analyzing feasible bottleneck reductions.

In the module presenting data on health systems (I-Health Systems), the data reflects the national norm, not the current level of what is available at the national or sub-national levels. This could have the affect of overestimating or underestimating resource needs and hence marginal costs.

In M-Cost, under availability, the stock of all drugs and supplies are captured as an investment cost. Note that in many cases, the stock lasts for less than one year (which typically is not considered an investment good). Then, to capture the costs of utilization, the drug or consumable supply is estimated as a recurrent cost to capture the replacement cost of that good (for both initial utilization and continuous utilization). From a pure costing perspective, this makes little intuitive sense and does not reflect the way drugs and supplies are procured and distributed in most country settings. For instance, most vaccines, immunization injection devices, and vitamin A capsules are often distributed two times a year or quarterly, and rarely do medical stores have the capacity to store drugs and supplies beyond one year.

Please see the attached Annexes 1 and 2 for a review of the worksheets, selected formulas related to costing and financing for the MBB tool, and a review of three specific interventions.

Ease of use

Version 4.0 of the MBB tool consists of a single Excel workbook, containing 27 worksheets described above. Recently revised (November 2007) yet still incomplete, technical notes are available as well as a 67-page user guide dated August 2006. In addition, this reviewer received modules 2 (bottleneck identification), 3 (estimating impact), and 4 (costing) for a course designed for the MBB implementers at the country level. Each module had a guide for the facilitator, as well as a manual for participants. The guide book instructs the user which data can be changed or validated through a series of text boxes developed to move the user through the worksheets. Unfortunately, the user guide was not harmonized to the MBB version 4.0 of the tool we reviewed. In addition, the user guide, the technical notes, and the Excel tool were not harmonized to one another with respect to reference columns and rows within each worksheet. The user is required to input data or modify assumptions for 11 worksheets. The data entry cells are not consistently marked and easy to identify on each worksheet. To facilitate easier data entry, column and row labeling could be clearer in each worksheet, and more consistent use of powder blue color is needed, and should be exclusively used to identify where users need to enter data. Cell formulas are complex and do not take advantage of Excel's variable naming function. For most users, it will not be easy for them to understand what is going on in the cell formula calculation, without reference to the technical notes. If key parameters had variable names, this may help users navigate more easily, rather than always referencing cell formulas

The MBB costing tool is intended to be introduced into a country setting with extensive technical assistance over a period of several weeks or months. Despite the intensive training, it is unlikely that the tool can be adapted "easily" or continuously updated once it is modified for a specific country application. It can be adapted initially, requiring significant resources

of time and funding to compile data from government sources and to meet with key stakeholders and experts to apply Delphi methods for obtaining expert opinion on assumptions.

Conclusions and recommendations

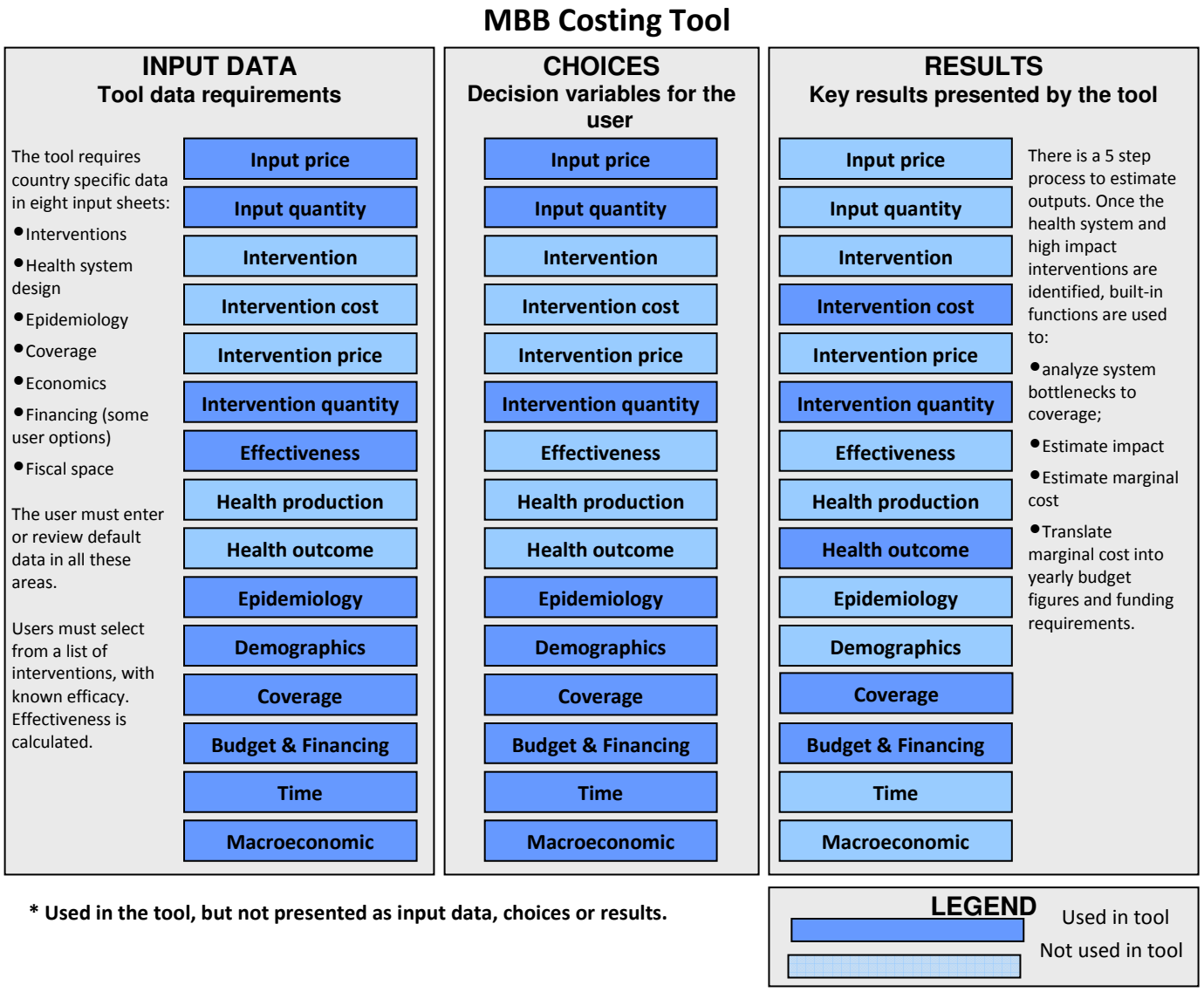
This report provides a comprehensive review of a very complex costing model, the MBB tool. The tool is part of a larger process that has benefits for strengthening in-country planning to assist country-level policymakers and program planners to consider health interventions to meet the MDGs. The tool helps users consider costs and impact of interventions, as well as trade-offs, constraints, and possible solutions in resource constrained settings. In its current form, the tool is challenging to use in the absence of significant technical support provided from the tool's developers and a team of support staff intended to work closely with country-level teams. We provide the following suggestions toward continued refinement of the tool, the user guide, and the technical notes for continued application of this important tool.

- The technical notes (MBB version 4.0) and user guide need to be further harmonized with one another and the Excel tool.
- The technical notes and the user guide should have a separate section indicating how to conduct the sensitivity analysis. They should distinguish between running different scenarios and conducting sensitivity analysis on key parameter estimates that have specified ranges and distributions.
- Since the model is complex and rests on hundreds of assumptions, it may be useful to consider a stand-alone assumptions worksheet where users could enter key data assumptions that affect multiple worksheets. This would centralize a number of parameters that are critical to multiple parts of the analysis. These could be more easily modified, facilitating the sensitivity analysis of results when key assumptions are changed. In addition, if variable naming were adopted, a dictionary of variable names and definitions could be provided as part of the technical notes.
- For some worksheets, better overview of their structure is needed. For example, M-COST needs an explanation of each column horizontally that precedes the calculations.
- For I-Economics, the user guide provides instructions for only entering unit costs for the base case. It would be helpful to also explicitly provide instructions and guidance for entering data for unit costs associated with Phase I, II, and III.
- For a given application, it is still very unclear how the number of workers and hours worked per health care worker are estimated as coverage increases for interventions. It would be helpful to have a section of the technical notes explain in clear language the conceptual framework around human resource use in the MBB model. More detail is needed for worksheet 0-HR & Infra in the user guide and in the technical notes.
- In the technical notes, more detailed variable definition and rational for some variables is needed. For example, for costing, what is the underlying definition of how human resource costs are estimated? In addition, how do subsidies fit into total

costing and where? The performance-based incentives and monitoring are based on time of the health worker, as defined on pages 82-84 and 91-92 of the technical notes. Demand simulation also requires time spent by community members or time spent by family for specific interventions (pages 84-85). For these variables, each variable should be measured in the same unit for easier comparability and comprehension of what is being measured (i.e., time spent per activity multiplied by wage per unit time, calculated on a yearly basis). Time needs to be clearly described and its formula in the spreadsheet consistent with that definition. If this is not possible, clearly explain when costing a visit makes more sense than costing the hours used for a visit or session.

- The model provides default values for clinical indicators such as intervention efficacy and specific indicators to assess coverage of high impact interventions. It would be useful to have these reviewed by the appropriate clinical experts, since some values and indicators are not consistent with current literature. A regular review process needs to be incorporated.
- The MBB tool has been used in a number of country applications and continues to be modified on a regular basis. Given the widespread use of this tool, we recommend that the tool developers gain consensus on the model structure and assumptions through a peer-reviewed process. This might include both a review by a technical advisory group, as well as publishing the model and results for a specific country application in a peer-reviewed journal.

Figure 1: MBB Costing Tool data requirements



Annex 1: Analysis of impact, costing, and financing worksheets and formula review

Table 1: Review of M-MDG1- Model output: Relative attributable underweight reduction to % U5 children moderate malnutrition

Intervention	Comments	Indicator – What is the source of these data?
Adequate Infant Feeding	Based on high impact interventions (infant and child feeding, breast feeding for children 0-5 months)	Based on timely continuous utilization: % of children aged 6-9 months receives breast milk and complimentary feeding
Prematurity prevention	Not directly from the list of high impact interventions but used the data on estimated residual impact (MDG-4) resulting from implementing selected high impact interventions (family preventive/WASH, family neonatal care, infant and child feeding, preventive care for adolescents and adults, preventive pregnancy care, PMTCT, preventive infant and child care, skilled delivery care, antenatal steroids for preterm labor, antibiotics for P/PROM); assuming that LBW will be reduced by the same level of impact on U5 mortality, which is referred to as morbidity in the tool (i.e., equally effective in reducing mortality and malnutrition).	% U5 children moderate malnourished (weight for age <2SD); % newborn low birth weight (NBLBW)
Diarrhea prevention	Not from the list of high impact interventions but used the data on estimated residual impact (MDG-4) resulting from implementing selected high impact interventions (family preventive/WASH services, breastfeeding for children 0-5 months, PMTCT, rotavirus immunization, family planning, folate supplementation, preventive pregnancy care); assuming that LBW will be reduced by the same level of impact on U5 mortality, which is referred to as morbidity in the tool (i.e. equally effective in reducing mortality and malnutrition).	% U5 children moderate malnourished (weight for age <2SD); # episode of diarrhea per under five per year

Pneumonia prevention	Not from the list of high impact interventions but used the data on estimated residual impact (MDG-4) resulting from implementing selected high impact interventions (family preventive/WASH services; family neonatal care; preventive care for adolescents and adults; preventive pregnancy care; PMTCT; Hib, HepB, Yellow fever, Meningitis, and pneumococcal immunizations); assuming that LBW will be reduced by the same level of impact on U5 mortality, which is referred to as morbidity in the tool (i.e. equally effective in reducing mortality and malnutrition).	% U5 children moderate malnourished (weight for age <2SD); # episode of ARI per under five per year
Measles prevention	Used the data on impact (MDG-4) resulting from measles immunization intervention (coverage frontier multiplied by pop efficacy); assuming that reduction in malnutrition results from reduction in number of measles episodes.	% U5 children moderate malnourished (weight for age <2SD); # episodes of measles per under five per year
Malaria Prevention	Not from the list of high impact interventions but used the data on estimated residual impact (MDG-4) resulting from implementing selected high impact interventions (family preventive/WASH, family planning, iron folate supplementation, skilled delivery care, antenatal steroids for preterm labor, antibiotics for P/PROM, preventive pregnancy care, PMTCT, IPT for children); assuming that LBW will be reduced by the same level of impact on U5 mortality, which is referred to as morbidity in the tool (i.e. equally effective in reducing mortality and malnutrition).	% U5 children moderate malnourished (weight for age <2SD); # Malaria episodes per capita/year in under fives
HIV/AIDS prevention	Not from the list of high impact interventions but AIDS prevalence in under 5 years was derived from the data on estimated reduction of HIV prevalence in 15-49 years (MDG-6)	% U5 children moderate malnourished (weight for age <2SD); AIDS prevalence in under 5 years
HIV prevalence in 15-49 years	Not from the list of high impact interventions but attributable underweight reduction was calculated from HIV prevalence in 15-49 years (MDG-6)	% U5 children moderate malnourished (weight for age <2SD); HIV prevalence in 15-49 years

Incidence of neonatal sepsis	Not from the list of high impact interventions but used the data on estimated residual impact (MDG-4) resulting from implementing selected high impact interventions (family preventive/WASH, family neonatal care, infant & child feeding, preventive care for adolescents and adults, preventive pregnancy care, PMTCT, preventive infant and child care, skilled delivery care, antenatal steroids for preterm labor, antibiotics for P/PROM); assuming that the change in the incidence (residual impact on MDG-4) through interventions will also impact malnutrition.	% U5 children moderate malnourished (weight for age <2SD);Incidence of neonatal sepsis
Asphyxia prevention	Not from the list of high impact interventions but used the data on estimated residual impact (MDG-4) resulting from implementing selected high impact interventions (family preventive/WASH, family neonatal care, infant & child feeding, preventive care for adolescents and adults, preventive pregnancy care, PMTCT, preventive infant and child care, skilled delivery care, antenatal steroids for preterm labor, antibiotics for P/PROM); assuming that the change in the incidence (residual impact on MDG-4) through interventions will also impact malnutrition.	% U5 children moderate malnourished (weight for age <2SD); Incidence of neonatal asphyxia

Table 2: I-Economics

I-Economics	Column(s) or row(s)	Comments
Additional notes on cost determinants for various inputs	J	Variables for performance subsidies and monitoring that are linked to health worker time allocation should be measured the same. The time unit and the wage per unit should be clearly defined and consistent across variables.

Table 3: I- Finance and budget

I-Finance and Budget	Column(s) or row(s)	Comments
Structure of the spreadsheet	B:E	Technical notes say there are drop down lists for columns C to R, however these are not enabled in this version.
Financing assumptions	P:U	What is the source of information for these? Input data by user, should be colored light blue.
Phase I: Total investment cost	V,W	Same as M-Cost BR or BT, may be useful for these cells to be linked, rather than recalculated.
Cumulative analysis Phase 2 and 3	5,6	For intermediate and indicative budget figures, labels need to be corrected and years more clearly labeled.

Table 4: M-COST

M-COST	Column(s) or row(s)	Comments	
Organization of M-COST	A:C	Hidden initially, difficult to understand worksheet without seeing these.	
	F:BA	These columns are intended to help user with links to other spreadsheets. This is not mentioned in the guide under section 5.4. The columns are actually a bit confusing.	
Aggregation of additional costs for all inputs	8, 31, 39, 66 etc. to 850, 851, 886, 887	The way the worksheet is set up, these are difficult to easily see. It would be useful to have a summary table in this worksheet.	Note: light blue is used for aggregation, which should be reserved for user input only.
Input quantity per SPU for baseline and objective	BI, BN, BY, CJ	This variable is either derived by a formula or a value, which has been assumed. In the manual there is no explanation for the assumed value. There is a reference to Annex D, which is not in the guide.	
SPU per 1% coverage	BJ, BO, BZ, CK	In some cases the SPU is pulled from the health systems worksheet and in other cases from the epidemiology worksheet. In some cases the there is a calculation to derive the SPU. The inconsistency across deriving the SPU for the list of inputs is confusing and should be located on a single worksheet or on a worksheet in one place, such as the I-Health Systems.	
Base SPU per 1 million inhabitants	BP, CA, CL	The cell formula is not consistent with what is explained in the technical notes. Need to explain how and why linked to MDGs.	Note: Minor, but formulas for Base and Objective should be ordered, following the same logic.
Objective SPU per 1 million inhabitants	BQ, CB, CM	The cell formula is not consistent with what is explained in the technical notes. Need to explain how and why linked to MDGs.	

Investment versus recurrent cost	BG, BL, BW, CH	Stocks of drugs are considered investment goods, although most countries order and distribute drugs and supplies periodically throughout the year. Percentage of year held is less than 1 year in assumptions.	

Table 5: O-Finance and Budget

O-Finance and Budget	Column(s) or row(s)	Comments
Output tables and graphs	AK:AZ	These must be used to generate graphs, but unclear what this is. Should be better labeled. Graphs need to be clearer, with percentages as labels as well.
Table 1	B13	Indicate per capita.
Table 5	155	Need to label per capita.

Table 6: O-HR and Infrastructure

O-HR and Infastructure	Column(s) or Row(s)	Comments
Description of O-HR and Infra		Technical notes are not harmonized with worksheet.
Unclear calculations	Between A and Y	What is this?
Total input quantities table		Explain how estimates are derived.
Total estimated number of workers table	AC:AG	Not clear how calculations are derived. Need explanation of calculations for baseline and each phase. Would be nice to better understand assumptions about labor at various levels and if HCW are working in facilities at capacity or below capacity.

Annex 2: Detailed review of three interventions

I. Family Community service delivery mode

SPU and target population for this level

Availability of essential commodities – Stock of drug and supply kits for each community
Availability of human resources – Community health worker
Physical access – Community health worker
Initial utilization – Families initiating healthy behaviors behavior
Timely continuous utilization – Families sustaining healthy behavior
Effective quality coverage – Supervised community health workers

Intervention A: Vitamin A treatment for measles

1. In I-Intervention, vitamin A occurs at all three of service delivery modes.
2. In I-Economics, the unit cost for vitamin A for treatment of measles is $0.30.
3. In O-coverage, the tracer interventions used to analyze the health system bottleneck are ORT, antibiotics for U5 pneumonia, basic emergency OB care for community based services, population oriented services, and individual oriented clinical services, respectively.
4. The tracer interventions affect the health system bottleneck analysis and in M-Cost, the base and objective SPU per 1 million population depends on these coverage rates of the tracer interventions through the efficiency adjustment factor. The efficiency adjustment factor or the availability coverage determinant is the ratio of the tracer intervention coverage rates for availability/effective quality coverage. This ratio is defined as "an adjustment factor to account for the system inefficiencies (i.e. wastages from availability to effective quality coverage). For costs related to the initial utilization coverage determinant this ratio is the baseline coverage of initial utilization to effective coverage of the tracer intervention, and so on.
5. Using the above method, the efficiency adjustment is 2.25 at the community level; 2.0 at the population based clinic services; and 24 at the referral clinical care level. The high efficiency adjustment factor at the referral clinical care reflects indicators for the tracer intervention of basic emergency obstetric care (i.e., the ratio of % B-EOC facilities without interruption in stock of essential supplies and drugs [oxytocics, magnesium sulfate, antibiotics] for the last 6 months / % complicated pregnancy treated in quality B-EOC facility). While this may be the appropriate ratio for B-EOC, it does not seem like an appropriate factor when applied to vitamin A for the treatment of measles.
6. In the case that an intervention is provided at multiple levels, the maximum coverage a country can achieve for the specific intervention is the coverage target rate at the family/community level. In the case of treatment of measles using vitamin A, there is no reason to suspect that coverage would be higher at the community level (through the HCW) than at a population based health post/health center.
7. In I-Epidemiology, the impact of vitamin A for treatment is modified by vaccination against measles, such that the number of episodes of measles per under-5 year old child is lower in

phase I (2007-2009) compared to the baseline estimates. This leads to negative estimates of costs in I-Finance and Budget. This may represent additional wastage in the system if already procured and stored, and not a cost saving.

8. Impact is estimated and attributed to MDG-4. Using Ghana as a country example, the vitamin A treatment has 46% efficacy, 75% affected fraction for an estimated effectiveness of 34%. Vitamin A treatment is included in M-MDG-5 and M-MDG-6, but without any estimate of impact (i.e., impact estimates are equal to zero). If already accounted for in M-MDG-4, suggest deleting in other MDG impact sheets.
9. In worksheet 0-HR and Infra, it is not clear which vitamin A supplies are for which of the interventions –maternal supplementation, child supplementation, or treatment for measles.

II. Population oriented schedulable services

SPU and target population for this level:

Availability of essential commodities – Stocks for vaccines/micronutrients /auto-disable syringes
Availability of human resources – Auxiliary nurses and midwives
Physical access – Functional health center/post providing outreach services
Initial utilization – Initial users of outreach services (number of pregnant women and infants)
Timely continuous utilization – Regular users of outreach services (number of pregnant women and infants)
Effective quality coverage – Supervised auxiliary nurses and midwives

Intervention A: Antenatal care—Effective coverage indicator is % women who receive ANC3 + and ANC 1

1. Not clear what this is, and cannot identify the inputs of this intervention in terms of labor, medical supplies (tape measures, scales, stethoscope, etc) or other cost centers. These would fall under input items lumped into human resources and physical access. Hard to evaluate if cost methodology is correct, since explicit description of this intervention is not clear. Assume it is only the visit where women are seen by auxiliary nurse or midwife. Currently assumes that there are no additional drugs or supplies used for these visits separate from the other antenatal care activities listed in the cluster of interventions (i.e. list of calcium supplementation, tetanus immunization, deworming, screening asymptomatic bacteriuria, screening and treatment of syphilis, screening and treatment of iron deficiency anemia, IPT and balanced protein energy supplements).
2. I-Economics and M-Cost—could not find any direct costs associated with the generic 'antenatal care.' Assume therefore, that all costs are considered shared costs.
3. Antenatal care is only at the population-based level, and not at the community-based level, yet community based interventions are being used for antenatal care.[1]

[1] Bhutta, Zulfiqar A.; Darmstadt, Gary L.; Hasan, Babar S; Haws, Rachel A. Community-Based Interventions for Improving Perinatal and Neonatal Health Outcomes in Developing Countries: A Review of the Evidence. *Pediatrics.* 2005; 115(2): 519-617.

4. Like other interventions in the MBB costing tool, such as the 'Treatment of measles with vitamin A,' antenatal care takes place at all levels of the system, including individual oriented clinical services and often at the district hospital. For many rural women, district level hospitals may be the only point of antenatal care. Critical to know the coverage of women receiving care at various levels—like what was done for vitamin A treatment of measles.
5. Women in developing countries living in urban areas and women in rural areas that attend district hospitals will often get a blood work up as part of their first trimester antenatal care visit. This includes hemoglobin to determine anemia, blood group, and HIV in some cases. It is unclear where this is included in the MBB costing tool.
6. Impact is captured in MDG 4, and contributes to asphyxia, NNMR, and IMR. It is not captured in M-MDG-1 or M-MDG-5 (maternal mortality). For the later, it can also be expected that antenatal care can also contribute to reduction in maternal mortality.
7. Overall, this was a difficult intervention to trace through the model.

Intervention B: Screening and treatment of syphilis—% women screened and treated with antibiotics.

1. This intervention is only provided at population-oriented schedulable services. By definition these are the functional health centers or posts providing outreach. In few countries syphilis screening takse place at this level. Current methods require that nurses or laboratory technicians draw blood and either have a lab to conduct RPR testing, or need to send samples to a centralized lab at district or provincial level for analysis. RPR tests require additional costs in drawing blood and transportation to central lab. Women are rarely treated on the same day they are tested using the RPR method, unless a rapid test is used (using venipuncture blood and ICS tests that give results in 20 minutes). The cost of the rapid test ranges from $0.40 to $1.00 and there are additional costs for drawing blood including, a lancet or micropipette tube.
2. For syphilis I-Economics – has only cost of syphilis test; does not include other costs including skilled laboratory labor, lab supplies for blood collection, maintenance of lab equipment as part of health post or transportation of samples to higher level reference facilities.
3. Penicillin treatment cost not included in cost either (one dose of penicillin is approximately $0.60 in Sub-Saharan Africa).
4. 0-Coverage – tracer indicators appear to be incorrectly entered. They are the same for each coverage determinant (rows 135:141). This does not affect estimates, but is confusing.
5. M-Cost – incorrect reference to I-Economics (rows AD:AE).
6. Tracer determinant used for antenatal care (% of women who receive ANC3+ ANC1 in first trimester during their pregnancy) is not highly correlated to coverage determinants for syphilis screening and treatment. We know that even in areas where ANC coverage has increased substantially, syphilis screening is not occurring because of the lack of

infrastructure and skilled laboratory staff to implement lab-based tests. In places where woman are screened, they are not always treated because they do not receive their results. Syphilis screening should be separate from syphilis treatment, as the coverage rates for these are not 1:1.

7. M-Cost is equal to cost of screening multiplied by 1.3 (distribution cost factor). The service production unit (SPU) for availability is the stock of 'syphilis test and drugs'. These should be treated separately as suggested above. Laboratory supplies move through different transportation channels than antibiotic drugs. The later are generally part of essential drug kits.
8. The service production unit (SPU) for initial and timely continuous utilization pf syphilis screening and testing is the number of pregnant women. The costs associated with alleviating this bottleneck capture the recurrent cost (replacement cost of stock) of 'syphilis tests and treatment supplies.' The indicators and tracer coverage indicators listed for initial utilization and continuous utilization would also have other inputs involved. However, there is no way to evaluate these as they relate to syphilis screening and know what these are (specific to syphilis screening and treatment per se) because of the way shared costs are estimated.
9. That is the extent of the costs that can be evaluated that are directly related to syphilis screening and treatment. No accounting for treatment with three doses of penicillin.
10. Impact is estimated in MDG4 for infectious disease, NNMR reduction, and IMR reduction. It should also be attributed to congenital outcomes.