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CROSSWALK ANALYSIS OF ANTIRETROVIRAL THERAPY COSTING MODELS AND THEIR POLICY IMPACT

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ACRONYMS

ART	antiretroviral therapy
ARV	antiretroviral
ASAP	AIDS Strategy and Action Plan
EPP	Estimation and Projection Package
HAPSAT	HIV/AIDS Program Sustainability Analysis Tool
IDU	injecting drug user
MBB	Marginal Budgeting for Bottlenecks
MSM	men who have sex with men
OI	opportunistic infection
OVC	orphans and vulnerable children
PACM	PEPFAR ART Costing Model
Peds 2010	Peds Target Setting Tool 2010
PEP	post-exposure prophylaxis
PEPFAR	U.S. President's Emergency Plan for AIDS Relief
PLWH	people living with HIV
PMTCT	prevention of mother-to-child transmission
RNM	Resource Needs Model
SAS	Statistical Analysis System
STI	sexually transmitted infection
TB	tuberculosis
UNAIDS	Joint U.N. Programme on HIV/AIDS
VCT	voluntary counseling and testing
WHO	World Health Organization

BACKGROUND

The World Health Organization (WHO) reports that antiretroviral therapy (ART) is now available to approximately 44% of individuals living in sub-Saharan Africa who require it¹. This increase in access to treatment is evidence of impressive scale-up over the past decade. However, much work remains to be done to achieve the goal of universal access. Although providing universal access to ART and mitigating the impact of the HIV epidemic is central to local government planning, many lack sufficient capacity to develop and manage their national strategic responses.

Mathematical models can assist policymakers in estimating the resources that are currently being spent on existing HIV programs, as well as plan for the scale of increase that will be necessary in the future. Furthermore, models can be used to help policymakers adjust current allocations in order to more effectively address the epidemic. Through the U.S. President's Emergency Plan for AIDS Relief (PEPFAR) and other initiatives, several different packages of modeling software have been developed to address different aspects of resource allocation. Focusing on software commonly in use, this crosswalk analysis evaluates and compares nine ART costing models, including model utility, data output, impact on policy decisions, and other pertinent information to inform HIV policymakers.

CROSSWALK METHODOLOGY

Published and unpublished literature on ART costing analysis was reviewed. The models themselves, when publicly available, were accessed and analyzed. Telephone interviews were conducted with key informants who had firsthand experience implementing the models. When possible, more than one key informant per model was interviewed in order to glean information from multiple sources. Following the telephone interviews, the ART Costing Crosswalk Analysis (see Table 1) was sent to each of the key informants for their input and validation.

SUMMARY

Nine models were found to be commonly implemented in sub-Saharan Africa in cost HIV treatment programs and were included in this crosswalk analysis. The nine models are the following:

- AIDS Strategy and Action Plan (ASAP) HIV/AIDS Costing Tool, Joint U. N. Programme on HIV/AIDS (UNAIDS)
- Goals Model, Futures Institute/Futures Group
- HIV/AIDS Program Sustainability Analysis Tool (HAPSAT), Health Systems 2020/Abt Associates
- Marginal Budgeting for Bottlenecks (MBB) Toolkit, U.N. Children's Fund/World Bank
- Peds Target Setting Tool 2010 (Peds 2010), Clinton Health Access Initiative
- PEPFAR ART Costing Model (PACM), The Centers for Disease Control and Prevention/Macro International

¹ World Health Organization. 2009. Towards Universal Access: Scaling up priority HIV/AIDS interventions in the health sector, Progress Report 2009. Available at http://www.who.int/hiv/pub/tuapr_2009_en.pdf (accessed September 2010)

- Resource Needs Model (RNM) HIV/AIDS, Futures Institute/Futures Group
- SIMCLIN, Clinton Foundation
- Spectrum, Futures Institute/Futures Group

These models have the ability to address slightly different needs—from costing operational plans, to identifying program bottlenecks, to estimating the resource needs for HIV drugs. The majority of the models measure financial costs, which can be defined as the amount paid by a program for its inputs. The costing data included in the models is mostly recurrent, meaning that the inputs consumed in the past year are repurchased in the following years. Most of the models also use a bottom-up costing approach in which the researchers estimate the unit costs of each input and then multiply this cost by the number of units delivered. The notable exception is PACM, which uses a top-down, economic approach that measures the total program expenditures to determine program costs and includes the value of inputs not directly paid for such as volunteer time, travel costs for service providers, and so forth (e.g., economic costs). More information on model methodology is detailed in Appendix A.

While each model was created for a specific purpose, each can also be used to answer a variety of questions. For example, the Goals model is used to calculate the relative cost-effectiveness of varying HIV interventions, but it also can answer the question, “What will be the impact of cuts in current levels of funding?” Likewise, HAPSAT was created to analyze the sustainability of a country’s comprehensive national portfolio of HIV interventions. It analyzes the financial and human resource requirements for achievement of various HIV policy targets over a five-year time horizon and evaluates the resulting resource gaps. However, HAPSAT can also be used to answer the question, “What are the key bottlenecks and when do they appear over time?” A list of the questions that could potentially be answered by each of the models is included in Appendix B.

PACM, SIMCLIN, and Peds 2010 cost only those program areas related to HIV treatment. However, several of the models cost a variety of HIV program areas, not solely the cost of ART. For example, MBB was designed to look at implementation constraints for all the Millennium Development Goals. ASAP, Goals Model, HAPSAT, RNM, and Spectrum include program areas related to HIV prevention, care, and support; orphans and vulnerable children (OVC); and nutritional support in addition to treatment. See Table 1, and Appendix C for a full list of program areas and data outputs included in each model.

These models have been used to influence policy throughout the world. RNM has been utilized in numerous countries, including Kenya and Honduras, to assist with costing national HIV strategic plans. UNAIDS currently uses RNM to develop its Global Resource Needs Estimates. These estimates provide UNAIDS with information on the financial gap between the available and the needed resources for ART. In addition, Spectrum is the foundation of epidemiological projections in 135 countries. This model analyzes HIV information to estimate the need for ART, as well as the cost of HIV care and treatment for a variety of opportunistic infections (OIs).

Table 1. ART Costing Models Crosswalk Analysis

CRITERIA/ MODEL	AIDS STRATEGY AND ACTION PLAN (ASAP) HIV/AIDS COSTING TOOL	GOALS MODEL	HIV/AIDS PROGRAM SUSTAIN- ABILITY ANALYSIS TOOL (HAPSAT)	MARGINAL BUDGETING FOR BOTTLE- NECKS TOOLKITS (MBB)	PEDS TARGET SETTING TOOL 2010 (Peds 2010)	PEPFAR ART COSTING MODEL (PACM)	RESOURCE NEEDS MODEL HIV/ AIDS (RNM)	SIMCLIN	SPECTRUM COSTING MODEL
<i>Organization(s) responsible for creating model software</i>	UNAIDS/World Bank	Futures Institute/ Futures Group	Abt Associates, Health Systems 20/20 Project	UNICEF/World Bank	Clinton Health Access Initiative	Centers for Disease Control and Prevention and Macro International	Futures Institute/ Futures Group	Clinton Foundation	Futures Institute/ Futures Group
<i>Main purpose of model</i>	Costing operational plans	Evaluating and planning of resource allocation	Evaluating sustainability by determining resource gap	Identifying implementation constraints of the health system	Calculating monthly pediatric ART enrollment estimates and ARV quantifications	Costing implementation of ART programs by PEPFAR partners	Costing strategic plans	Estimating resource utilization. Simulation model of an HIV care and treatment clinic.	Estimating the need for ARVs and costs for HIV care and other kinds of treatment including for OIs.
<i>Definition of costing principles</i>	Financial, bottom-up, capital, and recurrent	Financial, bottom-up, recurrent	Financial, bottom-up, recurrent	Economic, bottom-up	No direct costing element to the model, although ARV unit costs can be input to calculate ARV procurement costs.	Economic, top-down, capital, and recurrent	Financial, bottom-up, recurrent	Economic, bottom-up, recurrent	Bottom-up

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<i>Program areas included</i>	Prevention, treatment, and care (including provider-initiated testing, prophylaxis for OIs, ART nutritional support, laboratory monitoring, dental programs for PLWH, psychological treatment and support, palliative care, home-based care, alternative and informal providers, outpatient care, treatment of opportunistic infections, inpatient care, patient transport and emergency rescue), OVC, AIDS program development, human resources, mitigation, community development and research	Prevention (mass media, community mobilization, youth-focused interventions, interventions focused on sex workers and their clients, workplace programs, harm reduction for IDUs, interventions for MSM, condom provision, improving STI management, VCT, PMTCT, blood safety, PEP, safe injection, universal precautions). ART (laboratory tests for monitoring ART and treatment of OIs while on ART, care and prophylaxis in the absence of ART, diagnostic HIV testing, home-based care, palliative care, TB treatment, nutritional support, ART provider training)	Treatment, care, prevention, mitigation, ART, VCT, pre-ART monitoring, OI prevention and treatment, home-based care, palliative care, testing and directly observed treatment short-course for TB-HIV coinfection, PMTCT, behavior change prevention/abstinence, be faithful, use condoms, MARP outreach, youth-friendly services, mass media, OVC, economic and social support programs for PLWH, health systems, and shared costs	Demography, epidemiology, health services, intervention coverage, and costs are included. Includes all health-related Millennium Development Goals, but in HIV prevention and care: PMTCT (testing and counseling, ART, and infant feeding counseling); condom use; and cotrimoxazole prophylaxis for mothers living with HIV	Pediatric ART	ART, pre-ART, first line, second line, adult/pediatric, newly initiated/established, administrative/management, overheads, and investments are included	Prevention (mass media, community mobilization, youth-focused interventions, interventions focused on sex workers and their clients, workplace programs, harm reduction for IDUs, interventions for MSM, condom provision, improving STI management, VCT, PMTCT, blood safety, PEP, safe injection, universal precautions); ART (including laboratory tests for monitoring ART and treatment of OIs while on ART, care and prophylaxis in the absence of ART, diagnostic HIV testing, home-based care, palliative care, TB treatment, nutritional support, and ART provider training); OVC	ART (first line and second line), TB, pregnancy, toxicity, laboratory test, and human resources	OI treatment and service delivery costs, first and second line ARV treatment and service delivery costs, nutrition, TB prophylaxis, cotrimoxazole, and laboratory tests

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<i>Days of training required</i>	1 (7 days of further support offered)	3-4	1	5	less than 1 day	7	2	6-7	2 (if epidemiologist)
<i>Time frame to complete ART costing process</i>	2 weeks for a small to mid-sized country	1 month (3 months for whole model)	4-6 weeks	3-6 months	less than 1 day	8 months	1 (3 months for whole model)	6-7 days	2 days (if epidemiologist)
<i>Relationship with other models</i>	Fed by Spectrum and RNM	Fed by Spectrum and RNM	Fed by Spectrum	Fed by Spectrum	Stand-alone model	Fed by Spectrum	Can be used in conjunction with ASAP for Global Fund applications	Works with other Excel models and calculators	Spectrum is used as an input for Goals Model RNM, HAPSAT, MBB, and ASAP
<i>Countries Implemented</i>	Swaziland, Guyana, Kosovo, Malawi, Kenya, Ethiopia, Gambia, and Côte d'Ivoire	South Africa, Kenya, Ethiopia, Uganda, Lesotho, Ghana, Ethiopia, Namibia, Zambia, Mozambique, Rwanda, Malawi, Mali, Honduras, Mexico, China, Cambodia, and Ukraine	Zambia, Ethiopia, Côte d'Ivoire, Nigeria, Haiti, Kenya, S. Sudan, Guyana, and Democratic Republic of Congo	Angola, Benin, Burundi, Burkina Faso, Cameroon, Comoros, Côte d'Ivoire, Ethiopia, Ghana, Guinea, Guinea Bissau, India, Lesotho, Liberia, Madagascar, Malawi, Mali, Mauritania, Mozambique, Niger, Nigeria, Rwanda, Sierra Leone, Swaziland, Uganda, and Zambia	19 countries	Mozambique, Tanzania, Vietnam, and Ethiopia	56 countries between 2009-2010 including Ethiopia, Kenya, Uganda, Tanzania, Rwanda, Zambia, Mozambique, South Africa, Namibia, Ghana, Burkina Faso, Honduras, Thailand, Vietnam, Indonesia, and China	Rwanda, Ethiopia, Tanzania, Liberia, Bahamas, Jamaica, South Africa, Swaziland, China, and India	135 countries

CRITERIA/ MODEL	AIDS STRATEGY AND ACTION PLAN (ASAP) HIV/AIDS COSTING TOOL	GOALS MODEL	HIV/AIDS PROGRAM SUSTAIN- ABILITY ANALYSIS TOOL (HAPSAT)	MARGINAL BUDGETING FOR BOTTLE- NECKS TOOLKITS (MBB)	PEDS TARGET SETTING TOOL 2010 (Peds 2010)	PEPFAR ART COSTING MODEL (PACM)	RESOURCE NEEDS MODEL HIV/ AIDS (RNM)	SIMCLIN	SPECTRUM COSTING MODEL
<i>Skills needed to understand the findings</i>	No specialized skills. Different levels of detail are available for output reports, but they are generally straightforward.	Knowledge of HIV programs, statistics, unit costs, and epidemiology.	Knowledge of HIV programs, basic economics, and costing approaches. Ability to read tables and graphs. Competency using Excel.	Knowledge of economics, epidemiology, and statistics. Competency using Excel. Not intended to be self-explanatory or used without expert guidance.	Competency using Excel.	Knowledge of ART. Competency using Excel.	Expertise in demography, economics, and epidemiology. Requires a multidisciplinary team.	Knowledge of ART and epidemiology. Competency using SAS.	Knowledge of ART and epidemiology.
<i>Software package used</i>	Excel	Available as both Excel and Spectrum formats	Excel	Excel, Lotus	Excel	Excel	Excel	ACCESS, SAS. Outputs can be exported to Word or Excel; Word documents can be formatted for PowerPoint.	Windows-based, non-Excel custom software

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<i>Example of an impact on a policy decision</i>	In Swaziland, ASAP was used to pare down the original HIV action plan to focus on priorities and to prepare a realistic budget that reflected those priorities.	In Uganda and Lesotho, Goals Model assisted the government in the costing of their national strategic plans.	In Kenya, following the HAPSAT process the government began to focus more on sustainability by looking for alternative sources of HIV funding, and on quality by looking at loss-to-follow-up and adherence challenges.	In Mauritania, MBB analysis helped to support a 40% increase in Mauritania's health budget. In Mali, MBB analysis helped justify increased investments for prevention of maternal and child mortality.	In 19 countries, Peds 2010 has been used to forecast and quantify the pediatric ARV requirements for national HIV treatment programs. Some countries have revised the ARVs included in their national HIV treatment guidelines based on cost analysis from the tool.	In Mozambique, PACM led to a rationalization of the national HIV budget. PACM demonstrated a need to move additional funds into HIV treatment from prevention.	RNM has influenced policy in numerous countries, including Kenya and Honduras, by costing their national HIV strategic plans. UNAIDS uses RNM for their Global Resource Needs Estimates, which provide UNAIDS with information on the global financial gap between available and needed resources for ART.	In Rwanda, SIMCLIN helped to articulate the need for more “prescribing nurses” and specially trained counselors to support the national HIV program, which led to refocusing of health worker time through task shifting.	Spectrum is the foundation of epidemiological projections in 135 countries. It provides HIV data in a consistent way to estimate the need for ART.

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URL for downloading model and/or model website	http://web.worldbank.org/WBSITE/EXTERNAL/TOPICS/EXTHEALTHNUTRITION/EXTHIVAIDS/0,contentMDK:20269732~menuPK:5199822~pagePK:210058~piPK:210062~theSitePK:376471,00.html	http://www.futuresinstitute.org/pages/Goals.aspx or http://www.futuresinstitute.org/pages/spectrum.aspx	Model not yet publicly available for downloading, but available upon request. For more information visit http://www.hs20.org/ .	Model available on request.	Model available on request but not designed to be used without expert guidance.	Model not yet publicly available for downloading but available on request.	http://www.futuresinstitute.org/pages/ResourceNeeds.aspx	Manual is not currently available for downloading	http://www.futuresinstitute.org/pages/spectrum.aspx
URL for downloading user manual	Same as above	Same as above. Manual available in English, French, and Spanish.	Manual not yet publicly available for downloading, but available on request. For more information visit http://www.hs20.org/ .	Manual available on request in English with access to Help Desk support.	Manual available on request but not designed to be used without expert guidance.	Manual not yet publicly available for downloading but available on request.	Same as above	Manual is not currently available for downloading	http://www.healthpolicyinitiative.com/index.cfm?id=software&get=Spectrum
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MODEL LIMITATIONS

All of the models presented are inherently limited in some respect. Some are rather simplistic, such as Peds 2010, while other tools are exceedingly complicated, such as SIMCLIN. Still others are difficult to revise. For example, Spectrum does not allow one to easily view and alter the equations and was described by key informants as a “black box.” RNM does not incorporate effectiveness data and cannot provide health outcomes for the interventions included in the tool. Neither Goals Model nor RNM take into consideration macroeconomic conditions, such as the impact that a high proportion of workers living with HIV would have on a country’s economy. ASAP was described as cumbersome. It was originally designed to respond to five activities per function. The model now includes up to 99 activities. A more detailed list of model limitations is attached as Appendix D.

The training time required for a policymaker or program manager to learn to use the models varies from less than one day to one week, depending on the complexity of the model being used. Some of the tools can be implemented by a lay person without any specialized costing skills, while other tools, such as MBB and Peds 2010, are not intended for use without hands-on guidance from trained costing experts. The time required by a country to complete the entire cost modeling process varies, with PACM being the longest at an estimated eight months and Peds 2010 being the shortest, taking less than one day.

The majority of the models use Microsoft Excel software. Goals Model is available in both Excel and Spectrum formats. MBB uses both Excel and Lotus. SIMCLIN uses both Microsoft Access and Statistical Analysis System (SAS). Most of the models are fed epidemiological inputs from Spectrum.

SELECTED COUNTRY EXAMPLES

GOALS MODEL: KENYA

In preparation for its five-year HIV/AIDS Strategic Plan (2000–2005), the Kenyan government sought to determine the relative cost-effectiveness of a variety of HIV/AIDS interventions. The government had already identified a number of overarching objectives, including increasing access to care and treatment for people living with HIV (PLWH). The Goals Model was used to explore the impact of different levels of funding for care and treatment services on the national budget. Kenya’s Goals Model linked national budget line items to coverage of services and evaluated the impact of behavior change and prevention of new infections. From the Goals Model, a chart of coverage for key care and treatment services was produced that clearly displayed the impact of budget allocations on coverage goals. The model revealed that the cost of providing access to treatment to an additional 60,000 Kenyans living with HIV would be US\$76 million over the final two years of the strategic plan².

PACM: MOZAMBIQUE

In Mozambique, following implementation of PACM, there was a rationalization of the national HIV budget. Prior to implementation of the model, the distribution of funding between treatment and prevention initiatives was questioned. Data derived from PACM supported a need to redistribute funding into treatment. Based on these findings, the budget was revised and the government was able to justify the reallocation based on evidence from the PACM cost analysis.

² Forsythe, S. S., and M. T. Chepkwony. 2004. “Applying the Goals Model in Kenya to Allocate HIV/AIDS Resources Cost-Effectively.” Abstract of meeting at International Conference on AIDS. Bangkok, Thailand, July 11-16, 2004.

SIMCLIN: RWANDA

In Rwanda, data derived from the SIMCLIN model helped the government quantify the impact of human resource task shifting on a national level. The SIMCLIN model was used to estimate physician time saved when nurses who are able to prescribe antiretrovirals (ARVs) serve as the primary health care providers. The data revealed that implementing task shifting nationally would reduce the demand for physicians and increase the number of patients who initiate ARVs significantly. This data led to the refocusing of health care worker time through task shifting.³

CONCLUSION

This crosswalk analysis was developed to outline the uses, components, principles, and limitations of nine commonly used ART costing models. The evaluated models were found to be useful tools with the potential to guide HIV treatment decisions, as well as assist in the development of other HIV care and prevention programming in sub-Saharan Africa and around the world. Using this crosswalk analysis, policymakers and program managers may be better equipped to choose the most appropriate tool to answer specific policy questions and to effectively implement HIV care and treatment programming.

³ Chung, J., M. O'Brien, J. Price, and F. Shumbusho. 2008. "Quantification of Physician-time Saved in a Task Shifting Pilot Program in Rwanda." Abstract of meeting at International Conference on AIDS, Mexico City, Mexico, August 3-8, 2008.

APPENDIX A

MODEL METHODOLOGY

	Model Methodology
ASAP	<ul style="list-style-type: none">• Uses RNM and SPECTRUM Spectrum as inputs for basic epidemiology and demand data.• Data are gathered from situation analyses (epidemiological and behavioral surveys), structured interviews, focus groups, desk reviews, and meetings with key informants (procurement background, financial expertise).
Goals Model	<ul style="list-style-type: none">• Uses Spectrum as inputs for basic epidemiology and demand data.• Data are gathered from health ministry offices, health care facilities, donors, implementing organizations, and published reports.• Epidemiological data are collected from local studies, modes of transmission studies, and regional defaults.
HAPSAT	<ul style="list-style-type: none">• Data are gathered from health ministry offices, health care facilities, donors, implementing organizations, and published reports.• Costs of HIV treatment are calculated from the unit costs of components such as supplies, pharmaceuticals, laboratory tests, labor hours, facility operating costs, and management costs. Human resource needs are also estimated for each health worker cadre involved in HIV service delivery.
MBB	<ul style="list-style-type: none">• Epidemiological data is based on the UNAIDS costing tool.• Present levels of coverage are estimated using some of the following: household surveys, poverty maps, health information systems, facility surveys, geographic information systems, exit interviews, direct treatment observations, focus groups, etc.
PACM	<ul style="list-style-type: none">• Data are collected through retrospective program data review, including accounting records, expenditure logs, prescribing records, equipment inventories, and routine reporting forms.• Additional data are collected through key informant interviews to identify the programmatic activities to which resources were devoted and to develop a comprehensive description of the structure and functioning of the HIV treatment program at each facility.• Qualitative interview questions elicit the concerns, perceptions, and expectations of program staff members regarding program operating costs, scale-up, and sustainability.

RNM	<ul style="list-style-type: none"> • Suggests using Spectrum to obtain national-level demographic and epidemiological data required by the tool. • Provides some default data from published studies on the cost of prevention and care programs, but users are free to change some data if they have more accurate information. The user also inputs national data such as HIV prevalence information, demographics, and current coverage data.
Spectrum	<ul style="list-style-type: none"> • Uses default values from the UNAIDS Reference Group on Estimates, Modeling, and Projections. • Utilizes the Estimation and Projection Package (EPP) model developed by UNAIDS for its HIV incidence input assumptions. • EPP is used to estimate and project adult HIV prevalence from surveillance data.
SIMCLIN	<ul style="list-style-type: none"> • Relevant national or local data that have been published online or in journals, presented in scientific meetings, or gathered by country program staff is collected and used as default settings in the model. • To the extent that they are available, local data can be used to refine the default inputs.
Peds 2010	<ul style="list-style-type: none"> • Uses historical data (demand for drugs, ages of the patients, HIV epidemiological data) to estimate future demand. • The tool looks at the past two years of data and projects linear, optimistic, or pessimistic scenarios.

APPENDIX B

QUESTIONS ANSWERED

	Questions Answered
ASAP	<p>Costs strategic and operational plans. Examines the impact of different coverage levels, unit cost reductions, and various combinations of strategic plan activities to determine how best to operate within overall funding constraints.</p> <ul style="list-style-type: none">• What is the overall cost of achieving the strategic plan?• What are the unit costs?• What are the financial and human resource implications of various levels of task shifting?
Goals Model	<p>Calculates the relative cost-effectiveness of HIV/AIDS interventions.</p> <ul style="list-style-type: none">• How much funding is required to achieve the goals of the strategic plan?• What goals can be achieved with the available resources?• What is the effect of alternate patterns of resource allocation on the achievement of program goals?• What resources are required to expand coverage of prevention, care, treatment, and mitigation services to all who need them?• What goals can be achieved with the available resources?• How can resources be allocated most efficiently to provide the greatest benefit?• What is the gap between resources required and those available?• What will be the impact of cuts in current levels of funding?
HAPSAT	<p>Analyzes the sustainability of a country's comprehensive national portfolio of HIV interventions by looking at financial and human resource requirements for achievement of various HIV policy targets over a five-year time horizon and evaluating the resulting resource gaps.</p> <ul style="list-style-type: none">• How much does the current HIV program cost?• How are resources allocated across an HIV program?• What are expected future resource gaps for maintaining current or target volume of services?• What are the key bottlenecks and when do they appear over time?• What would be the implications of particular donors reducing or increasing their financial commitments?

MBB	<p>Identifies implementation constraints of the health system that should be removed to optimize expected health outcomes. Estimates the marginal/incremental resources required for overcoming those constraints and achieving better results. Relates these resources to the country’s macroeconomic framework.</p> <ul style="list-style-type: none"> • What are the major hurdles or “bottlenecks” hampering the delivery of health services, and what is the potential for their improvement? • How much money is needed for the expected results? • How much can be achieved with health outcomes such as mortality reduction by removing the bottlenecks? • What amounts of financing need to be mobilized and how should this funding be allocated and channeled?
PACM	<p>Estimates comprehensive costs of HIV treatment scale-up. Evaluates how costs change over time and what resources are needed from both the perspective of the country and of PEPFAR.</p> <ul style="list-style-type: none"> • What are the costs of supporting HIV treatment programs for ART and pre-ART patients over a five-year period? • How do these costs change over time? • What resources are required for scale-up both from PEPFAR and the country’s perspective?
RNM	<p>Calculates the total resources needed for prevention, care, treatment, and orphan support for HIV/AIDS.</p> <ul style="list-style-type: none"> • What are the resources needed for HIV/AIDS interventions in low- and middle-income countries? • What resources are needed for an expanded response to HIV/AIDS at the national level for prevention, care, treatment, and mitigation?
Spectrum	<p>Estimates ART need and impact.</p> <ul style="list-style-type: none"> • How many people require ART? • What is the unit cost and how much does it require? • What are the annual costs for ARVs, tuberculosis (TB) treatment, labs, OI treatment and prophylaxis, nutrition, and service delivery costs for the HIV national program? • How many infections averted, and what is the cost per infection averted?
SIMCLIN	<p>Simulates the natural history of patients in care or on treatment, tabulating resource utilization on a daily basis. There is also a more focused tool for making national-level ARV forecasts (GLOPRO—a set of inputs for 21 countries for ARV volume and distribution).</p> <ul style="list-style-type: none"> • What is the impact of alternative policies for resource allocation to provide the most effective treatment and quality care? • What is the impact of ART initiation or scale-up on clinic capacity or resource requirements? • What are the resource needs for a program? • What is the patient capacity of a program? • What is the impact of changes to treatment protocols on resource needs or patient capacity?

Peds 2010**Determines targets to be set for the number of pediatric patients on ART, and forecasts and quantifies corresponding drug requirements.**

- How many people will require ART in the upcoming year and what quantities of drugs should be procured to support them?
 - What if the scale-up is linear, optimistic (a defined percent increase over the linear), or pessimistic (a defined percent decrease below the linear)?
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APPENDIX C

PROGRAM AREAS AND DATA OUTPUTS

	Program Areas	Data Outputs
ASAP	<ul style="list-style-type: none"> Prevention, treatment, and care (including provider-initiated testing, prophylaxis for OIs, ART, nutritional support, laboratory monitoring, dental programs for PLWH, psychological treatment and support, palliative care, home-based care, alternative and informal providers, outpatient care, treatment of OIs, inpatient care, patient transport, and emergency rescue), OVC, AIDS program development, human resources, mitigation, community development and research 	<ul style="list-style-type: none"> Target levels for coverage intended by the strategic plan (including ARV, nutritional support, treatment of OIs, voluntary counseling and testing [VCT], prevention of mother-to-child transmission [PMTCT], testing, sexually transmitted infection [STI] management, blood safety, post-exposure prophylaxis [PEP], safe injection, and circumcision) unit costs Both general and at-risk populations are included Outputs include cost by benefactor, cost and expenditure by function, and cost by expenditure type The Global Fund Module converts the results to a format suitable for Global Fund proposals
Goals Model	<ul style="list-style-type: none"> Prevention (mass media, community mobilization, youth-focused interventions, interventions focused on sex workers and their clients, workplace programs, harm reduction for injecting drugs users [IDUs], interventions for men who have sex with men [MSM], condom provision, improving STI management, VCT, PMTCT, blood safety, PEP, safe injection, universal precautions) ART (laboratory tests for monitoring ART and treatment of OIs while on ART, care and prophylaxis in the absence of ART, diagnostic HIV testing, home-based care, palliative care, TB treatment, nutritional support, ART provider training) The mitigation model calculates the cost of interventions to support OVC 	<ul style="list-style-type: none"> Prevalence, incidence, infections averted, coverage of ART, OI treatment, palliative care, OI prophylaxis, and OVC Number of services delivered (intervention quantity)

HAPSAT	<ul style="list-style-type: none"> • Treatment, care, prevention, mitigation, ART, VCT, pre-ART monitoring, OI prevention and treatment, home-based care, palliative care, testing and directly observed treatment short-course for TB-HIV coinfection, PMTCT, behavior change prevention/abstinence, be faithful, use condoms, most-at-risk population outreach, youth-friendly services, mass media, OVC, economic and social support programs for PLWH, health systems, and shared costs 	<ul style="list-style-type: none"> • Three scenarios are modeled (maintain, scale-up, universal) • Outputs include key program impacts (AIDS death, PMTCT, etc.), financial resources required, human resource gap shortfalls • Total cost of HIV treatment services for pre-ART, palliative care, first line treatment, second line treatment, and pediatric ART • Total cost of HIV treatment services for a given policy by cost category (including health worker labor, ARV medications and supplies, laboratory tests, and overhead health worker time)
MBB	<ul style="list-style-type: none"> • Demography, epidemiology, health services, intervention coverage, and costs are included • Includes all health-related Millennium Development Goals, but in HIV prevention and care: PMTCT (testing and counseling, ART, and infant feeding counseling); condom use; and cotrimoxazole prophylaxis for mothers living with HIV 	<ul style="list-style-type: none"> • Outputs include marginal/incremental cost per input, per bottlenecks, and service delivery mode • Estimates costs, coverage, and calculates resource requirements (intervention cost) • Costs are also presented in budget format (budget and financing)
PACM	<ul style="list-style-type: none"> • ART, pre-ART, first line, second line, adult/pediatric, newly initiated/established, administrative/management, overheads, and investments are included 	<ul style="list-style-type: none"> • Total costs of supporting HIV treatment services by year/quarter, by cost component, by patient type (first line, pediatric, etc.), by program activity, and by funder; total cost and quantity needed for each ARV by quarter
RNM	<ul style="list-style-type: none"> • Prevention (mass media, community mobilization, youth-focused interventions, interventions focused on sex workers and their clients, workplace programs, harm reduction for IDUs, interventions for MSM, condom provision, improving STI management, VCT, PMTCT, blood safety, PEP, safe injection, universal precautions) • ART (including laboratory tests for monitoring ART and treatment of OIs while on ART, care and prophylaxis in the absence of ART, diagnostic HIV testing, home-based care, palliative care, TB treatment, nutritional support, and ART provider training) • OVC 	<ul style="list-style-type: none"> • Resources needed for HIV prevention, up to 10 types of care and treatment and orphan support, as well as program support (estimated as a percent of total direct program resources)

Spectrum	<ul style="list-style-type: none"> • OI treatment and service delivery costs, first and second line ARV treatment and service delivery costs, nutrition, TB prophylaxis, cotrimoxazole, and laboratory tests 	<ul style="list-style-type: none"> • The number of people who need ART, annual costs for ARVs, cost for TB, labs, OI treatment and prophylaxis, nutrition, service delivery costs • Benefit–cost ratios (total costs savings divided by total costs of the intervention) as well as cost- effectiveness measures such as cost per HIV infection averted, cost of death averted, child and total infections averted, treatment cost savings, net and total intervention costs, and net cost per infection or death averted
SIMCLIN	<ul style="list-style-type: none"> • ART (first line and second line), TB, pregnancy, toxicity, laboratory test, and human resources 	<ul style="list-style-type: none"> • Number of patients enrolled, alive, lost to follow-up, on ARVs, and in care • Resources required to provide care and treatment for the enrolled patients, amount of ARVs required for each formulation/dose • Number of laboratory tests required: cluster of differentiation 4 cell count/percent, full blood count or hemoglobin, full chemistry or liver function tests, viral load, and DNA polymerase chain reaction by month • Number of health workers in each category (physician, nurse, counselor, phlebotomist, pharmacist, laboratory technician, clerk)
Peds 2010	<ul style="list-style-type: none"> • Pediatric ART 	<ul style="list-style-type: none"> • Calculates monthly enrollment estimates, choosing one of four scale-up scenarios: linear, optimistic (a defined percent increase over the linear), pessimistic (a defined percent decrease below the linear), or completely user-defined

APPENDIX D

LIMITATIONS

	Limitations
ASAP	<ul style="list-style-type: none">• The Excel platform limits the model. It becomes somewhat unwieldy (up to 10 MB). Could be on a web-based platform.• You have to pay close attention to mapping when there are multiple activities related to the same function. It was originally set up to respond to 5 activities per function but at present is up to 99.• Determining the unit costs is sometimes difficult.
Goals Model	<ul style="list-style-type: none">• Requires a lot of data.• Does not incorporate macroeconomic conditions.• With input prices provided by the user, the tool assumes that the cost of inputs does not change over the years covered.
HAPSAT	<ul style="list-style-type: none">• The model is not currently available in the public domain.• It is difficult to measure how well a program is managed (e.g., generate accurate strategic information routinely, efficient organizational systems).• There is limited modeling of infrastructure/investment costs.• Unit costs do not change for time or coverage, there is no discounting of future costs, HIV incidence is not affected by modeled interventions (i.e., testing and ART do not impact transmission).• There is no discounting of downstream costs and benefits.• Not yet publicly available.
MBB	<ul style="list-style-type: none">• Assumes that spending is targeted to the more cost-effective health interventions.• It may not address risks from the political economy of health spending (e.g., that parts of the health system that are less cost-effective may be of particular interest to political elites).• Implicitly, it is assumed that these health care costs are financed by private spending, given the scarcity of government and aid financing.• Not publicly available.
PACM	<ul style="list-style-type: none">• Has a narrow focus on ART services.• Currently, the model does not include costs of related interventions (e.g., inpatient care, counseling and testing, PMTCT [except as it relates to women already on ART], and TB/HIV care).• Does not predict resource gaps.• Not yet publicly available.

RNM	<ul style="list-style-type: none"> • Does not incorporate effectiveness and cannot provide health outcomes for the interventions included in the tool. • Does not take into consideration macroeconomic conditions. • Prevention component provides a set of global default unit cost estimates, which the user is encouraged to modify for their own particular country.
Spectrum	<ul style="list-style-type: none"> • Can be somewhat of a “black box” in that you can not see the equations or change them easily.
SIMCLIN	<ul style="list-style-type: none"> • Narrow focus on ART services. • Does not include costs of related interventions (e.g., inpatient care, counseling and testing, PMTCT [except as it relates to women already on ART]). • A fairly complex model, which is not easy to learn and use. Making changes is difficult. Not a lot of people understand SAS. Some users question a model that they can not understand. There are several hundreds of pages of code. • Not publicly available.
Peds 2010	<ul style="list-style-type: none"> • A very simplified model. • No direct costing element built into the model, although ARV unit costs can be input to calculate ARV procurement costs. • Not publicly available.

For more information, please visit aidstar-one.com.

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