

# Resource Needs for HIV/AIDS:

Model for Estimating Resource  
Needs for Prevention, Care, and  
Mitigation

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The conceptual framework that is utilized here is based on a model initially developed by Lilani Kumaranayake and Charlotte Watts of the London School of Hygiene and Tropical Medicine, in a project financed by the World Bank, as well as on a model estimating the cost of care developed by Bernhard Schwartlander. The initial framework was further modified and described in a report by Rene Bonnel for the AIDS Campaign Team for Africa, World Bank. These initial models were developed further as part of a team that estimated the global funding requirements for HIV/AIDS for the United Nations General Assembly Special Session on HIV/AIDS in June, 2001, as summarized in a paper by Schwartlander et al. (2001).

The model was expanded further using approaches to costing from the Cape Town (CT) ARV Costing Model. The CT model was developed as part of ongoing work to anticipate the cost of antiretroviral treatment in the Western Cape Province, South Africa. Andrew Boule was responsible for programming and overall design. Demographic inputs were provided by Leigh Johnson. Fareed Abdullah ensured that the costing was appropriately adapted into a national model. Susan Cleary contributed conceptually to the costing framework and was responsible for the documentation of the model. Clinical inputs were provided by Douglas Wilson, Karen Cohen, Catherine Orrell and Gary Maartens. Taghreed Adam, Benjamin Johns, Tessa Tan Torres Edejer and David Evans provided technical input as well as country level data on unit costs. UNAIDS agreed for their country estimates of disease burden to be included. The Global Fund for AIDS, Tuberculosis and Malaria and the EIP programme at the World Health Organisation provided funding for the adaptation of the model for general use.

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# I. Introduction

## What is the Resource Needs Model?

The Resource Needs Model (RNM) calculates the total resources needed for prevention, care, and orphan and vulnerable children support for HIV/AIDS on a national level. The RNM can assist national-level strategic planning efforts by providing a tool and methodology to examine the financial resources needed to implement a variety of prevention interventions, care and treatment programs, and support for orphans and vulnerable children.

In 1999, the United Nations set ambitious goals for reducing incidence through the expansion of prevention efforts and increasing access to care and support for all people living with HIV/AIDS, first at the 21st special Session of the General Assembly, then at the special meeting of the Security Council on HIV/AIDS. In June 2001, a Special Session of the General Assembly was held to discuss further these important issues. The Resource Needs Model was utilized to estimate the costs of reaching the goals stated at the UNGASS on HIV/AIDS.<sup>1</sup>

The model contains three sub-models:

- The ***prevention model***, which calculates the cost of specific prevention interventions and allows the user to specify up to five additional priority populations such as prisoners, migrants, or truck drivers. The specific interventions are:
  - General population
    - Mass media
    - Community mobilization
  - Priority populations
    - Youth focused interventions
    - Interventions focused on sex workers and their clients
    - Workplace programs
    - Harm reduction for injecting drug users
    - Interventions focused on men who have sex with men
  - Service delivery
    - Condom provision
    - Improving STI management
    - Voluntary Counseling and Testing
    - Prevention of mother-to-child transmission
  - Health care
    - Blood safety

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<sup>1</sup> Schwartlander et al. (2001) "Resource Needs for HIV/AIDS," *Science* 292:2434-2436, 29 June 2001.

- Post exposure prophylaxis
  - Safe injection
  - Universal precautions
- The *care and treatment model*, which estimates the cost of care and treatment programs, including:
    - Anti-retroviral therapy (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
    - Tuberculosis treatment
    - Nutritional support
    - ART provider training
  - The *mitigation model*, which calculates the cost of interventions to support orphans and vulnerable children (OVC):
    - Educational support
    - Health care support
    - Family/home support
    - Community support
    - Administrative expenses

There are three main elements in the methodology of each sub-model:

- *Population target groups*
- *Unit costs*
- *Coverage or access targets*

The final expenditure for any specific program is a combination of these three elements. For the most part, each of these three elements is entered into the appropriate cell individually. Note that, for the care and treatment sub-model as well as for the VCT and PMTCT prevention interventions, it is possible to calculate the unit cost by estimating the quantity of the physical ingredients of an intervention (e.g. ARVs, diagnostic tests, health facility consultations) and multiplying this by the cost of each ingredient.

In addition to these three sub-models, different program-level costs can also be calculated either as a percentage of the total budget or as an absolute amount.

## Steps in Using the Resource Needs Model

There are five major steps involved in using the RNM:

1. **Form a national team to implement the model.** The model needs to be implemented by a national team that can be trained in the use of the model. This team will generally receive some initial training in the use of the model and then extensive training as the model is set up and used. Ideally the model will be implemented by a multi-disciplinary team composed of participants with various areas of expertise (demography, epidemiology, health finance, planning) representing different aspects of society (government, civil society, private sector, donors).
2. **Collect data on socio-demographic variables, health systems, HIV prevalence and condom use, and the costs of prevention and care programs.** The RNM contains default values for many of the variables used by the model. These values are derived from information obtained from published studies on the cost of prevention and care programs. This information can be used or replaced with locally available data. It also requires national data on the population size and distribution, adult HIV and STI prevalence, and sexual behavior (e.g., condom use).
3. **Enter data specific to RNM.** Once the data described in step 2 are collected for the relevant year, the data are entered into the RNM.
4. **Conduct workshops on resource needs.** In most applications the model will be used in a workshop with decision makers. The workshop will be an interactive session where participants will validate the assumptions that are important in the model, such as coverage targets and certain unit costs.
5. **Follow-up on workshop outcomes.** A variety of workshop outcomes are possible. Ideally the model is applied as part of the overall strategic planning process. In this case the model may continue to be used as goals are revised and funding plans are developed. The workshop may result in a new budget for the plan, or a commitment to raise additional funds to pay for essential programs. Reports and presentations may need to be prepared in order to disseminate the results to national decision makers, donors and program partners.

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## II. Using the Resource Needs Model

The Resource Needs Model (RNM) is implemented in an Excel workbook. It uses a number of tabbed worksheets. You can switch from one tab to the next by clicking on the tab with the mouse.

The main worksheets are:

- Title. Shows the title screen
- Menu. Shows the menu for prevention, care and treatment, mitigation and program support. Clicking on any of the labels in the worksheet will transfer you to the place in the model where the intervention is calculated. Clicking on "Menu" in any of the other worksheets will direct you back to the original Menu worksheet.
- Set-up. Contains the basic set-up information such as country name, national currency, exchange rate, and first year of the analysis.
- Input costs. Contains the basic input costs such as drugs, lab tests, and personnel time used to calculate costs at a disaggregated level for care and treatment, PMTCT, and VCT.
- HIV treatment. Contains the input screens to calculate unit costs for HIV treatment, including ART and OI treatment, using disaggregated input costs.
- PMTCT & VCT. Contains the input screens to calculate unit costs for PMTCT and VCT using disaggregated input costs.
- Prevention. Contains the inputs and calculations for all of the prevention interventions. If the "PMTCT & VCT" worksheet is used, the results from that worksheet are linked to this worksheet.
- Care and treatment. Contains the inputs and calculations for all the care and treatment interventions. If the "HIV treatment" worksheet is used, the results from that worksheet are linked to this worksheet.
- Mitigation. Contains the inputs and outputs for the interventions to support orphans and vulnerable children.
- Policy, mgmt, etc. Contains the inputs and outputs to estimate the resources needed for program support elements.
- Summary. Displays a table with all the results by intervention and year.
- Funding chart. Shows a stacked bar chart showing resources needed by intervention and year.
- Prevention funding chart. Similar to the Funding chart but for prevention only.
- Care funding chart. Similar to the Funding chart but for care and treatment only.

- Mitigation funding chart. Similar to the Funding chart but for orphans and vulnerable children only.
- Distribution chart. Displays a stacked bar chart showing the percent distribution of resources needed by component.
- Chart data. Displays the data used in the above charts.
- Socio-demographic data. Displays the definitions and units of observation for socio-demographic data used in the model.
- Demography. Contains the demographic input data derived from the Spectrum model.<sup>2</sup>
- Primary school population. Contains the input data for primary school population derived from the Spectrum model.
- Secondary school population. Contains the input data for secondary school population derived from the Spectrum model.
- Adult 15-49 summary. Contains the epidemiological input data for adults aged 15-49 derived from the Spectrum model.
- Adult 15+ summary. Contains the epidemiological input data for adults aged 15 and over derived from the Spectrum model.
- Children 0-14 summary. Contains the epidemiological input data for children aged 0-14 derived from the Spectrum model.
- HIV+ pregnant women. Contains the input data for HIV+ pregnant women derived from the Spectrum model.
- OVC summary. Contains the OVC input data derived from the Spectrum model.

Any of these worksheets can be accessed directly by clicking the appropriate tab at the bottom of the Excel display screen. Some worksheets may also be accessed by clicking the "Menu" button and then selecting the appropriate menu item.

## **Starting the program**

To start the Resource Needs Model, start Excel and then select "File", "Open" and select the Resource Needs Model file.

You may get a message similar to the following:

"Macros in this workbook are disabled because the security level is high..."

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<sup>2</sup> Available at [www.FuturesInstitute.org](http://www.FuturesInstitute.org).

This message relates to the worksheet labelled “Menu,” described above. The model has a menu page that will assist you in navigating through the various worksheets (see Box 1, below). You can return to this menu from each worksheet by clicking on the “Menu” button. If you receive the message above, it means that the menu will not work because macros are disabled. You can still use the program without the menu; however, it is better to allow the menu to operate.

**Box 1: Menu**

<b>Setup and input costs</b>		
<b>Title</b>	<b>Setup</b>	<b>Input costs</b>
<b>Utilisation of services and commodities by intervention</b>		
<b>Prevention</b> <b>PMTCT</b> <b>VCT</b>		<b>Care and treatment services</b> <b>ARV therapy</b> <b>Care and prophylaxis in the absence of ART</b> <b>Diagnostic testing</b>
<b>Coverage of population in need by intervention</b>		
<b>Prevention</b> <u>Priority populations</u> Youth focused interventions Sex workers and clients Workplace Injecting drug users Men who have sex with men Other vulnerable population 1 Other vulnerable population 2	<u>Service delivery</u> Condom provision STI management VCT PMTCT <u>Health care</u> Blood safety Post-exposure prophylaxis Safe injection Universal precautions	<b>Care and treatment services</b> ARV therapy Diagnostic testing Care and prophylaxis in the absence of ART  <b>Mitigation</b>
<b>Programme-level costs</b>		
<b>Operational Research</b> <b>Monitoring and evaluation</b> <b>Strategic communication</b> <b>Advocacy</b> <b>Procurement and stores</b>	<b>Human resources and facilities</b> <b>Training</b> <b>Deployment / Transport</b> <b>Programme management</b> <b>Laboratory equipment</b>	<b>Summarised</b>  Toggle visibility of sheets
<b>Outputs</b>		
<b>Summary of all resource needs</b>	Funding chart Prevention funding chart Care and treatment funding chart	Distribution of funding by category
► <b>Menu</b> / Setup / Input costs / HIV treatment / PMTCT & VCT / BB outputs / Prevention / Care and tre		

To do this, follow these steps:

1. Select “Tools” from the Excel menu.
2. Select “Macros” from the “Tools” menu.
3. Select “Security” from the “Macros” menu.
4. In the tab “Security level” select “Medium”.

5. Press "Ok". This will change you security level to allow Excel to run macros that are embedded within Excel workbooks.
6. Close the model by selecting "File" and "Close".
7. Open the model again by selecting "File" and "Open"

The menu button should now run correctly.

## Specifying the model configuration

The application of the Resource Needs Model can be customized for your application by setting the appropriate values in the "Setup" worksheet. Once you select this tab you will see a screen like the following:

### Box 2: Setup

	2007	2008	2009	2010	2011	2012
<b>Country</b>						
<b>Language</b>					English	
<b>Start year</b>				2007		
<b>Scale for currency</b>					Millions	
<b>National currency</b>					US\$	
<b>Currency to display</b>					US\$	
<b>National currency per US\$</b>					6	
<b>Demographic indicators</b>						
Total population	31,119,500	32,209,100	33,344,100	34,535,100	35,780,200	37,079,900
Male population 15-49	6,690,641	6,938,863	7,197,780	7,466,357	7,747,528	8,037,796
Female population 15-49	6,659,624	6,904,651	7,160,189	7,425,221	7,702,362	7,988,137
Male population 15-64	7,450,161	7,712,180	7,983,418	8,268,056	8,563,908	8,872,820
Female population 15-64	7,415,624	7,674,155	7,941,724	8,222,502	8,513,982	8,818,001
Crude birth rate (births/1000 pop)	50	49	49	49	49	49
Children of primary school age	7,332,335	7,576,581	7,838,503	8,121,550	8,425,910	8,751,293
Children of secondary school age	4,254,720	4,395,941	4,540,128	4,688,987	4,842,073	4,999,548
Adult HIV population	976,725	1,015,875	1,059,188	1,106,177	1,146,146	1,188,545
Paediatric HIV population	108,436	109,652	111,620	114,428	117,708	121,432
Newly symptomatic adults	74,857	75,884	78,161	81,515	85,668	90,085
Newly symptomatic children	27,540	27,816	28,194	28,718	29,278	29,944
Adult HIV Deaths	74,146	74,581	75,368	77,042	79,714	83,268
Paediatric HIV deaths	26,995	27,318	27,682	28,172	28,704	29,339
<b>Epidemiological indicators</b>						
	2007	2008	2009	2010	2011	2012

The light blue cells indicate inputs that are required, while the light green cells look up data from another sheet.

You should fill in each of the boxes with the appropriate data. A description of each item follows:

- Country. Type in the name of your country.
- Language. Select the language you want to use with the program by clicking in the blue cell next to the "Language" label, clicking on the down arrow and selecting the language.
- Start year. This is the first year of the estimates.
- Scale for currency. This sets the scale for the displays of resources needed. Click on the blue cell, click on the down arrow and select from the list box.
- National currency. The name of the currency used in the budget. Note that this could be US dollars.
- Currency to display. Select which currency you want to use for the output.
- National currency per US\$. Enter the exchange rate per US dollar. If the US dollar is selected as the National currency, this would be 1.

## **Entering demographic and epidemiological data**

The Resource Needs Model uses demographic data on the size and composition of the population and epidemiological data on the number of people infected with HIV and those progressing to late stage infection each year. It also uses estimates of orphans and TB patients.

These estimates are all available from Spectrum projections. Spectrum is a computer program developed by the Futures Group in cooperation with USAID, UNAIDS, WHO, UNICEF, United Nations Population Division and other organizations<sup>3</sup>. It produces estimates and projections that include key demographic and HIV/AIDS indicators. More details on how to use the Spectrum model to prepare these projections is available from the Spectrum manuals, particularly the DemProj<sup>4</sup> and AIM<sup>5</sup> manuals. These manuals and the Spectrum program can be downloaded from the web site of the Futures Institute at:

[www.FuturesInstitute.org](http://www.FuturesInstitute.org)

Once you have a Spectrum projection you can transfer the projection to the various worksheets required by the Resource Needs Model by following these steps:

1. Start Spectrum and open the projection file by selecting "File" and "Open".
2. In Spectrum, display the Demographic Summary table by selecting "Display", "Demography", "Summary", "Summary Demographic Indicators". Click the

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<sup>3</sup> John Stover. Projecting the demographic consequences of adult HIV prevalence trends: the Spectrum Projection Package. Sexually Transmitted Infections Volume 80, Supplement 1. August 2004, pps. i14-i18.

<sup>4</sup> John Stover and Sharon Kirmeyer. DemProj. Version 4. A Computer Program for Making Population Projections. Washington, DC: POLICY Project, 2005.

<sup>5</sup> John Stover. AIM Version 4. A Computer Program for Making HIV/AIDS Projections and Examining the Social and Economic Impacts of AIDS. Washington, DC: POLICY Project. 2005.

box "Scale table values" to remove the check mark, which will then display the data in levels. Then press "OK".

3. Select "Edit" and "Copy all" to copy the contents of the table to the Windows clipboard.
4. Switch to Resource Needs Model in Excel and select the tab "Demography."
5. Place the cursor on cell A1 (the top left cell). Then select "Edit" and "Paste" to paste the data in to the worksheet.
6. Return to Spectrum to display a table of the primary school population. Select "Display", "Demography", "Age Groups", and "Defined Age Groups". In the next screen, type in the lowest and highest ages for your primary school system. In addition, click on "Table" under "Chart Type", make sure there is no check mark in the box for "Scale table values", and then click "OK". Copy the table to the clipboard with "Edit" and "Copy all". Return to the Resource Needs Model and select the tab labeled "Primary school population". Select cell A1 and paste the data into the worksheet by selecting "Edit" and then "Paste."
7. Return to Spectrum to display a table of the secondary school population. Select "Display", "Demography", "Age Groups", and "Defined Age Groups". In the next screen, type in the lowest and highest ages for your secondary school system. In addition, click on "Table" under "Chart Type", make sure there is no check mark in the box for "Scale table values", and then click "OK". Copy the table to the clipboard with "Edit" and "Copy all". Return to the Resource Needs Model and select the tab labeled "Secondary school population". Select cell A1 and paste the data into the worksheet by selecting "Edit" and then "Paste."
8. Return to Spectrum and display the Adult 15-49 HIV Summary table by selecting "Display", "AIDS", "Adults 15-49" and "Adults 15-49 summary". Be sure to remove the check mark next to "Scale table values" if it is displayed. Copy the table to the clipboard with "Edit" and "Copy all". Return to the Resource Needs Model and select the tab labeled "Adults 15-49 summary". Select cell A1 and paste the data into the worksheet by selecting "Edit" and then "Paste."
9. Return to Spectrum and display the Adult 15+ HIV Summary table by selecting "Display", "AIDS", "Adults 15+" and "Adults 15+ summary". Be sure to remove the check mark next to "Scale table values" if it is displayed. Copy the table to the clipboard with "Edit" and "Copy all". Return to the Resource Needs Model and select the tab labeled "Adults 15+ summary". Select cell A1 and paste the data into the worksheet by selecting "Edit" and then "Paste."
10. Return to Spectrum and display the Child HIV Summary table by selecting "Display", "AIDS", "Children" and "Child 0-14 summary". Be sure to remove the check mark next to "Scale table values" if it is displayed. Copy the table to the clip board with "Edit" and "Copy all". Return to the Resource Needs

Model and select the tab labeled "Child 0-14 summary". Select cell A1 and paste the data into the worksheet by selecting "Edit" and then "Paste."

11. Return to Spectrum and display the HIV+ pregnant women table by selecting "Display", "AIDS", "Total population" and "Number of HIV+ pregnant women". Be sure to remove the check mark next to "Scale table values" if it is displayed. Copy the table to the clip board with "Edit" and "Copy all". Return to the Resource Needs Model and select the tab labeled "HIV+ pregnant women". Select cell A1 and paste the data into the worksheet by selecting "Edit" and then "Paste."
12. Return to Spectrum and select "Display", "AIDS", "Orphans" and "Summary by age". Be sure to remove the check mark next to "Scale table values" if it is displayed. Copy the table to the clip board with "Edit" and "Copy all". Return to the Resource Needs Model and select tab "OVC". Select cell A1 and paste the data.

Once these steps are completed you are ready to use the model.

## **Prevention Interventions**

To select any prevention intervention, just click the "Menu" button and select the appropriate menu item. The displays for most of the interventions are similar. Box 3 displays part of the screen for calculating the costs of an intervention for peer education for female sex workers.

The light blue cells indicate inputs that are required. The dark blue cells are figures that will be estimated by the model but you can replace the numbers with your own estimates if you prefer. The last line of each section shows the resources required for that intervention, by year.

Note that, after coverage for the initial year is entered, scroll to the right, and enter the target coverage level for the last year. Coverage rates for the cells between these two years are then calculated by the model.

The details of the inputs and calculations along with guidance on appropriate input values are given in Chapter III.

### Box 3: Prevention intervention, female sex workers

	2007	2008	2009	2010
<b>Annual resources required</b>	2,039	1,924	2,341	2,782
<b>Female sex workers</b>	2007	2008	2009	2010
Population size	# 280,000			
Annual growth rate in SWs	% 1.0			
Number of sex workers	280,000	282,800	285,628	288,484
<b>Coverage</b>				
% sex workers reached by intervention per year	10	12	13	15
% using condoms among those reached by intervention	50	52	53	55
% using condoms among those not reached by intervention	30	32	33	35
% of all condoms that are female condoms	5	5	5	5
<b>Unit costs</b>				
Cost per sex worker targeted	US\$ 78	US\$ 78.00		
Cost per male condom distributed	0.20	0.2		
Cost per female condom distributed	1.00	1.00		
<b>Results</b>				
Sex workers reached	28,000	32,993	38,084	43,273
Resources required	2.9	3.4	3.9	4.5

### Care and Treatment Interventions

Information for the HIV care and treatment worksheet is entered in the same way as for the prevention worksheet, described above, except that costs can be estimated in one of two ways:

1. They can be typed in directly into the "Care and treatment" worksheet, as was done for prevention interventions; or
2. They can be calculated using more disaggregated data.

This section of the manual briefly describes calculating costs in a disaggregated way, with further details of all care and treatment inputs available in Chapter IV.

There are three types of interventions for which disaggregated costs can be calculated:

- Care and prophylaxis in the absence of ART
- ART
- VCT and PMTCT

In most cases, the costing has two steps: (1) specifying the input cost of each ingredient (ART, lab test, etc), and (2) estimating the physical ingredients for each intervention (quantities of ART, quantities of lab tests, etc).

### Input costs

To specify the input cost of each ingredient, select “Input costs” from the menu. A screen like the one in Box 4 below will appear. In this worksheet, you can enter costs for drugs, laboratory tests, service delivery units (outpatient visits, inpatient days) and other consumables. Costs can be entered in local (L) currency or in US dollars (D) by clicking on any cell in the column labelled “Currency”, and selecting either L or D. You can type in any extra inputs that are not already in the worksheet in the appropriate column.

**Box 4: Input costs worksheet**

Tests	Currency	Cost per test	Description
FBC	D	6.35	
HB	D	1.08	
ALT	D	3.36	
Abbott determine	D	2.65	
Galfor	D	5.29	
Whitestar	D	3.97	
ELISA	D	5.29	
CD4	D	8.00	
Viral load	D	40.00	
PCR test	D	27.78	
Diff	D	6.35	
Creatinine	D	2.15	
Glucose	D	2.15	
Chol/TG	D	2.65	

Drugs	Currency	Annual cost	Short code	Description
AZT	D	129.00	Z	
3TC	D	58.00	C	
d4T	D	35.00	D	
ddI	D	252.00	I	
NVP	D	68.00	N	
EFV	D	345.00	E	
LPV/r	D	571.00	K	
TDF	D	450.00	T	
AZT/3TC	D	200.00	ZC	
d4T/3TC/NVP	D	140.00	DCN	
Bactrim	D	2.50		Annual cost of Bactrim
Formula milk	D	25.00		Annual cost of formula milk

Service delivery units	Currency	Cost per service	Description
ART visit	D	17.48	Visit to doctor for examination and medicines
Couns visit	D	3.00	Counselling session
Inpatient day	D	118.56	Inpatient day in secondary hospital
TB full course	D	613.38	Cost per TB case treated
Home-based care	D	3.00	Home based care
Palliative care	D	25.59	Palliative care
PMTCT visit	D	10.00	PMTCT component of antenatal visit
HIV visit	D	15.00	Primary care visit, pre-ART

Any drugs, tests or services that you specify in this sheet will be available for your use in later sheets. Note that it is important to provide a “short code” for ARVs. For individual ARVs, this must be one alphabet letter and for fixed dose combinations, the number of letters must correspond to the number of ARVs in

the fixed dose. For example, AZT/3TC would have two letters, such as ZC, and d4T/3TC/NVP would have three letters, such as DCN.

### HIV treatment

The ingredients of your HIV treatment package are all entered into the HIV treatment worksheet, which can be selected from the menu. There are four main categories of ingredients:

1. ARV regimens
2. Laboratory testing
3. Service delivery units
4. Other commodities

For ARV regimens, scroll to the section labelled “Regimens” (see Box 5 below). These rows allow the user to specify the proportion of patients on each ARV for the first line and second line regimens. You can specify 5 different first-line regimens and 5 different second-line regimens. Regimens are chosen by ticking boxes below the drop-down lists. You will also need to specify the proportion of your patients that are receiving each of the 5 regimens.

### Box 5: Specifying ARV Regimens

Everything below here is for calculating annual costs

Medicine				AZT	3TC	NVP	d4T	d4I	EFV	TDF	LPV/r	AZT/3TC	d4T/3TC/NVP	blank	blank
Code	Z	O	H	D	I	E	T	K	ZO	DGH	-	-	-	-	
Annual Cost (\$)	<6m	>=6m	Failing												
Regimen 1a	100.0%	100.0%	N/A	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
Regimen 1b	-	-	N/A	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
Regimen 1c	-	-	N/A	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
Regimen 1d	-	-	N/A	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
Regimen 1e	-	-	N/A	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
FL 1st 6 months net usage of ind. drugs	-	-	-	100.0%	100.0%	100.0%	-	-	-	-	-	100.0%	-	-	
FL > 6 months net usage of ind. drugs	-	-	-	100.0%	100.0%	100.0%	-	-	-	-	-	100.0%	-	-	
Regimen 2a	100.0%	100.0%	80.0%	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
Regimen 2b	-	-	-	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
Regimen 2c	-	-	-	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
Regimen 2d	-	-	-	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
Regimen 2e	-	-	-	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
SL 1st 6 months net usage of ind. drugs	100.0%	-	-	100.0%	-	-	100.0%	-	-	100.0%	-	-	-	-	
SL > 6 months net usage of ind. drugs	100.0%	-	-	100.0%	-	-	100.0%	-	-	100.0%	-	-	-	-	
Failing treatment net usage of ind. drugs	80.0%	-	-	80.0%	-	-	80.0%	-	-	80.0%	-	-	-	-	
net usage of ind. drugs	80.0%	-	-	80.0%	-	-	80.0%	-	-	80.0%	-	-	-	-	

Procurement, distribution and stock management 0%

HIV care in the absence of ART - # tests/year										
	FBC	Diff	Creatinine	ALT	Glucose	Chol/TG	blank	blank	blank	CD4
Undifferentiated	1	1	0	0	0	0	0	0	0	1

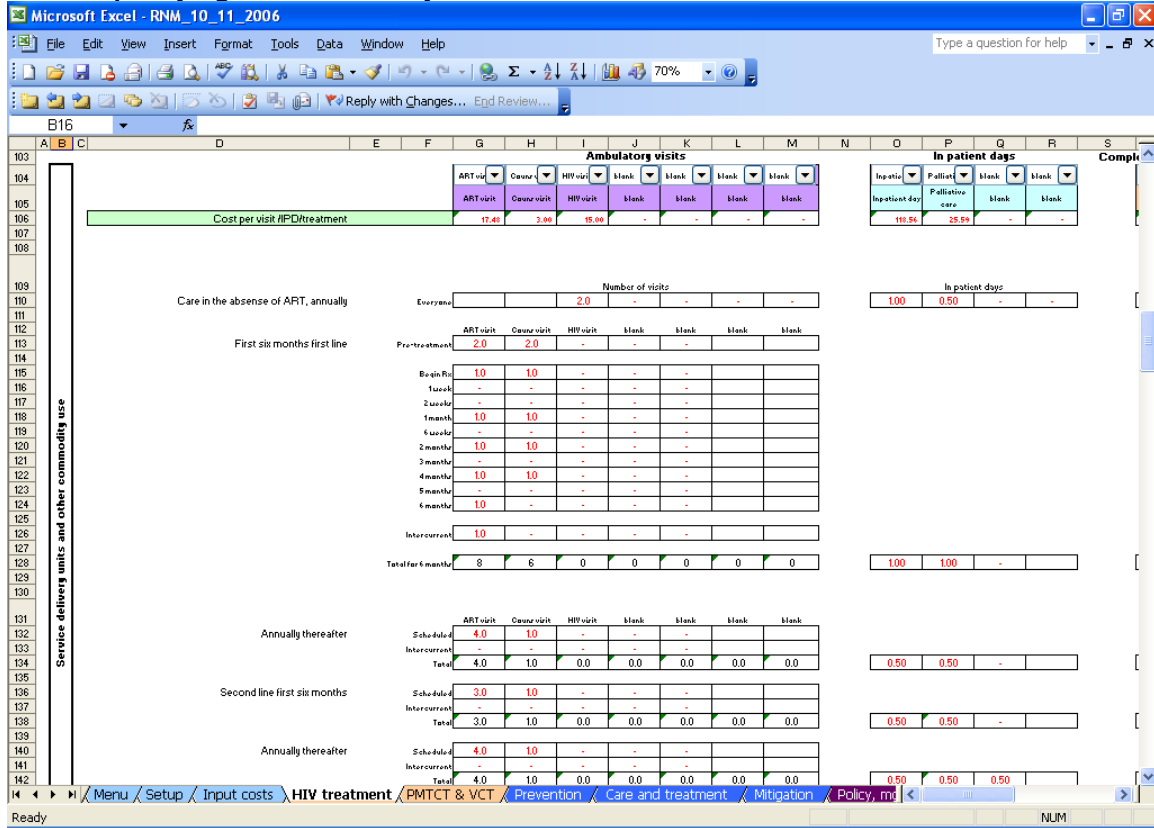
Laboratory tests Tests linked to drug Linked to ART duration

First-line SL / failing



categorised into ambulatory visits, inpatient days and completed treatments (such as tuberculosis treatment). Simply select your service delivery unit from the drop down boxes and specify the numbers of each type that are utilised per patient-period (6 months or annual) in the different HIV health states.

**Box 7: Specifying service delivery units and other commodities**



Once you are done, examine the summary at the bottom of the HIV treatment worksheet to make sure that the ingredients listed reflect your protocol.

Once you have completed specifying the ingredients of your interventions, you need to tell the model to use these ingredients. Scroll to the top of the “HIV treatment” worksheet and you will see a summary of your ingredients in each health state. Click on the “Insert ART” and “Insert other care” buttons and these costs will be inserted into the calculations of annual and total resource needs.

**PMTCT, VCT and Diagnostic Testing**

To calculate costs of PMTCT, VCT and Diagnostic Testing services at a disaggregated level, make sure that the costs of each of the ingredients has been entered in the “Input costs” worksheet, as described above.

Second, choose “PMTCT” or “VCT” from the “Utilization of services...” section of the menu. The first set of assumptions relates to either VCT or PMTCT testing and

counseling (see Box 8 below). Choose the type of lab test and service utilization by selecting from the choices available, and then specifying the percentage receiving the test, and the length of the service visit.

### Box 8: Specifying testing and counseling costs

The screenshot shows a Microsoft Excel spreadsheet with two main sections. The top section, titled 'Counseling and testing (VCT)', contains two tables. The first table lists materials for testing, and the second table lists service utilization for counseling visits. The bottom section, titled 'Antiretroviral interventions', is a table for selecting ARV regimens.

Materials	Name	Cost	Proportion receiving	Total
Rapid test 1	Abbott detect	2.65	100.0%	2.65
Rapid test 2	Galfar	5.29	16.5%	0.87
Serological test	ELISA	5.29	1.0%	0.05
	blank			-
				3.57

Service utilization		pre-test	Blood testing	post test	Total visits	Total
Visit type 1	Couns visit	3.00	1	0.5	1.5	4.50
Visit type 2	Couns visit	3.00	0.05		0.05	0.15
Visit type 3	blank	0.00			-	-
Visit type 4	blank	0.00			-	-
						4.65

Code	Proportion	Weeks antenatal	Daily-dose equivalents	Weeks postnatal	Z	C	N	D	I	E	T	K	ZC	blank	blank	blank	blank
Annual Cost (\$)																	
Antenatal regimen 1	0%				123.00	58.00	68.00	35.00	252.00	345.00	450.00	571.00	200.00	0.00	0.00	0.00	0.00
Antenatal regimen 2																	
Antenatal regimen 3																	
Antenatal regimen 4																	
Antenatal regimen 5																	
Intrapartum regimen 1																	
	100%		0.5														
Intrapartum regimen 2																	
Intrapartum regimen 3																	

After specifying testing and counseling costs, scroll down to the section labeled "Antiretroviral interventions," and select the type of ARV to be provided for PMTCT from the dropdown menu (see Box 9). Additional inputs for extra staff time, other lab tests, and replacement feeding can be specified in the last two sections of this worksheet, using the dropdown boxes (see Box 10).

Once you have finished specifying the ingredients of your service, you will need to tell the model to use these ingredients in the calculations. Scroll to the top of the "PMTCT & VCT" worksheet and you will see a summary of ingredients and costs. Click on the appropriate button to insert the costs into the desired prevention intervention.

### Box 9: Specifying ARV regimen for PMTCT program

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Medicine		Code	Proportion	Weeks antenatal	Daily-dose equivalents	Weeks postnatal	Z	C	N	D	I	E	T	K	ZC	-	-	-	-
Annual Cost (\$)							129.00	58.00	68.00	35.00	252.00	345.00	450.00	571.00	200.00	0.00	0.00	0.00	0.00
Antenatal regimen 1			0%				<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Antenatal regimen 2							<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Antenatal regimen 3							<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Antenatal regimen 4							<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Antenatal regimen 5							<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Intrapartum regimen 1			100%	0.5			<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Intrapartum regimen 2							<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Intrapartum regimen 3							<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Intrapartum regimen 4							<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Intrapartum regimen 5							<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Postnatal regimen 1			0%				<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Postnatal regimen 2							<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Postnatal regimen 3							<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Postnatal regimen 4							<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Postnatal regimen 5							<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

Additional nurse time required for antenatal care		Visit equivalents						
Visit type	Cost	Antenatal	Labour and delivery	Post partum	infant	Visit total	Total	
Visit type 1	0	0.00	0.3			0.3	-	
Visit type 2	Palliative care 25.59		0.2	0.1	0.1	0.4	10.24	
Visit type 3	blank	0.00				0.0	-	
Visit type 4	blank	0.00				0.0	-	
Visit type 5	blank	0.00				0.0	-	
Visit type 6	blank	0.00				0.0	-	
							10.24	

Menu / Setup / Input costs / HIV treatment / PMTCT & VCT / Prevention / Care and treatment / Mitigation / Policy, md

Ready NUM

### Box 10: Specifying replacement feeding and other commodities

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Additional nurse time required for antenatal care		Visit equivalents						
Visit type	Cost	Antenatal	Labour and delivery	Post partum	infant	Visit total	Total	
Visit type 1	0	0.00	0.3			0.3	-	
Visit type 2	Palliative care 25.59		0.2	0.1	0.1	0.4	10.24	
Visit type 3	blank	0.00				0.0	-	
Visit type 4	blank	0.00				0.0	-	
Visit type 5	blank	0.00				0.0	-	
Visit type 6	blank	0.00				0.0	-	
							10.24	

Additional laboratory tests for antenatal care		Number of tests				
Test	Cost	Antenatal	Labour and delivery	Post partum	infant	Total
Test 1	HIV 1.08	1.0	1.0	1.0		3.24
Test 2	CD4 8.00	0.9				7.20
Test 3	blank	0.00				-
Test 4	blank	0.00				-
Test 5	blank	0.00				-
Test 6	blank	0.00				-
						10.44

Costs of infant followup		Component	Cost	Mean months	Volume / month	% receiving	% of full unit	Unit eqivy	Cost	Total
Commodity 1	blank		0.00	6.0	8.0	100%		48.0	-	-
Commodity 2	blank		0.00					0.0	-	-
Commodity 3	blank		0.00					0.0	-	-
Drug 1	blank		0.00	1.5		100%		0.13	-	-
Drug 2	blank		0.00	10.5		5%		0.04	-	-
Drug 3	blank		0.00					0.00	-	-
										10.44

Menu / Setup / Input costs / HIV treatment / PMTCT & VCT / Prevention / Care and treatment / Mitigation / Policy, md

Ready NUM

## **Mitigation**

The resource requirements for orphans and vulnerable children (OVC) can be calculated using the worksheet labeled "Mitigation." As before, the light blue cells indicate that inputs are required. Figures in the dark blue cells will be estimated by the model, but you can replace the numbers with your own estimates if you prefer. The numbers in light green cells are provided by other worksheets, and should not be changed.

The first set of numbers regarding target populations is calculated by the model, based on other data that have been entered. The second and third sections, "Coverage" and "Unit costs", require input. The final rows show the resources required, by both sub-category and for the overall total. Further details about interventions for OVC are available in Chapter V below.

## **Policy, management, etc.**

The costs in the worksheet labeled "Policy, mgt, etc." are not directly related to the number of people receiving care, but instead refer to costs that operate across a number of different service delivery points, such as training, and monitoring and evaluation. These items tend to cost a certain amount for the whole program for a particular year. The model can calculate program-level costs by including a mark-up (percentage) on the intervention costs, or by entering a specific amount.

To enter the cost for a particular line item as a percentage, choose "Percentage" from the dropdown lists in the blue cells, and enter percentages of total intervention costs that will be needed. To enter the cost as an actual amount, choose "Exact" from the dropdown menu, and then scroll down to the lower section in the worksheet, where actual amounts can be entered for each year. Further details about these costs are available in Chapter VI below.

## **Model outputs**

Model outputs can be viewed by making selections from the "Outputs" section of the menu. The summary of costs by intervention is available by selecting, "Summary of all resource needs". These resource needs are also shown in various charts. Further details about outputs are available in Chapter VII below.

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## III. Prevention Interventions

### General Principles

The aim of the RNM is to estimate the cost of HIV/AIDS prevention, care and treatment, and orphan support needs in a particular country. The basic approach is to first estimate the number of people receiving each service by multiplying the number of people needing the service by the coverage rate (the percent of those needing the service that actually receive it). The resources needed are estimated by multiplying the number of people getting the service by the unit cost of providing the service.

This approach can be illustrated by examining the calculations for a single prevention intervention, peer outreach to sex workers.

First we need to know the **population size**. Here, this is the estimated number of sex workers in the country. You should enter the best estimate of the current number of sex workers and the rate at which this number will change in the future.

The next input is the **coverage**, or percent of sex workers that are currently reached by the outreach intervention. The future coverage goal can also be entered so that the model can calculate the resources needed to scale-up to the goal.

The final input needed is the **unit cost**, the cost to provide outreach services to one sex worker during one year. The unit cost is assumed to remain constant over the projection period.

With this information the model can estimate the resources required in the base year as:

- Resources needed = number of sex workers x coverage x unit cost

The same equation applies to any future year as well:

- Resources needed<sub>t</sub> = number of sex workers<sub>t</sub> x coverage<sub>t</sub> x unit cost

A similar approach is followed for each intervention. Estimates of the population size may refer to actual numbers of people, (such as sex workers, students, or people with sexually transmitted infections), the number of commodities needed

(such as units of safe blood, condoms, or post-exposure prophylaxis kits), or to the number of services needed (such as VCT visits).

The calculations for the other prevention interventions all follow the model described above: resources required = population size x coverage x unit costs. For some interventions the **population sizes** can be estimated from social and economic statistics and demographic data. For example, the number of primary school students is a combination of the population in a certain age group (calculated by Spectrum) and the gross enrollment rate. In other cases direct estimates must be provided, for example the number of sex workers or number of cases of sexually transmitted infections. There are several methods that have been used for estimating the size of populations at higher risk, such as sex workers, MSM and IDU. These include census and enumeration, capture-recapture, multiplier methods, nomination methods, and population surveys. A good source of information on how to estimate population sizes is available from UNAIDS.<sup>6</sup> In addition, an Excel workbook was developed to accompany the RNM that contains recent data for most countries in the world for statistics such as school enrollment rates, labor force participation rates, etc. These data can be found at: [www.unaids.org/](http://www.unaids.org/) or [www.FuturesInstitute.org](http://www.FuturesInstitute.org) .

Information on **coverage** should be available from national service statistics. Another international source containing data from about 80 countries is the HIV/AIDS Coverage Survey report.<sup>7</sup> Note that the information may be available as the number of people receiving the service, such as the number of VCT clients, rather than as a percentage. In this case, because the model will also display the number of people receiving the service whenever you enter a coverage estimate, you would adjust the estimated coverage until you get the correct number of people served.

The future coverage targets can be whatever the program wishes to achieve. Generally these are set in terms of comprehensive coverage that provides equitable access to prevention services and has a significant impact on the epidemic. For some interventions the obvious target coverage may be 100%, such as safe blood or school-based AIDS education. For others it may be unrealistic to expect to reach 100% of the population in need and a target of 80% may be more feasible. For example, the UNGASS target for PMTCT is the reach 80% of women accessing antenatal care. For others the target should be set to have an impact on transmission. Studies have shown that in order to have a significant impact on transmission interventions for sex workers, men who have sex with men, injecting drug users and other populations at higher risk need to reach coverage of 60-80%. Table 1 below gives a recommended target levels for the prevention interventions:

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<sup>6</sup> Estimating the Size of Populations at Risk for HIV: Issues and Methods. UNAIDS/FHI. Available at [www.UNAIDS.org](http://www.UNAIDS.org).

<sup>7</sup> Two surveys now exist: Coverage of selected services for HIV/AIDS prevention, care and support in low and middle income countries in 2003, POLICY Project, June 2004; and Coverage of selected services for HIV/AIDS prevention, care and support in Low- and Middle-income countries in 2005, POLICY Project, July 2006, along with supplemental country tables. All are available at [www.Constellafutures.com](http://www.Constellafutures.com).

Table 1. Target Coverage Levels by Intervention

AIDS education for students	100%
Blood safety	100%
Post-exposure prophylaxis	100%
Safe injection	100%
Universal precautions	100%
Mass media	100%
Interventions for priority populations (sex workers, MSM, IDU)	60-80%
Service delivery interventions (condoms, STI treatment, VCT, PMTCT)	60-80%
Workplace interventions	5-50% depending on severity of the epidemic

Source: UNAIDS, Resource needs for an expanded response to AIDS in low- and middle-income countries, August 2005, available at: [http://data.unaids.org/publications/irc-pub06/resourceneedsreport\\_en.pdf](http://data.unaids.org/publications/irc-pub06/resourceneedsreport_en.pdf).

**Unit cost** estimates should be program costs, that is, the expenditure required by the program to implement the intervention. This is different from the economic costs which would include more costs, such as the value of donated commodities and volunteer labor. Information on unit costs may be available from the organizations implementing the interventions. A manual and model for estimating unit costs is available from UNAIDS.<sup>8</sup> In addition, a number of countries have provided unit cost estimates at a series of resource needs workshops organized by UNAIDS. Where these are available they are provided below in the discussion of each intervention. Note that some of the wide variation in the unit costs is due to different elements being offered by different countries for various interventions. For example, some countries may include treatment of STIs in their intervention targeting sex workers, which results in a higher unit cost.

### Female sex workers

The population size is the estimated number of female sex workers in the base year. This population grows or declines according to the assumed growth rate.

<sup>8</sup> Costing Guidelines for HIV/AIDS Intervention Strategies, ABD-UNAIDS Study Series: Tool 1. February 2004.

The default assumption is that the number of sex workers grows at the same rate as the population of men aged 15-49.

There are four coverage indicators required.

1. % sex workers reached by intervention. The percentage of female sex workers that are reached by the intervention.
2. % using condoms among those reached by the intervention. The rate of *consistent* condom use among those sex workers exposed to the intervention.
3. % using condoms among those not reached by the intervention. The rate of *consistent* condom use among sex workers that are not exposed to the intervention. This is used elsewhere in the model to calculate the total number of condoms needed annually.
4. % of condoms that are female condoms. The percentage of all condoms used by all female sex workers that are female condoms.

There are also three inputs required for unit costs.

1. Cost per sex worker targeted. The annual cost per female sex worker of peer outreach programs. Unit cost estimates from the country workshops range from \$3 - \$120, with a median of \$25, and inner quartile range of \$15 - \$60.
2. Cost per male condom distributed. This refers to the full costs of condom distribution, rather than just the commodity costs. Unit cost estimates range from \$0.01 (lower quartile) to \$0.29 (upper quartile) with a median of \$0.15. This should be the cost to the outreach program. If the condoms are provided free of charge from another source, then the cost should be zero.
3. Cost per female condom distributed. This refers to the full costs of condom distribution, rather than just the commodity costs. Unit cost estimates range from \$0.85 (lower quartile) to \$1.75 (upper quartile) with a median of \$1.00. This should be the cost to the outreach program. If the condoms are provided free of charge from another source, then the cost should be zero.

The calculations are as follows:

Number of female sex workers<sub>t</sub> = Female sex workers<sub>(t-1)</sub> \* (1 + annual growth rate/100)<sub>(t-1)</sub>

Female sex workers reached<sub>t</sub> = Female sex workers<sub>t</sub> \* % female sex workers reached by intervention<sub>t</sub> / 100

The resources required are estimated as the number of female sex workers reached times the cost of outreach plus the cost for male and female condoms.

Resources required<sub>t</sub> = Female sex workers reached<sub>t</sub> x Cost per female sex worker reached + Female sex workers reached<sub>t</sub> x Sex worker acts per year x % using condoms among those reached by intervention<sub>t</sub>/100 x (Cost per male condom distributed x (1 - % of all condoms that are female) + Cost per female condom distributed x % of all condoms that are female)

Note that the assumption regarding number of sex acts per sex worker per year is entered in the "Condom provision" intervention, described further below.

### **Male sex workers**

The population size is the estimated number of male sex workers in the base year. This population grows or declines according to the assumed growth rate. The default assumption is that the number of male sex workers grows at the same rate as the population of men aged 15-49.

There are four coverage indicators required.

5. % sex workers reached by intervention. The percentage of male sex workers that are reached by the intervention.
6. % using condoms among those reached by the intervention. The rate of *consistent* condom use among those male sex workers exposed to the intervention.
7. % using condoms among those not reached by the intervention. The rate of *consistent* condom use among sex workers that are not exposed to the intervention. This is used elsewhere in the model to calculate the total number of condoms needed annually.
8. % of condoms that are female condoms. The percentage of all condoms used by all male sex workers that are female condoms.

There are also three inputs required for unit costs. There are no estimates for this intervention from country-level workshops; however, unit cost per condom distributed should be similar to the cost used for female sex worker programs.

4. Cost per sex worker targeted. The annual cost per male sex worker of peer outreach programs.
5. Cost per male condom distributed. This refers to the full costs of condom distribution, rather than just the commodity costs. Unit cost estimates for female sex worker programs range from \$0.01 (lower quartile) to \$0.29 (upper quartile) with a median of \$0.15. This should be the cost to the outreach program. If the condoms are provided free of charge from another source, then the cost should be zero.
6. Cost per female condom distributed. This refers to the full costs of condom distribution, rather than just the commodity costs. Unit cost estimates for female sex worker programs range from \$0.85 (lower quartile) to \$1.75 (upper quartile) with a median of \$1.00. This should be the cost to the outreach program. If the condoms are provided free of charge from another source, then the cost should be zero.

The calculations are as follows:

Number of male sex workers<sub>t</sub> = Male sex workers<sub>(t-1)</sub> \* (1 + annual growth rate/100)<sub>(t-1)</sub>

Male sex workers reached<sub>t</sub> = Male sex workers<sub>t</sub> \* % sex workers reached by intervention<sub>t</sub> / 100

The resources required are estimated as the number of male sex workers reached times the cost of outreach plus the cost for male and female condoms.

Resources required<sub>t</sub> = Male sex workers reached<sub>t</sub> x Cost per male sex worker reached + Male sex workers reached<sub>t</sub> x Sex worker acts per year x % using condoms among those reached by intervention<sub>t</sub>/100 x (Cost per male condom distributed x (1 - % of all condoms that are female) + Cost per female condom distributed x % of all condoms that are female)

Note that the assumption regarding number of sex acts per sex worker per year is entered in the "Condom provision" intervention, described further below.

### **Men who have sex with men (MSM)**

The population size is the estimated number of MSM in the base year. This population grows or declines according to the assumed growth rate. The default assumption is that the number of MSM grows at the same rate as the population of men aged 15-49. The model also asks for an estimate of the number of sex acts per year per MSM. This figure varies from country to country with a range of about 50 to 110.

There are three coverage indicators required.

1. % MSM reached by intervention. The percentage of MSM that are reached by the intervention.
2. % using condoms among those reached by the intervention. The rate of *consistent* condom use among those MSM exposed to the intervention.
3. % using condoms among those not reached by the intervention. The rate of *consistent* condom use among MSM that are not exposed to the intervention. This is used elsewhere in the model to calculate the total number of condoms needed annually.

There are two inputs required for unit costs.

1. Cost per MSM targeted. The annual cost per MSM of peer outreach programs. Unit cost estimates range from \$14 (lower quartile) to \$45 (upper quartile) with a median of \$20.
2. Cost per male condom distributed. This refers to the full costs of condom distribution, rather than just the commodity costs. Unit cost estimates range from \$0.01 (lower quartile) to \$0.29 (upper quartile) with a median of \$0.15. This should be the cost to the outreach program. If the condoms are provided free of charge from another source, then the cost should be zero.

The calculations are as follows:

Number of MSM<sub>t</sub> = MSM<sub>(t-1)</sub> \* ( 1 + annual growth rate/100)<sub>(t-1)</sub>

$$\text{MSM reached}_t = \text{MSM}_t * \% \text{ MSM reached}_t / 100$$

The resources required are estimated as the number of MSM workers reached times the cost of outreach plus the cost for male condoms.

$$\text{Resources required}_t = \text{MSM reached}_t \times \text{Cost per MSM reached} + \text{MSM reached}_t \times \text{MSM acts per year} \times \% \text{ using condoms among those reached by intervention}_t / 100 \times \text{Cost per male condom distributed}$$

### **Injecting drug users (IDU)**

The population size is the estimated number of IDU in the base year. This population grows or declines according to the assumed growth rate. The default assumption is that the number of IDU grows at the same rate as the population of men aged 15-49.

There are several inputs required in order to estimate the need for different interventions targeted to IDU. These are:

Number of IDU reached per counselor: This is the number of IDU that one counselor can support during a year. It typically ranges from 20 to 40.

Number of sex acts per IDU per year. The number of times a typical IDU has sex during a year. This is used to estimate condom requirements.

Number of IDU injections per year. The number of times the average IDU injects per year.

There are six coverage indicators required to describe the different IDU interventions. Coverage may be set to zero if any of these interventions are not part of the prevention program in your country.

1. % IDU receiving harm reduction interventions. The percentage of IDU that are reached by general harm reduction programs. You may use this intervention if you do not have information on the specific type of interventions listed below. However, it will be better to set the coverage for this intervention to 0 and specify the coverage of specific interventions in the following rows.
2. % IDU receiving counseling and testing.
3. % IDU receiving community outreach and peer education.
4. % IDU receiving syringe and needle exchange.
5. % IDU receiving drug substitution
6. % IDU reached by condom promotion interventions

There are also seven unit costs required, one for each intervention. Unit costs for the outreach interventions may vary from \$10 - \$60.

1. Cost of harm reduction programs per IDU reached
2. Cost of counseling and testing per IDU reached

3. Cost of community outreach and peer education per IDU reached
4. Cost per needle distributed and destroyed
5. Cost of drug substitution per IDU reached
6. Cost per condom. This should be the cost to the outreach program. If the condoms are provided free of charge from another source, then the cost should be zero.
7. Cost to train one counselor

The calculations are as follows:

$$\text{Number of IDU}_t = \text{Number of IDU}_{(t-1)} \times (1 + \text{annual growth rate}/100)_{(t-1)}$$

$$\text{Number of needles and syringes required}_t = \text{Number of IDU}_t \times \text{Number of injections per IDU per year}$$

$$\text{Number of condoms required}_t = \text{Number of IDU}_t \times \text{Number of sex acts per IDU per year}$$

$$\text{IDU reached}_t = \text{Number of IDU} \times \% \text{ IDU receiving harm reduction programs}_t / 100$$

$$\text{Counselors trained}_t = \text{IDU reached}_t / \text{Number of IDU reached per counselor}$$

$$\text{IDUs receiving counseling and testing}_t = \text{Number of IDU} \times \% \text{ receiving counseling and testing}/100$$

$$\text{IDUs receiving community outreach and peer education}_t = \text{Number of IDU}_t \times \% \text{ receiving community outreach and peer education}_t / 100$$

$$\text{IDUs receiving needle and syringe exchange programs}_t = \text{Number of IDU}_t \times \% \text{ receiving NSEP}_t / 100$$

$$\text{IDUs receiving drug substitution}_t = \text{Number of IDU}_t \times \% \text{ receiving drug substitution}_t / 100$$

$$\text{Number of needles and syringes provided}_t = \text{Number of needles and syringes required}_t \times \% \text{ of IDU receiving needles and syringes}_t / 100$$

$$\text{Number of condoms required}_t = \text{Number of condoms required}_t \times \% \text{ of IDU reached by condom interventions}_t / 100 \times (1 + \text{condom wastage}/100)$$

$$\text{Resources required for counseling and testing}_t = \text{IDUs receiving counseling and testing}_t \times \text{Cost of counseling and testing per IDU reached}$$

$$\text{Resources required for community outreach and peer education}_t = \text{IDUs receiving community outreach and peer education}_t \times \text{Cost of community outreach and peer education}$$

$$\text{Resources required for needles and syringes}_t = \text{Number of needles and syringes provided}_t \times \text{Cost per needle and syringe provided and destroyed}$$

$$\text{Resources required for drug substitution}_t = \text{IDUs receiving drug substitution}_t \times \text{Cost of drug substitution per IDU targeted}$$

Resources required for condoms<sub>t</sub> = Number of condoms provided<sub>t</sub> x Cost per condom

Resources required for counselor training<sub>t</sub> = Counselors trained<sub>t</sub> x Cost to train one counselor

Resources required<sub>t</sub> = sum of resources required for each intervention<sub>t</sub>

### **User-defined interventions: Other vulnerable populations**

You may define up to five additional specific interventions for priority populations such as truck drivers and prisoners. The initial population size is the estimated number of people in the specific priority population in the base year. This population grows or declines according to the assumed growth rate. The default assumption is that the population grows at the same rate as the population of all adults 15-49.

There is one coverage indicator required.

1. % reached by intervention

There is one input required for unit costs.

2. Cost per person reached

The calculations are as follows:

$$\text{Population}_t = \text{Population}_{(t-1)} * (1 + \text{annual growth rate}/100)^{(t-1)}$$

$$\text{Population reached}_t = \text{Population}_t * \% \text{ reached by intervention}_t / 100$$

The resources required are estimated as the number of people reached times the cost per person reached.

$$\text{Resources required}_t = \text{Population reached}_t * \text{Cost per person reached}$$

### **Community mobilization**

The population size is the number of people aged 15-64, provided to the model by Spectrum for all of the years of the plan.

There is one coverage indicator required.

1. % reached by intervention

There is one input required for unit costs.

1. Cost per person reached

The calculations are as follows:

$$\text{Population reached}_t = \text{Population}_t * \% \text{ reached by intervention}_t / 100$$

The resources required are estimated as the number of people reached times the cost per person reached.

$$\text{Resources required}_t = \text{Population reached}_t * \text{Cost per person reached}$$

## Youth

There are two types of prevention interventions for youth: one reaching youth that are in school, and the other reaching youth that are out of school. The in-school youth programs consist of training teachers to give information about HIV/AIDS, so the costs are calculated based on how many teachers are trained, and how frequently training takes place. Out-of-school youth programs are peer education programs, where the unit cost is calculated based on the cost of reaching each out-of-school youth.

There are seven inputs required to define the target population for youth interventions. These are:

1. Primary school gross enrollment rate-males. The primary school gross enrollment rate for males is the number of male students divided by the male population of primary school age. It may be above 100% if many children younger or older than the typical age group are enrolled. This information should be available from the Ministry of Education.
2. Primary school gross enrollment rate-females. The primary school gross enrollment rate for females is the number of female students divided by the female population of primary school age. It may be above 100% if many children younger or older than the typical age group are enrolled. This information should be available from the Ministry of Education.
3. Primary pupil-teacher ratio. This is the average number of primary students per teacher. This information should be available from the Ministry of Education.
4. Secondary school gross enrollment rate-males. The secondary school gross enrollment rate for males is the number of male students divided by the male population of secondary school age. It may be above 100% if many children younger or older than the typical age group are enrolled. This information should be available from the Ministry of Education.
5. Secondary school gross enrollment rate-females. The secondary school gross enrollment rate for females is the number of female students divided by the female population of secondary school age. It may be above 100% if many children younger or older than the typical age group are enrolled. This information should be available from the Ministry of Education.
6. Secondary pupil-teacher ratio. This is the average number of secondary students per teacher. This information should be available from the Ministry of Education.
7. Frequency of teacher re-training (years). The number of years after which teachers are re-trained in AIDS education.

There are three coverage indicators required.

1. % primary students with teachers trained in AIDS.
2. % secondary students with teachers trained in AIDS.
3. % out-of school youth reached

There are also three unit cost estimates required.

1. Cost per teacher trained in primary education. This is the cost to train a primary school teacher in AIDS education. The median unit cost across countries with information is \$75 with an inter-quartile range of \$32 - \$150.
2. Cost per teacher trained in secondary education. This is the cost to train a secondary school teacher in AIDS education. The median unit cost across countries with information is \$75 with an inter-quartile range of \$32 - \$150.
3. Cost of peer outreach for out-of-school youth. The median unit cost across countries with information is \$12 with an inter-quartile range of \$8 - \$21.

The calculations are as follows:

Number of primary teachers<sub>t</sub> = Primary school-aged population<sub>t</sub> x (Primary school enrollment rate-males + Primary school enrollment rate-females) / 2 / 100 / Primary pupils per teacher

Number of secondary teachers<sub>t</sub> = Secondary school-aged population<sub>t</sub> x (Secondary school enrollment rate-males + Secondary school enrollment rate-females) / 2 / 100 / Secondary pupils per teacher

Number of youth not in school<sub>t</sub> = Primary school-aged population<sub>t</sub> x (1 - {primary school gross enrollment rate-males + primary school gross enrollment rate-females} / 2 / 100) + Secondary school-aged population<sub>t</sub> x (1 - {secondary school gross enrollment rate-males + secondary gross enrollment rate-females} / 2 / 100)

## **Workplace programs**

Workplace programs are prevention interventions provided to employees in the work place. We assume that these interventions are target to employees in the formal sector. There are four inputs required to estimate the number of formal sector employees. They are:

1. Labor force participation rate – male. The percentage of men 15-64 who are in the labor force.
2. Labor force participation rate – female. The percentage of women 15-64 who are in the labor force.
3. Percent of labor force in services and industry. The percentage of the total labor force that is employed in the services and industry sector. These employees are assumed to be in the formal sector.
4. Percent of labor force in wage employment in agriculture. The percentage of the labor force that is engaged in agriculture for a wage.

There are three coverage indicators which refer to the interventions provided in the workplace. They are:

1. % workforce receiving peer education
2. % workforce receiving STI treatment
3. % workforce receiving condoms

In all three cases these percentages refer to the percentage of the formal workforce that receives the intervention in the workplace.

There are three unit cost inputs that describe the three workplace interventions.

1. Cost per employee reached with peer education. For countries with data available the median cost is \$5 with an inter-quartile rate of \$3 - \$10.
2. Cost per STI case treated. For countries with data available the median cost is \$11 with an inter-quartile range of \$9 - \$15.
3. Cost per condom distributed. For countries with data available the median cost is \$0.15 with an inter-quartile range of \$0.12 - \$0.27.

The calculations are as follows:

Number of formal sector employees<sub>t</sub> = (Male population 15-64<sub>t</sub> x Labor force participation rate-male/100 + Female population 15-64<sub>t</sub> x Labor force participation rate-female/100) x (Percent labor force in services and industry + Percent labor force in wage employment in agriculture)/100

Workers reached with peer education<sub>t</sub> = Number of formal sector employees<sub>t</sub> x % workforce receiving peer education<sub>t</sub>

STI cases treated<sub>t</sub> = Number of formal sector employees<sub>t</sub> / (Male population 15-49 + Female population 15-49) x (Male STI cases + Female STI cases) x % workforce receiving STI treatment / 100

(This equation first estimates the percentage of the adult population that is in the formal sector workforce, then multiplies that percentage by the total annual number of STI cases to estimate the number of STI cases per year among formal sector employees. This is then multiplied by the coverage rate to estimate the number of cases treated in the workplace.)

Condoms provided<sub>t</sub> = Number of formal sector employees<sub>t</sub> x Sex acts with regular partners x % workforce receiving condoms / 100 x (1 + condom wastage/100)

Resources required<sub>t</sub> = Workers reached with peer education<sub>t</sub> x cost per employee reached with peer education + STI cases treated<sub>t</sub> x cost per STI case treated + Condoms provided<sub>t</sub> x Cost per condom distributed

## Condom provision

There are eight inputs required to calculate the number of condoms required. They are:

1. Percent of population 15-49 that is sexually active.
2. Percent of males 15-49 in regular partnerships. 'Regular partnerships' refers to marriage or living together on a permanent basis.
3. Percent of males 15-49 reporting non-regular partners.
4. Number of sex acts with casual partners per year. Casual partners are non-regular partners that are not sex workers.
5. Number of sex acts with regular partner per year. Surveys have found that this figure varies from about 50 – 110 with a median of about 66.
6. Number of commercial sex acts per sex worker per year.
7. Percent of condoms wasted during storage and distribution. The default value is 10%
8. Percent of condoms distributed through social marketing programs.

There are two measures of coverage.

1. % of casual acts covered by condom use. This is the percentage of casual sex contacts that involve condom use. This may range from 5% to as high as 60-70%.
2. % marrieds with casual partners using condoms in marital sex. This refers to condom use with marital sex among those couples where at least one partner has an outside partner. This rate is usually quite low, less than 10%.

There are two unit cost estimates required:

1. Cost per male condom distributed by the public sector. This should generally include the full costs of distribution, not just the cost of the condom itself. For countries with data available the median cost is \$0.14 with an inter-quartile range of \$0.10 - \$0.30.
2. Cost per condom distributed by social marketing. For countries with data available the median cost is \$0.14 with an inter-quartile range of \$0.10 - \$0.30.

The cost of a distributed condom should reflect the cost to the government or to the social marketing program. Sometimes this cost will be the commodity cost alone, while other times the cost will include the distribution costs associated with it, including operational and management costs. Stallworthy<sup>9</sup> presents information on the cost of distributing condoms through social marketing programs. These unit costs include costs such as cost of the condom, operations, management, technical assistance and other indirect costs. Although the cost

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<sup>9</sup> Stallworthy G, Meekers D. 1998. An analysis of unit costs in selected condom social marketing programs, 1990-1996. Presentation at the XII World AIDS Conference, Geneva, June 28-July 3, 1998.

per condom sold varied between US\$0.08-US\$0.13 for several large countries with long-running programs, the average unit cost per condom sold for 13 other countries ranged between US\$0.17-US\$0.34. In addition, there were a few outliers where costs were greater than US\$0.40 per condom.

The number of condoms needed and the resources required are calculated as follows:

We assume that risky acts requiring condom use are all acts with a sex worker, all acts of MSM and IDU, all casual sex contacts and all marital contact when at least one partner has outside partners. If the cost of condoms is included in interventions for sex workers, MSM and IDU then no additional cost for condoms for those populations is included here, but if the cost per condom for any of those interventions is set to 0, then the condoms costs are included here.

Number of condoms required<sub>t</sub> = Number of sex workers<sub>t</sub> x sex worker acts per year + Number of MSM<sub>t</sub> x MSM acts per year + Condoms for IDUs + Male population 15-49<sub>t</sub> x % men with casual partners/100 x sex acts per year with casual partners + Male population 15-49<sub>t</sub> x % men with regular partners/100 x % males with casual partners x contacts per year with regular partners

Condoms provided for sex work<sub>t,g</sub> = (Sex workers reached<sub>t,g</sub> x % condom use among sex workers reached by intervention<sub>t,g</sub> /100 + (Sex workers<sub>t,g</sub> – Sex workers reached<sub>t,g</sub>) x % condom use among sex workers not reached by intervention/100) x sex worker acts per year x (1 + condom wastage/100)

where the equation is calculated for g = male, female sex workers

Condoms for MSM<sub>t</sub> = MSM reached<sub>t</sub> x % condoms use among those reached by the intervention/100 x MSM sex acts per year x (1 + condom wastage/100)

Condoms provided for casual sex<sub>t</sub> = (Male population 15-49 x % male with non-regular partners/100 x Sex acts with non-regular partners x % casual acts covered with condoms) x (1 + condom wastage/100)

Condoms provided for marital sex<sub>t</sub> = (Male population 15-49<sub>t</sub> x % males with regular partners/100 x % males with non-regular partners/100 x sex acts with regular partner x % marrieds with casual partners using condoms in marital sex/100 ) x (1 + condom wastage/100)

Condoms provided<sub>t</sub> = Condoms for sex work<sub>t</sub> + Condoms for MSM<sub>t</sub> + Condoms for IDU<sub>t</sub> + Condoms for casual sex<sub>t</sub> + Condoms for marital sex<sub>t</sub>

Resources required<sub>t</sub> = Condoms provided<sub>t</sub> x {cost per male condom distributed by public sector x (1 - % condoms provided by social

marketing/100) + cost per male condom distributed through social marketing x % condoms provided by social marketing/100}

## STI management

There are six inputs required to estimate the need for management of sexually transmitted infections.

1. Number of new cases of treatable STIs-male. The annual number of new cases of sexually transmitted infections in males.
2. Growth rate of new cases of treatable STIs-male. The annual rate of increase in new cases of treatable STIs in males. The default value is the growth rate of the adult male population.
3. Number of new cases of treatable STIs-female. The annual number of new cases of sexually transmitted infections in females.
4. Growth rate of new cases of treatable STIs-female. The annual rate of increase in new cases of treatable STIs in females. The default value is the growth rate of the adult female population.
5. Percent of STIs that are symptomatic-males. The percent of treatable STIs in males that are symptomatic and, therefore, likely to be identified for treatment.
6. Percent of STIs that are symptomatic-females. The percent of treatable STIs in females that are symptomatic and, therefore, likely to be identified for treatment.

There are two inputs describing the coverage of STI treatment.

1. % males with STIs receiving treatment
2. % females with STIs receiving treatment

There is only one unit cost input required.

1. Cost per STI case treated. For countries with data available the median unit cost is \$12 with a range of \$9 (lower quartile) to \$25 (upper quartile).

The calculations are as follows:

Number of symptomatic STI cases-males<sub>t</sub> = Number of new cases of treatable STIs-males<sub>(t-1)</sub> x (1 + annual growth rate-males/100)<sub>(t-1)</sub> x Percent of STIs that are symptomatic-males / 100

Number of symptomatic STI cases-females<sub>t</sub> = Number of new cases of treatable STIs-females<sub>(t-1)</sub> x (1 + annual growth rate-females/100)<sub>(t-1)</sub> x Percent of STIs that are symptomatic-females / 100

STI cases treated<sub>t</sub> = Number of symptomatic STI cases-males<sub>t</sub> x % males with STIs receiving treatment + Number of symptomatic STI cases-females<sub>t</sub> x % females with STIs receiving treatment

Resources required<sub>t</sub> = STI cases treated<sub>t</sub> x Cost per STI case treated

### **Voluntary counseling and testing**

There is only one input required to estimate the need for VCT.

1. Percent of adult population requiring VCT annually. This percentage is then applied to the population aged 15-49 which was provided by Spectrum.

There is one coverage indicator.

1. % of adult population receiving VCT annually. This is applied to the population in need of VCT.

There is one unit cost measure required.

1. Cost per VCT client. For countries with data available the median is \$15 and the range is \$11 (lower quartile) to \$25 (upper quartile).

If the disaggregated approach to calculating VCT unit cost is followed, refer to Chapter IV for detailed explanations of the ingredients, and Chapter II for a tutorial on entering the cost into the Prevention worksheet.

The calculations are as follows:

Number of people needing VCT services<sub>t</sub> = Population 15-49<sub>t</sub> x % of adult population needing VCT annually / 100

Number of VCT clients<sub>t</sub> = Number of people needing VCT services<sub>t</sub> x % of adult population receiving VCT annually<sub>t</sub> / 100

Resources needed<sub>t</sub> = Number of VCT clients<sub>t</sub> x Cost per VCT client

### **Prevention of mother-to-child transmission**

There is just one input required to estimate the need for PMTCT.

1. Percent of pregnant women who had some antenatal care. The calculations assume that only women receiving some antenatal care can be reached by PMTCT interventions. This percent is combined with data provided by Spectrum (total population, crude birth rate) to calculate pregnant women receiving antenatal care.

There are three coverage indicators for PMTCT.

1. % of pregnant women attending ANC tested for HIV. The percentage of all pregnant women who attend antenatal clinics that are tested for HIV. This indicator combines the availability of PMTCT at antenatal clinics and the percent of women who accept the test if the service is available.
2. % HIV-positive pregnant women treated with ARV. This is the percent of women who are tested and found to be HIV-positive who receive treatment to prevent mother-to-child transmission.

3. % HIV-positive women who receive infant formula. The percent of HIV-positive women who are provided with infant formula in order to avoid transmission through breastfeeding.

There are also three unit costs required. As discussed in Chapter II, unit costs for PMTCT can be provided in two ways: directly in the Prevention worksheet, or input from the worksheet labeled "PMTCT & VCT." The definitions of the variables are below, which are particularly useful if the unit costs are being entered directly into the Prevention worksheet. If the disaggregated approach is followed, note that further definitions of the ingredients in the Input worksheet are in Chapter IV, and that the procedure for using the disaggregated costs is described in the tutorial in Chapter II.

1. Cost per women screened. The cost per woman who is counseled and tested. For countries with data available the median cost is \$8 with a range of \$4 (lower quartile) to \$10 (upper quartile).
2. Cost per woman testing HIV-positive and receiving treatment. This includes the additional counseling costs for a woman who is found to be HIV+, a confirmatory test, and the cost of treatment to prevent transmission of HIV to the baby. For countries with data available the median cost is \$40 with a range of \$10 (lower quartile) to \$165 (upper quartile).
3. Cost per woman of infant formula. If infant formula is provided, this is the cost of the formula. Countries have been assuming that formula is provided for six months; for countries with data available the median cost is \$24 with a range of \$14 (lower quartile) to \$47 (upper quartile).

The calculations are as follows:

Number of women attending ANC services<sub>t</sub> = Population<sub>t</sub> / 1000 x Crude birth rate<sub>t</sub> x Percent of women who had some antenatal care / 100

Number of women receiving counseling and testing<sub>t</sub> = Number of women attending ANC services<sub>t</sub> x % of pregnant women attending ANC tested for HIV / 100

Number of HIV+ women receiving ART prophylaxis<sub>t</sub> = Number of women receiving counseling and testing<sub>t</sub> x HIV prevalence among pregnant women<sub>t</sub> / 100 x % HIV positive women treated with ART/100

Number of HIV+ women receiving formula<sub>t</sub> = Number of women receiving counseling and testing<sub>t</sub> x HIV prevalence among pregnant women<sub>t</sub> / 100 x % HIV positive women receiving formula/100

Resources required<sub>t</sub> = Number of women receiving counseling and testing<sub>t</sub> x Cost per women receiving counseling and testing + Number of HIV+ women receiving ART prophylaxis<sub>t</sub> x Cost per women testing HIV+ and receiving ART + Number of HIV+ women

receiving formula<sub>t</sub> x Cost per woman of six months of formula

HIV prevalence among pregnant women is assumed to be equal to adult HIV prevalence for generalized epidemics and equal to HIV prevalence among females 15-49 in concentrated and low level epidemics. Countries are classified as having generalized epidemics if adult HIV prevalence is greater than one percent.

### **Mass media**

The population in need of mass media is assumed to be the entire adult population. There is a single coverage indicator which is the number of mass media campaigns per year. The only unit cost input required is the cost per campaign. For countries with data available the median cost is \$150,000 with a range of \$70,000 to \$390,000. The resources required are estimated as:

Resources required<sub>t</sub> = Number of mass media campaigns per year<sub>t</sub> x cost per campaign

### **Blood safety**

The only input required to estimate the need for safe blood is the number of units of blood required per 1000 people. This figure should be available from the national blood transfusion service.

The only coverage input needed is the percentage of blood tested before transfusion.

The only unit cost required is the cost of screening blood for HIV. This is the cost of screening for HIV only, not the cost of blood collection, since only the HIV screening cost is usually considered an AIDS-related cost. For countries with data available the median cost is \$10 with a range of \$4 (lower quartile) to \$15 (upper quartile).

Resources required for safe blood are estimated as follows:

Units of safe blood required<sub>t</sub> = Population<sub>t</sub> / 1000 x Units of blood per 1000 population

Units of safe blood produced<sub>t</sub> = Units of safe blood required<sub>t</sub> x percent of units of blood tested before transfusion

Resources required<sub>t</sub> = Unites of safe blood produced<sub>t</sub> x cost per screening a unit of blood

### **Post-exposure prophylaxis**

Post-exposure prophylaxis (PEP) refers to anti-retroviral treatment provided, usually for one month, to a person who may have been newly exposed to HIV. This is typically provided for health care personnel who may have come in

contact with infected blood through a needle stick or other accident and for rape victims.

The estimate of need is based on the estimated number of PEP kits per million population. The default assumption is one kit per million population. For countries with data available the median unit cost is \$184 with a range of \$125 (lower quartile) to \$243 (upper quartile).

Resources needed are estimated as follows:

Number PEP kits required<sub>t</sub> = Population<sub>t</sub> / 1,000,000 x PEP kits per million population

PEP kits provided<sub>t</sub> = PEP kits required<sub>t</sub> x Percent of need that is met

Resources required<sub>t</sub> = PEP kits provided<sub>t</sub> x Cost per PEP kit

### **Safe medical injection**

HIV can be spread through injection with contaminated needles and syringes. Interventions to prevent contaminated injections promote the use of needles and syringes that can only be used once (auto-destruct needles) and the reduction of unnecessary injections. The number of unsafe injections is estimated from three inputs.

1. Average number of immunizations per child aged 0-23 months. This should be the actual number of injections per child, not the recommended number.
2. Number of adult injections per person per year.
3. Percent of injections that are unsafe.

WHO has estimated the number of adult injections per person per year and the percent of injections that are unsafe by region, as shown in the table below.

There are two coverage indicators.

1. Percent of unsafe injections replaced with auto-destruct (AD) syringes
2. Percent reduction in number of injections. This is the percent reduction in injections that would result from efforts to reduce unnecessary injections.

The only unit cost input is the additional cost per auto-destruct syringe provided. This is the difference between the cost of AD syringes and re-usable syringes. The additional cost is generally about \$0.03 per syringe.

The calculations are as follows:

Number of unsafe immunizations<sub>t</sub> = Population<sub>t</sub> / 1000 x crude birth rate x average number of immunizations per child 0-23 months x percent of injections that are unsafe / 1000

Number of other unsafe injections<sub>t</sub> = Population 15-49<sub>t</sub> x injections per capita x percent of injections that are unsafe / 100

Number of AD syringes provided<sub>t</sub> = (Number of unsafe immunizations<sub>t</sub> + Number of other unsafe injections<sub>t</sub> x (1 – percent reduction in other

injections / 100) x percent of unsafe injections replaced  
with AD syringes

Resources required<sub>t</sub> = Number of AD syringes provided<sub>t</sub> x additional cost per AD  
syringe

## Universal precautions

“Universal precautions” refers to the use of gloves, masks and gowns by health care personnel to avoid infection through contaminated blood. The need for universal precautions is estimated from the number of hospital beds, as that is how unit costs are usually calculated. For countries with data available the median annual cost is \$150 with a range of \$60 (lower quartile) to \$380 (upper quartile). The calculations are as follows.

Number of hospital beds<sub>t</sub> = Population<sub>t</sub> / 1000 x hospital beds per 1000  
population

Number of hospital beds covered<sub>t</sub> = Number of hospital beds<sub>t</sub> x Percent of health  
workers covered<sub>t</sub> / 100

Resources needed<sub>t</sub> = Number of hospital beds covered<sub>t</sub> x annual cost per  
hospital bed

Region	Injections per person per year	Percent of injections that are potentially unsafe
Afr D : Algeria, Angola, Benin, Burkina Faso, Cameroon, Cape Verde, Chad, Comoros, Gabon, Gambia, Ghana, Guinea, Guinea-Bissau, Equatorial Guinea, Liberia, Madagascar, Mali, Mauritania, Mauritius, Niger, Nigeria, Sao Tomé-et-Principe, Senegal, Seychelles, Sierra Leone, Togo.	2.2	19 %
Afr E : Botswana, Burundi, Central African Republic, Congo, Côte d'Ivoire, Democratic Republic of the Congo, Eritrea, Ethiopia, Kenya, Lesotho, Malawi, Mozambique, Namibia, Rwanda, South Africa, Swaziland, Uganda, United Republic of Tanzania, Zambia, Zimbabwe.	2.0	17 %
Amr B : Antigua and Barbuda, Argentina, Bahamas, Barbados, Belize, Brasil, Chile, Colombia, Costa Rica, Dominica, Dominican Republic, El Salvador, Grenada, Guyana, Honduras, Jamaica, Mexico, Panama, Paraguay, Saint Kitts and Nevis, Saint Lucia, Saint Vincent and Grenadines, Suriname, Trinidad and Tobago, Uruguay, Venezuela.	1.7	1 %
Amr D : Bolivia, Écuador, Guatemala, Haiti, Nicaragua, Peru	1.9	11 %
Emr D : Afghanistan, Djibouti, Égypt, Iraq, Morocco, Pakistan, Somalia, Sudan, Yemen.	4.3	70 %
Eur B : Albania, Armenia, Azerbaijan, Bosnia-Herzegovina, Bulgaria, Georgia, Kyrgyzstan, Uzbekistan, Poland, Rumania, Slovakia, Tajikistan, The Former Yugoslav Republic of Macedonia, Turkey, Turkmenistan, Yugoslavia.	2.5	1 %
Eur C : Belarus, Estonia, Hungary, Kazakhstan, Latvia, Lithuania, Republic of Moldova, Russian Federation, Ukraine.	3.5	11 %
Sear B : Indonesia, Sri Lanka, Thailand.	2.1	30 %
Sear D : Bangladesh, Bhutan, Democratic People's Republic of Korea, India, Maldives, Myanmar, Nepal.	4.0	75 %
Wpr B : Cambodia, China, Cook Islands, Fiji, Kiribati, Lao People's Democratic Republic, Malaysia, Marshall Islands, Micronesia (Federated States of), Mongolia, Nauru, Niue, Palau, Papua New Guinea, Philippines, Republic of Korea, Samoa, Tonga, Tuvalu, Vanuatu, Viet Nam	2.3	30 %
World	3.4	40 %

Source : AM Hauri, GL Armstrong, YJF Hutin. "The global burden of disease attributable to contaminated injections given in health care settings" International Journal of STDs & AIDS, 2004; 15: 7-16.

## IV. Care and Treatment

The care and treatment section of the RNM utilizes a similar methodology as the prevention section in that it combines estimates of population target groups, unit costs, and coverage targets, based on access to care and treatment. There are some differences, however, that are explained in detail below.

In the model, HIV is categorised into two broad intervention categories:

1. Care and prophylaxis in the absence of ART
2. ART

ART is further subdivided into five different health states:

- a) First six months on first-line ARV therapy. These six months are separated from ongoing time on ARV therapy because costs are usually lower and deaths are usually higher during this period
- b) Ongoing time on first-line ARV therapy
- c) First six months on second-line ARV therapy. As before, these six months are separated from ongoing time to capture any cost and survival differences associated with switching from first to second-line
- d) Ongoing time on second-line ARV therapy
- e) Patients who have clinical progression after starting ART, who may or may not still be receiving ARVs

The model is very flexible and can accommodate a wide array of different types of interventions (ART, treatment and prophylaxis of opportunistic infections, counselling, nutritional support, home based care, palliative care) and service settings (community, primary health care, hospital).

In most cases, the basic approach to costing services is two-fold:

1. Estimate the physical *ingredients* of each interventions in each health state per patient-period, for example:
  - a. quantities of different types of ARVs
  - b. numbers of different types of lab tests
  - c. utilisation of outpatient visits or inpatient days
2. Specify the *input cost* of each ingredient, for example:
  - a. annual cost of ARVs
  - b. cost of each different lab test
  - c. cost per outpatient visit or inpatient day

This information is combined with number of patients and coverage rates to calculate an annual cost.

The model estimates resource needs for up to 10 types of care and treatment. When the 'ingredients', or disaggregated, approach to costing is used, calculations are performed for three categories of care and treatment: ART, Non-ART care and prophylaxis, and Diagnostic testing. In most cases, the other interventions (e.g., home-based care, palliative care) are covered by the service delivery units that are entered for ART and care in the absence of ART, as specified in the "HIV treatment" worksheet. There are situations, however, when the funding streams for home-based care or palliative care are completely separate and there is not a direct link between the other care services and these services. In these cases, the gray radio button labeled, "Show/hide HBC, palliative care, TB, nutrition and ARV training" should be selected so that the following interventions appear explicitly:

- (1) Home-based care (HBC)
- (2) Palliative care
- (3) Training for ART care
- (4) Nutritional support
- (5) Tuberculosis

When these interventions appear explicitly, information on unit costs should be entered directly into the "Care and treatment" worksheet.

The population newly requiring treatment in a particular year is assumed to be equal to the number of people living with HIV who are newly symptomatic during that year, and is provided by Spectrum. Symptoms are assumed to occur about two years before death from AIDS would occur in the absence of ART. In the absence of ART care and treatment is needed for two years until death. Patients receiving ART survive longer and have reduced need for palliative care and OI treatment. The number of people needing ART is those newly symptomatic plus patients on ART in the previous year who survive to the current year. The details of these calculations are given below.

## **Input costs**

Definitions of the laboratory tests, drugs, and service delivery units that are delineated in the "Input costs" worksheet are as follows:

### *Tests*

FBC – Full blood count or complete blood count

HB – haemoglobin

ALT - ALanine Aminotransferase

Abbott determine – Abbott determine HIV-1/2 rapid assay test

Gaifor – Gaifor confirmatory test

Whitestar – Whitestar rapid test

ELISA - HIV enzyme immunoassay test

CD4 – CD4 cell count test

Viral load – HIV viral load test

PCR test - Polymerase Chain Reaction test for HIV

Diff – Differential blood test

Creatinine – Creatinine blood test

Glucose – Glucose blood test

Chol/TG – Cholesterol and triglycerides test

Default safety and monitoring laboratory testing schedules have already been specified in the “HIV treatment” worksheet, based on the recommended testing schedules for ARVs<sup>10</sup>. You don't have to make any changes to this section if you wish to accept the default values in the model. However, you might wish to change the frequency of CD4 and viral load testing.

### *Drugs*

AZT - Azidodeoxythymidine, also known as zidovudine (ZDV)

3TC – Efavirenz, also known as lamivudine

d4T – stavudine

ddl – didanosine

NVP – Nevirapine

EFV – Efavirenz

LPV/r - Lopinavir/Ritonavir, also known as Kaletra

TDF – tenofovir DF

AZT/3TC – combination of AZT and 3TC

d4T/3TC/NVP – combination of d4T, 3TC and NVP

Cotrimoxazole – prophylaxis against opportunistic infections

Formula milk – infant formula, usually in powder form

Nutrition – nutritional supplements

You can specify a mark-up on ARV prices to cover procurement, stock management and distribution in the “HIV treatment” worksheet. The current assumption in the model is a 15% mark-up.

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<sup>10</sup> WHO, Scaling up antiretroviral therapy in resource-limited settings: treatment guidelines for a public health approach, 2003, World Health Organisation: Geneva, available at [http://www.who.int/hiv/pub/prev\\_care/en/arvrevision2003en.pdf](http://www.who.int/hiv/pub/prev_care/en/arvrevision2003en.pdf).

You can choose your different first and second-line ARV regimens and enter them into the appropriate boxes in the "HIV treatment" worksheet. Note that the "Failing" allows the user to define regimens for patients that are failing treatment. Because there might still be clinical benefit for patients to stay on ARVs even if virologically failing, you might choose to assume that a proportion stays on treatment and that a proportion goes off treatment for reasons of intolerance.

### *Service delivery units*

ART visit – Cost of one visit to a physician for an examination and drugs

Couns visit – Cost of one visit to a counselor for a counseling session

Inpatient day – Cost of one inpatient day in a secondary, or district, hospital

TB full course – Cost of a complete course of treatment for one case of tuberculosis

Home-based care – Cost of one home-based care visit, described further below

Palliative care – Cost of one palliative care visit, described further below

PMTCT visit – Cost of the PMTCT counseling and testing portion of an antenatal care visit

HIV visit – Cost of one visit for primary care, before ART begins

HIV treatment can be provided in a number of service delivery contexts. For example, treatment of severe opportunistic infections might require inpatient care, but provision of medicines for prophylaxis against opportunistic infections would happen in clinics or hospital outpatient departments.

Services are categorised into ambulatory visits, inpatient days and completed treatments (such as tuberculosis treatment). Simply select your service delivery unit from the drop down boxes in the "HIV treatment" worksheet and specify the numbers of each type that are utilised per patient-period (6 months or annual) in the different HIV health states.

Pre-ART services could include the treatment and prophylaxis of opportunistic and HIV-related infections through outpatient visits, TB care, inpatient care and home based care.

ART services would primarily include the use of outpatient visits, but some inpatient and TB treatment might still be required. The first six months on a regimen are typically more service intensive than subsequent time on a regimen.

Finally, the model can estimate the service utilisation that is associated with a terminal event (death). During this time, patients might spend a number of days in hospital or in palliative care.

### **Anti-retroviral therapy (ART)**

There are four inputs required to calculate the costs of ART.

1. Population in need receiving ART (coverage): The population in need of ART that receives it.
2. Total adults currently on ART: The current stock of ART patients, that is, the number of adults that are on ART at the beginning of the projection.
3. Average time on ART for those currently on ART: The number of years a person currently on ART is expected to survive (not those beginning treatment during the projection).
4. Ratio of paediatric to adult ARV drug costs: Because paediatric syrups and table formulations tend to be more expensive than their adult counterparts, a mark-up can be specified. A simple approach to calculating the necessary mark-up is to work out the cost per year for a 3 year old child receiving syrups, and a 10 year old child receiving tablets, average the annual costs, and compare to the adult annual costs for the same regimen. This will give a rough idea of the price inflator that needs to be applied to your ARV prices for children. Currently, the model assumes ARVs for children cost 1.35 times more (i.e. 35%).

The model calculates survival separately for care and prophylaxis in the absence of ARVs (No-ART) and ART. No-ART survival is assumed to be 12 months on average, based on a review of HIV natural history data<sup>11</sup>. This implies that newly symptomatic patients entering the model are assumed to have died by the end of one year.

For ART, default assumptions regarding survival, patient retention and proportions on first-line and second-line are shown in Box 1 below<sup>12</sup>. Duration on ART refers to the length of time (in years) that a patient has been on ART. Proportion alive and in care is then specified by duration on ART. At baseline, 100% are alive and in care but by 6.5 years, this has decreased to 60%. The median survival in the model is therefore 6.5 years. Of those surviving and remaining in care, a certain proportion will fail the first line regimen and start taking second line. The proportion on second line increases as duration on ART increases. Similarly, as duration on ART increases, the proportion failing second-line also increases.

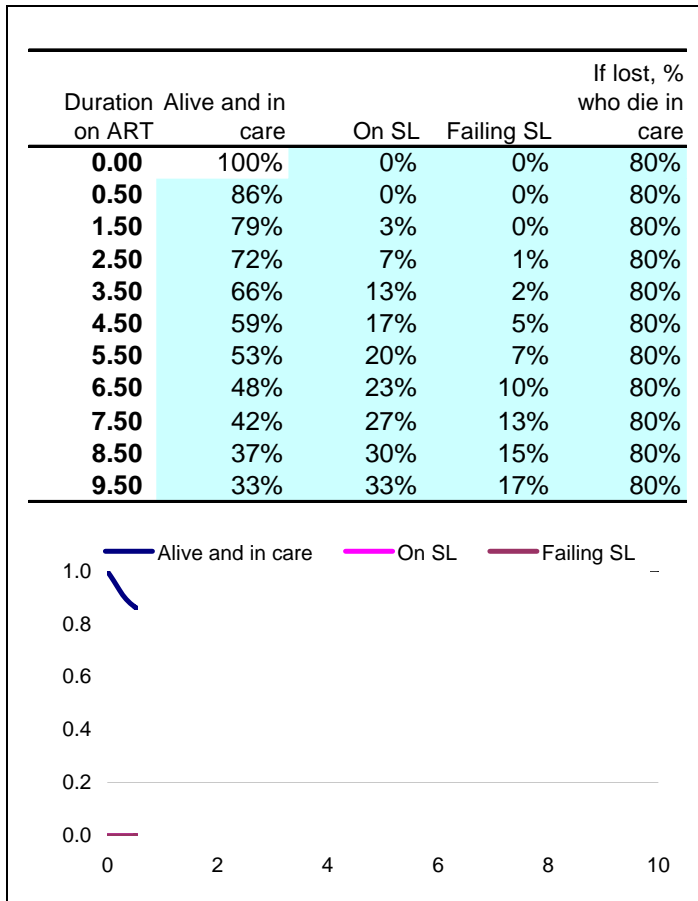
Note that you may change these survival and retention rates, if you have data that are more appropriate for your country.

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<sup>11</sup> Schneider, M., M. Zwahlen and M. Egger, *Natural history and mortality in HIV-positive individuals living in resource-poor settings: A literature review*. UNAIDS Obligation HQ/03/463871. 2004, UNAIDS: Geneva.

<sup>12</sup> Cleary SM, McIntyre D, Boule A, “The cost-effectiveness of Antiretroviral Treatment in Khayelitsha, South Africa - a primary data analysis,” *Cost Eff Resour Alloc*. 2006 Dec 6;4(1):20.

### Box 1: ART survival, retention and regimens



The calculations are as follows:

$$\text{Total ART Costs}_{t,c} = \text{Initial number of patients receiving ART}_{0,c} \times \text{Unit cost}_c + \text{Number of patients}_{t,c} \times \text{Percent receiving ART}_{t,c} \times \text{unit cost}_c$$

where:

- Unit cost = Weighted average of adult and child drug costs for each regimen  $c$ , where  $c$  = first six months of first-line therapy, remainder of first-line therapy in patient-year terms, first six months of second-line therapy, remainder of second-line therapy in patient-year terms, failure (although still receiving ART), and dying;
- Percent receiving  $\text{ART}_{t,c}$  = Percent of patients initially receiving regimen  $c$  at time  $t$ , i.e., the coverage rate; and
- Number of patients  $_{t,c}$  = Number of patients on different regimens  $c$  at time  $t$ , cycling through the different regimens according to the chart above.

## **Non-ART care and prophylaxis**

This section of the model is used if the unit costs for non-ART care and treatment are calculated using a disaggregated approach, that is, using the “Input costs” and “HIV treatment” worksheets. Non-ART care and treatment consists of any care and treatment for those patients not on ART, including treatment for opportunistic infections, home-based care, palliative care, counseling, laboratory testing, provision of prophylaxis, etc.

The provision of prophylaxis is an important part of non-ART care and treatment. HIV infection weakens the immune system and makes people susceptible to infections that can normally be controlled when the immune system is healthy. For example, many people are infected with latent tuberculosis, but the immune system keeps this infection from developing into active tuberculosis. However, in people with advanced HIV infection, this protection is weakened and active tuberculosis occurs more frequently. Drugs can prevent some common HIV-related diseases. Cotrimoxazole can protect against many of the causes of pneumonia and diarrhoea. Isoniazid can prevent active tuberculosis. These drugs are inexpensive and effective in HIV-positive individuals.

Prophylaxis against these common infections can extend life and improve the quality of life for many individuals. Prophylaxis is also cost-effective, since preventing these infections costs less than treating them.

In this section, the population in need is calculated by the model as a residual, and is defined as those patients who are in need of ART who are not receiving it.

The only coverage assumption needed is the percent of those needing non-ART care and prophylaxis that are receiving it.

The unit costs are calculated using the “Input costs” and “HIV treatment” worksheets.

The calculations are:

Non-ART care and prophylaxis costs<sub>t</sub> = Patients in need of non-ART care and treatment<sub>t</sub> x unit cost<sub>t</sub>

## **Diagnostic testing**

Diagnostic testing refers to tests ordered by health care providers who suspect on the basis of symptoms that a person is infected with HIV or the routine offer of testing to all patients who conditions might suggest an elevated risk, such as STI patients or TB patients. The target population is generally set as all hospital patients plus tuberculosis patients, but some other indicator of the number of people in contact with the health care system could be used as well.

There is one coverage indicator:

1. Percent of medical patients receiving diagnostic testing

The unit cost is the cost of the HIV test, and can be calculated using either the "Input costs" and "PMTCT & VCT" worksheets, or entered directly.

The calculations are as follows:

$$\text{Number of medical patients tested}_t = \text{Number of medical patients}_t \times \% \text{ medical patients tested}_t$$
$$\text{Resources required}_t = \text{Number of medical patients tested}_t \times \text{cost per test}$$

As discussed above, when you do not want to calculate costs in a disaggregated way, click on the gray radio button labeled, "Show/hide HBC, palliative care, TB, nutrition and ARV training," and then enter the assumptions required for these interventions as described below.

### **Home-based care**

Home-based care (HBC) is external support to chronically ill individuals and their families. It may include counseling, medical care, supplies for medical care, clothing, extra food, help with household work, companionship, financial support, legal services, training for care-givers, school fees, shelter or other medical or social services.

The population in need of home-based care is the number of people newly needing care multiplied by 2, since we assume that the need for care lasts for 2 years, and is calculated by the model.

When home-based care is displayed explicitly in the "Care and treatment" worksheet, coverage and unit costs must be entered. The single coverage indicator is the percentage of those in need of care who receive home-based care. The single unit cost input is the cost per person per year of home-based care.

The calculations are as follows:

$$\text{Number receiving home-based care}_t = \text{Number newly needing care}_t \times 2 \times \text{coverage}_t$$
$$\text{Resources needed}_t = \text{Number receiving home-based care}_t \times \text{unit cost}$$

### **Palliative care**

Palliative care refers to care that addresses pain and discomfort associated with HIV. When delivered through home-based care it should be considered as part of that intervention. When delivered through another setting, such as a health post, clinic or hospital, it is considered here.

The population potentially in need of palliative care is the number of adults and children newly needing care minus those who start receiving ART plus those dying this year. The costs of caring for children are expressed as a ratio of the adult costs. The default value is 100%.

The calculations are as follows:

Pop in need of palliative care<sub>t</sub> = (Adults newly needing care<sub>t</sub> + Children newly needing care x Ratio of child care costs to adult care costs) x (1 - % on ART) + Patients dying<sub>t</sub>

Pop receiving palliative care<sub>t</sub> = Pop in need of palliative care<sub>t</sub> x coverage<sub>t</sub>

Resources needed<sub>t</sub> = Pop receiving palliative care<sub>t</sub> x unit cost

### **Training for ART care**

Training may be required to prepare physicians and clinical managers to treat patients on ART. To estimate the need for training there are 10 inputs required. The first six refer to the number of facilities where ART could be provided. These include: referral hospitals, general hospitals, primary hospitals, maternity clinics, other clinics and health posts with nurses. Four other inputs are also required:

1. Maximum patients served by FTE: the maximum number of patients that can be served by a health worker working full time on ART.
2. Percent of time physician spends on caring for AIDS patients. The percent of time that the average physician who care for AIDS patients spends on AIDS care.
3. Clinic manager per health center. The average number of clinics managers per health center. Typically this would be one.
4. Length of training. The number of days a typical training session lasts to train health workers to care for ART patients.

The calculations are as follows:

Number of physicians required<sub>t</sub> = Adult equivalents on ART<sub>t</sub> / Maximum patients served by FTE / Percent of time physician spends on caring for AIDS patients

Number of training days required<sub>t</sub> = Number of physicians required<sub>t</sub> x length of training + Training days in clinical management<sub>t</sub>

Training days in clinical management<sub>t</sub> = minimum(Number of hospitals and clinics<sub>t</sub> x length of training OR Number of physicians required<sub>t</sub> x length of training)

(If the number of physicians trained is smaller than the number of facilities then those physicians will also be trained in clinic management. If the number is larger than the number of facilities then one physician or clinic manager will be trained per facility.)

Resource needed<sub>t</sub> = Number of training days<sub>t</sub> x cost per day of training

### **Nutritional support**

Patients receiving ART may also need nutritional support to restore their health and allow them to benefit fully from ART. Two inputs are required to estimate the population receiving nutritional support:

1. Percentage of children that are undernourished: The percentage of children under the age of 5 that is undernourished.

2. Ratio undernourished < 5 : undernourished HIV+. This is the ratio of the percentage of children under the age of 5 that are undernourished to the percentage of all HIV+ eligible for ART that are undernourished. The default values are 0.44 for low income countries and 0.10 for middle income countries.

The percentage of all HIV+ patients eligible for ART that are undernourished is estimated by multiplying the percentage of children under 5 that are undernourished by the ratio of undernourishment among children under 5 to HIV+ patients:

$$\text{Percent of HIV+ undernourished}_t = \text{Percent of children under five that are undernourished} \times \text{ratio undernourished < 5 : undernourished HIV+}$$

We assume that nutritional support is provided in the first year to patients starting ART.

$$\text{Number receiving nutrition support}_t = \text{Adult equivalents starting on ART}_t \times \text{Percent of HIV+ undernourished}_t$$

$$\text{Resources required}_t = \text{Number receiving nutrition support}_t \times \text{unit costs}$$

The unit costs typically range between \$100 and \$200.

### **Tuberculosis**

The resources needed for tuberculosis treatment are simply the number of people with TB multiplied by the percent receiving treatment multiplied by the annual costs of treatment.

$$\text{Resources needed}_t = \text{Number with TB}_t \times \text{Coverage}_t \times \text{Unit cost of treatment}$$

## V. Support for Orphans and Vulnerable Children

Orphans are defined as children under the age of 18 that have lost one or both parents. An AIDS orphan is a child under 18 who has lost one or both parents to AIDS. Programming for orphan support in general should not distinguish between AIDS and non-AIDS orphans. Both need education, food, clothing, etc. Many other children may be vulnerable and in need of support. Definitions of vulnerability vary from country to country, so the number of orphans and vulnerable children potentially in need of support will depend on national definitions.

In countries with generalized AIDS epidemics a significant proportion of orphans are due to AIDS. As a result orphan support is often included as part of the AIDS budget. In other countries, AIDS may be responsible for only a small percentage of all orphans. In those cases, orphan support may not be considered part of the AIDS budget and this section can be skipped.

Estimates of the number of orphans by age are the starting point for this analysis. But not all orphans are in need of public support. Some may be living with one surviving parent who can afford to care for them. We estimate the proportion of orphans in need of public support as the proportion of households living below the poverty line.

Orphans and vulnerable children need many types of support including education, food, health care, shelter, clothing, economic support and psychosocial support. Some services, such as education and health care, may be provided free by the government or may require fees. The support services here are split into five categories:

1. Education support: Primary school (school fees, uniforms, books and supplies, special fees/assessments) and secondary school (school fees, uniforms, books and supplies, special fees/assessments, skills training)
2. Health care support: Child 0-4 (full course of childhood immunizations, vitamin A/zinc/iron supplements, routine health care), Child 5-9 (routine health care), Child 10-18 (routine health care, RH and HIV prevention information and services)
3. Family/home support: bednet, clothes, shoes, blanket and bedding, food, microfinance, income generating activities, seed for food crops, self-support grants)
4. Community support: Identification of OVC in the community, outreach for street children, train and support for one full-time community worker, child care
5. Organization costs: Administration, M&E, fund raising, reporting

Estimates of the number of orphans and vulnerable children should be provided by age. These may come from Spectrum projections or from other sources. The

default calculations from Spectrum assume that all orphans and vulnerable children are included in the target population, that is, they include orphans and vulnerable children from non-AIDS causes. In Spectrum, vulnerable children are defined as those children who will have one and/or both parents die in the next year.

Two other inputs are required to estimate the population in need:

1. Secondary school enrollment rate: This is the gross enrollment rate, which is the number of secondary school students divided by the number of children of secondary school age.
2. Percent living below the poverty line: The percent of households living below the national poverty line.

Note that, if a secondary-age child is not enrolled in school, they are part of the target population for skills training.

The number of orphans and vulnerable children needing support is estimated as follows:

Education support:	$\text{Primary school}_t = \text{OVC}_{5-12,t} \times \% \text{ below poverty line}$ $\text{Secondary school}_t = \text{OVC}_{13-17,t} \times \text{secondary school enrollment rate} \times \% \text{ below poverty line}$ $\text{Skills support}_t = \text{OVC}_{13-17,t} \times (1 - \text{secondary school enrollment rate}) \times \% \text{ below poverty line}$
Health care support <sub>t</sub> :	$\text{Children aged 0-4, 5-9 or 10-18} \times \% \text{ below poverty line (according to age range of interventions)}$
Family home support <sub>t</sub> :	$\text{OVC}_{0-17,t} \times \% \text{ below poverty line (all interventions)}$
Community support:	$\text{Identification of OVC in community} = \text{OVC}_{0-17,t} \times \% \text{ below poverty line} / 36 \text{ (assumes each community worker identifies 36 OVC)}$ $\text{Outreach for street children} = \text{OVC}_{0-17,t} \times \% \text{ below poverty line} \times 0.05 \text{ (assumes ratio of 20 to 1)}$ $\text{Train and support one full-time community worker} = \text{OVC}_{0-17,t} \times \% \text{ below poverty line} / 36 \text{ (assumes each community worker services 36 OVC)}$ $\text{Child care} = \text{OVC}_{0-4,t} \times \% \text{ below poverty line}$

Each of the interventions requires a coverage rate, which is applied to the target population. Initial coverage rates can be entered into the initial year, then target rates for the final year, and the model will interpolate the coverage rates in between.

The unit costs are required for each type of support. Median costs and first and third quartiles are shown below for OVC support in sub-Saharan Africa, based on a survey of 300 organizations in 22 countries. These are costs paid by organizations, so if there is free primary schooling or health care in a country, those costs were entered as zero.

Median costs per child in US Dollars for sub-Saharan Africa in 2004

	Median	1 <sup>st</sup> /3 <sup>rd</sup> Quartiles
<b>Education</b>		
<i>Primary school</i>		
1. School fees	18	12/34
2. Uniforms	14	11/24
3. Books and supplies	17	10/23
4. Special fees/assessments	10	3/18
<i>Secondary school</i>		
1. School fees	103	41/143
2. Uniforms	21	18/38
3. Books and supplies	44	25/63
4. Special fees/assessments	33	15/81
5. Skills training	98	31/154
<b>Health care support</b>		
<i>Child 0-4</i>		
1. Full course of childhood immunizations	1	0/7
2. Vitamin A, zinc and iron supplements	12	2/32
3. Routine health care	27	16/46
<i>Child 5-9</i>		
1. Routine health care	32	15/65
<i>Child 10-17</i>		
2. Routine health care	28	18/43
3. RH and HIV prevention information and services	41	19/107
<b>Family/home support</b>		
1. Bednet	7	5/9
2. Clothes	28	19/57
3. Shoes	16	13/26
4. Food	310	298/466
5. Blanket and bedding	16	12/32
6. Microfinance	107	54/125
7. Income generating activities	87	32/146
8. Seed for food crops	36	18/74
9. Self-support grants	93	44/112
<b>Community support</b>		
1. Identification of children in need in the community	10	6/20
2. Outreach for street children	126	19/200
3. Train and support one full-time community worker	345	117/656
4. Child care	86	24/116
<b>Organization costs</b>		
1. Administration, M&E, fund raising, reporting as a percent of all costs	16%	14%/25%

Source: J Stover, L Bollinger, N Walker, R Monash. Resource needs to support orphans and vulnerable children in sub-Saharan Africa, forthcoming, January 2007, *Health Policy*.

The costs are calculated as follows:

$$\text{Resources required}_t = \sum_s \text{Number needing support}_{s,t} \times \text{coverage}_{s,t} \times \text{unit cost}_s$$

where  $s$  = interventions in each of the sub-categories education, health care, family/home, and community

One final assumption is needed to calculate the expenditures for administrative costs. Organization costs for OVC interventions are calculated as a percentage of total overall costs, and should include consideration of administrative, monitoring and evaluation, fund raising, and reporting expenditures:

$$\text{Organization costs}_t = \text{Resources required}_t \times \% \text{ spent on organization costs}$$

The median and average percentages for sub-Saharan Africa are shown in the table above.

Total resources required for OVC activities is then the sum of resources required and organization costs:

$$\text{Total resources required}_t = \text{Resources required}_t + \text{Organization costs}_t$$

## VI. Program Support

Program support includes the policy, management and administration, research, and monitoring and evaluation activities necessary to support the implementation of a national program. These costs are not directly related to the number of people receiving care, as they refer to costs that operate across a number of different service delivery points, such as training, and monitoring and evaluation.

Resources for these functions are estimated either as a percent of total direct program resources, or as an absolute amount. An often used rule-of-thumb states that 5% of program funding should be allocated to monitoring and evaluation. Similar percentages may be appropriate for the other functions. The calculated resources can be matched to the estimated actual spending in the base year in order to calibrate the percentages to realistic levels.

Resources required for:

Enabling environment<sub>t</sub> = Program resources<sub>t</sub> x % or amount for enabling environment

Programme Management<sub>t</sub> = Program resources<sub>t</sub> x % or amount for management and administration

Research<sub>t</sub> = Program resources<sub>t</sub> x % or amount for research

Monitoring and evaluation<sub>t</sub> = Program resources<sub>t</sub> x % or amount for monitoring and evaluation

Strategic Communication = Program resources<sub>t</sub> x % or amount for strategic communication

Advocacy = Program resources<sub>t</sub> x % or amount for advocacy

Procurement and stores = Program resources<sub>t</sub> x % or amount for procurement and storage

Programme-level HR = Program resources<sub>t</sub> x % or amount for managing human resources at the programme level

Training = Program resources<sub>t</sub> x % or amount for general training

Deployment/Transport = Program resources<sub>t</sub> x % or amount for deployment and transport

Laboratory equipment = Program resources<sub>t</sub> x % or amount for laboratory equipment

## VII. Outputs

The outputs from the Resource Needs Model are contained in individual worksheets within the workbook. Some of the outputs are in tabular form, while other outputs appear in graphs. The outputs that can be obtained are listed below according to the title of each individual worksheet:

- **Summary:** A summary of the expenditures on each of the prevention, care, and orphan support activities, for each of the years under analysis. Column B in this table is used to indicate whether this intervention is considered part of the AIDS program. If it is, then column B should contain a "Y". For low prevalence countries, some programs (such as orphan support or universal precautions) may not be considered part of the AIDS program budget. In that case, you can enter a "N" in column B and that intervention will be excluded from the total.
- **Funding chart:** A stacked bar chart that shows the distribution of expenditures for each of the prevention, care, and orphan support activities, for each of the years under analysis.
- **Prevention funding chart:** A stacked bar chart, as in the 'Funding chart' worksheet, except focusing on prevention activities only, for each of the years under analysis.
- **Care funding chart:** A stacked bar chart, as in the 'Funding chart' worksheet, except focusing on care and treatment support activities only, for each of the years under analysis.
- **Mitigation funding chart:** A stacked bar chart, as in the 'Funding chart' worksheet, except focusing on orphan and vulnerable children support activities only, for each of the years under analysis.
- **Distribution chart:** A stacked bar chart showing the percentage contribution of each component to total resource needs by year.

## VIII. Glossary of Terms

**AIDS.** The abbreviation for the acquired immune deficiency syndrome, a disabling and fatal disease caused by the human immunodeficiency virus (HIV).

**Epidemiology.** The study of the incidence, distribution, and determinants of an infection, disease, or other health-related event in a population. Epidemiology can be thought of in terms of who, where, when, what, and why. That is, who has the infection/disease, where are they located geographically and in relation to each other, when is the infection/disease occurring, what is the cause, and why did it occur?

**EPP: Epidemic Projection Package.** The computer package recently developed by the UNAIDS Reference Group on Estimates, Modelling and Projections to project HIV prevalence. The output from the model can feed directly into the Spectrum/AIM model (described below) to calculate various impacts. It can be found at <http://www.futuresgroup.com>, under software.

**Harm reduction program.** A prevention intervention designed to reach intravenous drug users. This program may contain a combination of different elements, including outreach programs, IEC campaigns, distributing disinfectants and clean syringes, and distributing condoms.

**HIV.** The human immunodeficiency virus is the virus that causes AIDS. Two types of HIV are currently known: HIV-1 and HIV-2. Worldwide, the predominant virus is HIV-1. Both types of virus are transmitted by sexual contact, through blood, and from mother to child, and they appear to cause clinically indistinguishable AIDS. However, HIV-2 is less easily transmitted, and the period between initial infection and illness is longer in the case of HIV-2.

**HIV Infection.** Infection with the human immunodeficiency virus (HIV). HIV infection is primarily a sexually transmitted infection, passed on through unprotected penetrative sex. The virus can also be transmitted through blood transfusions, through the use of unsterilized injection equipment or cutting instruments, and from an infected woman to her fetus or nursing infant.

**Interpolation.** Given two numbers that serve as boundary points, it is possible to estimate the values that lie at intervals between the two points. For example, if the HIV prevalence rate for a country or region was actually measured only in 1985 and in 1995, by assuming even increments from year to year, it is possible to interpolate a TFR for each intervening year. Spectrum uses a linear form of interpolation so that the difference between each annual value is the same. Other nonlinear forms of interpolation are also possible but are not used here.

**Mass media campaign.** An information, education, and communication campaign undertaken via different media to reach a large number of people. Media may include channels such as radio, television, and print.

**Model.** Computer system designed to demonstrate the probable effect of two or more variables that might be brought to bear on an outcome. Such models can reduce the effort required to manipulate these factors and present the results in an accessible format.

**Module.** Synonym for "model."

**Orphan.** In this manual, an orphan is defined as a maternal, paternal, or dual AIDS or non-AIDS orphan. This is the definition recently adopted by the US Census Bureau, UNAIDS, UNICEF, and USAID, after modelling work completed by the UNAIDS Reference Group on Estimates, Modelling and Projections.

**Perinatal and Perinatal Transmission.** Pertaining to or occurring during the periods before, during, or shortly after the time of birth; that is, before delivery from the 28th week of gestation through to the first seven days after delivery. The transmission of HIV from an infected woman to her fetus or newborn child is referred to as perinatal transmission.

**Prevalence.** The proportion of a defined population with the infection, disease, or other health-related event of interest at a given point or period of time.

**Spectrum/AIM.** A group of computer models that analyze existing information to determine the future consequences of today's reproductive health programs and policies. These models may be used to project the impact of HIV prevalence, calculated by the EPP model (see above), on various demographic and economic outcomes. The models and documentation are available for free download at <http://www.futuresgroup.com>, under Software.

## IX. Acronyms and Abbreviations

<b>AIDS</b>	acquired immunodeficiency syndrome
<b>ANC</b>	antenatal clinics
<b>ARV</b>	anti-retroviral therapy
<b>DHS</b>	Demographic and Health Survey
<b>DOTS</b>	Directly Observed Therapy Short Course
<b>FC</b>	female condom
<b>GDP</b>	gross domestic product
<b>GNP</b>	gross national product
<b>HIV</b>	human immunodeficiency virus
<b>IDU</b>	injection drug user
<b>IE&amp;C</b>	information, education, and communication
<b>MSM</b>	men who have sex with men
<b>NEP</b>	needle exchange programs
<b>NGO</b>	nongovernmental organization
<b>OI</b>	opportunistic infection
<b>OVC</b>	orphans and vulnerable children
<b>PLHA</b>	people living with HIV/AIDS
<b>PMTCT</b>	prevention of mother-to-child transmission
<b>PY</b>	person years
<b>SW</b>	sex worker
<b>STI</b>	sexually transmitted infection
<b>UN</b>	United Nations
<b>UNFPA</b>	United Nations Fund for Population Activities

<b>UNGASS</b>	United Nations General Assembly Special Session on HIV/AIDS
<b>USAID</b>	United States Agency for International Development
<b>VCT</b>	voluntary HIV counseling and testing
<b>WHO</b>	World Health Organization