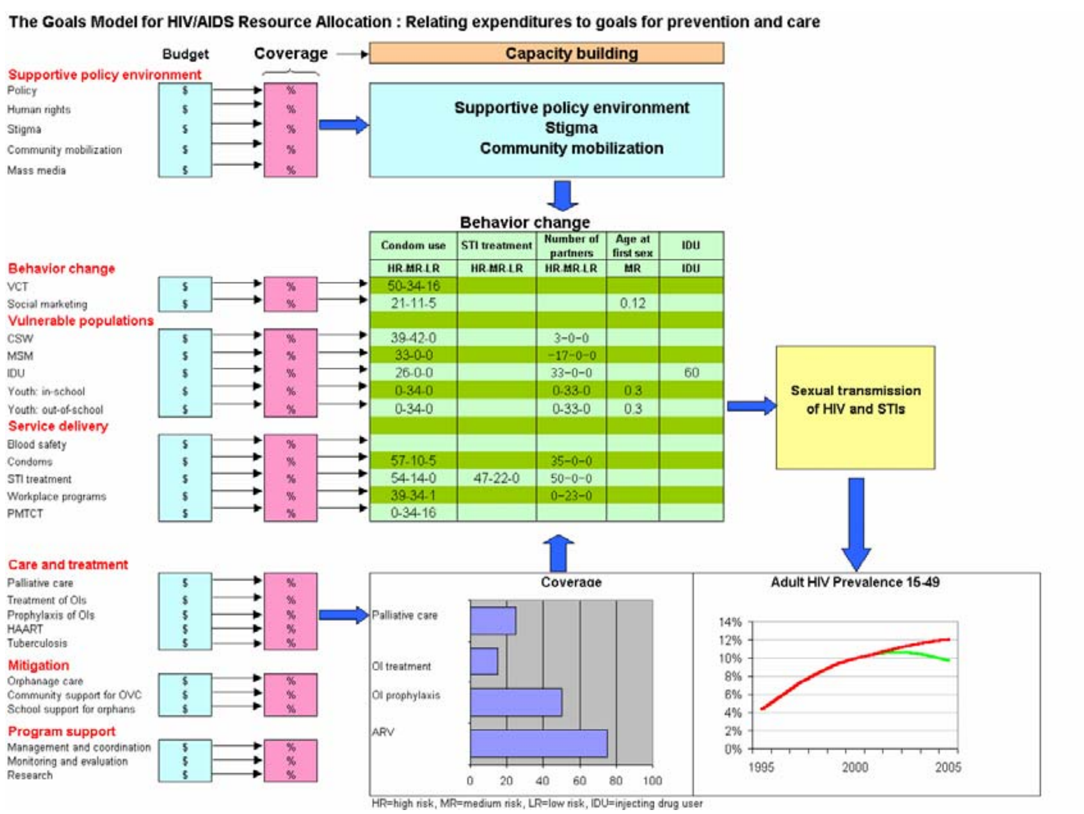
Goals Model

For Estimating the Effects of Resource Allocation Decisions on the Achievement of the Goals of the HIV/AIDS Strategic Plan

Version 3.0
March 2003



THE Futures GROUP INTERNATIONAL

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Version 3.0
March 2003

John Stover
Lori Bollinger
Katharine Cooper-Arnold
The Futures Group International

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I. Introduction

A. What is *Goals?*

The ***Goals*** model is intended to support strategic planning at the national level by providing a tool to link program goals and funding. The model can help answer several key questions:

- How much funding is required to achieve the goals of the strategic plan?
- What goals can be achieved with the available resources?
- What is the effect of alternate patterns of resource allocation on the achievement of program goals?

The ***Goals*** model does not provide all the answers. It is intended to assist planners in understanding the effects of funding levels and allocation patterns on program impact. The model can help planners understand how funding levels and patterns can lead to reductions in HIV incidence and prevalence and improved coverage of treatment, care and support programs. It does not, however, calculate the "optimum" allocation pattern or recommend a specific allocation of resources between prevention, care and mitigation.

Goals is intended for use by national programs to explore the effects of different funding levels and patterns on national goals. It is generally 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). A technical team works together to implement the model for the first time. Then the model is used in interactive workshops with planners and stakeholders to explore the effects of different program configurations on the provision of care and support and the prevention of new HIV infections. Through this interaction participants gain a better understanding of the dynamics of funding and impact. This prepares them to develop realistic budgets and goals that reflect their priorities. A typical application may take two weeks to set up the model, which can then be used with occasional updating to support annual planning exercises and *ad hoc* studies.

Designing and implementing an HIV/AIDS national program is complex and important. Prevention, treatment, and palliative care costs are a significant component of the health budget. In most national strategic plans, although the activities to be undertaken are clearly outlined, these activities are not tied to specific prevalence goals the countries want to attain. By projecting estimates of future program needs, ***Goals*** can help planners respond to changes in intervention, care, and drug therapy funding. It should be noted that when trying to provide high-quality HIV/AIDS services, political, legal, and ethical considerations sometimes take priority over economic issues in determining the most cost-effective resource allocation pattern.

Designing and incorporating an HIV/AIDS program into strategic plan goals is a complicated process requiring skilled and dedicated personnel, appropriate technologies, legislation, infrastructure, and adequate funds. Note that, although ***Goals*** can be used to show how the distribution of funds will affect HIV/AIDS prevalence and coverage, it does not imply that program goals can be achieved merely by allocating the necessary funds.

B. Why Use the *Goals* Model?

The ***Goals*** model may be used for several purposes. Millions of dollars are spent annually to prevent HIV infection without a thorough understanding of the most effective way to allocate these funds. Therefore, one reason to use the ***Goals*** model is to estimate the impact of budget decisions on the achievement of HIV/AIDS program goals. By anticipating the consequences and trade-offs of allocation options, ***Goals*** can support the decision making process and may include the following activities:

- Estimating reductions in HIV prevalence
- Estimating increases in coverage of essential care and treatment services.
- Allocating resources between prevention and care programs.
- Setting priorities for high-risk populations.
- Calculating training needs required to provide services.

By understanding how resources need to be spent to achieve proposed goals, these simulations can help planners choose goals that are attainable and useful. For example, information on the magnitude of the economic effects of STIs on the prevalence and incidence of HIV may move the allocation of resources away from other sectors and toward the health sector.

Another important use of the ***Goals*** model is the examination of alternative resource allocation strategies. Rather than simply project current expenditures into the future, the analyst can ask, "How much funding is required to achieve national coverage for the most cost-effective interventions? How much funding is required to provide palliative care to everyone who needs it? How many pregnant women can be treated with ARV to prevent maternal-to-child transmission? Would the allocation of additional expenditures to HAART have a significant impact on HIV prevalence goals?"

The ***Goals*** model is not intended to replace the tools and techniques used in day-to-day operations. It is intended to support policy dialogue about the allocation of resources and its contribution to achieving the goals of the HIV/AIDS national strategic plan. It is designed to support discussion of long-term issues, such as reduction in HIV incidence and prevalence, the implications of initiating HAART, alternative options in preventing mother-to-child transmission, and the funding requirements to meet national HIV and STI health goals.

C. Steps in Using the *Goals* Model

There are six major steps involved in using ***Goals***:

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 and can apply it to the national strategic plan. 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 HIV/STI prevalence, sexual behavior, existing human capacity and the costs of prevention and care programs.** The ***Goals*** model contains a large amount of information obtained from published studies on the cost and impact 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 and number of partners).

3. **Adapt the model to the national strategic plan.** The model is designed to show the consequences of allocating funds to various prevention, care and treatment programs. To do this, the activities in the strategic plan

need to be linked (or mapped) to the categories in the model. This may require adding some line items for activities that are in the plan but not in the model, or mapping the budget categories in the plan to those used in the model.

4. **Enter data specific to *Goals*.** Once the data described in step 2 are collected for the current year and decisions are made about funding options and adapting the model to the activities in the strategic plan, the data are entered into the ***Goals*** model.

5. **Conduct resource allocation workshops.** In most applications the model will be used in a workshop with decision makers. The workshop will be an interactive session where participants will try out different resource allocation strategies and observe the consequences. Participants may use the model to examine different types of issues, such as "Which prevention interventions are most cost-effective?" "How many people are receiving palliative care with the current allocation?" "How many people can be treated with HAART with available funds? How would that change if drug prices were lower?" As various options are tested with the model the participants will gain a better understanding of the trade-offs involved and the amount of funding required to achieve the goals.

6. **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.

II. Inputs Needed for *Goals*

The ***Goals*** model requires a wide variety of inputs, including detailed information about the strategic plan to be analyzed, data regarding sexual behavior by risk group, demographic data, base year human capacity, and assumptions about types of care and mitigation activities that will be provided. Standard values based on international experience are provided for some inputs. However, country- or program-specific data should be supplied wherever possible.

Several of the inputs required can be obtained by using the ***Spectrum*** program. This program can be used to get an estimate of the key demographic parameters for the historical period, to make a demographic projection for the future and to project prevalence and the number of HIV infections and AIDS cases by age and sex. ***Spectrum*** can create an automatic demographic projection for almost any country in the world using estimates from the Population Division of the United Nations (United Nations 2001). It can also be used to make an HIV/AIDS projection with the addition of an estimate of adult HIV prevalence over time. A prevalence estimate can be developed using the ***EPP*** model. Both models are available from the Futures Group web site at www.futuresgroup.com. The use of these models is described briefly in Chapter V, Program Tutorial. Full details are available from the manuals for these models, also available from www.futuresgroup.com.

The purpose of this chapter is to discuss the necessary inputs, and to suggest sources of data and default values that may be used when local data are unavailable.

Goals is contained in an Excel workbook, organized by various worksheets. Cells highlighted in purple require data inputs to adapt the model to the local situation. Cells highlighted in light green contain default values based on international data. These values can be changed if local data are available, but it is not necessary to do so. The inputs that are required are located in the following worksheets:

- **Set-up – Inputs:** Assumptions regarding time horizon and currency
- **Demographic – Inputs:** General demographic information
- **Sexual behavior – Inputs:** Data regarding sexual behavior by risk group, including condom use

- **HIV-STI prevalence – Inputs:** Assumptions regarding epidemiological data, including the prevalence of HIV and STIs
- **Unit costs - Inputs:** Data regarding unit costs for prevention activities
- **Public % - Inputs**: Percent of the population that is covered by the public sector for both prevention and care activities
- **Care - Inputs:** Information about care and mitigation activities, including data and assumptions regarding levels of activities to be provided
- **Care costs - Inputs:** Assumptions regarding the cost of providing different types of care
- **Budget map – Inputs.** Relates budget line items to the ***Goals*** categories.
- **Budget - Inputs**: Budget allocation by line item
- **HAART success - Inputs:** Proportion succeeding and failing on HAART each year
- **Standard assumptions:** Default values for data based on scientific studies. These do not need to be changed but can be changed if so desired.

In addition, a Capacity sub-model is contained within ***Goals***. This sub-model estimates the training needs and costs associated with implementing the level of activities calculated by the rest of the model. There are four different worksheets utilized by the Capacity sub-model:

- **Goals inputs:** Number of people each activity will reach.
- **Base year capacity:** Number of existing trained staff by occupation for each activity.
- **Program reach:** Number of clients reached per trained person.
- **Characteristics**: Various characteristics of each occupation needed to calculate full-time equivalent personnel, including salary, attrition and death rates, and sick time.

Each of these worksheets is explained in greater detail below.

A. Set-up

- **First year**: This is the first year of the strategic plan under analysis.
- **Summary scaling factor for currency**: The units in which the currency will be displayed, e.g., "1,000,000" for millions.

- **Local currency name**: The name of the local currency, for display purposes.
- **Exchange rate, local currency per US dollar**: If US dollars are to be used instead of a local currency, simply use "1" as the exchange rate. Exchange rates are available through many different sources, including the World Bank's World Development Indicators and the International Monetary Fund's International Financial Statistics. Supplying the exchange rate is necessary as the default unit cost data are all denominated in US dollars.
- **Existence of supportive policy environment:** The policy environment and the degree of political support are crucial to effective programs. Political support is necessary to mobilize resources and use them effectively. The value should be between 0.0 and 1.0, where 1.0 is the most supportive. One set of estimates of program strength (closely related to political support) for countries in sub-Saharan Africa were prepared by the World Bank (Bonnel, 2001) and are shown in Table 1.

Table 1. Estimated strength of HIV/AIDS program activities

Very Low	Low	Medium	Strong
Angola	Benin	Botswana	Senegal
Congo	Burkina Faso	Cameroon	
DR Congo	Burundi	Central African Republic	
Djibouti	Gambia	Côte d'Ivoire	
Eritrea	Ghana	Kenya	
Ethiopia	Guinea	Lesotho	
Liberia	Madagascar	Malawi	
Nigeria	Mali	Mauritania	
Sierra Leone	Mauritius	Mozambique	
Somalia		Namibia	
		South Africa	
		Swaziland	
		Tanzania	
		Zambia	
		Zimbabwe	

Source: Bonnel, 2001.

B. Demography - inputs

The following demographic data are required by ***Goals:***

- ***Total population***: The total national population for each of the years of the strategic plan
- ***Number of men 15-49***: The number of men aged 15-49 in the national population for the years of the strategic plan

- ***Number of women 15-49***: The number of women aged 15-49 in the national population for the years of the strategic plan

- ***Average number of wives per husband:*** This input is the average number of wives per husband, which will be greater than one when polygyny exists in a country. In this situation, a weighted average should be calculated, where the calculation is the percentage of men who report more than one wife, times the number of wives reported for that particular percentage, plus the percentage of men reporting only one wife. When polygyny does not exist, the value should be one. This value will probably remain the same across all years.

- ***Number of youth***: The number of males and females defined as "youth" in the national population for the years of the strategic plan. The age group can vary, depending on the target population for school-based interventions.

- ***Proportion of youth in school:*** The percentage of youths of the defined age group enrolled in school. A good source for this information is the World Bank's *World Development Report*, or the accompanying database, *World Development Indicators*. Those youths who are not in school, calculated as the residual, then form the population group to be reached by out-of-school programs.

- ***Annual number of births:*** The total number of births nationally in the years of the strategic plan

These inputs may be based on a national population projection, if one exists. The Population Division of the United Nations publishes the *World Population Prospects* (United Nations 2001) which contains estimates and projections for most countries of the world. This information can be accessed on the Internet at: http://www.undp.org/popin

Most of the demographic information can be generated with the ***Spectrum*** model as described above.

C. Sexual behavior - inputs

The sexual behavior data required for the model must be specific to various risk group categories. The ***Goals*** model uses four risk categories:

- Men who have Sex with Men (MSM)
- High
- Medium
- Low

Although the definition of these risk groups may vary by country, one way of defining these risk groups is as follows. The MSM group consists of those men who have sex with other men. Those men and women in the high risk group either have many partners per year, such as sex workers (SWs), or have sex with SWs. Men and women in the medium risk group are those who have more than one sexual partner per year, but do not engage in commercial sex. For example, someone who is married but has casual sex with one or two other partners throughout the year would be in the medium risk category. Finally, the low risk category contains men and women who have only one sexual partner per year.

Note that men and women should be classified by their *highest risk group*, that is, the highest group into which the *individual* falls. For example, an MSM who also has heterosexual partners is classified in the MSM group. Note that the risk groups are mutually exclusive, i.e. an individual cannot be in more than one risk group.

Sometimes detailed data for sexual behavior and STI rates are available from country-specific surveys, such as Demographic and Health Surveys (DHS), or other surveys available nationally. Alternatively, when national-level surveys do not exist, or do not contain the necessary data, smaller surveys that are available may be used.

The sexual behavior variables to be provided are:

- ***Percent of men/women 15-49 that are sexually active:*** The percent of men and percent of women that are sexually active. Note that it is only necessary to enter the *total* percentage for each of these two lines; it is not necessary to have this statistic by risk group category. One possible source for this information is the DHS.

- ***Percent of men in risk group category:*** The percent of adult men who are in each risk group category. Although some of these statistics might be available in a DHS, such as percent of men reporting casual sex, others might not be readily available, such as percent of men in the MSM category. Other possible data sources include studies in the published literature. Note that the percent of men in the low-risk group is calculated as a residual, and does not need to be filled in by the user. In other words, the percent of men in the low-risk group is calculated as:

  100 – percent in MSM – percent in high-risk – percent in medium-risk

  The distribution of women by risk group is not stated explicitly in the list of assumptions. It is calculated based on information provided for men. For example, the percent of women in the high-risk category is calculated as a combination of the number of high-risk men, the number of contacts with SWs, and the number of partners per SW. The percent of women in the low-risk category is calculated as the percent of men in the low-risk category divided by the average number of wives per husband. Thus in a non-polygynous society, the percentage of low-risk women and men is the same. Finally, the percent of women in the medium-risk category is the residual.

Male coital frequency (acts per year): Male coital frequency is the number of sexual acts of intercourse by males for each year. The statistics for this category vary by risk group category, and are specific to the category. For example, the default value of "50" in the high-risk category implies that a man in that category has 50 sexual acts with SWs per year. Below is a summary of data on coital frequency compiled from selected DHS reports, for sexually active married women:

Table 2. Coital frequency

	Monthly Frequency		
Country	**All Sexually Active Married Women**	**Users of Coitus-Dependent Methods**	**Equivalent: # Acts/Year**
DHS I Data			
Brazil	8.9	8.8	106
Bolivia	3.6	3.6	43
Burundi	8.1	--	--
Colombia	5.8	5.0	60
Dominican Republic	5.8	6.2	74
Ecuador	5.7	5.8	70
Ghana	2.6	2.1	25
Guatemala	5.6	5.6	67
Indonesia	4.1	4.2	50
Kenya	4.4	4.5	54
Mexico	5.4	5.4	65
Peru	5.7	5.6	67
Sri Lanka	5.3	5.0	60
Sudan	6.5	--	--
Thailand	4.1	4.2	50
Uganda	7.2	--	--
Mean	5.5	5.1	61
DHS II Data			
Brazil (NE)	6.5	6.9	83
Cameroon	4.4	5.2	62
Colombia	4.7	4.4	53
Dominican Republic	7.1	7.1	85
Indonesia	4.2	4.6	55
Kenya	4.4	5.1	61
Madagascar	5.5	6.1	73
Morocco	5.7	6.1	73

Namibia	4.6	--	--
Niger	4.1	--	--
Nigeria	4.4	3.3	40
Paraguay	6.5	5.5	66
Peru	5.8	6.4	77
Rwanda	8.1	--	--
Tanzania	5.1	4.8	58
Zambia	7.5	5.7	68
Mean	5.5	5.5	66

- ***Number of partners per year – men/women:*** The number of sexual partners per year will vary by risk category, and by gender. These data are more likely to be found in a national survey such as a DHS than coital frequency, except for data on the number of partners for high-risk women. Note that the cell for number of partners per year for women in the MSM category is blank. Also note that, if polygyny exists in the country, the number of partners per year for low-risk men will reflect the average number of wives per husband (see above).

- ***Current condom use (%):*** This input requires an estimate of total condom use by risk category. Current condom use will vary by risk category, and sometimes by gender, as well. When condom use by gender is available, the user could input the average of reported condom use by men and women. That is, it may be that SWs report condom use of 50%, but men visiting SWs report only 20% condom use. In this case, an average of the two rates could be used. Note also that when types of condom use are available, such as consistent vs. occasional, usually the consistent condom use reported would be used.

D. HIV/STI prevalence - inputs

- ***HIV prevalence – male/female/total:*** The ***Goals*** model requires HIV prevalence rates for both males and females by risk group. The model will calculate the national adult prevalence from the prevalence by risk group. This can be used as a check to make sure the prevalence inputs by risk group produce the correct national average. The "Total" column displays the weighted average of HIV prevalence, weighting the user-supplied HIV prevalence rates by the percentage of the population in each risk group.

  Data on HIV prevalence rates by risk group do exist for some countries; the best source for identifying such data is the US Census Bureau data base, available at:

http://www.census.gov/ftp/pub/ipc/www/hivaidsn.html

- ***Prevalence of ulcerative/non-ulcerative STIs:*** Prevalence of STIs is specified as the proportion of the adult population with an STI infection. Ulcerative STIs include syphilis, chancroid and herpes simplex virus-2. Non-ulcerative STIs include gonorrhea and chlamydia. One possible source for such data is the US Census Bureau data base, available at:

  http://www.census.gov/ftp/pub/ipc/www/hivaidsn.html

  The "Total" column calculates the weighted average of ulcerative and non-ulcerative STI prevalence, weighted by the percentage of population in each risk group. This is similar to the calculation performed for HIV prevalence, described above.

- ***Percent of STI cases treated:*** This input refers to the percent of all STI cases that are effectively treated. Many STIs do not cause symptoms, especially in women. Also, in some contexts, women do not consider many STI symptoms as requiring care. Thus, in the absence of a screening program, the percentage seeking treatment is likely to be low. Even for those who do seek treatment, the diagnosis may be incorrect or the appropriate drugs may not be available. Thus, the percentage of STI cases effectively treated may be quite low, 20 percent or less in many settings.

- ***Prevalence among 15-49 year olds, No Change: Goals*** displays a chart of adult HIV prevalence showing the historical trend and the future projection. The historical trend is specified in this worksheet. These figures do not affect the calculations, only the graph of HIV prevalence. The pattern of historical prevalence may be estimated by fitting a curve to surveillance data. This can be done with the EPP model. The model and manual are available from the Futures Group web site at www.tfgi.com.

- ***Ratio 15-24/15-49:*** The ratio of HIV prevalence for those aged 15-24 compared to those aged 15-49. Information on prevalence among the population 15-24 may be available from surveillance data or from community surveys. If a ***Spectrum*** projection is used to generate the demographic and HIV/AIDS data, it can also be used to calculate this ratio.

E. Unit costs - inputs

Note that unit costs should be entered in the appropriate currency. If US dollars are used as the default currency, all figures should be entered in US dollars. If, instead, the local currency is being used, costs should be entered using values in local currency. All representative costs for the various cost inputs discussed below are discussed in terms of US dollars. If no local costs are available, leave the *Local Currency* column blank, and the model will utilize the default international values automatically.

- ***Cost per male/female condom distributed by public sector/social marketing:*** 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. The default unit cost per male condom distributed for social marketing programs of US$0.20 is based on an analysis of 23 condom social marketing programs between 1990-1996 (Stallworthy, 1998). In this study, the unit cost includes costs such as cost of the condom, operations, management, technical assistance and other indirect costs. Although the cost 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. Thus here an average of US$0.20 per condom distributed is used as a default value. Note that this cost includes the commodity cost of the condom. The default values for public sector condom distribution are estimated to be about half of the social marketing costs. The user may change these values, if desired.

- ***Cost per STI case treated:*** This input variable is the total cost per STI treated, including the cost of drugs, capital costs, training costs, labor costs, and costs of administrative support. The default value in the program of US$10.15 is based on the total unit cost figure calculated from the Mwanza, Tanzania STI treatment intervention (Gilson et al., 1997). Other studies, seen in the table below, calculate similar levels of expenditure to treat STIs. Note that some of these studies are almost 10 years old, so prices will not reflect current price levels:

Table 3. Cost of STI treatment per person

Country	Cost per person	Source
South Africa	US$6.80; syndrome packet US$1.50	Harrison, Karim et al., 2000
Mozambique	US$12.65-15.00	Bastos dos Santos et al., 1992
Namibia	US$6.80	Stanton et al., 1998
Cameroon	US$19.00	Machester et al., 1993
Senegal	US$10.06	Van der Veen et al., 1992
Botswana	US$8.15	Maribe et al., 1995
Zambia	US$7.00	Hira and Sunkutu, 1993

Nigeria	US$4.69	Okonofua et al., 1998
India	US$4.25	Vishwanath et al., 2000
Thailand	US$13.00-37.00	Forsythe et al., 1998
Indonesia	US$18.70	Djajakusumah et al., 1998

- ***Cost of VCT per session:*** The cost of a single session of voluntary counseling and testing should be entered as the input variable. Note that this is not the cost of a group session of counseling, but instead is the cost per person per session. Group counseling may take place as part of a PMTCT program, but those costs are calculated separately below. The default value used here of US$27 is from Kenya (Sweat et al., 1998). Costs from other studies are summarized below:

Table 4. Voluntary Counseling and Testing Cost per person

Country	Cost per person	Source
South Africa	US$11.00	Wilkinson et al., 1997
Uganda	US$5.32-13.39	Alwano-Edyegu and Marum, 1999
Kenya	US$16.00-27.00	Mutemi et al., 2000
Uganda	US$12.00	UNAIDS, 1999b
Tanzania	US$28.93	Sweat et al., 1998
Kenya	US$26.65	Sweat et al., 1998
Ghana	US$20.00	Kumaranayake et al., 2001

- ***Cost per youth reached by peer educator:*** There are no published studies that provide data on the cost of peer education per youth reached. Therefore, following the methodology described in Bonnel (2001), the default cost per youth reached by a peer educator is assumed to fall somewhere between the cost of a workplace program, and the cost of reaching a SW, at US$10.81.

- ***Cost per teacher trained:*** This input is combined with the number of teachers trained per student to calculate the annual cost of school-based interventions. The cost should include the operating costs of the program, including training, curriculum materials, and labor costs associated with the actual intervention of the teacher reaching the students.

  The only study with actual data regarding this type of intervention is Boerma and Bennett (1997) for Tanzania. Costs are estimated for both primary and secondary schools, and for two types of programs – low-level and medium-level of effort. The low-level cost is based on a simple program, with teacher training and basic materials only, while the medium-level cost scenario includes developing training materials and establishing the program. The costs are listed in the table below. The default value of US$200 used in this model is the medium-level cost scenario for primary schools. The medium-level costs will capture the ongoing costs of the programs, including the training costs. Note that, most likely, training will not be necessary every year, so that the US$200 figure will also cover the operating costs of the intervention. If the target age group is not the primary school level, then the cost should be adjusted appropriately.

Table 5. Cost per teacher trained

Schooling Level	Low-cost scenario	Medium-cost scenario
Primary	US$75	US$200
Secondary	US$121	US$241

- ***Cost per sex worker reached:*** This value consists of the program costs associated with a peer education program for sex workers. These costs should include consideration of training the peer educators, as well as the time spent in the field and any costs associated with distributing condoms. The default value provided in the model is based on a peer education intervention in Cameroon (Kumaranayake et al., 1998). The costs in this intervention ranged from US$15.83-21.12, but did not include the costs of condoms or labor costs of educators. Thus the default value of US$20 is somewhat higher than the average of the two scenarios, in order to take these costs into account.

- ***Cost per person reached with mass media:*** This is the annual cost of mass media interventions per person reached by the intervention. There are two different ways of calculating the cost of a mass media intervention – the cost per country for each campaign, and the cost per person reached for each campaign. Studies that have calculated costs of mass media interventions are displayed in the table below. In order to translate this information into the appropriate input here, the user must consider how many campaigns per year will be implemented, and how many people will be reached.

  A default value of US$1 per person reached with mass media annually is used. This figure is based on three assumptions:

  - an average campaign price of US$500,000
  - six campaigns per year, based on coverage rates in Schwartlander et al. (2001) which assumed 2 campaigns per year when HIV prevalence is less than 0.5 percent, 4 campaigns

per year when HIV prevalence is between 0.5 and 1.0 percent, 5 campaigns per year when HIV prevalence is between 1.0 and 5.0 percent, and 6 campaigns per year when HIV prevalence is greater than 5.0 percent

- an adult population of approximately 6 million people, half of which is assumed to be reached by the mass media campaign.

Table 6. Cost for mass media interventions

Country	Cost per campaign	Cost per capita	Source
Dominican Republic	US$438,677	US$0.06	Cited in Soderlund et al., 1993
Cameroon	US$516,817		Kumaranayake et al., 1998, cited in Bonnel, 2001
Ghana	US$154,500		Kumaranayake et al., 2000
Zimbabwe	US$58,205*		Kumaranayake et al., 2000
Gabon	US$357,347	US$0.32	Dubow, 1992, cited in Soderlund et al., 1993
* Marginal costs of intervention only			

- ***Cost per employee reached in workplace programs:*** The unit cost per employee reached in workplace programs, including costs of the education program, costs of STI treatments if provided and condoms distributed through the intervention. The default value of US$7.14 per employee is based on two factors - an average of four different interventions, described in the table below, and an additional factor for STI treatment costs. The average cost of these four programs is US$6.13, but these programs did not provide STI treatments. An additional US$1.01 cost per employee is added to the default unit cost figure, based on assuming that 10 percent of the workforce is treated at the workplace, and on using the default value of US$10.15 cost per STI case treated.

Table 7. Cost per employee reached

Country	Cost per employee	Source
Zimbabwe	US$10.00	Katzenstein et al., 1998
Zimbabwe	US$6.00	Hyde et al., cited in UNAIDS, 2000b
Tanzania	US$4.00	Hamelmann et al., 1995
Brazil	US$4.50	Hearst et al., 1997

- ***Cost per community worker trained:*** The cost per community worker is multiplied by the number of people reached by each community worker (described below), to calculate the total cost of a community intervention. These costs should include all costs associated with training and supporting an outreach worker, including pre-service and in-service training costs, as well as on-going labor costs to implement the intervention. To date, there are no studies that evaluate the costs of providing community outreach workers. The default value of US$118 is based on information from various national strategic plans.

- ***Cost per safe unit of blood:*** The full cost of an intervention ensuring safety of the blood supply is a combination of the number of units of blood that need to be tested, and the cost to test each unit of blood. Representative costs for testing blood for HIV in different countries are shown in the table below. The default value of US$4.42 is based on the 1995 study in Zambia, due to the high quality of the research. Note that this cost does seem to vary by region, with Latin America consistently reporting higher costs.

Table 8. Cost per safe unit of blood

Country	**Cost per unit**	**Source**
Zimbabwe	US$5.34	Soderlund et al., 1993, in 2000 $
Zambia	US$12.46	Soderlund et al., 1993, in 2000 $
Uganda	US$18.22	Soderlund et al., 1993, in 2000 $
Zambia	US$4.42	Foster and Buve, 1995
Trinidad, Dominican Republic, Philippines	US$1.30-3.15	De Moya et al., 1992
Latin America/Caribbean	US$15-110	Cuchi et al., 1998

- ***Cost per person reached (MSM):*** The unit cost of reaching someone in the MSM risk group. The default value of US$20 matches the unit cost to reach sex workers, on the assumption that the costs would be similar.

PMTCT Intervention (Prevention of Mother-To-Child Transmission)

- ***Cost per HIV test:*** The cost per HIV test is a weighted average of testing costs for HIV positive and HIV negative pregnant women. Usually someone who tests positive will undergo a second, confirmatory test. The default value assumes a total testing cost of US$3.40.

- ***Cost for all types of counseling:*** The costs for counseling will depend on the number of counseling sessions offered. At present, the usual practice is to provide one session prior to the HIV test, usually in a group setting, and a second session after the test results are received. Those testing positive usually receive more intensive counseling than those whose results are negative. Thus total costs will be a function of whether counseling is offered on an individual or group basis, the total number of sessions offered, as well as the overall HIV prevalence in the country. Representative costs that have been experienced in various countries, for both HIV tests and counseling, are presented in Table 9:

Table 9. Counseling costs

Country	HIV Test/Counseling Costs	Source
Based on Lusaka, Zambia clinic	$1.00/initial kit + $3.00/confirmatory test = $4.00/total per woman Includes facility rent, counselors' salaries and administrative costs	Marseille et al., 1997
United States	$60.00/HIV- (includes $4.80/ELISA test and $55.20/pre- and posttest counseling) ------------------------------------ $162.74/HIV+ (includes $63.40/3 ELISA + 1 Western blot and $99.34/pre- and posttest counseling)	Mauskopf et al., 1996
Based on Uganda clinic data	$18.50 (includes 2 ELISA tests and staff time for pre- and posttest counseling up to 30 min)	Mansergh et al., 1997
South Africa	$2.70/Rapid HIV test $2.70/Double ELISA HIV test $1.40/Single ELISA HIV test	Wilkinson et al., 1998
Thailand	3918 baht/HIV testing and counseling	Walker, 1995
Tanzania Kenya	$29/client $27/client (general clinic, not ANC)	Sweat et al., 1998

- ***Cost of anti-retrovirals for prevention of MTCT:*** The cost per woman of the anti-retrovirals provided in the PMTCT program. The default value of US$4 is the drug cost of nevirapine per woman.

- ***Cotrimoxazole:*** The provision of cotrimoxazole is an optional part of a PMTCT program. One suggested regimen is to provide 6 months of the prophylaxis to the mother while pregnant, an initial 6 months to the infant, and then continuing the prophylaxis to the infant should he test positive. One price quote for cotrimoxazole is US$12.50 per year per adult (UNAIDS, 2000a).

- ***Vitamins:*** Providing vitamins to pregnant women may be an optional portion of a PMTCT program as well.

- ***Cost per month of formula:*** The monthly cost of providing replacement feeding for an HIV positive mother. If necessary, this cost should include the cost of providing bottled water.

- ***Number of months of formula provided by government:*** This is combined with cost per month of formula to calculate total costs of replacement feeding.

- ***Proportion of women adopting replacement feeding:*** The proportion of HIV positive women who utilize formula provided by the government.

Miscellaneous information

- ***Students reached per trained teacher:*** The cost of school-based programs is calculated based on the number of teachers trained, rather than the number of youths reached, as is the case for programs for out-of-school youths. The estimate should include consideration of pupil-teacher ratios, as well as the number of times a teacher would speak with students per year with this program. The default value supplied is 100, based on figures used in Schwartlander et al. (2001).

- ***Participation rate in formal workforce:*** The estimate of the number of workers who will be reached in formal sector workplace programs, is based on the labor force participation rate in the formal sector. The formal sector is defined as employment in which workers are paid a stable income or wage, or have a contract, or have fringe benefits. This rate is the sum of the percentages of the labor force in the industry and service sectors, available from the World Bank's *World Development Report*, or the accompanying database, *World Development Indicators*. In countries where there is substantial employment in commercial agriculture, within which workplace programs might be undertaken, the percentage of the labor force in formal agriculture should be added to the total. One source for this information is the *United Nations Statistical Yearbook.*

- ***People reached per community worker:*** The cost of community mobilization is calculated based on the number of community mobilization workers who are trained. To determine how many people these workers reach, we need to know the number of people reached per worker. The default value, based on previous estimates associated with various national HIV/AIDS strategic plans, is 260. The user may overwrite this value, if preferred.

- ***Percent of all condoms that are female condoms:*** This is used to calculate the total cost of condom distribution based on a weighted cost of male vs. female condoms.

- ***Proportion of condoms distributed by social marketing:*** There are two condom distribution networks in the model, social marketing and public sector. The user must specify the percentage of condoms that will be distributed by the social marketing distribution network, and the model assigns the residual to the public sector.

- ***Blood units required per 1000 people:*** This input will be combined with the unit cost of screening blood for HIV to calculate the cost of a safe blood program. The default value, 4.4, is the weighted average of blood donations per 1000 people for various sub-Saharan African countries (Van de Perre et al., 1997). Some results for individual countries in this article are in the table below:

Table 10. Estimated numbers of blood donations, 1995

Country	Donations per 1000 population	Country	Donations per 1000 population
Angola	2.2	Liberia	4.6
Benin	2.9	Madagascar	1.8
Botswana	1.7	Malawi	4.0
Burkina Faso	0.9	Mali	1.0
Burundi	0.3	Mauritania	3.5
Cameroon	4.4	Mauritius	0.8
Cape Verde	3.1	Mozambique	1.8
Central African Republic	3.0	Namibia	6.3
Chad	1.2	Niger	0.3
Comoros	3.3	Nigeria	3.1
Congo	7.6	Rwanda	2.5
Cote d'Ivoire	3.0	Senegal	3.0
Equatorial Guinea	4.9	Sierra Leone	0.7
Eritrea	0.9	South Africa	23.6
Ethiopia	0.7	Swaziland	6.0
Gabon	4.3	Togo	2.3
Gambia	5.0	Uganda	1.0
Ghana	4.0	United Rep. of Tanzania	3.3

Guinea	3.0	Zaire	4.3
Guinea-Bissau	2.4	Zambia	5.0
Kenya	3.3	Zimbabwe	4.5
Lesotho	2.2	Total	4.4

- ***Reduction in prevention effectiveness with poor policy environment:*** Prevention efforts will be most effective in the presence of a supportive policy environment. In Uganda the leadership of President Museveni and the involvement of religious and community leaders in the AIDS program played a major role in supporting efforts to change behavior and reduce the number of new infections. In countries where there is little political support it will be difficult to mobilize resources for AIDS programs and those resources that are available are less likely to be effective. ***Goals*** includes this relationship by reducing the effectiveness of prevention interventions in inducing behavior change in the presence of poor political support. The degree of political support is specified in the ***Set up-Inputs*** worksheet. The reduction in effectiveness caused by a lack of political support is specified here, in the ***Unit costs*** worksheet. This variable can have any value between 0 and 1. Zero means that there is no effect of political support on prevention effectiveness. A value of 1 means implies a direct reduction such that effectiveness would be reduced by 50 percent if the rating for political support were 0.5. The default value for this variable is 0.25.

F. Public % – inputs

This worksheet provides the opportunity to restrict the population considered to the population served by the public sector. This may be useful in cases where the private sector provides health services to a significant proportion of the population. In this case, the government budget would reflect only expenditures required to cover the population served by the public sector and the coverage calculated by the model would reflect the proportion of the population served by the public sector that received the particular information or service. The model assumes that a similar coverage level would exist in the private sector. The proportion of the population served by the public sector will be different for different services. For mass media, it is likely to be 100 percent. For STI treatment, it is likely to be much less than 100 percent. If the private sector does not serve a significant portion of the population, then this value should be set to 100 percent.

G. Care– inputs

The next worksheet requires inputs related to care and mitigation activities, including four types of care (palliative, OI treatment, OI prophylaxis, ARV) and activities concerning orphans and vulnerable children (OVC).

The cost of providing treatment is a combination of the drug costs and the cost of delivering the service to the patient. This worksheet requires information on the service delivery costs for each type of care. These values may be obtained from studies of local costs. Default values based on the international literature are provided. The calculation of these default values is described below.

There are three different delivery modes: home-based, clinic-based, and hospital-based. Each type of treatment category – palliative, OI treatment, OI prophylaxis, and ARV – utilizes different combinations of these delivery modes. The service cost calculations are a combination of number of visits per category, and cost per visit. After the assumptions for each type of treatment category are explained here, a table follows giving the background data for the calculations of numbers of visits and costs per visit, by delivery mode. Note that, although the default values are portrayed on an annual basis, the same methodology used to calculate lifetime drug costs for each type of treatment is used here, as well. In other words, palliative and OI treatment lifetime service costs are twice the annual cost, while OI prophylaxis and ARV therapy lifetime service costs are related to the number of life-years gained due to the therapies.

- ***Palliative care service cost***: Half of lifetime palliative care is assumed to be delivered via home-based care at a cost of US$13.40/year (Smart, 2000), while the other half is delivered through a clinic. It is assumed further that palliative care requires two outpatient clinic visits, at a cost of US$6 per visit (Nandakumar, 2000, see table below).

- ***OI treatment service cost*:** Half of lifetime OI treatment care is assumed to be delivered through a clinic, and half is delivered through a hospital. Six lifetime clinic visits for OI treatment are assumed, at a cost of US$6 per visit (Nandakumar, 2000). Twenty lifetime days in hospital are assumed, at a cost of US$55 per day (Gilks et al., 1998).

- ***OI prophylaxis service cost*:** It is assumed that someone receiving OI prophylaxis will also be receiving either OI treatment, or ARV therapy. Thus the costs for service delivery of OI prophylaxis are assumed to be included under either OI treatment or ARV therapy service costs.

- ***ARV therapy service cost*:** The service cost for ARV therapy is based on Harvard (2001), which calculated the costs of delivering ARV therapy in developing countries following a DOTS-like model. The costs have two components: US$200 per year for delivering DOTS, and US$240 per year (US$40 per visit for six visits) for testing and monitoring costs.

The literature underlying the assumptions above is summarized below:

Table 11. Summaries of cost of care studies

Sub-category	Country	Year of Inter-vention	Cost	Source
Home care	Botswana	1994	$49/visit	Gilks et al., 1998
Home care	Zimbabwe	1995	$16-23 / urban visit, $38-42 / rural visit	Hansen et al., 1998
Home care	Kenya	2000	$13.40/patient/year	Smart, 2000
Home care	Ghana	1999/00	$.31/person annually (full, economic costs)	Kumaranayake et al., 2000
Home care	Burkina Faso	1997	$20/person/month, including drugs, training, administration, all delivery costs	Sawadago et al., 1997
Home/hospital	Zambia	1993	$2/visit; $4.08/day in hospital	Martin et al., 1996
Home/hospital	Cambodia	1999	$9.28 / urban visit, $3.71 /urban visit for addressing health needs only (comparable to health facility costs), $14.64 / rural visit, $5.86 / rural visit for addressing health needs only, $15 / client for health facility based outpatient care, $10.20 / client for community-based home care for physical health, $25.50 / client for community-based home care for full service	Wilkinson, 2000
Home/hospital	Tanzania	1998/99	$8.74/hospital day; $3.49/patient/day for home based care provider; $2.66/patient/day for volunteer home-based care	Msobi and Msumi, 2000
Home/hospital	Zambia		$26 per urban visit, $1000 / client for health facility based outpatient care, $5.50 / client for community-based home care	Wilkinson, 1998
Hospital care	Zimbabwe	1995	$13/day for HIV/AIDS patient	Gilks et al., 1998b
Hospital care	Zimbabwe	1995	$161.44/stay of 8.5 days for HIV/AIDS; $115.17 /stay of 5.4 days for non-HIV/AIDS	Hansen et al., 2000
Hospital care	Kenya	1997	Mean length of stay 9.7 days, mean cost per admission $150.88. 62% of costs borne by hospital, 33% by patient, 5% by NHIF (National health insurance scheme)	Gilks et al., 1998b

Sub-category	Country	Year of Inter-vention	Cost	Source
Hospital care	Philippines	5/93-6/94	Mean # of outpatient visits 4/patient/year, mean of 3 admissions/patient. $301 for first year of diagnosis (asymptomatic); $830 for early symptomatic stage; $5,774 for late symptomatic stage. Indirect costs $324,653/patient. Overall lifetime direct/indirect cost $332,510.	Aplasca et al., 1996
Hospital care	Brazil	1997	Avg annual direct cost per patient: $179.5 for Day Hospital; $336.16 for Hospital; $5401.38 for Ambulatory Special Service (includes ART)	Cyrillo et al., 2000
Hospital care	Brazil	1994	Sao Paolo: $261/admission for all causes, avg stay=6.6 days; $549/admission for AIDS, avg stay=10.8 days; Brazil: $226/admission for all causes, avg stay=6.1 days; $609/admission for AIDS, avg stay=13 days;	Iunes et al., 1998
Hospital care	Zambia	1999	Avg cost of $5 - avg stay is 30 days - total cost for treating OIs $150; $200/stay including drug and other direct costs	Mpundu, 2000
Hospital care	Thailand	1994	$808/public inpatient (no days); $163/public outpatient; $1154/ARV therapy; $809/OIs; $10052/private inpatient; $760/private outpatient; $238/private clinics; $271/pharmacies; $137/traditional healers; $775/home care	Kongsin et al., 1998
Hospital care	Ghana	1999/00	$4262/person annually for inpatient care	Kumaranayake et al., 2000
Hospital care	Thailand	1993-95	Median admission duration 14 days; avg medical costs for inpatients $58/day; observation room $61/day; HIV/Counselling Clinic, $45/month	Suwanagool et al., 2000
Outpatient	Cote d'Ivoire	1988-95	Ten-day treatment for diarrhoea $12; avg cost of transport to unit $3/patient	Boka-Yao, 1998
Outpatient	Rwanda	1999	$6.40/per visit (on average)	Nandakumar et al., 2000
Palliative	Uganda	1991	$15.70/adult for palliative treatment applying "WHO-Patient morbidity standard treatment method"; $5.20/child	Mubiru et al., 1993
Prophylaxis	World	2000	$8-17/person/year for cotrimoxazole, prophylaxis	UNAIDS, 2000a

- ***Percent of population in need with access to care:*** Since one of the outputs of Goals is calculating the coverage of the population in need with the given expenditure, it is important to evaluate which people actually have access to the care being provided. In some countries, this will be close to 100%; in others, the percentage will be much lower, particularly with respect to the provision of HAART.

- ***Number of HIV+ adults:*** The total number of people who are alive and infected with HIV. This is available as an output from Spectrum.

- ***Number of new adult AIDS cases:*** The total number new adult AIDS cases each year. This is available as an output from Spectrum.

- ***Number of new child AIDS cases:*** The total number of new AIDS cases for children (aged below 15). This is available as an output from Spectrum.

- ***Number of orphans.*** The total number of AIDS orphans alive in each year. This is available as an output from Spectrum.

- ***Reduction in prevention effectiveness in the absence of care:*** The reduction that would occur in the effectiveness of prevention interventions if care and treatment programs were not available. In general, greater provision of care will reduce stigma and create a more positive environment for prevention programs, while a lack of care will do the opposite. On the other hand, the availability of HAART can lead some people to adopt risky behavior in the belief that AIDS is a treatable condition. A recent literature review discussed ten different possible linkages between care/mitigation and prevention (Bollinger, 2001b):

1. *Reducing stigma* may increase *utilization of VCT services*, thus ***slowing transmission***
2. *Reducing stigma* may *reverse marginalization of risk groups*, ***decreasing transmission risk*** for those risk groups, as well as the general population who may have been dissociating themselves from any possible risk
3. *Providing VCT centers* (linked with providing care services) may ***slow transmission*** via behavior change on behalf of counseled people
4. *Providing care* within a community may *promote a sense of identification and solidarity*, resulting in ***reduced transmission***. Providing care also prolongs the life of PWHAs, who make effective advocates for prevention activities.
5. On the other hand, *providing HAART* may ***increase HIV transmission***, as *risky behavior increases* due to reduced perception of risk.

6. Although *providing HAART reduces viral load*, it is not clear that infectivity is reduced; at this point, the ***net transmission effect is unknown***.
7. One possible effect that might ***speed transmission*** is the *increase in drug-resistant HIV strains* that arise through *taking HAART*.
8. *Providing care* also *lengthens the duration of illness*, particularly at the later stages, thus potentially ***increasing transmission***.
9. *Mitigating orphans' circumstances* may ***reduce transmission*** by *preventing their sexual exploitation*.
10. *Mitigating the circumstances of PWHAs* may ***reduce transmission*** by *reducing the social vulnerability* of their families, and allowing them to continue to be *productive economically*.

Although it is important to explore these links, it seems clear that this distinction between care/mitigation and prevention activities is an artificial construct at the national level; at the local level, the literature shows that the two sets of activities are generally provided together, and are impossible to separate. These links are incorporated into the ***Goals*** model by calculating a "reduction factor" based on coverage rates for care/mitigation activities. This factor is multiplicative with the impact of prevention interventions; as coverage of various care/mitigation activities increase, the impact of prevention interventions increases, as well. These impacts, in turn, affect both HIV prevalence and incidence for the country.

The value of this factor can vary between 0 and 1. A value of 0 indicates no effect of care on prevention effectiveness, while a value of 1 indicates that prevention effectiveness is directly related to care coverage such that zero care coverage would result in no effectiveness of prevention activities and 50 percent care coverage would reduce the stated effectiveness of prevention activities by 50 percent. Any value between 0 and 1 indicates an intermediate situation. The default value for this variable is 0.25.

H. Budget map – inputs

The next set of inputs creates a correspondence between the budget line items in the strategic plan and the prevention and care categories used in the ***Goals*** model.

The first step is to enter the budget line items in the column labeled "Budget line items". Up to 50 line items may be entered. Headings, such as "prevention", can be included if desired to make the list easier to read.

The second step is to select the appropriate ***Goals*** category for each line item. This is done by entering the number corresponding to the ***Goals*** category in the column labeled "Number". The ***Goals*** categories and numbers are shown in the table on the right of the worksheet. For example, if one of the line items is "procurement of STI drugs", it would be mapped to the ***Goals*** category "STI treatment" by entering the number 19 next to the line item.

If the strategic plan budget is very detailed it may be useful to use sub-categories in order to keep the number of budget line items to 60 or less.

Note also that, at this point, the amount of money associated with each user-defined category is not entered into the program. This happens at the next stage of the process. Thus, if some line items are aggregated to make analysis of the model more straightforward, careful track should be kept of the budget associated with each new category.

I. Budget – inputs

The worksheet labeled "Budget – Inputs" is automatically supplied with the activities from the strategic plan that were typed into the "Budget Map – Inputs" worksheet. In this worksheet the amount budgeted for each activity for each year of the strategic plan is entered. A maximum of three alternative budgets may be analyzed within each workbook, although only one must be supplied in order for the model to operate. As noted above, if some of the activities of the strategic plan have been combined, the budget associated with those sub-totals needs to be entered here.

J. Care costs – inputs

Inputs defining care and treatment activities are divided into three different sets: specifying the level of treatment to be provided, calculating the drug costs associated with the different types of treatment, and calculating the service costs for the different types of treatment. The service cost calculation has been described above; the worksheet here considers the other two sets of inputs.

In order to calculate the costs of treatment that will be provided to people living with HIV/AIDS, it is necessary to specify which level of services will be provided. There are three different levels of care: essential, intermediate, and advanced. These services and levels of care are from the WHO/UNAIDS publication, "Key Elements in HIV/AIDS Care and Support" (2000). The user may type either "1" in the column labeled "In=1, Out=0" in order to include an activity in a level, or "0" to exclude it.

Note that there are some activities that are listed in the WHO/UNAIDS guidelines that are not included here. For example, "essential" care usually includes VCT and STI treatment. In the ***Goals*** model, these activities are separate line items in the calculations, and as such are not included here. In addition, activities that pertain to populations other than PLWH/A are considered elsewhere in ***Goals*** (e.g., funding of community efforts that reduce the impact of HIV infection, specific public services that reduce the economic and social impacts of HIV infection, and recognition and facilitation of community activities that mitigate the impact of HIV infection).

The drug costs associated with delivering treatment for the different activities listed have default values associated with them. All listed costs are annual, but are then multiplied by an appropriate factor to derive lifetime costs. Palliative care and OI treatment costs are each multiplied by a factor of two to approximate lifetime costs. The underlying logic is that the last year of life will require both types of drugs for the entire year, while the second year of drug costs will be spread out in some fashion throughout the years prior to the last year of life. The drug costs for both OI prophylaxis and ARV therapy are first doubled, as with palliative care and OI treatment, but then additional years of drug costs are added according to the number of years of life gained from the treatment (see above).

The default values for the drug costs are calculated based on an extensive literature search regarding the frequency of opportunistic infections (OI) and their respective drug treatment costs. The full details of the calculations are presented in Appendix B. Basically, the literature search found 30 different studies from developing countries throughout the world that contained information on what types of OIs were prevalent. Note that not all OIs were observed in each study. These data were then sorted by OI incidence for each of the 32 OIs that define the four stages of HIV/AIDS, as described in the WHO/UNAIDS guidelines (2000). The cost for treating each OI was derived from either UNAIDS (1998), World Bank (1997), or other sources. A weighted average was then formed to calculate the cost of treating the 14 activities listed in the three treatment levels above. The resulting overall treatment costs are quite similar to those found in World Bank (1997, p. 177), where a similar methodology was used.

The only exception to this is the cost for ARVs. The current default value for this annual cost is US$600.00, but may be changed by the user.

- **Orphans**

The final set of inputs for the care and mitigation section of the model is the costs associated with the interventions providing care for orphans and vulnerable children (OVC). In order to calculate total costs, the unit costs are multiplied by the number of orphans.

There are three types of interventions that affect OVC:

- Orphanage care
- Community assistance
- School expenses

Each unit cost is an annual cost per child.

There are several studies regarding cost of care in orphanages, all conducted in Africa, listed in the table below. Orphanage costs consist of living expenses, which include items such as food, clothing, and other basic commodities. A default value of US$300 is utilized here, as it is approximately the median among the studies.

Table 12. Orphanage care cost per child

Country	Cost per child	Source
Tanzania	US$120	Boerma and Bennett, 1997
Ethiopia	US$300	United Nations, 2000
S Africa	US$345	Desmond and Gow, 2001
S Africa	US$128	Desmond and Gow, 2001
Malawi	US$162	World Bank, 1994
Tanzania	US$1063	World Bank, 1997

The cost for community assistance includes costs of community-based organizations visiting households with OVCs and community feeding posts. The default value of US$51 is an average of three studies: Drew et al. (1998), which calculated an average cost of US$9 per child in Zimbabwe; Desmond and Gow (2001), which calculated an average cost of US$37 per child in South Africa; and World Bank (1997), which estimated an average cost of US$107 per child in Tanzania for community assistance.

The default value of US$25 for school expenses is based on calculations performed for Tanzania in Boerma and Bennett (1997). School expenses include consideration of school fees and uniforms.

K. HAART success – inputs

As noted above when discussing the additional number of life years gained from HAART, this is a function of both adherence and the success of the therapy. Adherence to the HAART regimen can be difficult, due to side effects that are experienced as well as its complexity. This worksheet assists the user to calculate the number of life years gained via HAART by examining the continuation rates at each stage of treatment. Thus someone will start HAART, and there will be a certain probability that he or she will continue to the next year, based on adherence and whether the drug regimen itself is successful. Those who fail are placed on another therapy, and again have a certain probability of succeeding. There are three rounds of therapy in total. The final number that is calculated is the additional years of life earned by HAART. The user may change the various probabilities in order to calculate different life years gained. This final calculation is then fed into the "Care – Inputs" spreadsheet.

L. Standard assumptions

This worksheet contains the standard epidemiological assumptions that ***Goals*** uses to calculate changes in STI and HIV prevalence. The default values are based on a wide scientific literature, and as such should not be changed for most applications.

- ***Duration data:*** These data indicate the amount of time that an individual with an STI is infectious, that is, when the STI can be transmitted to another individual, in months. Default values from the literature (e.g., Boily et al., 2000) have been supplied for:

    1. Duration of infectiousness of untreated STI (1.2 months)
    2. Duration of infectiousness of treated STI (0.5 months)

    There are different duration rates for treated and untreated STIs. The treated STI is assumed to be infectious for only 0.5 months, while an untreated STI is assumed to be infectious for 1.2 months. Note that this is not the length of time the untreated STI lasts, but rather the length of time when the STI is infectious, and thus transmittable.

- ***Condom efficacy***: This variable reflects the efficacy of condom use during actual use. Thus it incorporates consideration of improper use of the condom by an individual, as well as whether or not the condom itself fails. The default value of 95 percent is based on the statistic used and documented in the AVERT model (Bouey et al., 1998). The user may change this default value, if desired.

- ***HIV transmission probabilities per contact:*** This set of inputs defines the transmission rates for HIV per sexual contact. The rates vary by whether the sexual contact is:

    1. Male - female: The male is HIV positive, while the female is HIV negative
    2. Female - male: The female is HIV positive, while the male is HIV negative
    3. Male - male: One of the males is HIV positive, while the other male is HIV negative.

The rates also vary by whether an STI is present or not, and whether the STI that is present is ulcerative or non-ulcerative. When an STI is non-ulcerative, the transmission rate for HIV is ten times the transmission rate when no STI is present. When the STI is ulcerative, the transmission rate is increased by another three times, or thirty times the initial transmission rate when no STI is present. When both ulcerative and non-ulcerative STIs are present, the transmission rate when ulcerative STIs are present is used. Note that only one transmission rate is used between two males; no attempt is made to differentiate between anal insertive or anal receptive transmission rates.

These HIV transmission rates are identical to the rates used in the AVERT model, which in turn were based on an extensive literature search described in the AVERT manual (see Bouey et al., 1998). The user may overwrite the default values, if desired.

- ***STI transmission probabilities per contact:*** The second set of transmission rates is the set of STI transmission probabilities associated with one sexual contact when the STI is either ulcerative (GUD) or non-ulcerative (non-GUD).

- ***Mother-to-child transmission rates:*** There are three different transmission rates associated with vertical transmission of HIV in ***Goals*** – the base transmission rate, where no intervention takes place; an intervention of drug therapy alone; and an intervention of drug therapy and replacement feeding. The default transmission rates are from the PMTCT model in Spectrum; their derivation is explained fully in the manual associated with that model.

- ***Maximum coverage for prevention interventions:*** Because unit costs may vary as interventions are implemented, a maximum coverage factor is assumed in the model. Generally, unit costs begin high, decrease as economics of scale are reached, then increase again as populations that are difficult to reach become the target population. Yet the actual shape of cost curves for interventions is not known currently. Therefore, in order to capture the fact that probably not all of a target population can be reached, a maximum coverage factor of 80 percent for prevention interventions is assumed. The use may change this value if they desire. Further discussion of the reasons underlying this factor can be found in the methodology section of the manual.

- ***Maximum coverage for care, treatment and support:*** Unlike maximum coverage for prevention interventions, it is assumed by default that the maximum coverage for care, treatment and support can reach 100 percent, because it is possible for all of the population to have access to these services. Note that this does not imply that everyone has this access, only that it is possible for 100 percent access to exist.

- ***Ratio of child treatment costs to adult treatment costs:*** Child care costs are estimated as a proportion of adult costs. This ratio is applied to both drug and service treatment costs for all children who have HIV/AIDS. A default value of 75% is given, based on experiences in South Africa.

- ***Years of life gained by the four treatment types:*** The number of additional life years gained per person after receiving palliative care, OI treatment, or OI prophylaxis. The number of life years gained due to HAART is calculated with the "HAART Success" worksheet, described below. These numbers are a combination of adherence and successful therapy. There are very few studies that evaluate the effect of either OI prophylaxis and/or ARV therapy on number of life-years gained in developing countries, primarily because these therapies are not widely available in those settings. One study set in Spain found that isoniazid prophylaxis extended life by three years (Moreno et al., 1997). A literature search of studies examining adherence to ARV therapy in developing countries found an average adherence rate of approximately 65%, resulting in approximately three years of additional life-years gained (Bollinger, 2001a).

- ***Reduction in need for OI Tx and prophylaxis when on HAART:*** The percentage reduction in both drug and service delivery costs of OI treatment and prophylaxis due to the patient receiving ARV therapy. Again, there is little scientific evidence measuring the exact impact of HAART on the treating opportunistic infections and providing prophylaxis, however there is certainly some effect.

- ***HAART is started 1 year or 2 years before death:*** If most patients who are on HAART start very late in the course of their disease (for example when CD4 counts are under 100) then this input should be set to 1 to indicate that most HAART patients were within one year of death at the time they started HAART. If the majority of patients start HAART earlier, then this input should be set to 2.

Impacts

The next set of inputs is a series of values associated with the matrix labeled "Impact." As described in detail in the Methodology section, these four matrices of values represent the impact of interventions on measures of behavior change. The changes in behavior in turn affect the calculation of HIV prevalence and incidence, which are then displayed as the final results of the model. Thus these

Impact screens are an intermediate step along the path towards the model's final results.

There are three dimensions associated with this matrix of impacts: the type of intervention; the risk group category (MSM, High, Medium, and Low); and the type of behavior change under review (Condoms, STIs, Partners, and Age at first sex). For example, a peer counseling program for SWs will have an impact on condom use for the high risk group.

It is important to note that the values in these matrices are based on a large literature of cost-effectiveness interventions; the process of deriving these impact numbers, and the literature underlying each category, is described fully in Appendix A. Although the user may change these values, since these numbers are based on a thorough review of the scientific literature, the default values should only be changed when the user has a very clear notion of why the change should occur. Each of these cells has a potential impact on HIV prevalence and incidence.

Each of the matrices has a set of values broken out by risk group category: MSM, High, Medium, and Low. These risk categories are defined at the beginning of the input section, as well.

There are four types of behavior changes that can be affected by the various interventions, labeled as follows and described in detail here:

- ***Condoms: reduction in non-use:*** These impacts are based on reported increases in consistent condom use in a number of different studies (see Appendix A for details). However, because different countries are at different based levels of condom use, the statistics from these studies need to be translated into a form that is useful for all countries. Thus increases in condom use are re-calculated as reductions in condom non-use, so that they are scale-neutral.

- ***STIs: reduction in non-treatment:*** The figures used in this matrix are an average of increases in STI treatment received due to the relevant intervention. Again, because countries have different levels of STI treatment in the base year, the final impact number needs to be scale-neutral. Thus the increases are translated into reductions in non-treatment of STIs, similar to the transformation for condom use.

- ***Partners: reduction in # of partners:*** These impacts measure the percentage reduction in the number of partners associated with individual interventions for the various risk groups. Note that this is already a scale-neutral calculation.

- ***First sex: Change in age at first sex:*** This matrix presents the change, in years, in the age when an individual first has sex. For example, according to the value in the matrix, a school-based intervention increases the age at first sex by 0.30 years. Thus here a positive calculated impact is beneficial, as it represents a delay in the onset of sexual activity. The effect of these impacts is to decrease the size of the population at risk for both STI and HIV transmission, as they are not sexually active.

Note that some cells are empty in each of these four matrices, as not all interventions will have an impact for all risk groups for all behavior change categories. For example, peer counseling for SWs has an impact on condom use, but does not have an impact on increasing the age at first sex. As stated above, the details of these calculations, along with the sources of the effectiveness data, are described in Appendix A.

- ***Adjustment factor:*** The final column shown in purple in the Impacts matrix is a vector of adjustment factors for each activity. As discussed above, there are two other reduction factors that operate on the matrix of Impacts – one for policy environment, and the other representing the linkages between care and prevention. These two factors, however, operate on the entire matrix uniformly. It is possible that the user may want to vary an impact for a particular activity, based on information they have. If this is the case, the user may alter the impact of a particular activity via this vector.

- ***Median period from HIV infection until AIDS death (years):*** The average number of years between initial infection with HIV until death from AIDS.

M. Capacity sub-model

The Capacity sub-model can be operated in conjunction with the rest of the ***Goals*** model, or separately. There are four individual worksheets that require inputs, each of which is listed below.

Goals inputs

The inputs for this worksheet can be provided in two different ways. When the rest of the model has been set up, the required inputs are accessed from the rest of the model. That is, if the rest of the model has been set up, the input data for this worksheet are provided automatically through various links.

If, however, the Capacity sub-model is going to be run separately from the rest of ***Goals***, there are two main sets of inputs that need to be provided:

- ***HIV prevalence (annually):*** The percentage of adults aged 15 to 49 who are infected with HIV.
- ***Number of people to be reached by each intervention (annually):*** For each intervention, the number of people that are in the target population. For example, the 'MSM outreach' intervention would reach a

maximum of 80 percent of the MSM population, for each year that the intervention will take place. Note that, if the rest of the model is not to be used, it would be useful to read the manual regarding how the target population is defined. For example, those people receiving STI treatment are adults with STIs who have access to treatment facilities.

Base year capacity

The second input worksheet for the Capacity sub-model requires information about base year capacity for each intervention by the type of labor required. The first step in this worksheet is to define all types of labor associated with each intervention, by typing in the appropriate code under the column headed 'Labor Code'. Once the labor code is typed in, entries in the column headed 'Labor Category' are filled in automatically.

The possible labor categories can be seen in the far right-hand side of the worksheet. Note that there are eight possible slots for user-defined labor categories, in addition to the 'Other' category already listed. Some interventions will require only one type of labor, while others will require more than one type. For example, the 'Management/Administration' activity may require only one type of labor, 'Administrative', while an activity such as VCT may require 'Counselors', 'Administrative', and 'Outreach' personnel.

The rest of the inputs are combined to calculate the number of full-time equivalent personnel that currently exist. Each line item requires entries for:

- ***Number of existing trained staff:*** The number of staff, by occupation, that are already fully trained.
- ***Percentage of time spent on program:*** The percentage of time that the existing trained staff spends on each intervention, on average.
- ***Sick time:*** The average percentage of time that the existing trained staff does not work due to sickness.

After these three inputs are provided for each occupation and each intervention, the model calculates the full-time equivalent number of staff that is fully trained.

Program reach

In this worksheet, the labels for interventions and occupations for each intervention are automatically copied from the previous worksheet. Each line item requires input regarding:

- ***Program reach:*** Number of clients in the target population that are reached per each full-time equivalent trained person.

Default values have been entered, most of which are based on sources in the literature, listed in the 'Source' column. When more than one source is listed, the program reach is an average over all of the sources. A complete bibliography of these sources, sorted alphabetically by the source identification code, can be found in Appendix C.

If any of these default values need to be changed, new values can be typed in the green column. The labor codes and categories are listed at the right for reference purposes.

Characteristics

The final input worksheet for the Capacity sub-model requires inputs for the aggregate labor categories:

- ***Annual salary:*** The annual salary for a full-time equivalent employee, for each labor category.
- ***Attrition:*** The percentage of full-time equivalent employees who leave their position for reasons other than death during one year (e.g., quit, fired, laid off).
- ***Death rate (%):*** The percentage of full-time equivalent employees who die from any cause annually.
- ***% of time spent on program:*** On average, the percentage of time that an employee would spend on a particular program. This figure could be a weighted average derived from the inputs in the 'Base year capacity worksheet'. This input is used in the final calculation of training needs to translate full-time equivalent employees into the number of employees that need to be trained.
- ***Sick time (%):*** On average, the percentage of time each employee would be sick. This input is also used in the final calculation of training needs to translate full-time equivalent employees into the number of employees that need to be trained.
- ***% requiring pre-service training (in-service, continuing education):*** The percentage of employees who require the various types of training. Pre-service training consists of training necessary prior to beginning employment. In-service training consists of training during employment to introduce new skills and information to employees. Continuing education consists of intermittent training to bring employees up-to-date after both pre-service and in-service activities have been completed.
- ***Number trained per pre-service workshop (in-service, continuing education):*** The number of people that can be trained in each workshop setting. Note that this number is not in full-time equivalent terms; rather it is the maximum number of people that can be effectively trained per workshop.

- ***Cost per pre-service workshop (in-service, continuing education):*** The total cost of holding a particular workshop.

III. Analysis

After all inputs have been entered into ***Goals***, the model may be used to analyze the impact of resource allocation decisions in the worksheet labeled "Summary."

This worksheet contains the elements of the model needed to perform an analysis of the strategic plan. The first column lists the summary categories in ***Goals***, the next two columns contain budget information pertaining to the plan, and the fourth column displays the coverage that can be attained with the budget under analysis. There are also two graphs that display the trend in adult HIV prevalence and coverage of care and support services. The first graph indicates the changes in HIV prevalence that will result from the proposed budget, while the second graph shows the coverage that can be achieved for selected interventions, including all of the levels of care. Each of these elements is explained further below.

There are two ways to examine the impact of changes in a budget:

1. Select budget scenario "A", "B", or "C", based on the budget data entered into the worksheet labeled "Budget – Inputs." Recall that the original budget data will be aggregated into the ***Goals*** summary categories, according to the classification provided. The year to be displayed can also be specified. The appropriate budget data are then displayed in the column labeled "PLAN BUDGET." The graphs will display the impact on HIV prevalence and coverage. The budget scenario can be changed to see the effects on prevalence and coverage. Changes to the budget scenarios can only be made in the "Budget – Inputs" worksheet.
2. Alternatively, the effects of changes in funding for specific activities can be examined by using the column labeled "Interactive Budget – Final Year." Budget data can be typed directly into this column. The program automatically uses these new data to calculate prevalence and coverage. In this way the program can be used interactively to explore changes in funding for specific activities. (The interactive budget figures refer to the final year. The model interpolates between the first and last years to fill in funding levels for the intervening years.) Deleting a interactive budget figure will cause the model to return to the selected budget scenario.

The fourth column displays the coverage rates associated with the strategic plan under analysis. The model automatically calculates the coverage rates associated with the budget allocation for each activity. This will most likely be particularly important in the treatment and support categories.

Recall that there are maximum coverage rates for prevention and care/mitigation activities; the default values are 80 percent for prevention, and 100 percent for care/mitigation. Note that one implication of this maximum rate is that coverage rates of over 80 percent for prevention activities will not have an impact on the behavior change variables, and hence prevalence. Another implication is that, once the maximum coverage rate has been reached, adding monies to a particular activity will not change the coverage rate that is displayed.

There are two graphs that are displayed on the "Summary" worksheet. The first graph displays the level of HIV prevalence. Many times one of the goals of a strategic plan is to reduce the level of HIV prevalence in the country. Two lines will be displayed on the graph – HIV prevalence with no change in the current level of expenditure, and HIV prevalence with the strategic plan's future level of expenditure. In this way, the impact of the increased expenditure can be seen on the change in future HIV prevalence.

The second graph on the "Summary" worksheet displays a chart illustrating coverage rates associated with the current budget allocation for most of the care and mitigation activities, along with the PMTCT program. The coverage rates are calculated as the percent of population in need of the service that are actually receiving the service (e.g., pregnant women are the population target group in need of a PMTCT intervention).

Coverage rates for the following activities are displayed:

- PMTCT
- STI treatment
- Palliative care
- Treatment of OIs
- Prophylaxis of OIs
- HAART

IV. Outputs from *Goals*

Goals displays outputs in graphical form separately in various worksheets. Each of these worksheets is described below. Note that the underlying numerical data for the outputs can be seen in the worksheet labeled "Indicators Table."

- **Prevalence 15-49 Chart:** The national HIV prevalence level for adults, those aged 15-49, based on the budget allocation currently under analysis. This is an enlarged version of the graph displayed on the "Summary" page.

- **Prevalence 15-24 Chart:** The national HIV prevalence level for young adults, those aged 15-24, again based on the budget allocation currently under analysis. This is useful when one of the goals of a strategic plan is to reduce prevalence among young adults.

- **Coverage Chart:** The coverage levels achieved by the current strategic plan for care and mitigation activities. This is an enlarged version of the graph displayed on the "Summary" page, with an additional category of "Orphans."

- **Behaviour Chart**: The changes in behavior that are the result of evaluating the effect of all of the interventions via the four Impact matrices. This shows the effects on each behavior change category. This chart can be used to verify that the changes are reasonable, e.g., that condom use for spouses is not 100 percent, after the intervention has taken place. Note that the last category, percent sexually active, increases (decreases) as the result of an increase (decrease) in the age at first sex.

- **Allocation Chart:** A pie chart that displays the allocation of resources according to the sub-categories in the model. This shows the balance between various elements of the strategic plan, such as the percentage of expenditures devoted to prevention vs. treatment. Sometimes the strategic plan itself will have a goal that addresses the balance between these various elements.

- **Expenditures Averted Chart:** The total amount of expenditures that are averted in the future due to behavior changes caused by prevention program expenditures, separately for children and adults. This chart shows the expenditures averted over the next ten years as a results of infections averted during the next five years. Adult infections averted will avoid care and treatment expenditures 7-10 years in the future, while child infections averted will have a more immediate effect.

- **Training Needs:** This worksheet displays, for each year of the strategic plan, the training required and costs for the three different types of training in the model: pre-service, in-service, and continuing education. For each type of training, the following statistics are displayed: number of full-time equivalent personnel to be trained; number of actual people to be trained; and number of workshops to be held. A total cost of holding all of the training workshops is also displayed annually.

V. Program Tutorial

This tutorial, with sample data, covers the key steps in installing and running the Microsoft Excel spreadsheet version of the **Goals** module. This version has been designed to use data from the Spectrum system of policy models. Spectrum models and their manuals can be downloaded from the web site of the Futures Group International (www.futuresgroup.com). This manual assumes that the user is familiar with Excel.

A. Requirements

The ***Goals*** model only requires a computer running Microsoft Windows and Microsoft Excel.

To use ***Goals*** and Spectrum, you will need a computer system with the following characteristics:

- 32MB or more of RAM
- 40 MB of free space on your hard disk
- Windows 95, Windows 98, Windows Me, Windows 2000, or Windows XP

B. Before You Start

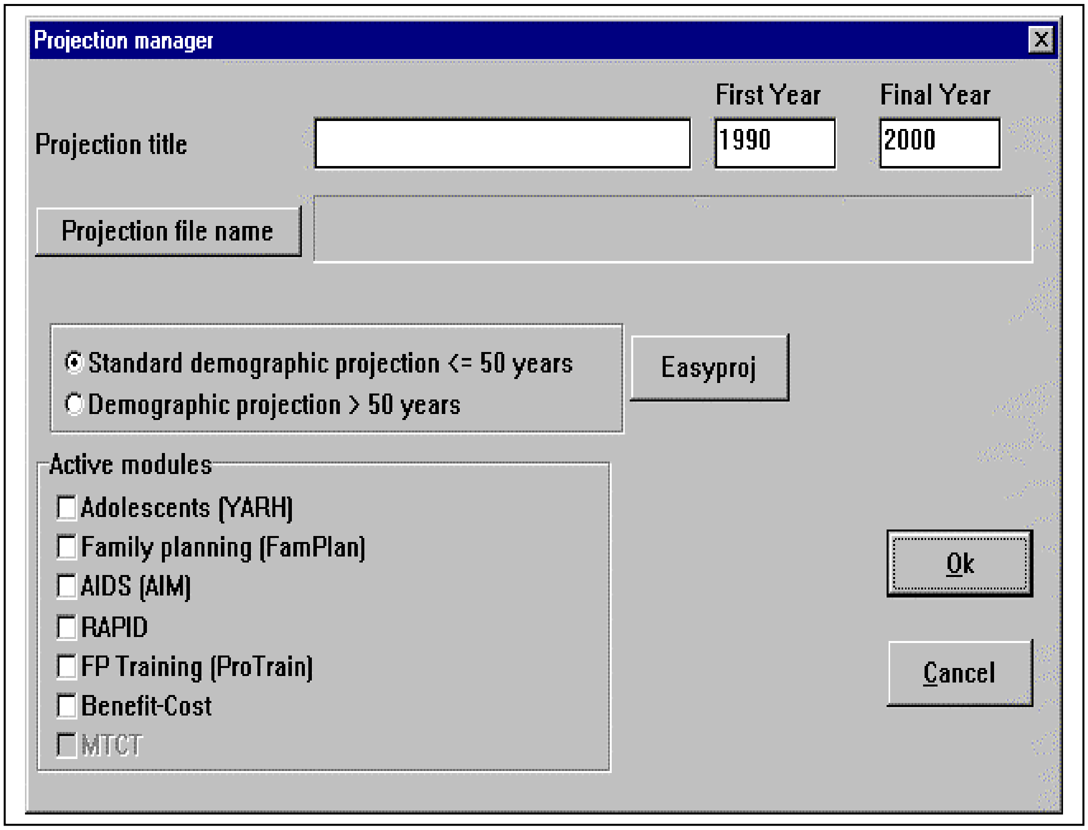
Before running the ***Goals*** model you will need to collect the input information described above in Chapter II.

In most cases it is advisable to prepare a ***Spectrum*** projection first, since this will provide many of the inputs required for ***Goals***. To prepare a ***Spectrum*** projection, follow these steps:

Step 1. Install the *Spectrum* program. It can be downloaded from the Internet at www.tfgi.com or you can request a copy on CD-ROM from The Futures Group International.

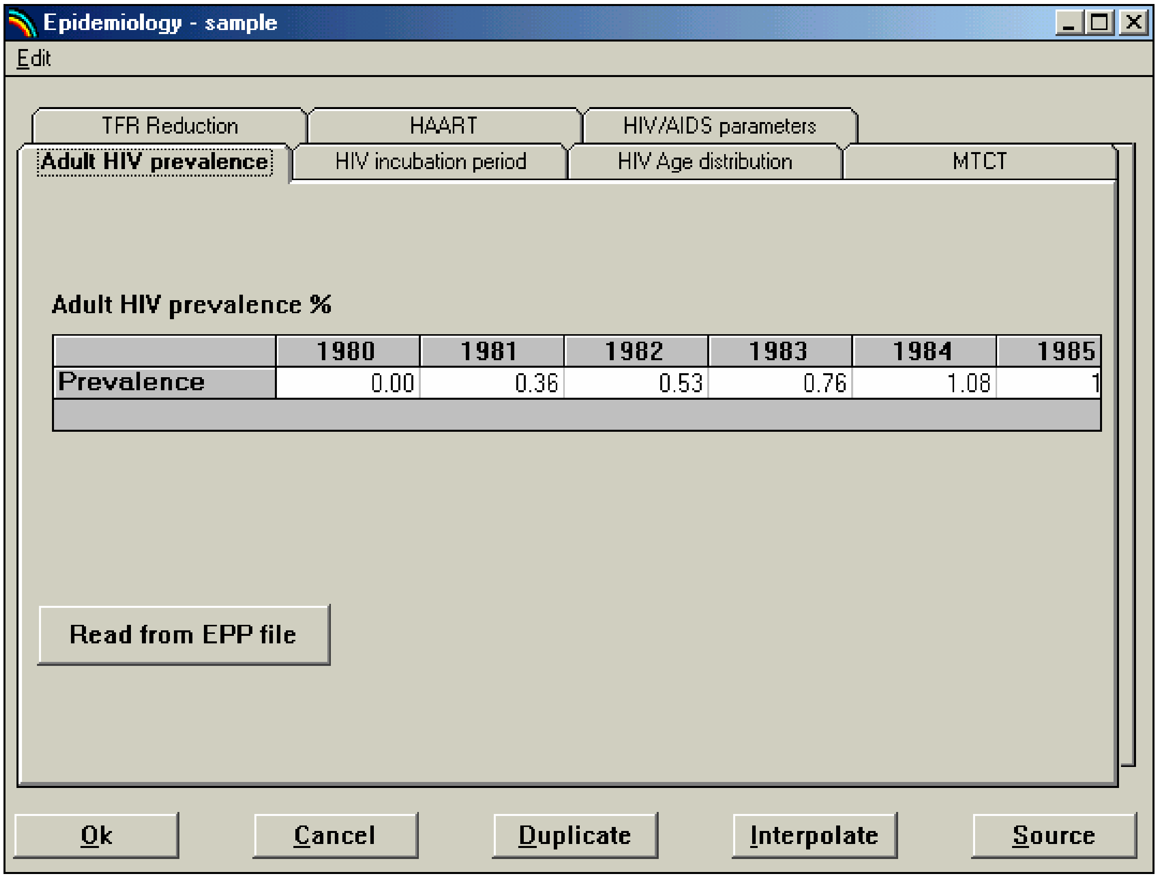
Step 2. Start Spectrum. Start the Spectrum program by selecting it from the start menu or running from a CD-ROM.

Step 3. Create a population projection. Create a new population projection by selecting "File" and "New" from the Spectrum menu. The "Projection manager" dialogue box will appear and will look like the following screen:



Click in the box next to "Projection title" and type a title for the projection. Set the "First year" to 1980 and the "Final year" to 2005, or whatever the final year of the strategic plan is. Click on the "Projection file name" button and enter a file name for this projection. (Be sure to select a location on the hard disk, C:, drive for the file and not on the CD-ROM since the program cannot write a file to the CD-ROM.) Click the check box next to "AIDS (AIM)" to add the AIM module to the program. Then click the "EasyProj" button. From the EasyProj screen choose your country from the list. Once you click "OK", the program will load all the necessary demographic data.

Step 4. Enter a prevalence estimate. Select "Edit" and "AIDS (AIM)" from the Spectrum menu and "Epidemiology" from the dialog box. Then you will see the editor for the prevalence projection. It will look like the screen shown below. You need to enter an estimate of adult HIV prevalence by year. The best way to create this estimate is to use the EPP model. (You can download the EPP model and manual from the Futures Group website at www.tfgi.com). Alternatively, you can type the figures directly into the editor. Click the "Ok" button to complete this step.



Step 5. Display the output. From the main Spectrum menu, select "Display", "AIDS (AIM)" and "Epidemiology". You will then see a drop down menu with a list of HIV/AIDS indicators. The key indicators are summarized in the last two choices in the list: "Adults 15-49 summary" and "Child AIDS summary". Select one of these choices. The first time you select a display after you have changed input values, you will see the message "Inputs have been changed. Re-project population now?" Click on the "Yes" button to tell Spectrum to re-calculate the projection. Next you will see the display configuration dialog box. Click OK and you will see a table displaying the results of the projection. This table and the child summary will have most of the information you need for ***Goals***. The number of AIDS orphans is available by choosing "Display", "AIDS", "Impacts" and "AIDS orphans.

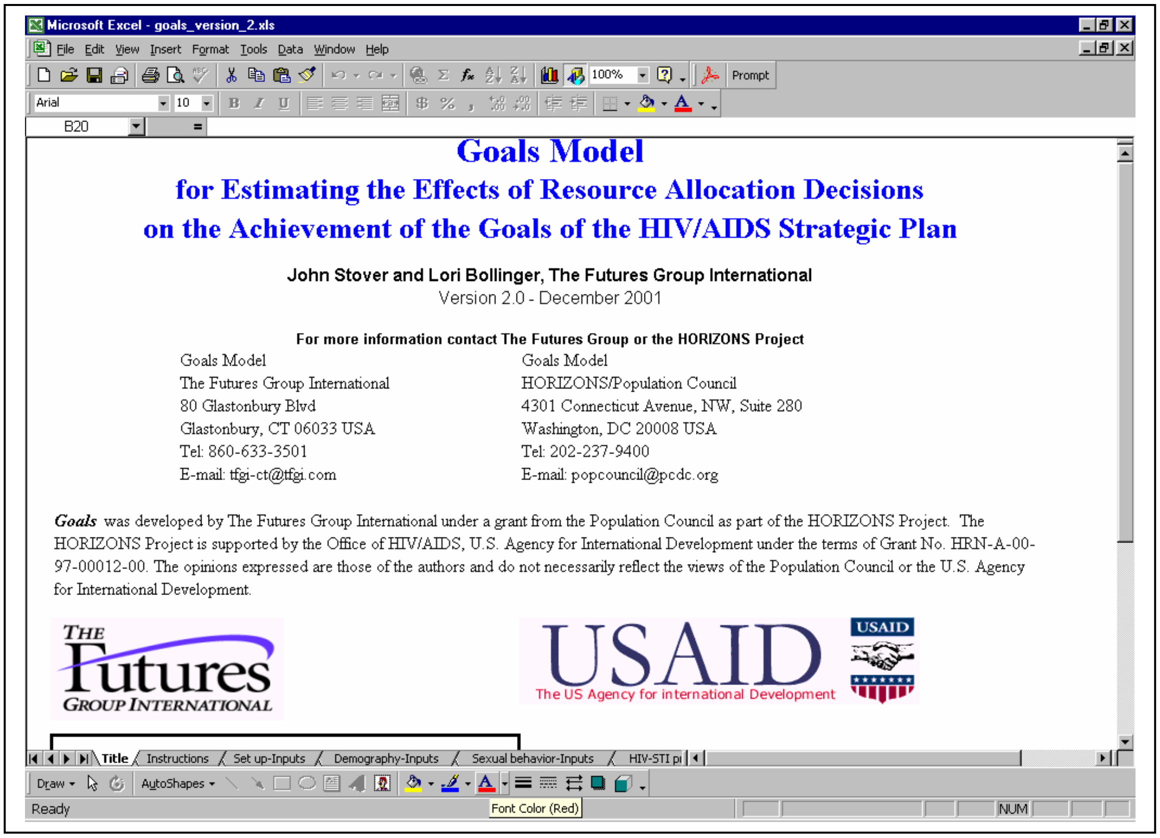
Step 6. Save the projection. Save the projection by selecting "File" and "Save" or "Save As" from the Spectrum menu.

C. Loading the *Goals* Excel Spreadsheet

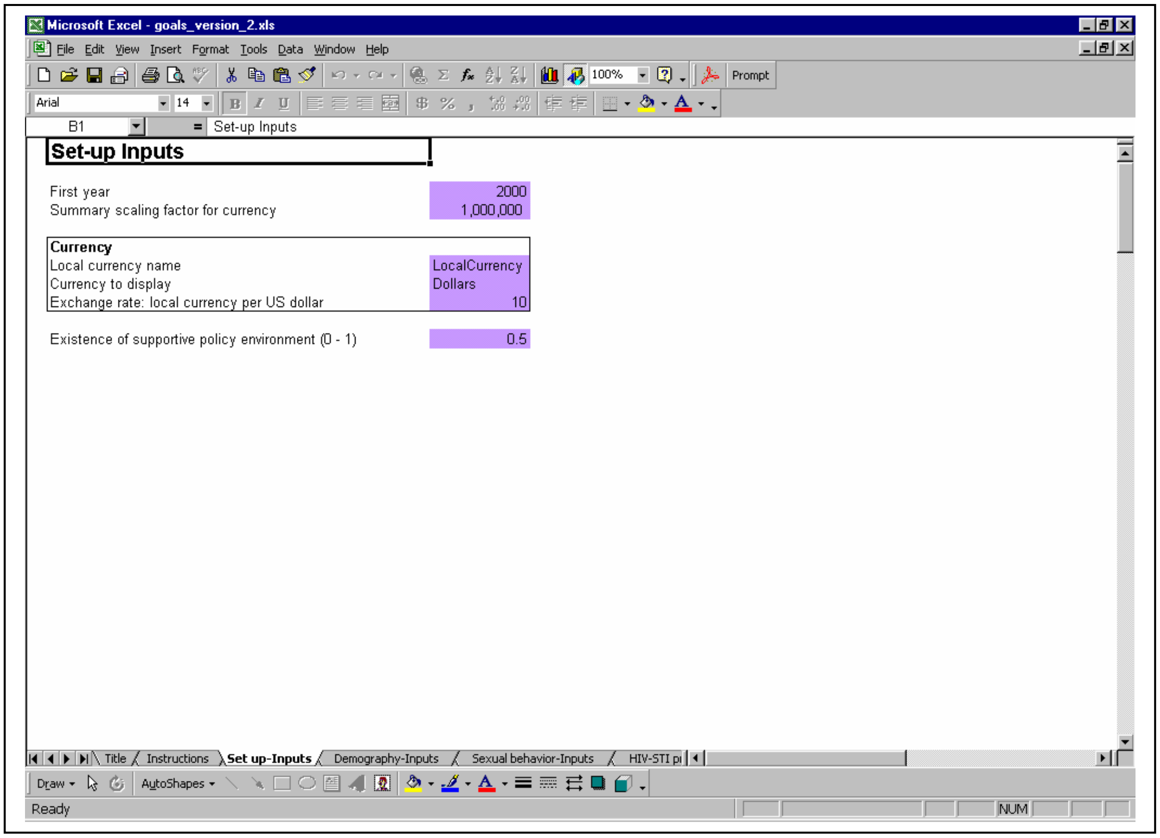
First start the Microsoft Excel program. Next, you need to open the ***Goals*** Excel spreadsheet. To do this,

1. Select "File" and "Open" from Excel.

2. Select the file titled "Goals.XLS" from your disk; if you installed Spectrum on your C drive, you will find the file in c:\spectrum\excel. The file will automatically load, and you will see the introduction screen.



At the bottom of the screen are tabs allowing you to navigate through the spreadsheet (e.g., Title, Instructions, Set-up-Inputs, Demography-Inputs, etc.). You can move through the spreadsheet by clicking on the appropriate tab. When you select one of the tabs at the bottom of the screen, you will see a display like the one shown below:



D. Entering Data and Assumptions

1. About the Worksheets

To enter the assumptions start with the "Set-up Inputs" worksheet and go through each worksheet in order until you reach the worksheet labeled "Standard assumptions". Sources of the inputs are noted, where relevant, in the source column of the worksheets. Spectrum programs may be used as sources for some of the ***Goals*** data inputs. A discussion of these values also can be found in the Inputs section of the manual. Directions for entering assumptions are also provided in the Instructions worksheet.

In the ***Goals*** model, there are two classes of inputs:

1. Country-specific values you have to change such as total population or HIV prevalence. In the worksheets, a light purple background indicates cells where you need to enter data or assumptions. If you want to run an application, these country-specific values must be entered.

2. Standard values that you do not have to change such as HIV transmission rates or impact assumptions. In the worksheets, a light green background indicates cells with these standard values based on international studies. However, country-specific data can be entered, if available.

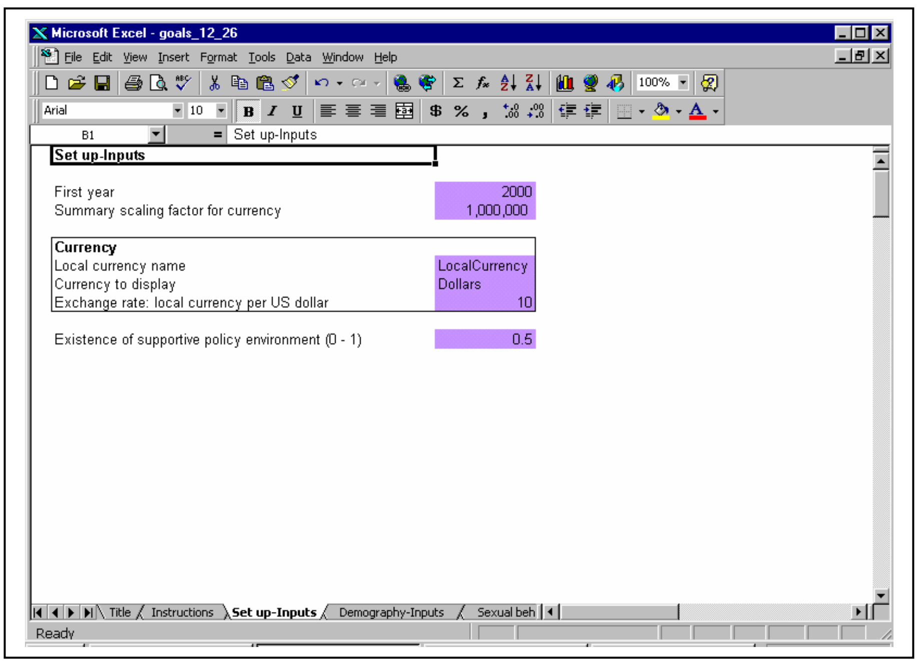
A light yellow background is used to highlight worksheet titles and areas of special interest.

A white background indicates cells that you cannot change and are "locked out" or protected. These cells are protected to prevent you from accidentally changing a formula. (If you need to change one of these cells you can do so by un-protecting the worksheet by choosing “Format”, “Worksheet”, “Unprotect”. If you do this remember to protect the worksheet again after your change to avoid accidentally erasing a formula.)

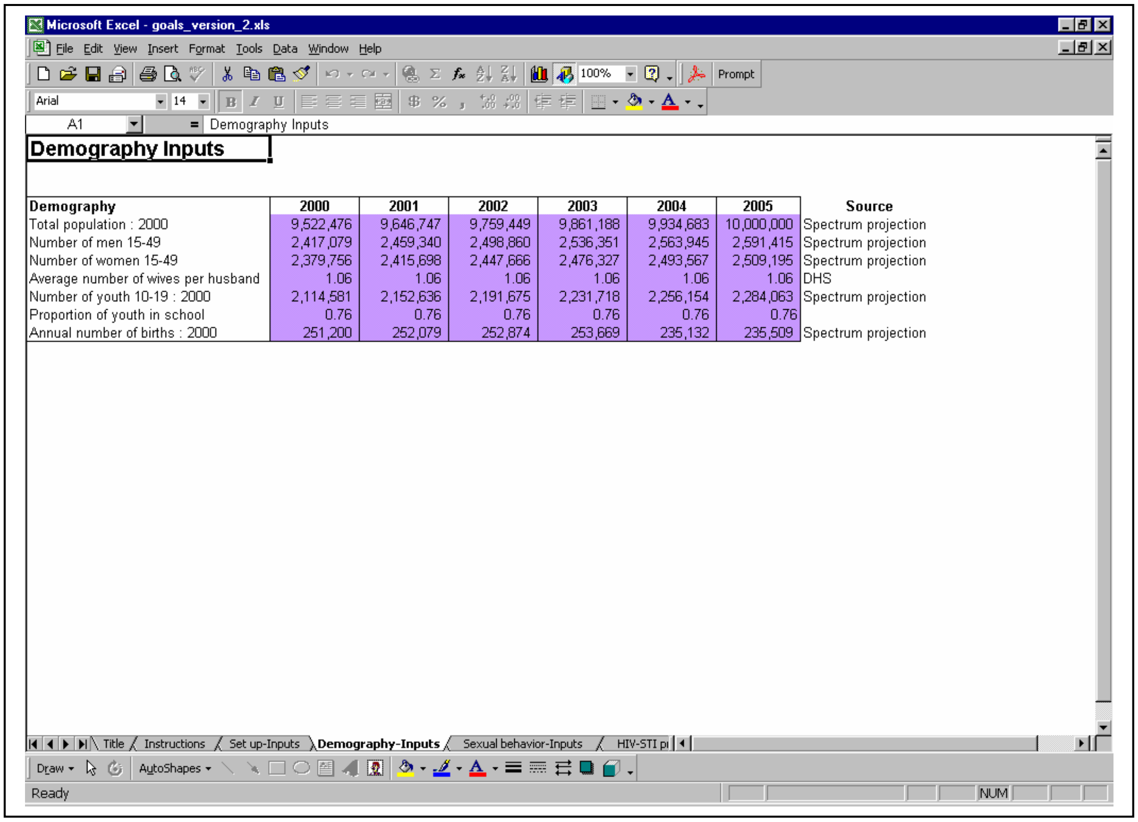
2. Entering the Country-specific Values

Enter the country-specific values for the following nine worksheets. Go through the worksheets in order.

Set-up-Inputs



Demography Inputs



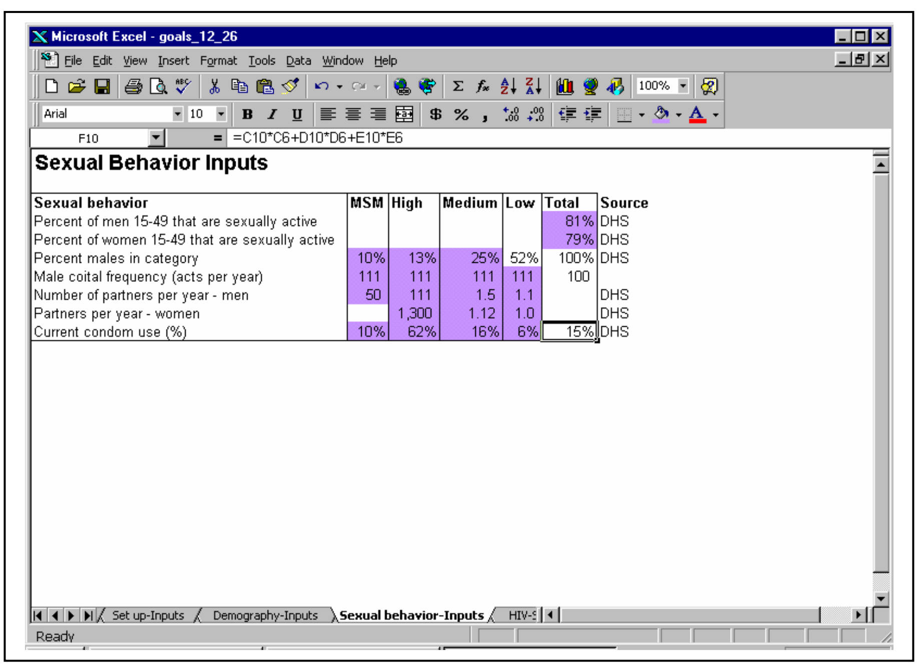
Microsoft Excel - goals_version_2.xls

Demography Inputs

Demography	2000	2001	2002	2003	2004	2005	Source
Total population : 2000	9,522,476	9,646,747	9,759,449	9,861,188	9,934,683	10,000,000	Spectrum projection
Number of men 15-49	2,417,079	2,459,340	2,498,860	2,536,351	2,563,945	2,591,415	Spectrum projection
Number of women 15-49	2,379,756	2,415,698	2,447,666	2,476,327	2,493,567	2,509,195	Spectrum projection
Average number of wives per husband	1.06	1.06	1.06	1.06	1.06	1.06	DHS
Number of youth 10-19 : 2000	2,114,581	2,152,636	2,191,675	2,231,718	2,256,154	2,284,063	Spectrum projection
Proportion of youth in school	0.76	0.76	0.76	0.76	0.76	0.76	
Annual number of births : 2000	251,200	252,079	252,874	253,669	235,132	235,509	Spectrum projection

Most of these inputs can be obtained from a Spectrum projection.

Sexual-behavior-Inputs



Microsoft Excel - goals_12_26

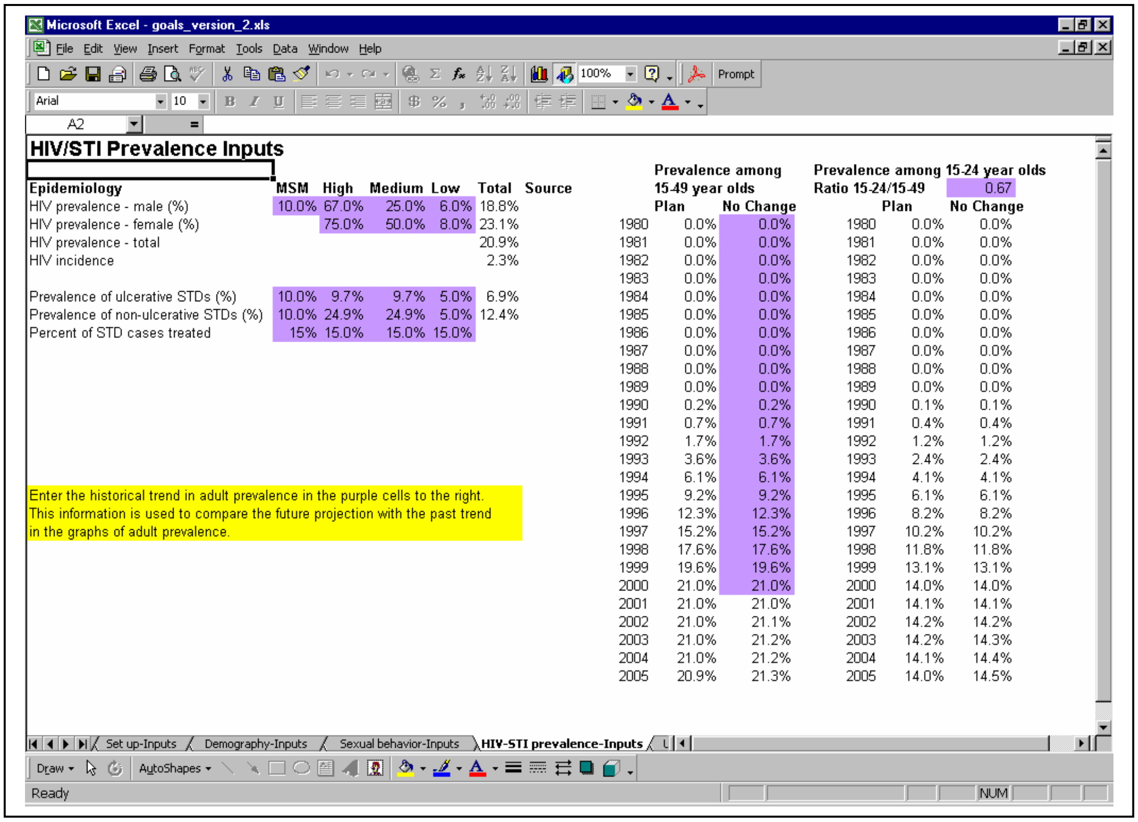
F10 = =C10*C6+D10*D6+E10*E6

Sexual Behavior Inputs

Sexual behavior	MSM	High	Medium	Low	Total	Source
Percent of men 15-49 that are sexually active					81%	DHS
Percent of women 15-49 that are sexually active					79%	DHS
Percent males in category	10%	13%	25%	52%	100%	DHS
Male coital frequency (acts per year)	111	111	111	111	100	
Number of partners per year - men	50	111	1.5	1.1		DHS
Partners per year - women		1,300	1.12	1.0		DHS
Current condom use (%)	10%	62%	16%	6%	15%	DHS

Many of the inputs on sexual behavior are available from a Demographic and Health Survey if the AIDS module is included.

HIV-STI Prevalence -Inputs



Microsoft Excel - goals_version_2.xls

HIV/STI Prevalence Inputs

Epidemiology	MSM	High	Medium	Low	Total	Source
HIV prevalence - male (%)	10.0%	67.0%	25.0%	6.0%	18.8%	
HIV prevalence - female (%)		75.0%	50.0%	8.0%	23.1%	
HIV prevalence - total					20.9%	
HIV incidence					2.3%	
Prevalence of ulcerative STDs (%)	10.0%	9.7%	9.7%	5.0%	6.9%	
Prevalence of non-ulcerative STDs (%)	10.0%	24.9%	24.9%	5.0%	12.4%	
Percent of STD cases treated	15%	15.0%	15.0%	15.0%		

Enter the historical trend in adult prevalence in the purple cells to the right.
This information is used to compare the future projection with the past trend
in the graphs of adult prevalence.

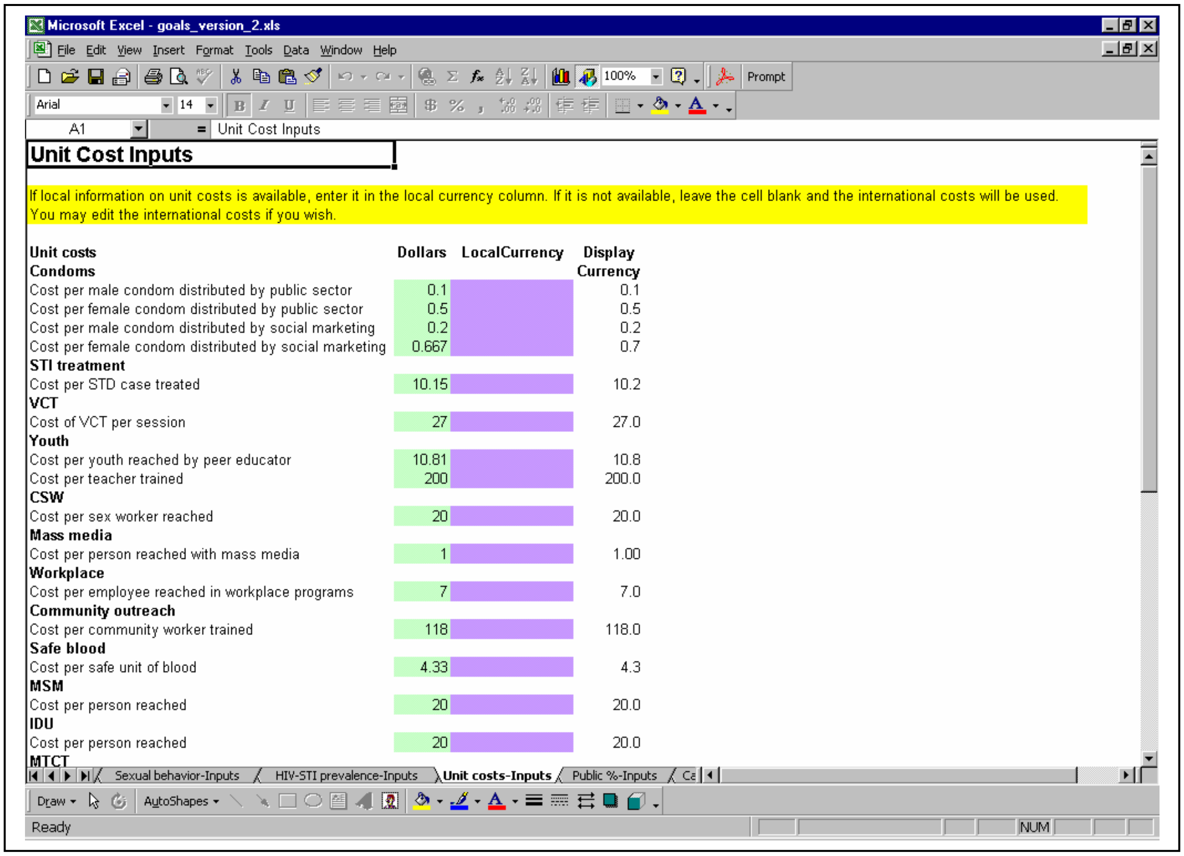
Prevalence among 15-24 year olds Ratio 15-24/15-49: 0.67

Prevalence among 15-49 year olds	Plan	No Change	Prevalence among 15-24 year olds	Plan	No Change
1980	0.0%	0.0%	1980	0.0%	0.0%
1981	0.0%	0.0%	1981	0.0%	0.0%
1982	0.0%	0.0%	1982	0.0%	0.0%
1983	0.0%	0.0%	1983	0.0%	0.0%
1984	0.0%	0.0%	1984	0.0%	0.0%
1985	0.0%	0.0%	1985	0.0%	0.0%
1986	0.0%	0.0%	1986	0.0%	0.0%
1987	0.0%	0.0%	1987	0.0%	0.0%
1988	0.0%	0.0%	1988	0.0%	0.0%
1989	0.0%	0.0%	1989	0.0%	0.0%
1990	0.2%	0.2%	1990	0.1%	0.1%
1991	0.7%	0.7%	1991	0.4%	0.4%
1992	1.7%	1.7%	1992	1.2%	1.2%
1993	3.6%	3.6%	1993	2.4%	2.4%
1994	6.1%	6.1%	1994	4.1%	4.1%
1995	9.2%	9.2%	1995	6.1%	6.1%
1996	12.3%	12.3%	1996	8.2%	8.2%
1997	15.2%	15.2%	1997	10.2%	10.2%
1998	17.6%	17.6%	1998	11.8%	11.8%
1999	19.6%	19.6%	1999	13.1%	13.1%
2000	21.0%	21.0%	2000	14.0%	14.0%
2001	21.0%	21.0%	2001	14.1%	14.1%
2002	21.0%	21.1%	2002	14.2%	14.2%
2003	21.0%	21.2%	2003	14.2%	14.3%
2004	21.0%	21.2%	2004	14.1%	14.4%
2005	20.9%	21.3%	2005	14.0%	14.5%

Set up-Inputs / Demography-Inputs / Sexual behavior-Inputs / HIV-STI prevalence-Inputs

The prevalence trend can come from the Spectrum projection. The figures for prevalence by risk group should be based on surveillance studies.

Unit costs-Inputs



Microsoft Excel - goals_version_2.xls

Unit Cost Inputs

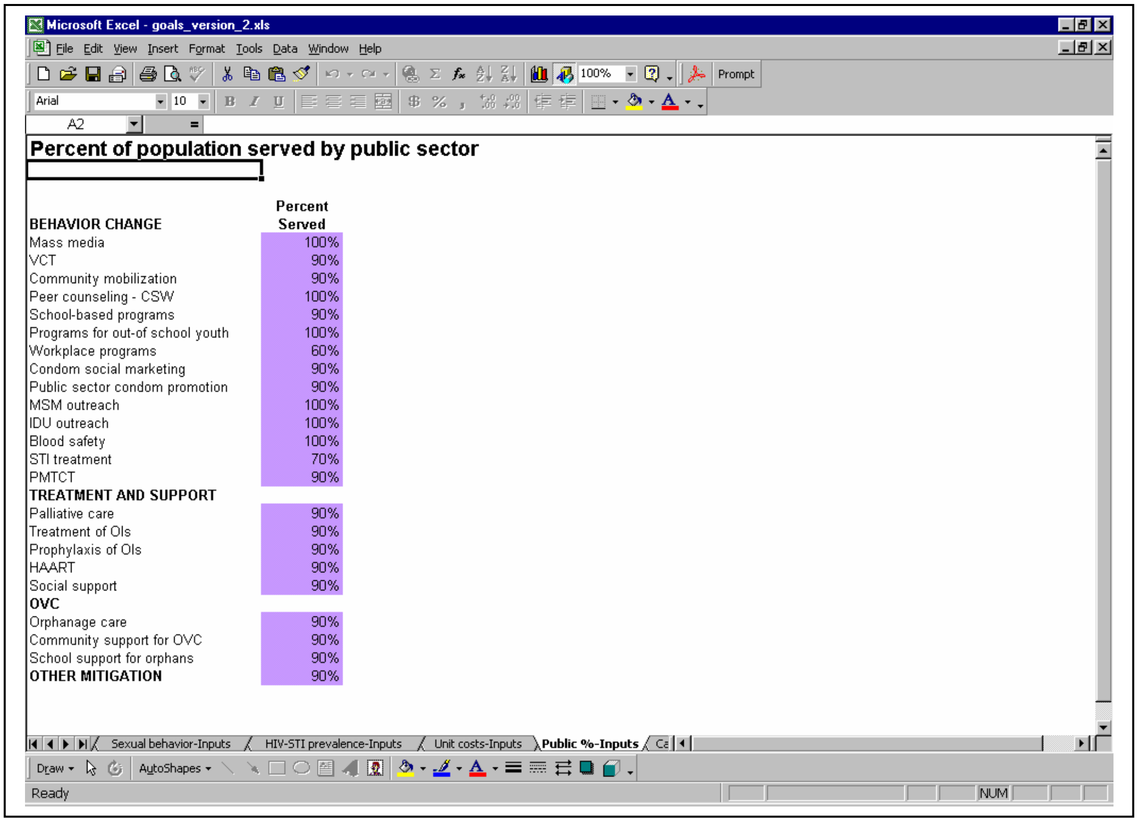
If local information on unit costs is available, enter it in the local currency column. If it is not available, leave the cell blank and the international costs will be used.
You may edit the international costs if you wish.

Unit costs	Dollars	LocalCurrency	Display Currency
Condoms			
Cost per male condom distributed by public sector	0.1		0.1
Cost per female condom distributed by public sector	0.5		0.5
Cost per male condom distributed by social marketing	0.2		0.2
Cost per female condom distributed by social marketing	0.667		0.7
STI treatment			
Cost per STD case treated	10.15		10.2
VCT			
Cost of VCT per session	27		27.0
Youth			
Cost per youth reached by peer educator	10.81		10.8
Cost per teacher trained	200		200.0
CSW			
Cost per sex worker reached	20		20.0
Mass media			
Cost per person reached with mass media	1		1.00
Workplace			
Cost per employee reached in workplace programs	7		7.0
Community outreach			
Cost per community worker trained	118		118.0
Safe blood			
Cost per safe unit of blood	4.33		4.3
MSM			
Cost per person reached	20		20.0
IDU			
Cost per person reached	20		20.0
MTCT			

Sexual behavior-Inputs / HIV-STI prevalence-Inputs / Unit costs-Inputs / Public %-Inputs

Enter unit cost values for all categories. If local information on unit costs is available, enter it in the purple cells in the Local Currency column. If it is not available, leave the cell blank and the international costs in the light green cells will be used. If you enter local data in the purple cells, these values will be the ones shown in the Display Currency column and will be the values used in the model calculations.

Public % -Inputs



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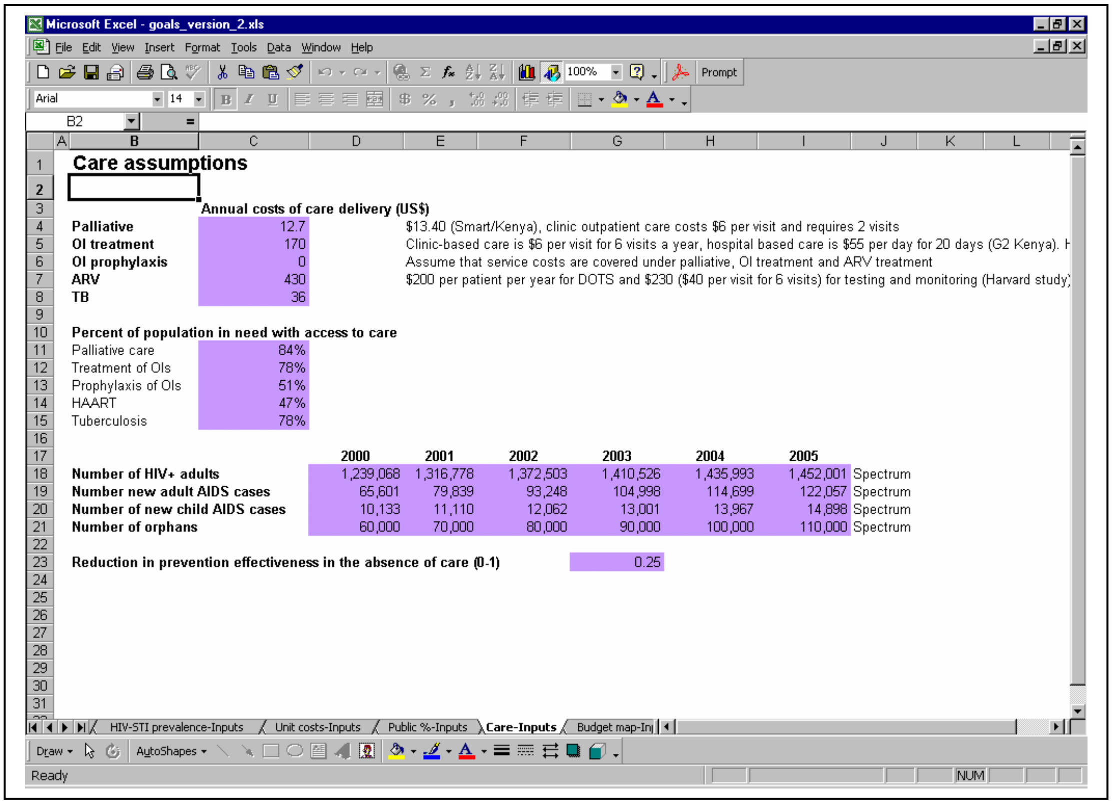
Percent of population served by public sector

	Percent Served
BEHAVIOR CHANGE	
Mass media	100%
VCT	90%
Community mobilization	90%
Peer counseling - CSW	100%
School-based programs	90%
Programs for out-of school youth	100%
Workplace programs	60%
Condom social marketing	90%
Public sector condom promotion	90%
MSM outreach	100%
IDU outreach	100%
Blood safety	100%
STI treatment	70%
PMTCT	90%
TREATMENT AND SUPPORT	
Palliative care	90%
Treatment of OIs	90%
Prophylaxis of OIs	90%
HAART	90%
Social support	90%
OVC	
Orphanage care	90%
Community support for OVC	90%
School support for orphans	90%
OTHER MITIGATION	90%

Enter the percentage of the population covered by the public sector for each prevention and care service.

Care-Inputs



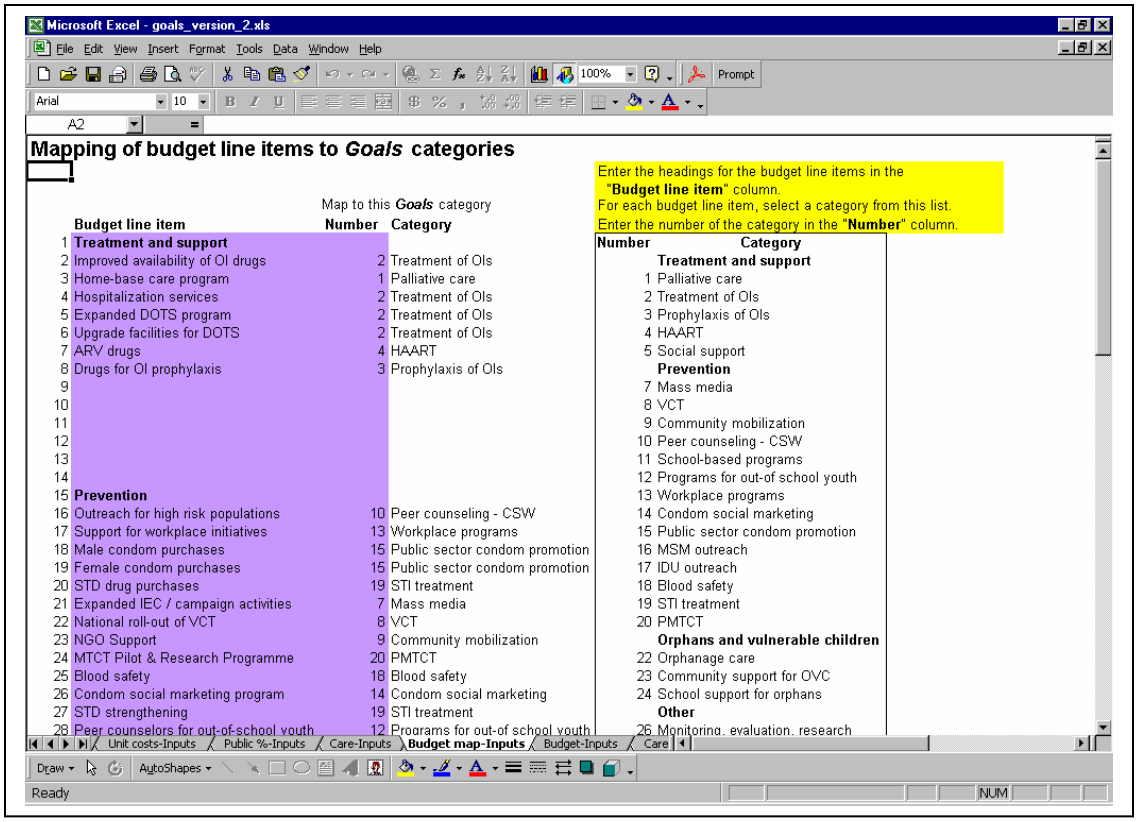
Microsoft Excel - goals_version_2.xls

Care assumptions

	Annual costs of care delivery (US$)							
Palliative	12.7	$13.40 (Smart/Kenya), clinic outpatient care costs $6 per visit and requires 2 visits						
OI treatment	170	Clinic-based care is $6 per visit for 6 visits a year, hospital based care is $55 per day for 20 days (G2 Kenya). H						
OI prophylaxis	0	Assume that service costs are covered under palliative, OI treatment and ARV treatment						
ARV	430	$200 per patient per year for DOTS and $230 ($40 per visit for 6 visits) for testing and monitoring (Harvard study)						
TB	36							
Percent of population in need with access to care								
Palliative care	84%							
Treatment of OIs	78%							
Prophylaxis of OIs	51%							
HAART	47%							
Tuberculosis	78%							
		2000	**2001**	**2002**	**2003**	**2004**	**2005**	
Number of HIV+ adults		1,239,068	1,316,778	1,372,503	1,410,526	1,435,993	1,452,001	Spectrum
Number new adult AIDS cases		65,601	79,839	93,248	104,998	114,699	122,057	Spectrum
Number of new child AIDS cases		10,133	11,110	12,062	13,001	13,967	14,898	Spectrum
Number of orphans		60,000	70,000	80,000	90,000	100,000	110,000	Spectrum
Reduction in prevention effectiveness in the absence of care (0-1)					0.25			

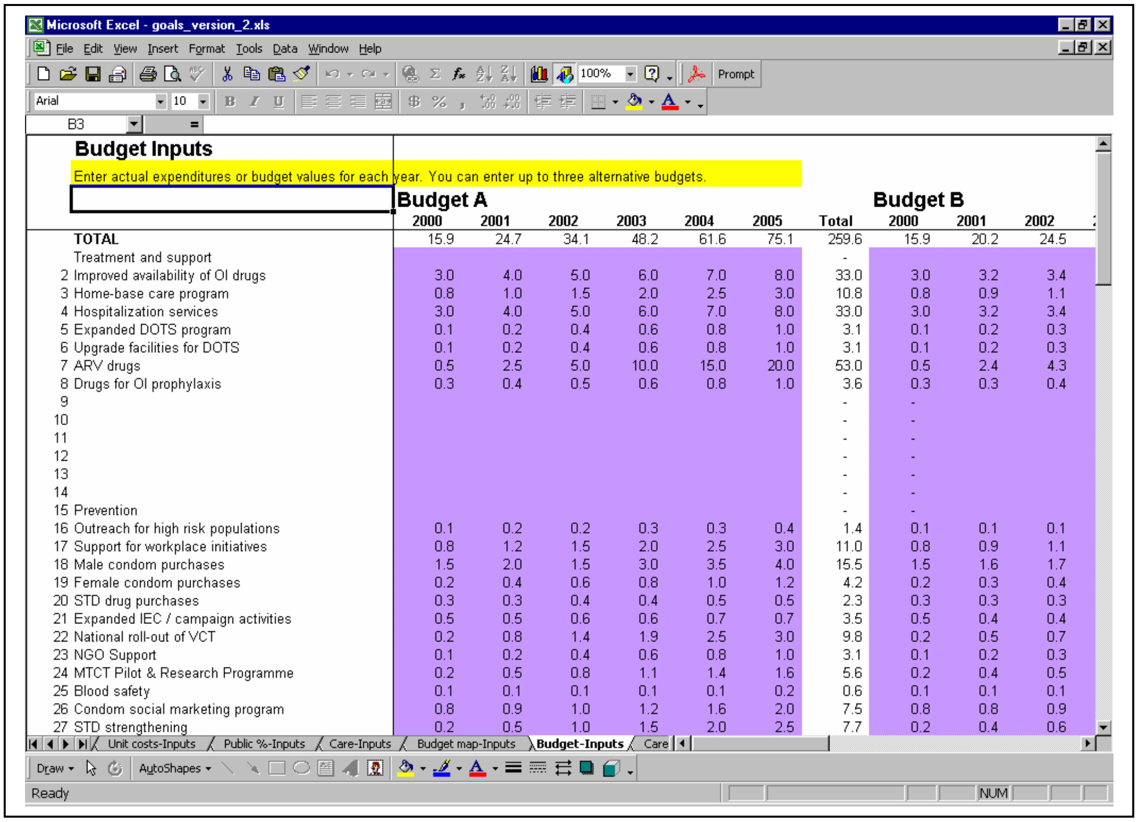
The estimates of numbers of HIV+ adults, new AIDS cases and orphans can come from a Spectrum projection. Estimates of cost of service delivery and percent with access to these services must be based on local information.

Budget - Map Inputs



Enter the headings for the budget items in the "Budget line item" column in the purple cells. You may add up to 60 additional line items. For each budget line item, select a category from the "Category" list at the far right. Enter the number of the category in the "Number" column. The white cells in the "Category" (Map to this *Goals* Category) column will then automatically show the corresponding name of the number you chose from the "Category" list.

Budget - Inputs



Microsoft Excel - goals_version_2.xls

Budget Inputs

Enter actual expenditures or budget values for each year. You can enter up to three alternative budgets.

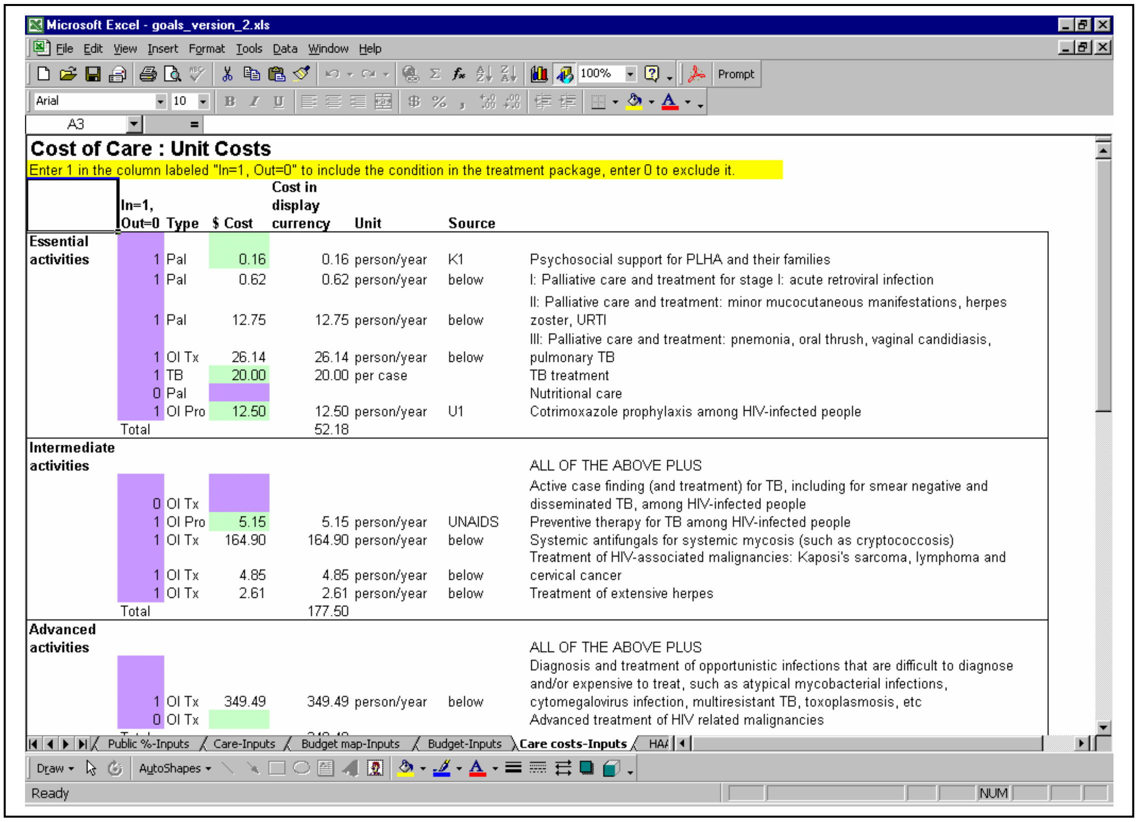
	Budget A 2000	2001	2002	2003	2004	2005	Total	Budget B 2000	2001	2002
TOTAL	15.9	24.7	34.1	48.2	61.6	75.1	259.6	15.9	20.2	24.5
Treatment and support							-			
2 Improved availability of OI drugs	3.0	4.0	5.0	6.0	7.0	8.0	33.0	3.0	3.2	3.4
3 Home-base care program	0.8	1.0	1.5	2.0	2.5	3.0	10.8	0.8	0.9	1.1
4 Hospitalization services	3.0	4.0	5.0	6.0	7.0	8.0	33.0	3.0	3.2	3.4
5 Expanded DOTS program	0.1	0.2	0.4	0.6	0.8	1.0	3.1	0.1	0.2	0.3
6 Upgrade facilities for DOTS	0.1	0.2	0.4	0.6	0.8	1.0	3.1	0.1	0.2	0.3
7 ARV drugs	0.5	2.5	5.0	10.0	15.0	20.0	53.0	0.5	2.4	4.3
8 Drugs for OI prophylaxis	0.3	0.4	0.5	0.6	0.8	1.0	3.6	0.3	0.3	0.4
9							-	-		
10							-	-		
11							-	-		
12							-	-		
13							-	-		
14							-	-		
15 Prevention							-	-		
16 Outreach for high risk populations	0.1	0.2	0.2	0.3	0.3	0.4	1.4	0.1	0.1	0.1
17 Support for workplace initiatives	0.8	1.2	1.5	2.0	2.5	3.0	11.0	0.8	0.9	1.1
18 Male condom purchases	1.5	2.0	1.5	3.0	3.5	4.0	15.5	1.5	1.6	1.7
19 Female condom purchases	0.2	0.4	0.6	0.8	1.0	1.2	4.2	0.2	0.3	0.4
20 STD drug purchases	0.3	0.3	0.4	0.4	0.5	0.5	2.3	0.3	0.3	0.3
21 Expanded IEC / campaign activities	0.5	0.5	0.6	0.6	0.7	0.7	3.5	0.5	0.4	0.4
22 National roll-out of VCT	0.2	0.8	1.4	1.9	2.5	3.0	9.8	0.2	0.5	0.7
23 NGO Support	0.1	0.2	0.4	0.6	0.8	1.0	3.1	0.1	0.2	0.3
24 MTCT Pilot & Research Programme	0.2	0.5	0.8	1.1	1.4	1.6	5.6	0.2	0.4	0.5
25 Blood safety	0.1	0.1	0.1	0.1	0.1	0.2	0.6	0.1	0.1	0.1
26 Condom social marketing program	0.8	0.9	1.0	1.2	1.6	2.0	7.5	0.8	0.8	0.9
27 STD strengthening	0.2	0.5	1.0	1.5	2.0	2.5	7.7	0.2	0.4	0.6

Enter the actual expenditures or budget values for each year of the strategic plan. You can enter up to three alternative budgets. The categories of "Budget Inputs" are automatically brought over from the "Budget-map-Inputs" worksheet.

3. Entering the Standard Values

In the following three worksheets, the standard values based on international studies can be used, or country-specific data can be entered, if available.

Care costs-Inputs



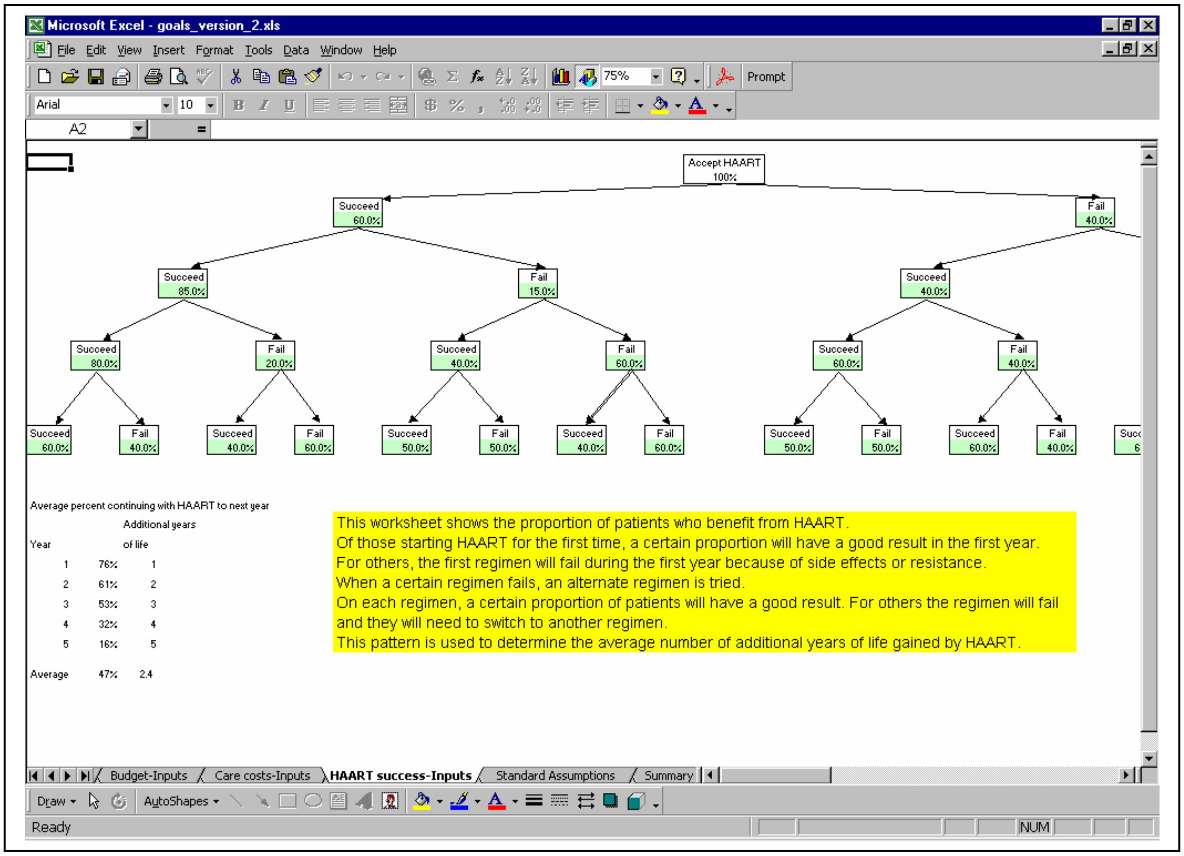
Cost of Care : Unit Costs

Enter 1 in the column labeled "In=1, Out=0" to include the condition in the treatment package, enter 0 to exclude it.

	In=1, Out=0	Type	$ Cost	Cost in display currency	Unit	Source	
Essential activities	1	Pal	0.16	0.16	person/year	K1	Psychosocial support for PLHA and their families
	1	Pal	0.62	0.62	person/year	below	I: Palliative care and treatment for stage I: acute retroviral infection
	1	Pal	12.75	12.75	person/year	below	II: Palliative care and treatment: minor mucocutaneous manifestations, herpes zoster, URTI
	1	OI Tx	26.14	26.14	person/year	below	III: Palliative care and treatment: pnemonia, oral thrush, vaginal candidiasis, pulmonary TB
	1	TB	20.00	20.00	per case		TB treatment
	0	Pal					Nutritional care
	1	OI Pro	12.50	12.50	person/year	U1	Cotrimoxazole prophylaxis among HIV-infected people
	Total			52.18			
Intermediate activities							ALL OF THE ABOVE PLUS
	0	OI Tx					Active case finding (and treatment) for TB, including for smear negative and disseminated TB, among HIV-infected people
	1	OI Pro	5.15	5.15	person/year	UNAIDS	Preventive therapy for TB among HIV-infected people
	1	OI Tx	164.90	164.90	person/year	below	Systemic antifungals for systemic mycosis (such as cryptococcosis)
	1	OI Tx	4.85	4.85	person/year	below	Treatment of HIV-associated malignancies: Kaposi's sarcoma, lymphoma and cervical cancer
	1	OI Tx	2.61	2.61	person/year	below	Treatment of extensive herpes
	Total			177.50			
Advanced activities							ALL OF THE ABOVE PLUS
	1	OI Tx	349.49	349.49	person/year	below	Diagnosis and treatment of opportunistic infections that are difficult to diagnose and/or expensive to treat, such as atypical mycobacterial infections, cytomegalovirus infection, multiresistant TB, toxoplasmosis, etc
	0	OI Tx					Advanced treatment of HIV related malignancies

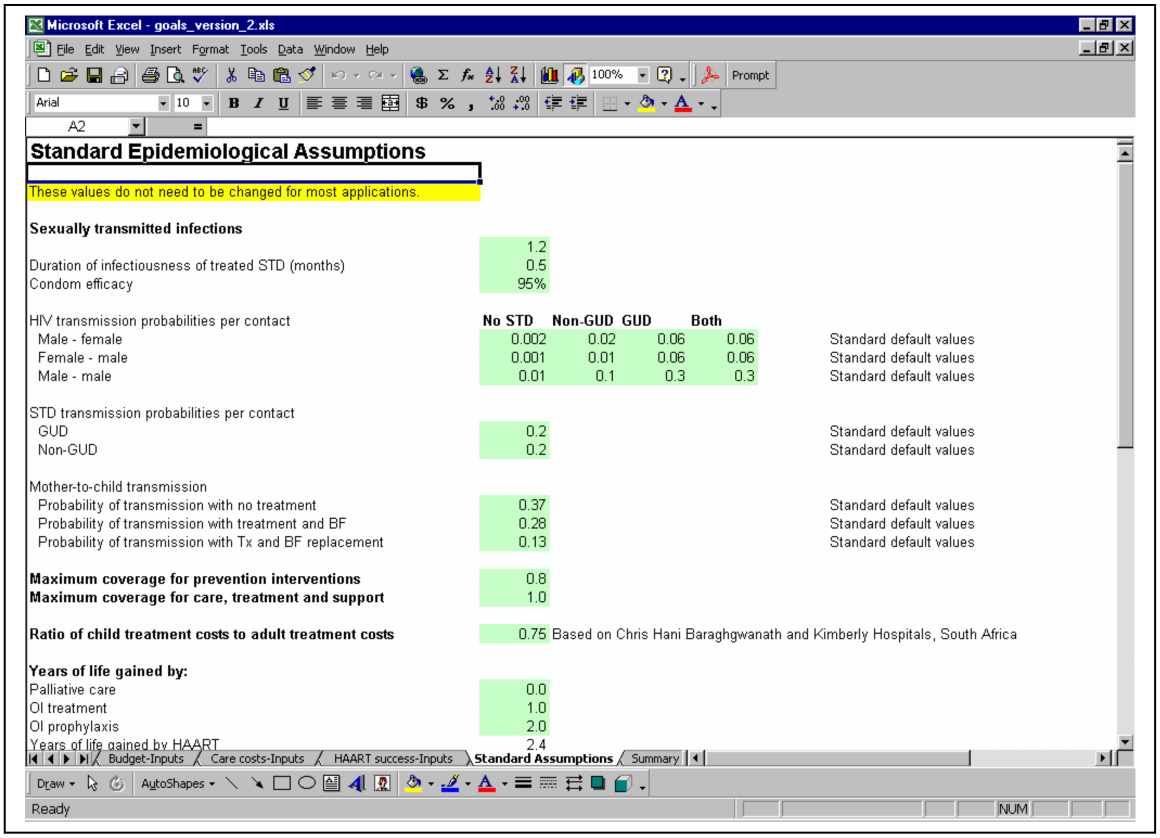
Enter 1 in the column labeled "In=1, Out=0" to include the condition in the treatment package, or enter 0 to exclude it. Opportunistic infections (OI) are explained in the " Definitions" worksheet.

HAART success-Inputs



The assumptions in light green are based on the literature, and do not need to be changed for most applications. The logic underlying the diagram is explained both in the Inputs section above and on the worksheet itself.

Standard Assumptions



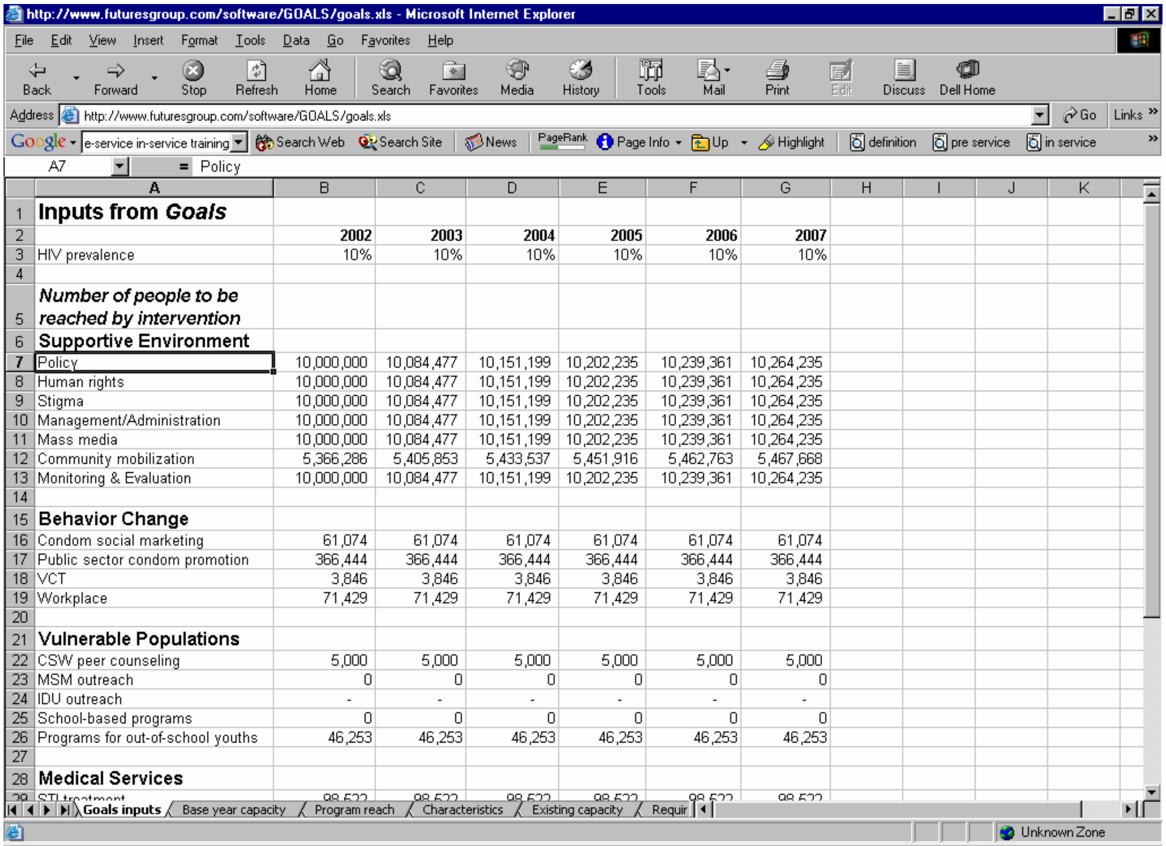
Standard Epidemiological Assumptions

These values do not need to be changed for most applications.

Sexually transmitted infections					
	1.2				
Duration of infectiousness of treated STD (months)	0.5				
Condom efficacy	95%				
HIV transmission probabilities per contact	**No STD**	**Non-GUD**	**GUD**	**Both**	
Male - female	0.002	0.02	0.06	0.06	Standard default values
Female - male	0.001	0.01	0.06	0.06	Standard default values
Male - male	0.01	0.1	0.3	0.3	Standard default values
STD transmission probabilities per contact					
GUD	0.2				Standard default values
Non-GUD	0.2				Standard default values
Mother-to-child transmission					
Probability of transmission with no treatment	0.37				Standard default values
Probability of transmission with treatment and BF	0.28				Standard default values
Probability of transmission with Tx and BF replacement	0.13				Standard default values
Maximum coverage for prevention interventions	0.8				
Maximum coverage for care, treatment and support	1.0				
Ratio of child treatment costs to adult treatment costs	0.75	Based on Chris Hani Baraghgwanath and Kimberly Hospitals, South Africa			
Years of life gained by:					
Palliative care	0.0				
OI treatment	1.0				
OI prophylaxis	2.0				
Years of life gained by HAART	2.4				

The standard epidemiological assumptions are already entered in the worksheet and do not need to be changed for most applications.

Inputs from *Goals*



	2002	2003	2004	2005	2006	2007
Inputs from *Goals*						
HIV prevalence	10%	10%	10%	10%	10%	10%
Number of people to be reached by intervention						
Supportive Environment						
Policy	10,000,000	10,084,477	10,151,199	10,202,235	10,239,361	10,264,235
Human rights	10,000,000	10,084,477	10,151,199	10,202,235	10,239,361	10,264,235
Stigma	10,000,000	10,084,477	10,151,199	10,202,235	10,239,361	10,264,235
Management/Administration	10,000,000	10,084,477	10,151,199	10,202,235	10,239,361	10,264,235
Mass media	10,000,000	10,084,477	10,151,199	10,202,235	10,239,361	10,264,235
Community mobilization	5,366,286	5,405,853	5,433,537	5,451,916	5,462,763	5,467,668
Monitoring & Evaluation	10,000,000	10,084,477	10,151,199	10,202,235	10,239,361	10,264,235
Behavior Change						
Condom social marketing	61,074	61,074	61,074	61,074	61,074	61,074
Public sector condom promotion	366,444	366,444	366,444	366,444	366,444	366,444
VCT	3,846	3,846	3,846	3,846	3,846	3,846
Workplace	71,429	71,429	71,429	71,429	71,429	71,429
Vulnerable Populations						
CSW peer counseling	5,000	5,000	5,000	5,000	5,000	5,000
MSM outreach	0	0	0	0	0	0
IDU outreach	-	-	-	-	-	-
School-based programs	0	0	0	0	0	0
Programs for out-of-school youths	46,253	46,253	46,253	46,253	46,253	46,253
Medical Services						
STI treatment	98,522	98,522	98,522	98,522	98,522	98,522

These inputs are provided automatically by ***Goals***, when the full model is run. When the Capacity sub-model is run individually, HIV prevalence and the size of the target population groups must be provided.

Base year capacity

Microsoft Excel - Goals-H-3-11-03.xls

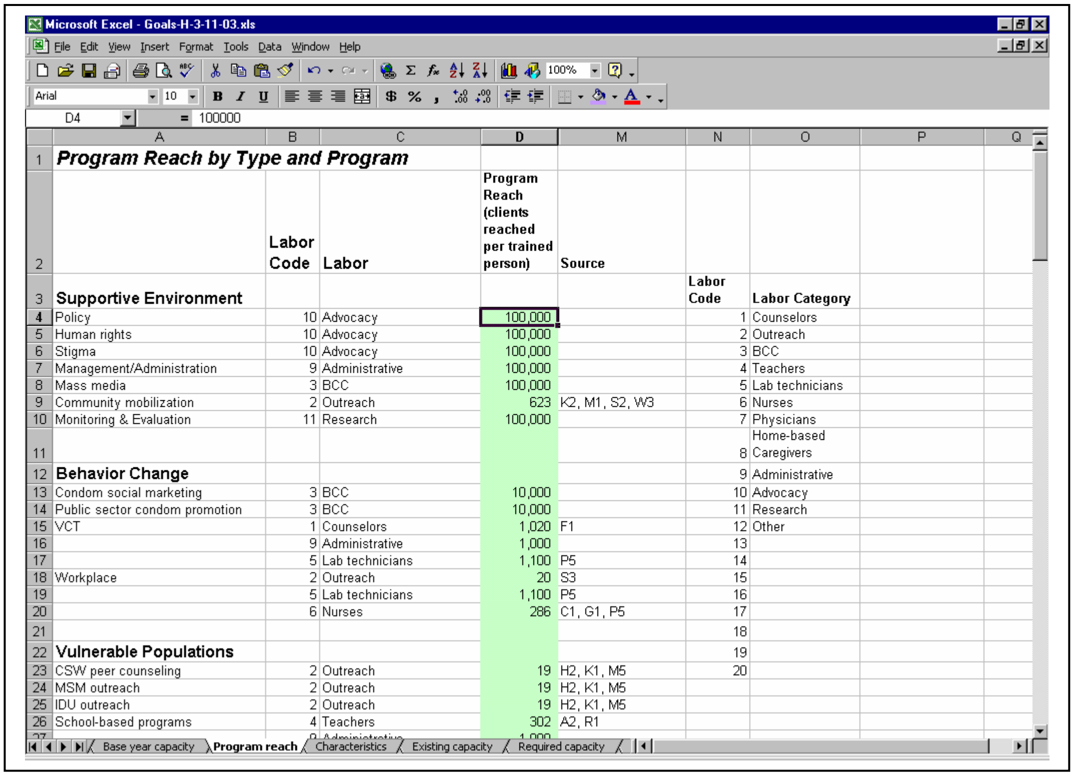
C37 = =IF(B37="","",VLOOKUP(B37,$K$4:$L$23,2))

	A	B	C	D	E	F	G	K	L
1	**Base Year Capacity by Type and Program**				*Base year =*		1998		
2		Labor Code	Labor Category	Number of existing trained staff	Percentage of time spent on program	Sick time	FTE		
3	**Supportive Environment**							Labor Code	Labor Category
4	Policy	10	Advocacy	250	50%	5%	119	1	Counselors
5	Human rights	10	Advocacy	250	50%	5%	119	2	Outreach
6	Stigma	10	Advocacy	250	50%	5%	119	3	BCC
7	Management/Administration	9	Administrative	50	50%	5%	24	4	Teachers
8	Mass media	3	BCC	150	50%	5%	71	5	Lab technicians
9	Community mobilization	2	Outreach	20000	100%	5%	19000	6	Nurses
10	Monitoring & Evaluation	11	Research	350	50%	5%	166	7	Physicians
11								8	Home-based Caregivers
12	**Behavior Change**							9	Administrative
13	Condom social marketing	3	BCC	150	50%	5%	71	10	Advocacy
14	Public sector condom promotion	3	BCC	150	50%	5%	71	11	Research
15	VCT	1	Counselors	150	50%	5%	71	12	Other
16		9	Administrative	100	50%	5%	48	13	
17		5	Lab technicians	150	50%	5%	71	14	
18	Workplace	2	Outreach	4000	50%	5%	1900	15	
19		5	Lab technicians	150	50%	5%	71	16	
20		6	Nurses	300	50%	5%	143	17	
21								18	
22	**Vulnerable Populations**							19	
23	CSW peer counseling	2	Outreach	2000	50%	5%	950	20	
24	MSM outreach	2	Outreach	2000	50%	5%	950		
25	IDU outreach	2	Outreach	2000	50%	5%	950		
26	School-based programs	4	Teachers	2500	50%	5%	1188		
27		9	Administrative	100	50%	5%	48		
28	Programs for out-of-school youths	2	Outreach	500	50%	5%	238		
29									
30	**Medical Services**								

Base year capacity / Program reach / Characteristics / Existing capacity / Required capacity

The areas in purple must be filled in, including labor codes, number of existing trained staff, percentage of time spent on program, and sick time for each labor category for each intervention.

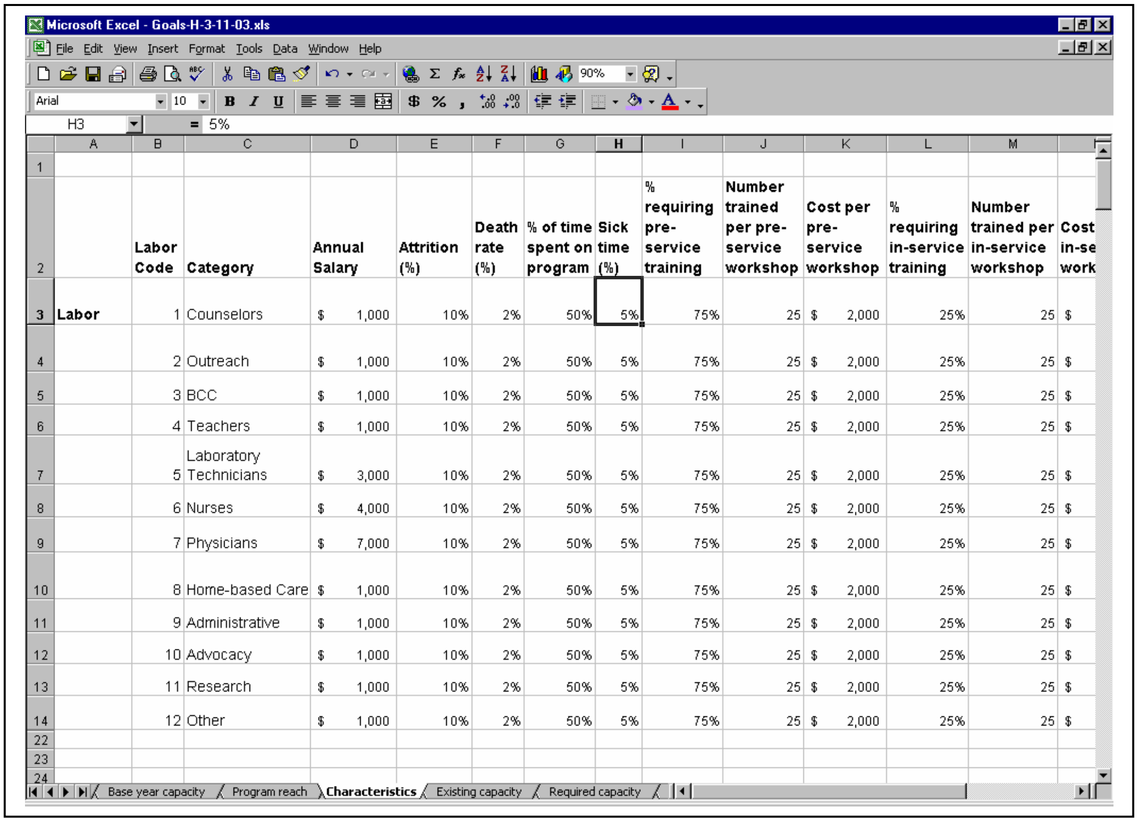
Program reach



	A	B	C	D	M	N	O
1	*Program Reach by Type and Program*						
2		Labor Code	Labor	Program Reach (clients reached per trained person)	Source		
3	Supportive Environment					Labor Code	Labor Category
4	Policy	10	Advocacy	100,000		1	Counselors
5	Human rights	10	Advocacy	100,000		2	Outreach
6	Stigma	10	Advocacy	100,000		3	BCC
7	Management/Administration	9	Administrative	100,000		4	Teachers
8	Mass media	3	BCC	100,000		5	Lab technicians
9	Community mobilization	2	Outreach	623	K2, M1, S2, W3	6	Nurses
10	Monitoring & Evaluation	11	Research	100,000		7	Physicians
11						8	Home-based Caregivers
12	Behavior Change					9	Administrative
13	Condom social marketing	3	BCC	10,000		10	Advocacy
14	Public sector condom promotion	3	BCC	10,000		11	Research
15	VCT	1	Counselors	1,020	F1	12	Other
16		9	Administrative	1,000		13	
17		5	Lab technicians	1,100	P5	14	
18	Workplace	2	Outreach	20	S3	15	
19		5	Lab technicians	1,100	P5	16	
20		6	Nurses	286	C1, G1, P5	17	
21						18	
22	Vulnerable Populations					19	
23	CSW peer counseling	2	Outreach	19	H2, K1, M5	20	
24	MSM outreach	2	Outreach	19	H2, K1, M5		
25	IDU outreach	2	Outreach	19	H2, K1, M5		
26	School-based programs	4	Teachers	302	A2, R1		
27		9	Administrative	1,000			

Default values for program reach are available, with citations to the sources in Appendix C. These values may be overwritten, if so desired.

Characteristics



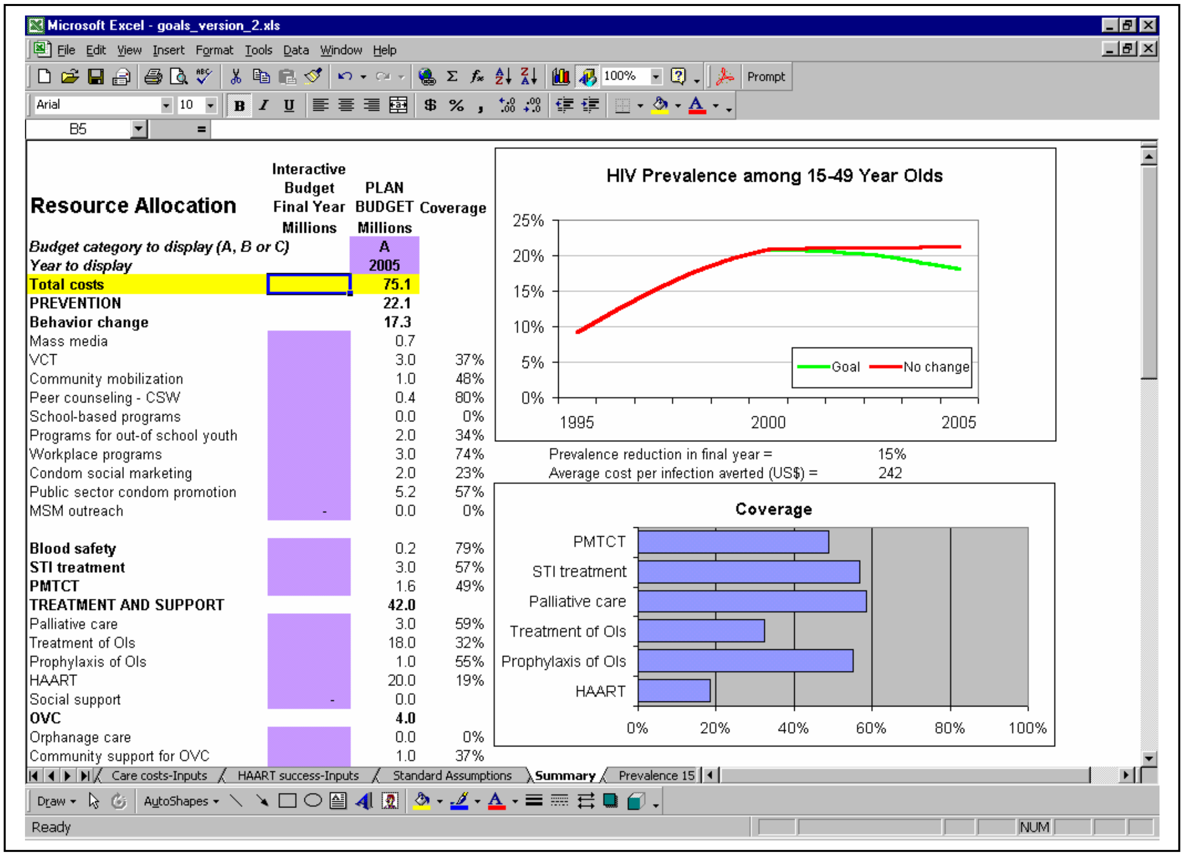
	Labor Code	Category	Annual Salary	Attrition (%)	Death rate (%)	% of time spent on program	Sick time (%)	% requiring pre-service training	Number trained per pre-service workshop	Cost per pre-service workshop	% requiring in-service training	Number trained per in-service workshop	Cost in-se work
Labor	1	Counselors	$ 1,000	10%	2%	50%	5%	75%	25	$ 2,000	25%	25	$
	2	Outreach	$ 1,000	10%	2%	50%	5%	75%	25	$ 2,000	25%	25	$
	3	BCC	$ 1,000	10%	2%	50%	5%	75%	25	$ 2,000	25%	25	$
	4	Teachers	$ 1,000	10%	2%	50%	5%	75%	25	$ 2,000	25%	25	$
	5	Laboratory Technicians	$ 3,000	10%	2%	50%	5%	75%	25	$ 2,000	25%	25	$
	6	Nurses	$ 4,000	10%	2%	50%	5%	75%	25	$ 2,000	25%	25	$
	7	Physicians	$ 7,000	10%	2%	50%	5%	75%	25	$ 2,000	25%	25	$
	8	Home-based Care	$ 1,000	10%	2%	50%	5%	75%	25	$ 2,000	25%	25	$
	9	Administrative	$ 1,000	10%	2%	50%	5%	75%	25	$ 2,000	25%	25	$
	10	Advocacy	$ 1,000	10%	2%	50%	5%	75%	25	$ 2,000	25%	25	$
	11	Research	$ 1,000	10%	2%	50%	5%	75%	25	$ 2,000	25%	25	$
	12	Other	$ 1,000	10%	2%	50%	5%	75%	25	$ 2,000	25%	25	$

Salaries, attrition rates, death rates from all causes, percentage of time spent on intervention, and sick time must be filled in for each labor category. In addition, for each type of training, the percentage requiring that type of training, the number trained per workshop, and the cost per workshop must all be supplied.

E. Making the Projection

In ***Goals***, you can enter data for a new projection or edit the assumptions once they have been entered. In this Excel version of ***Goals***, sample data is provided if you would like to reproduce the results shown in the tutorial. To make a resource allocation projection:

1. Examine the results. Once the data and assumptions have been entered into the input spreadsheets, you can view the results in the Summary worksheet as shown below.



In the Summary worksheet, you will see two graphs. They are:

- **HIV Prevalence among 15-49 Year olds.**
- **Coverage.**

Below the HIV prevalence graph you will see a row titled "Average cost per infection averted". This is a value calculated by the model (also shown in the Indicators table).

2. **Select the budget and year to display.** You will see two rows:

- **Budget category to display**. Use this row to select the budget you want to use by entering A, B or C in the purple cell at the top of the budget column labeled "Plan Budget".
- **Year to display.** You may use this row to change the year shown in the "Plan Budget" column.

3. Override the budget values. You will see two budget columns. They are:

- **Plan Budget.** This column shows the strategic plan budget expenditures for any year that you enter in Year to display. Note that the actual budget expenditures cannot be changed in the Summary sheet. If you would like to change the actual budget values, you will need to return to the "Budget-inputs" worksheet; if you would like to change the budget line items, you will need to return to the "Budget map-Inputs" worksheet and change the items there.

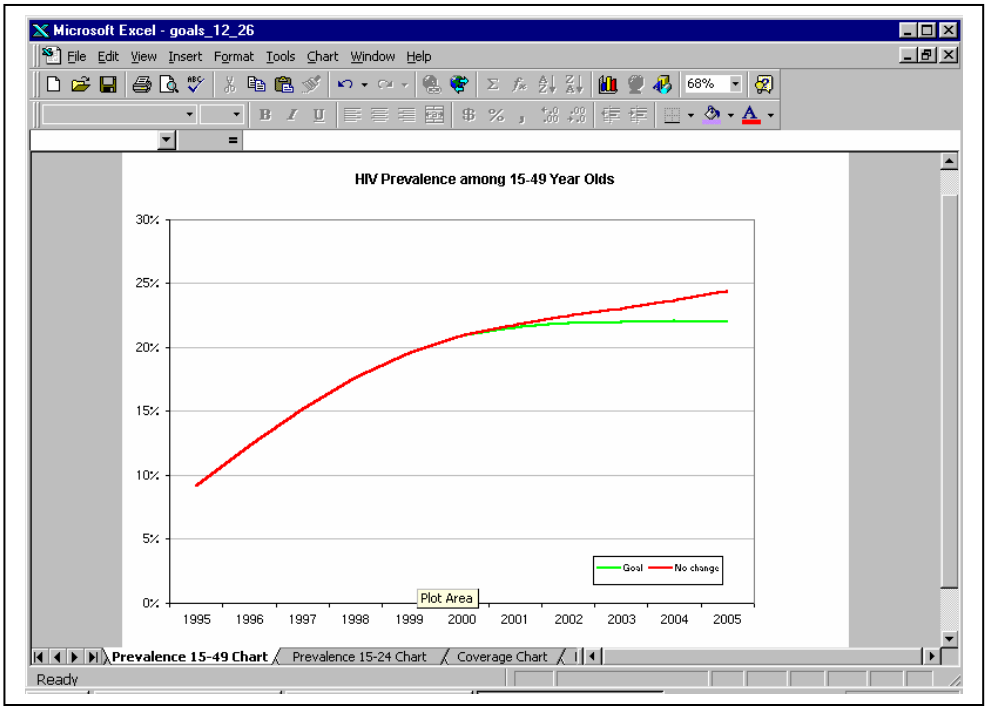
- **Interactive Budget - Final Year.** This column allows you to override the "Plan Budget" values and enter your own value for a particular category by typing the new value in the appropriate purple cell. The value should refer to funding in the last year of the plan. (Values for years between the first and last will be interpolated by the model.) You can use this column to explore the effects of different funding levels for specific categories without returning to the "Budget-Inputs" worksheet. For example, you could increase the funding for a particular category to see what effect it will have on prevalence and coverage. You could also change the funding level to find out what level would be required to achieve full coverage. Note that changing values in the interactive column will affect HIV prevalence, coverage, and the total costs (yellow cell) of the budget.

4. Remove custom budget figure. If you would like to remove one of the custom values you typed in the Interactive Budget column, just delete it.

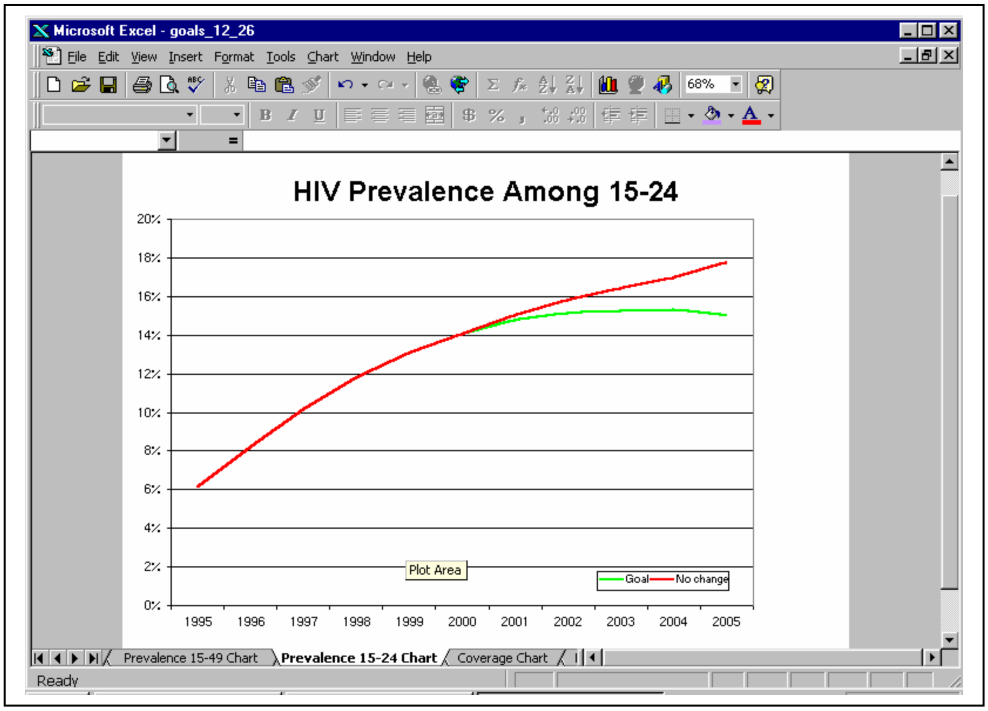
5. Examine coverage. The "Coverage" column shows the proportion of the population in need that receives the information or uses the service. The coverage percentage will increase or decrease with changes in budget expenditures.

6. Examine Additional Output Charts. Examine the results of the projection in the six output charts and the Indicators Table in the following worksheets. For the sample data, these charts show projection results using the A budget and 2005 as the final year to display.

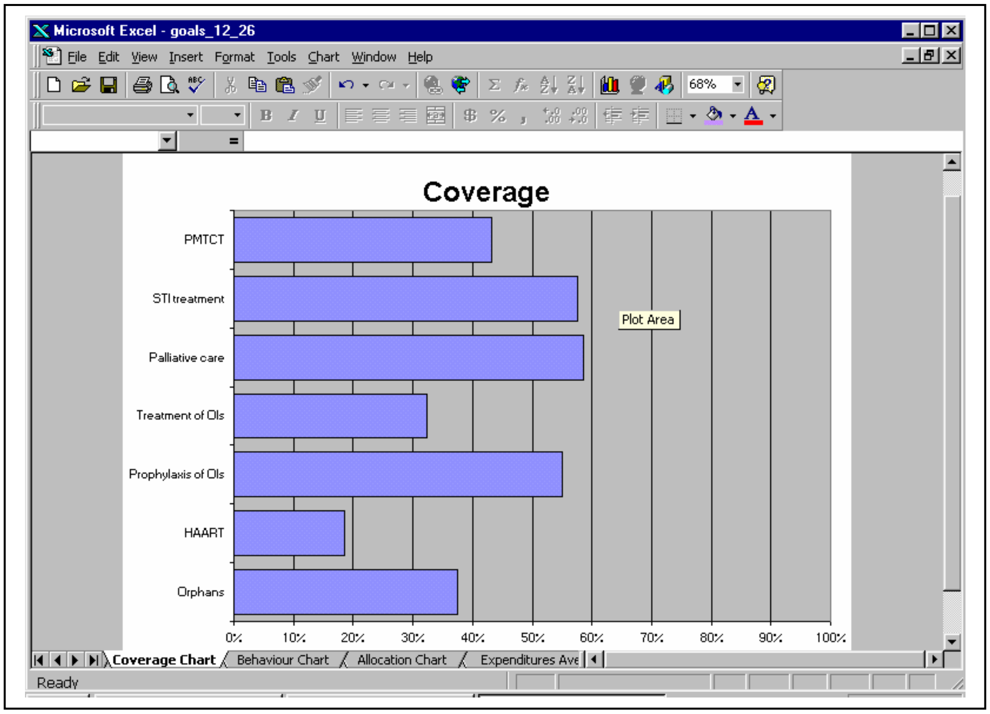
Prevalence 15-49



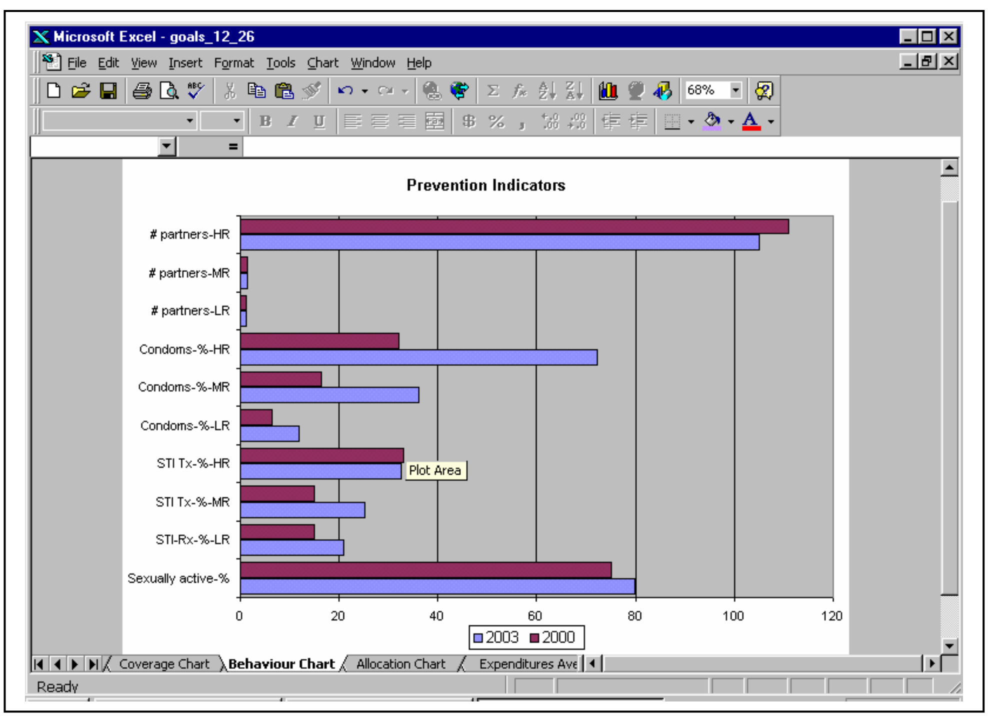
Prevalence 15-24



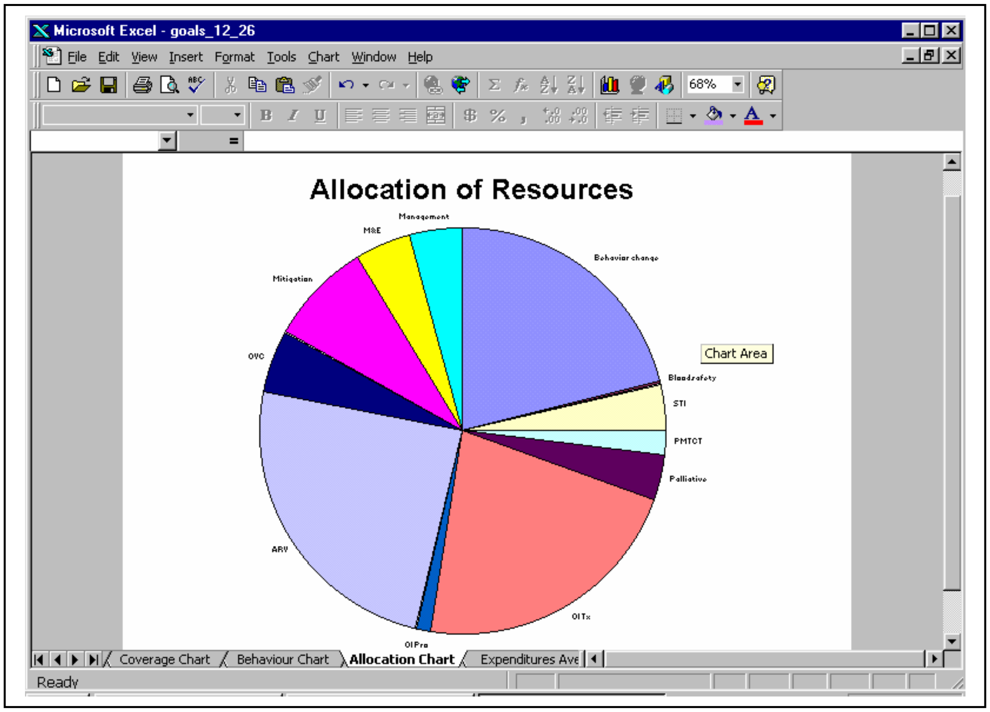
Coverage



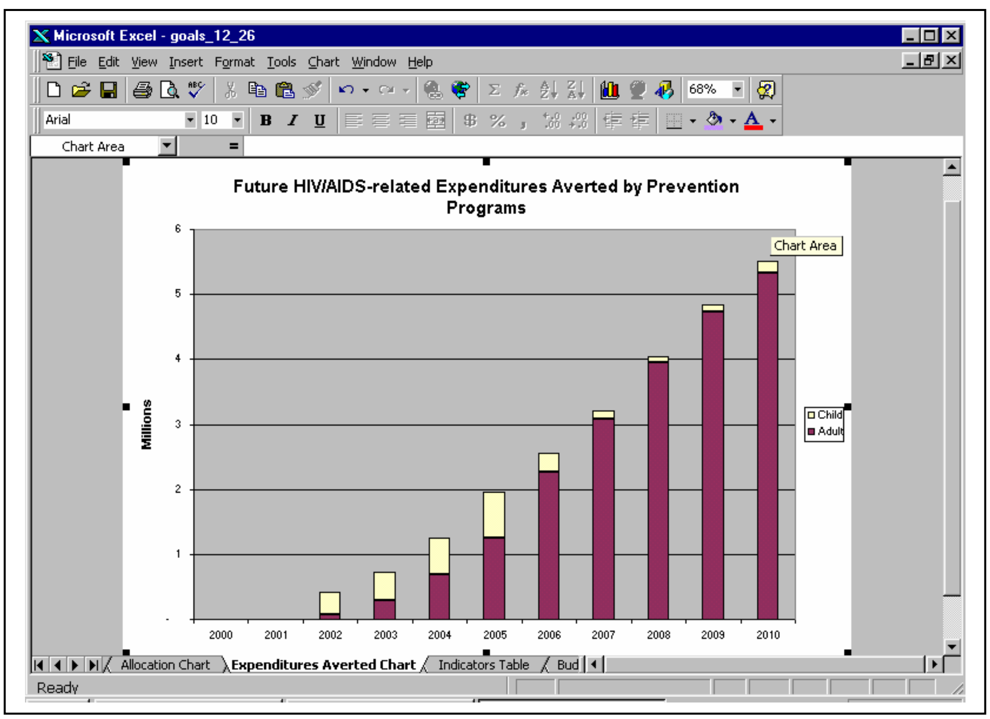
Behavior



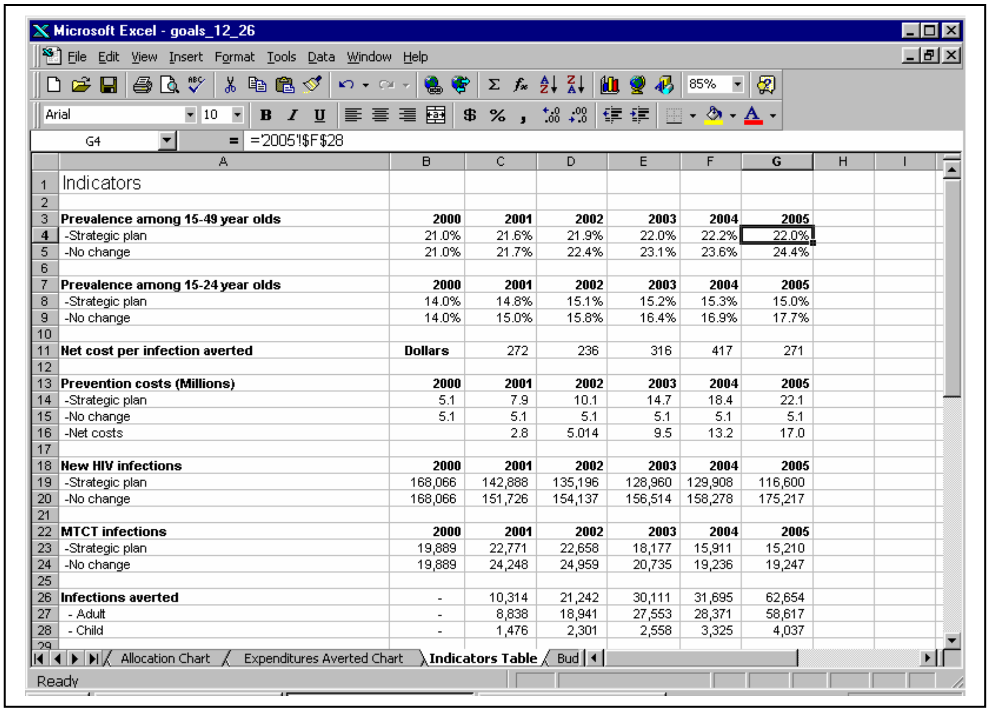
Allocation



Expenditures Averted

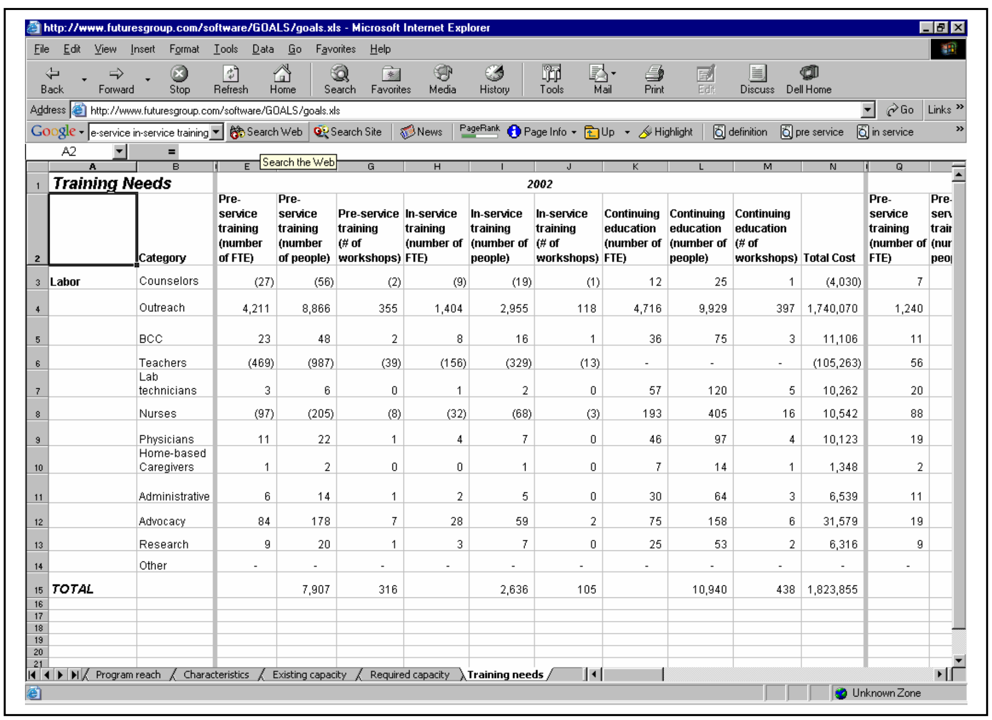


Indicators Table



	Indicators						
3	**Prevalence among 15-49 year olds**	**2000**	**2001**	**2002**	**2003**	**2004**	**2005**
4	-Strategic plan	21.0%	21.6%	21.9%	22.0%	22.2%	22.0%
5	-No change	21.0%	21.7%	22.4%	23.1%	23.6%	24.4%
7	**Prevalence among 15-24 year olds**	**2000**	**2001**	**2002**	**2003**	**2004**	**2005**
8	-Strategic plan	14.0%	14.8%	15.1%	15.2%	15.3%	15.0%
9	-No change	14.0%	15.0%	15.8%	16.4%	16.9%	17.7%
11	**Net cost per infection averted**	**Dollars**	272	236	316	417	271
13	**Prevention costs (Millions)**	**2000**	**2001**	**2002**	**2003**	**2004**	**2005**
14	-Strategic plan	5.1	7.9	10.1	14.7	18.4	22.1
15	-No change	5.1	5.1	5.1	5.1	5.1	5.1
16	-Net costs		2.8	5.014	9.5	13.2	17.0
18	**New HIV infections**	**2000**	**2001**	**2002**	**2003**	**2004**	**2005**
19	-Strategic plan	168,066	142,888	135,196	128,960	129,908	116,600
20	-No change	168,066	151,726	154,137	156,514	158,278	175,217
22	**MTCT infections**	**2000**	**2001**	**2002**	**2003**	**2004**	**2005**
23	-Strategic plan	19,889	22,771	22,658	18,177	15,911	15,210
24	-No change	19,889	24,248	24,959	20,735	19,236	19,247
26	**Infections averted**	-	10,314	21,242	30,111	31,695	62,654
27	- Adult	-	8,838	18,941	27,553	28,371	58,617
28	- Child	-	1,476	2,301	2,558	3,325	4,037

Training Needs



Training Needs		2002										
	Category	Pre-service training (number of FTE)	Pre-service training (number of people)	Pre-service training (# of workshops)	In-service training (number of FTE)	In-service training (number of people)	In-service training (# of workshops)	Continuing education (number of FTE)	Continuing education (number of people)	Continuing education (# of workshops)	Total Cost	Pre-service training (number of FTE)
Labor	Counselors	(27)	(56)	(2)	(9)	(19)	(1)	12	25	1	(4,030)	7
	Outreach	4,211	8,866	355	1,404	2,955	118	4,716	9,929	397	1,740,070	1,240
	BCC	23	48	2	8	16	1	36	75	3	11,106	11
	Teachers	(469)	(987)	(39)	(156)	(329)	(13)	-	-	-	(105,263)	56
	Lab technicians	3	6	0	1	2	0	57	120	5	10,262	20
	Nurses	(97)	(205)	(8)	(32)	(68)	(3)	193	405	16	10,542	88
	Physicians	11	22	1	4	7	0	46	97	4	10,123	19
	Home-based Caregivers	1	2	0	0	1	0	7	14	1	1,348	2
	Administrative	6	14	1	2	5	0	30	64	3	6,539	11
	Advocacy	84	178	7	28	59	2	75	158	6	31,579	19
	Research	9	20	1	3	7	0	25	53	2	6,316	9
	Other	-	-	-	-	-	-	-	-	-	-	-
TOTAL			7,907	316		2,636	105		10,940	438	1,823,855	

7. Search for the best allocation to achieve the goals of the strategic plan. After the budget values are entered, and the results of the allocation are examined, you may want to change the budget allocation. The model immediately calculates the difference in the HIV prevalence and the coverage rates shown in the two graphs, as well as the changes in the six output charts and the Indicators table shown above. You may want to make these changes in budget allocations individually; that is, make one change, then examine the difference this one change makes on the various results.

You can try different budget allocations in order to answer several key planning questions, such as:

- How much funding is required to achieve the goals of the strategic plan?
- If funding is limited, what can be achieved in terms of prevalence and coverage with the available funding?
- Is it possible to achieve more by allocating the same amount of funds differently?
- How much is required to achieve maximum coverage of all interventions and services?

Using the sample data in the Summary worksheet, you can explore the consequences of alternative resource allocation strategies by:

- **Changing the budget.** You can change the budget you want to use by selecting A, B, or C, in the purple cell at the top of the budget column labeled "Plan Budget".

  In the sample data, if you change the budget from A to B, the total cost (in yellow cells) will decrease from US$75.1 to US$38.7 million, the average cost per infection averted will increase from US$307 to US$209, and the HIV prevalence among 15 to 49 year olds will increase from 18.1 percent to 20.0 percent in the final year of the projection.

- **Changing the year to display**. You can also show expenditures for any year in the plan budget by changing the "Year to display".

  Using the sample data, if you change the year to display from 2005 to 2002, the display will change to show coverage in 2002 rather than 2005.

- **Overriding the budget values.** You can enter your own budget values for a particular category by typing in the new value in the column labeled "Interactive Budget - Final year". Changing values in the interactive column will affect HIV prevalence, coverage, and the total costs.

In the sample data (using the A budget), if you change the budget value for VCT from US$3.0 to US$5.0 million, HIV prevalence will decrease from 22.0 percent to 21.7 percent, VCT coverage will increase from 40 percent to 65 percent, and the total costs will increase by 2.7 percent from US$75.1 million to US$77.1 million in the final year of the projection.

- **Examining the coverage column.** The values in the coverage column will change as the budget expenditures change. If you would like to know what the coverage for a specific service would cost, you may change the budget value in the Interactive Budget column until the coverage reaches the appropriate percentage.

  For example, if you would like the percent coverage for treatment of OIs to equal 45 percent instead of 32 percent, you would need to spend US$25 million instead of US$18 million in the final year of the plan.

F. Saving the Projection

Be sure to save your new ***Goals*** spreadsheet. In order to preserve the original, general version of the ***Goals*** spreadsheet, it is a good idea to save your new spreadsheet with a different name. To do this, choose "File" from the Excel menu, then choose "Save As" from the pull-down menu.

VI. Methodology

A schematic outline of the operation of the ***Goals*** model is shown on the next page.

Goals uses the estimated budget allocations for each activity to calculate the coverage that can be achieved. The proportion of the population that can be covered is a function of the amount of funding, the amount of need for the service and the cost per person covered (unit costs). For most of the prevention interventions this calculation is relatively simple. For example, the proportion of commercial sex workers covered by a peer outreach program is calculated as the funding allocated to this activity divided by the cost per sex worker reached divided by the number of sex workers

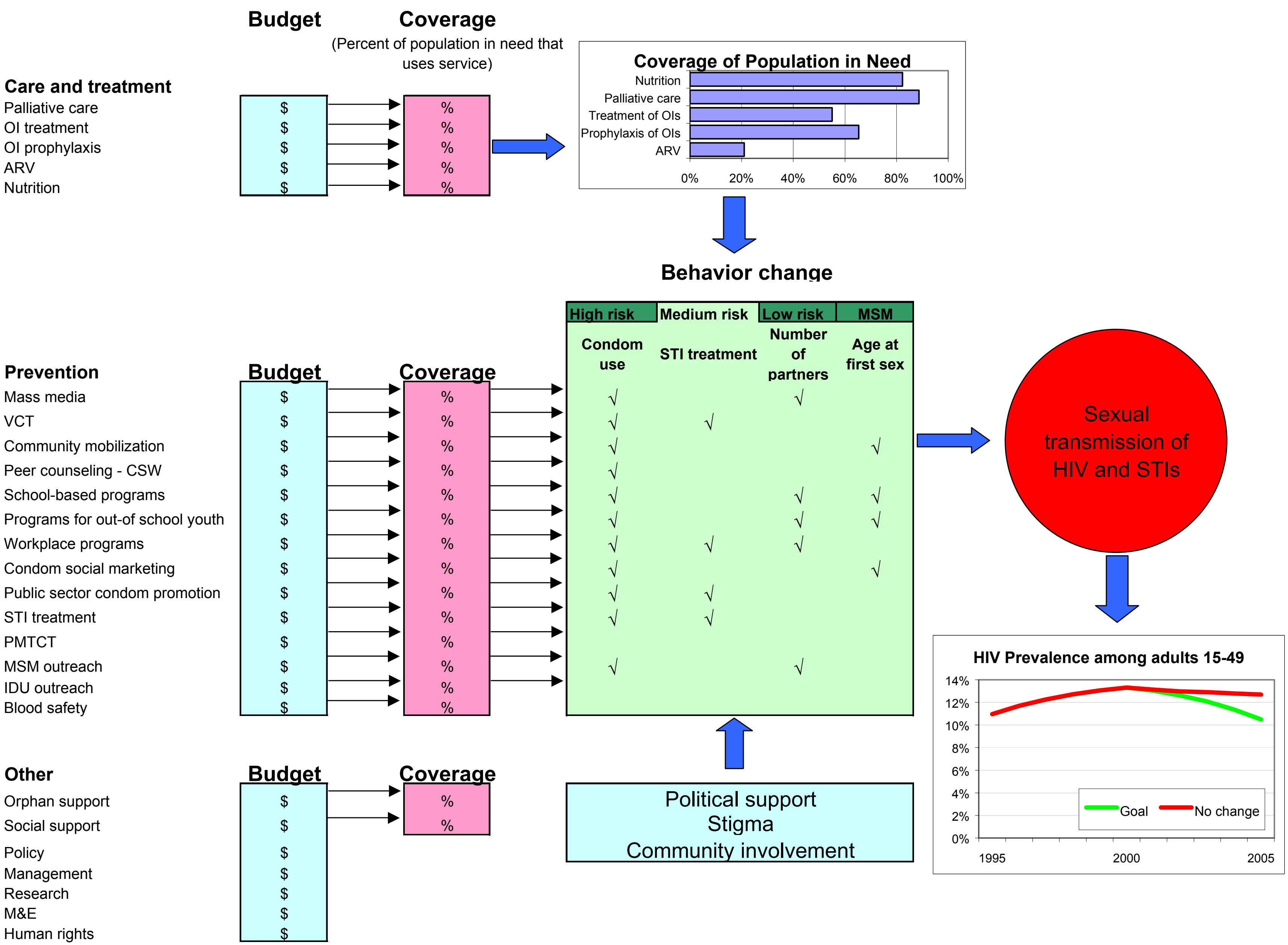
The amount of funding allocated to an activity can be specified in one of two ways. Funding can be allocated directly to the activity categories used by ***Goals*** or it can be determined by mapping budget lines to the categories used in ***Goals***. In the later approach, each of the line items in the plan budget is mapped to one of the prevention, care or mitigation categories in ***Goals.*** As funding is allocated to budget line items, the appropriate items are summed to find the total funding for each ***Goals*** category.

The unit costs of providing these services could change as coverage changes. In the general case, we might expect that costs per person would be high when very few people are covered since the density of clients would be low. Unit costs would be expected to drop as coverage increases since the same infrastructure can be used to serve more clients. In some cases, unit costs might rise again as coverage nears 100 percent due to the difficulty of reaching the last few percent of the population. Unfortunately very little information is available showing how unit costs vary with coverage. Therefore, in this model, we have assumed that unit costs are constant across all coverage levels. However, in order to account for the difficulty of extending coverage to everyone, the model has a maximum coverage level for prevention and a maximum for care. The default values are 80 percent for prevention and 100 percent for care. Thus funds allocated to prevention activities beyond what is needed to achieve 80 percent coverage will have no effect.

For prevention services only, coverage changes certain behaviors (condom use, STI treatment, number of partners and age at first sex). These behavioral changes are translated into infections averted through a simple HIV and STD transmission model. The impact of prevention activities on behavior is specified by an impact matrix that describes the percentage change in behavior among those people receiving the service or information. The values in this matrix have been derived from the published literature on the impact of prevention interventions. The effectiveness of prevention programs can be affected by the coverage of care services (prevention is assumed to be more effective when care is readily available) and the policy environment (prevention is assumed to be more effective in the presence of a supportive policy environment).

Each of these components is discussed in detail below.

The *Goals* Model for HIV/AIDS Resource Allocation : Relating expenditures to goals for prevention and care



A. Need for services

The need for services is either the number of people that need the service (e.g., those needing VCT) or the number of treatments or commodities needed (e.g., the number of condoms required). Thus, the need for school-based education programs would be all students in the appropriate levels while the need for peer counseling for commercial sex workers would be all commercial sex workers. The need for each intervention in ***Goals*** is shown in the table below.

Table 13. Population in need of each service

Intervention	Need
Community mobilization	All adults
Condom social marketing and public sector condom distribution	Casual and commercial sex acts[1]
Mass media	All adults
MSM outreach	Men who have sex with men
Peer counseling for commercial sex workers	Commercial sex workers
Prevention of mother-to-child transmission	Births
Programs for out-of-school youth	School age children not in school
Safe blood	Units of safe blood required[2]
School-based programs	Students
STI treatment	Cases of sexually transmitted infections
Voluntary counseling and testing	All adults wanting to be tested[3]
Workplace programs	Formal sector employees[4]
Palliative care	HIV-infected population needing care[5]
Treatment of opportunistic infections	HIV-infected population with opportunistic infections[6]
Prophylaxis for opportunistic infections	Those identified as HIV-positive[7]
Anti-retroviral therapy	Symptomatic HIV-infected population [8]
Orphan services	AIDS orphans

[1] Number of males 15-49 **x** proportion of males sexually active **x** (proportion of males in high risk category **x** number of partners x contacts per partner) + (proportion of males in medium risk category x number of partners x contacts per partner)
[2] Total population x units of safe blood per capita per year
[3] Assumed to be equal to twice the number of people infected with HIV. It is also assumed that people will want to be tested every five years.
[4] Employees in the formal sector are all those employees in industry and services plus those in commercial agricultural employment.
[5] The need for palliative care is approximated by the number of HIV-positive people within the last two years of life.
[6] The number of people needing treatment for opportunistic infections is approximated by the number of HIV-positive people in the last one or two years of life, minus those who are on HAART.
[7] The number of people needing prophylaxis for opportunistic infections is approximated by the number of HIV-positive people in the last one or two years of life, minus those who are on HAART.
[8] The number of people needing HAART is approximated by the number of HIV-positive people in the last one or two years of life, plus those who continue on HAART from the previous year.

B. Coverage

Coverage is the proportion of the appropriate population that receives information or utilizes a particular service. In general, it is calculated as the funding available divided by the unit costs divided by the total need.

1. Community mobilization

Coverage = funding for community mobilization **/** cost per community worker trained **x** number of people reached per community worker **/** population 15-49

This calculation assumes that community mobilization is achieved by training community workers who reach a certain number of people within a community with HIV/AIDS information.

2. Condom promotion and distribution

Coverage for public sector programs is equal to the funding available divided by the cost per condom distributed divided by the number of sex acts requiring protection.

Coverage = funding for pubic sector condoms / cost per condom distributed / sex acts potentially requiring condom protection

A similar calculation is performed for condoms distributed through social marketing programs.

Coverage = funding for condom social marketing / cost per condom distributed / sex acts potentially requiring condom protection

3. Peer outreach for commercial sex workers

Coverage = funding for peer outreach / cost per sex worker reached / number of sex workers

4. Programs for out-of-school youth

Coverage = funding for out-of-school youth / cost per youth reached by peer educator / number of youth 6-15 x (1 – proportion of youth in school)

5. School-based programs

Coverage = funding for school-based programs / cost per teacher trained x students reached per trained teacher / (youth 6-15 x proportion of youth in school)

6. Voluntary counseling and testing

Coverage = funding for VCT / cost per VCT session / [(males 15-49 x proportion of men that are sexually active + females 15-49 x proportion of women that are sexually active) x HIV prevalence x 2 / 5]

The number of people that will ever want to be tested is less than the number of sexually active people. Those who perceive no risk of infection are unlikely to seek testing. Testing is most likely to be sought by those with multiple partners and those who suspect that their partner has other partners. The models estimates the number of people wanting to be tested in any five year period as twice the prevalence of HIV infection. Thus, the population seeking testing each year is the number of sexually active men and women multiplied by twice the prevalence and divided by 5 years.

7. Workplace prevention programs

Coverage = funding available for workplace programs / cost per employee reached / (population 15-49 x participation in the formal sector workforce)

Workplace prevention programs can reach workers in the formal sector labor force. Coverage is calculated as the funding available divided by cost per employee reached divided by the number of people in formal sector employment.

8. Treatment for sexually transmitted infections

Coverage = funding for STI treatment / cost per case treated / number of STI cases

The number of STI cases needing treatment is calculated as the sum of across all four risk groups of the prevalence of STIs multiplied by the number of people in the risk group.

STI cases = Σ_r $prevalence_r$ x ($males_r$ + $females_r$)

Where r = risk group (low, medium, high, MSM)

This calculation assumes that all STI cases potentially require treatment. The easiest to treat cases will be symptomatic bacterial STIs, since people with these infections are likely to seek treatment and effective treatment is available. Cases that are asymptomatic will not be detected except through screening programs. Viral STIs cannot be cured with antibiotics but some treatments can help to alleviate symptoms. Depending on the mix of symptomatic and asymtpomatic cases and the mix of bacterial and viral STIs the maximum coverage for STI treatment may be well below 100 percent.

9. Injecting drug users

Coverage = funding for IDU programs / cost per person reached / number of IUDs

10. Men who have sex with men

Coverage = funding for MSM programs / cost per person reached / number of MSMs

11. Safe blood

Coverage = funding available for safe blood / cost per safe unit of blood / (total population x units of blood required per capita per year)

12. Prevention of mother-to-child transmission of HIV

Coverage is calculated in the MTCT module of Spectrum. Coverage is the funding available divided by the unit costs divided by the annual number of births. The unit costs are composed of the costs of testing and providing pre-test counseling (received by everyone); the costs of post-test counseling for HIV- women; the costs of post-test counseling, drugs and breastfeeding counseling for all HIV+ women; and the costs of replacement feeding for those women not breastfeeding and receiving free formula.

13. Care and treatment

The model considers four types of care:

- Palliative care
- Treatment of opportunistic infections
- Prophylaxis for opportunistic infections
- Anti-retroviral therapy

People infected with HIV need various types of care and treatment throughout the course of their illness. Most of the need for treatment occurs in the late stages of infection. This model approximates the annual care needs for people in various stages of infection by assuming that all care is concentrated in the last one or two years of life. (The exact number of years is an input to the calculations that can be changed depending on how early people are likely to seek care or testing.) Thus, the number of people needing palliative care in any year is the number of HIV-positive people in the last one or two years of life. This number is approximated by multiplying the number of new AIDS cases in that year by one or two.

Number needing palliative $care_t$ = new AIDS $cases_t$ x (1 or 2)

This same approach is used to calculate people needing treatment for opportunistic infections, except that HAART is assumed to reduce the incidence of opportunistic infections and, thus, the need for treatment.

Number needing OI treatment$_t$ = new AIDS cases$_t$ x (1 or 2) – number on HAART$_t$ x proportion reduction in OI treatment needs when on HAART

Prophylaxis for opportunistic infections and anti-retroviral therapy can extend the life of the patient. Therefore, in the initial year of a program the number of people needing care is the same as for palliative care, one or two times the number of new AIDS cases. In subsequent years this number will increase by the number of new AIDS cases and decrease by the average number of people progressing to death, in spite of the care.

needing OI prophylaxis$_1$ = new AIDS cases$_t$ x (1 or 2)
needing OI prophylaxis$_t$ = # needing OI prophylaxis$_{t-1}$ - # needing OI prophylaxis$_{t-1}$ / additional years from OI pro + new AIDS cases$_t$ – number on HAART$_t$

needing ARV$_1$ = new AIDS cases$_t$ x 2
needing ARV$_t$ = # needing ARV$_{t-1}$ - # needing ARV$_{t-1}$/ additional years from ARV + new AIDS cases$_t$

where:

additional years from OI pro = additional years of life provided by OI prophylaxis
additional years from ARV = additional years of life provided by ARV

Care is provided at three locations:

- Home-based care
- Clinics
- Hospitals

The drug costs vary by type of care but not by location of service. The service costs vary by location and number of visits. Thus the coverage that can be achieved with a given amount of funding is determined by dividing the population needing care by the sum of the per patient drug costs for the type of care and per patient service costs.

Coverage$_c$ = Population needing treatment$_c$ / (drug costs$_c$ + service costs$_c$)

The subscript c refers to the type of care: palliative, treatment of opportunistic infections, prophylaxis for opportunistic infections, and anti-retroviral therapy.

The costs of treatment for a child are assumed to be some fraction (usually one-half to two-thirds) of the costs for an adult.

14. AIDS Orphans

Three types of orphan care are included in the model: orphanages, community support and support for school fees. In each case the coverage is calculated as the number of orphans divided by the cost of support per child.

Coverage = number of orphans / cost of support per orphan

C. Additional funding requirements

The funding allocated to each of the prevention, care and support categories described above does not cover all funding needs. Resources are also required for central functions such as policy, research, evaluation and administration. Funds can be allocated to these functions as required.

D. Changes in behaviors affecting sexual transmission of HIV

The prevention interventions are intended to reduce the transmission of new infections. Except for safe blood all the prevention interventions operate by changing behaviors that are linked to HIV transmission. Four types of behavior are affected by the prevention interventions in the model:

- Condom use
- Treatment for sexually transmitted infections
- Number of sexual partners
- Age at first sex

The model considers four different risk groups: men who have sex with men (MSM), high, medium and low. The specific definitions of these groups depend on the use of the model. However, in a typical application high-risk refers to commercial sex workers and their clients, medium-risk refers to men and women who have multiple partners and low-risk refers to men and women who have a single partner. People that are in more than one risk group are classified according to the highest-risk group.

Each prevention intervention can affect any or all of the four key behaviors. The effects may be different depending on the risk group. Thus a commercial sex worker intervention may affect condom use, treatment of STIs and number of partners among high-risk women and high and medium risk men, but would not be expected to affect age at first sex or other behaviors among low risk men or women. School-based interventions may affect age at first sex, condom use and numbers of partner among medium-risk men and women but would not be expected to affect high-risk populations.

Several prevention interventions may affect the same behaviors in the same risk groups. Therefore, the impact of interventions on condom use and STI treatment are calculated as percentage reductions in non-use. Impacts on the other two behaviors are calculated as percentage reductions in the number of partners per year and percentage increases in age at first sex.

The effect of each intervention is dependent on the coverage and the size of the impact. The coverage is calculated based on the funding and unit costs as described above. An impact matrix is used to determine the effect on behavior change. The default values in this matrix are derived from almost 100 impacts studies reported in the literature. The studies used to construct his matrix are described in Appendix A. For each cell in the matrix, the available evidence was reviewed. When more than one study was available a judgment was made about the best value to use. Values reported from the best studies, such as randomized control trials, were given more weight than those from less exacting studies. The final matrix represents our best judgment given the available evidence. The impact matrix is given in the table below.

Table 14. Impact of prevention interventions on behaviors

	Condom use			STI treatment			Number of partners			Age at first sex
	Reduction in non-use			Reduction in non-treatment			Reduction in numbers of partners			Increase in age at first sex
	High Risk	Medium Risk	Low Risk	High Risk	Medium Risk	Low Risk	High Risk	Medium Risk	Low Risk	Medium Risk
Mass media										
VCT	-80%	-80%	-80%	-67%	-80%	-80%				
Faith-based initiatives		-12%	-3%							-0.20
Community mobilization		-11%								-0.20
Peer counseling - CSW	-39%	-43%		-50%			-20%			
School-based programs		-37%						-33%		0.30
Programs for out-of school youth		-18%								0.30
Workplace programs	-39%	-34%	-1%					-23%		
Condom social marketing	-21%	-10%	0%							0.13
Public sector condom distribution	-45%	-10%	-5%	-56%	-39%	-22%	-35%			
IDU peer outreach	-28%						-33%			
MSM peer outreach	-29%						-21%			
STI treatment	-54%	-14%		-47%	-24%					

The impacts specified in the matrix are assumed to be maximum impacts achievable only in the best environments. A major factor affecting the effectiveness of prevention interventions is the environment for care. If no care is provided for people with HIV, stigma will usually be high and there will be little incentive to be tested, declare your HIV status or even talk about AIDS with family or friends. In such an environment, prevention activities will have less impact than in one where care and treatment are readily available. ARV treatment may also have a negative affect on prevention if people are less concerned about HIV infection because they think it is an easily treatable disease. If this leads to more risky behavior then prevention activities may be less effective. On the other hand, ARV treatment may reduce the transmission of HIV by reducing the viral loads of those infected. We do not know the net effect of all of these influences. However, it seems clear that prevention and care should not be treated in isolation and it is likely that the net effect of better treatment is to enhance prevention effectiveness.

To simulate this effect, the impacts shown in the table are only achieved when the average coverage for all four types of care is 100 percent. When it is less than 100 the impacts are reduced by a factor that is specified in the input assumptions.

$$\text{impact}_i = \text{maximum impact}_i \times [\ 1 - \text{care reduction factor} \times (1 - \text{average care coverage})]$$

Average care coverage is the average proportion of the population in need receiving each type of care (palliative care, OI treatment, OI prophylaxis and ARV). The reduction factor is an input assumption, discussed in the chapter on inputs.

The policy environment can also affect the effectiveness of prevention intervention. Strong political support and supportive policies can lead both to more resources being allocation to prevention and care and to more effective use of those resources. As a result, the impact of prevention programs may also be reduced if the policy environment is poor. Thus the equation for impact becomes

$$\text{impact}_i = \text{maximum impact}_i \times [\ 1 - \text{care reduction factor} \times (\ 1 - \text{average care coverage})] \times [1 - \text{policy reduction factor} \times (1 - \text{policy environment score})]$$

For each risk group, changes in these four behaviors are calculated by multiplying the proportion of the population covered by an intervention by the impact of the intervention and then cumulating the impacts across all prevention interventions. The proportion of the population covered by the intervention is the coverage that is achieved from the specified funding minus the coverage before the intervention. Thus, only changes in behavior attributable to the additional funding are calculated. These changes are combined with existing behavior to determine the new behaviors. The details of this calculation for each behavior are shown below.

The model divides the population into risk groups in order to create as much homogeneity within a risk group as possible. This improves the accuracy of the calculations of HIV transmission. The four behaviors are quantified by specifying the average level for the risk group. Thus, the number of partners might be 1000 for female sex workers and one for low-risk women. If all women were combined into one risk group the average number of partners might be only 1.1. This average would grossly underestimate the transmission of HIV since most transmission will take place among those with most partners. For this reason it is necessary to disaggregate the population into homogeneous groups.

For this model we have chosen three risk groups for heterosexual transmission. It could be argued that there should be more risk groups, since there is still a range of behaviors in each group. Alternatively we might have chosen to use just two risk groups. Three risk groups were selected initially for practical purposes. Information is available from behavioral surveys on those who engage in commercial sex, those who have casual partners and those who are at very low risk. It would be very difficult to obtain reliable information on more risk groups without special surveys.

We tested the assumption that three risk groups would be enough by testing the model with two historical cases, Kenya and Uganda. In Kenya some behavioral data are available from DHS surveys in 1989, 1993 and 1998. Estimates of national prevalence are also available for those years. For Uganda DHS surveys are available for 1988/89 and 1995. In both cases we used the Spectrum computer model to estimate incidence from estimates of national prevalence. The ***Goals*** model was set up for the earliest year in each case using the available data. Since little information on STI prevalence was available for the earliest years a pattern of STI prevalence across the risk groups was selected that allowed the model to fit HIV incidence in the first year. Two calculations for later years were made under the assumption of (1) no changes behavior and (2) actual changes as recorded in the DHS for condom use and proportion in each risk category. The results are shown in the figure below. For Uganda the most significant behavior changes were a reduction in the proportion of people in the high-risk categories and the proportion sexually active. For Kenya the most significant changes were increases in condom use.

The model calculations match the actual experience reasonably well. This confirms that three risk groups are adequate to capture the major effects of behavior change on HIV incidence.

Figure 1. Adult HIV incidence in Uganda: actual experience compared with model calculations of no behavior changes and actual behavior changes

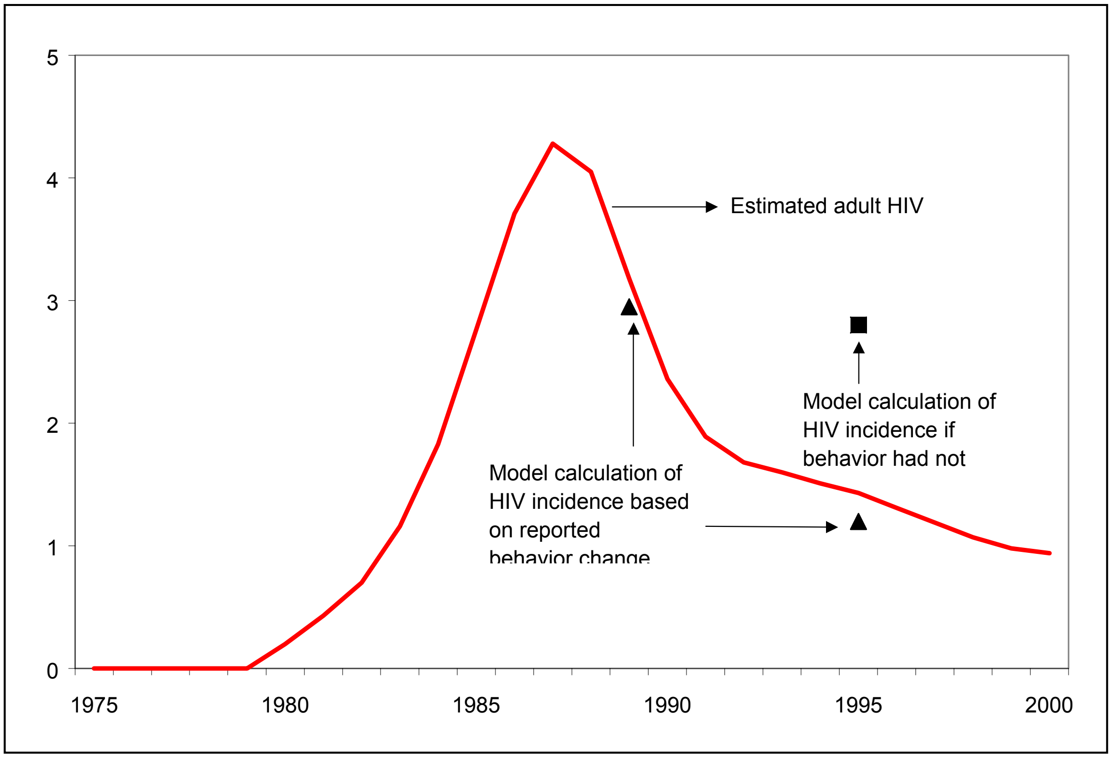
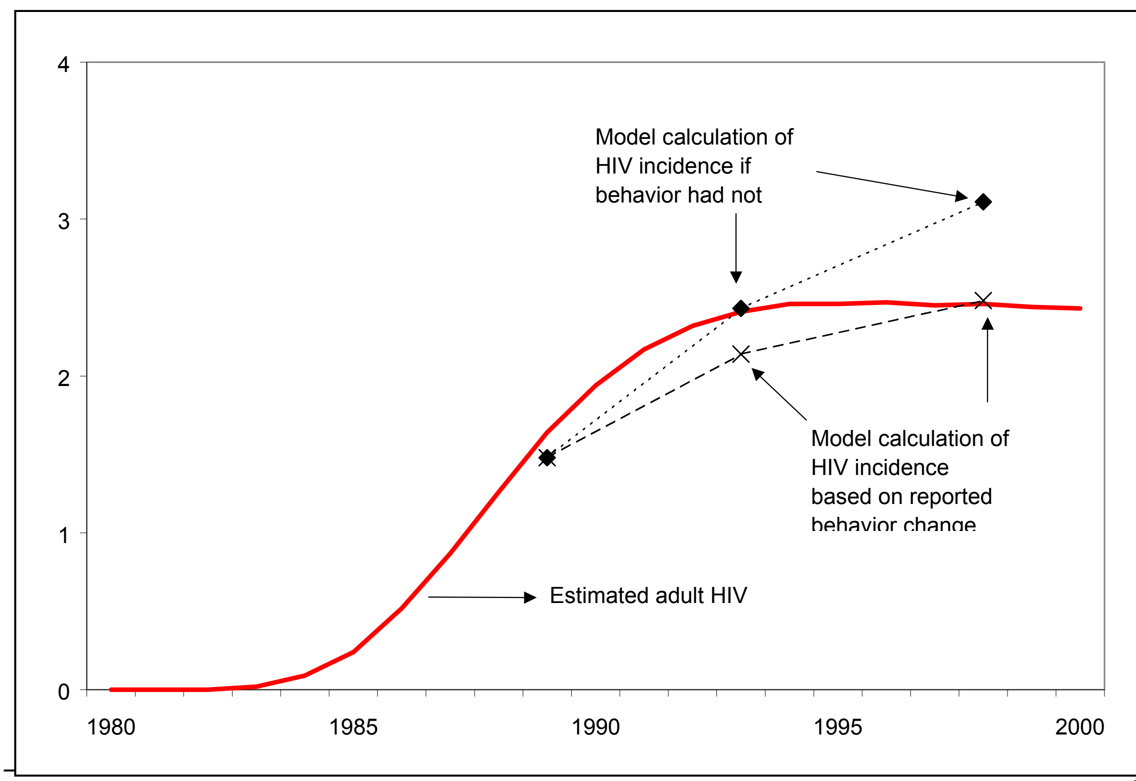


Figure 2.Adult HIV incidence in Uganda: actual experience compared with model calculations of no behavior changes and actual behavior changes



1. Condom use

$$\text{Condom use}_t = 1 - (1 - \text{condom use}_0) * \Pi_i\,(\text{coverage}_t - \text{coverage}_0) * \text{impact}_i$$

Condom use in year t is calculated as one minus non-use of condoms. Non-use is calculated as one minus the use in year 0 multiplied by the impact of prevention interventions. The impact of prevention interventions is calculated by multiplying for all interventions the increase in coverage times the impact of that intervention on non-use of condoms (from the impact matrix shown above).

2. STI treatment

$$\text{STI Tx}_t = 1 - (1 - \text{STI Tx}_0) * \Pi_i\,(\text{coverage}_t - \text{coverage}_0) * \text{impact}_i$$

STI treatment in year t is calculated as one minus the proportion not treated. The proportion not treated is calculated as one minus the proportion treated in year 0 multiplied by the impact of prevention interventions. The impact of prevention interventions is calculated by multiplying for all interventions the increase in coverage times the impact of that intervention on non treatment (from the impact matrix shown above).

3. Number of partners

$$\text{Number of partners}_t = \text{Number of partners}_0 * \Pi_i\,(\text{coverage}_t - \text{coverage}_0) * \text{impact}_i$$

The number of partners in year t for each risk group and sex is calculated as the number of partners in the base year multiplied by the impact of the prevention interventions. The impact is calculated as the product across all interventions of the change in coverage multiplied by the impact (from the impact matrix shown above).

4. Age at first sex

$$\text{Age at first sex}_t = \text{Age at first sex}_0 + \Sigma_i\,(\text{coverage}_t - \text{coverage}_0) \times \text{impact}_i$$

Age at first sex in year t is calculated as age at first sex in the base year plus the impact of prevention interventions. The impact is the sum across all interventions of the change in coverage multiplied by the impact of the intervention.

E. HIV prevalence and incidence

HIV prevalence is calculated as prevalence in the previous year plus HIV incidence minus AIDS deaths. AIDS deaths are estimated as prevalence divided by the average time from infection to death.

$prevalence_t$ = $prevalence_t$ + $incidence_{t-1}$ – $prevalence_{t-1}$ / survival period

HIV incidence is equal to new HIV infections divided by the uninfected population.

$incidence_t$ = new $infections_t$ / ($population_t$ x (1 – $prevalence_t$))

The total number of new sexually transmitted infections in a year is equal to the sum of new infections across all risk groups and both sexes.

new infections = $\Sigma_{r,s}$ new $infection_{r,s}$

The annual number of new infections in a heterosexual risk group is the sum of the infections occurring to both men and women in that risk group. For men who have sex with men, it is the sum of all new male infections in the risk group.

new $infections_r$ = new $infections_{r,s}$ + new $infections_{r,p}$

Where r is the risk group, s is the target population (male or female) and p is the partner population.

The number of new infections in the target population is equal to the number of uninfected people in the population multiplied by the annual risk of infection.

new $infections_{r,s}$ = $ProbInf_{r,s}$ x (1 – HIV $prevalence_{r,s}$) x $population_{r,s}$

The number of people in each risk group is determined by the size of the sexually active population and the distribution across risk groups.

$population_{r,s}$ = sexually active $population_t$ x proportion in risk $group_r$

The proportion of the population in each risk group is specified for the initial year in the assumptions section of the model. The sexually active population is calculated as the population aged 15-49 multiplied by the proportion that is sexually active.

sexually active $population_s$ = population $15\text{-}49_s$ x proportion sexually $active_s$

The proportion that is sexually active is calculated from the base year value and the impact of prevention interventions that raise the age at first sex.

The decrease in the percentage of the population that is sexually active that is caused by a one year increase in age at first sex is approximated by the equation:

decrease = 1 / { (50-15) x proportion sexually active in the base year)}

The probability of infection is calculated using an equation developed by Weinstein *et al*[1] and implemented in the AVERT model.[2] This equation calculates the probability of infection as a function of HIV prevalence in the partner population, the transmissibility of HIV, the impact of a sexually transmitted infection on HIV transmissibility, the proportion of the population with sexually transmitted infections, condom use, numbers of partners per year and number of sexual contacts with each partner. The general equation is:

$$ProbInf_{r,s} = 1 - \{p_{r,p}\Sigma_s w_{r,s}[1 - r_{gs}(1\text{-}f_r e)]^{nr} + (1 - p_{r,p})\}^{mr}$$

Where:

$P_{r,s}$ = probability of a person in the target population of risk group r becoming infected with HIV
p_p = HIV prevalence in the partner population
w_s = proportion of the target population in one of four possible states (has no sexually transmitted infection, has an ulcerative STI, has an inflammatory STI, has both an ulcerative and inflammatory STI)
r_{gs} = the transmissibility of HIV given STI state s and partner combination g, where g has three possible states (male to female, female to male, and male to male)
f_r = proportion of sexual contacts involving condom use
e = efficacy of condom use in preventing HIV transmission
n_r = number of sexual contacts per partner per year in risk group r
m_r = number of partners per year in risk group r

HIV prevalence in the partner population is provided by the AIM module in Spectrum. The efficacy of condom use in preventing HIV transmission is an input specified in the assumptions section. The default value is 95 percent. The number of partners per year is also specified as an input in the assumptions section.

The transmissibility of HIV by STI status can be specified in the assumptions section. The default values are the same as those used in the AVERT model. They are shown in the table below.

[1] Weinstein MC, JD Graham, JE Siegel and HV Fineberg. "Cost-effectiveness analysis of AIDS prevention programs: concepts, complications, and illustrations" in **Confronting AIDS: Sexual Behavior and Intravenous Drug Use**. Edited by CF Turner, HG Miller and LE Moses. Washington, DC: National Academy Press, 1989:471-499.
[2] Bouey, Paul, Tobi Saidel, Thomas Rehle. **AVERT: A Tool for Estimating Intervention Effects on the Reduction of HIV Transmission**. Arlington, VA: Family Health International, 1998.

Table 15. Probability of transmitting HIV in a single contact by presence of sexually transmitted infections in either partner

Partnership	No STI	Ulcerative STI	Non-ulcerative STI	Both ulcerative and non-ulcerative STI
Male-to-female	0.002	0.060	0.020	0.060
Female-to-male	0.001	0.060	0.010	0.060
Male-to-male	0.010	0.300	0.100	0.300

Condom use and the number of partners are calculated from the rates in the base year and the impact of interventions as described above in sections C.1 and C.3.

The proportion of the population in each of the four possible states of sexually transmitted infections is calculated from the prevalence of STI infection in the risk group.

The proportion of the population with both an ulcerative and non-ulcerative STI (both) is the product of the prevalence of ulcerative STIs (GUD) and the prevalence of non-ulcerative STIs (non GUD).

$proportion_{both} = prevalence_{GUD} \times prevalence_{non\ GUD}$

The proportion with an ulcerative STI only is equal to the prevalence of ulcerative STIs minus the proportion with both an ulcerative and non-ulcerative STI.

$proportion_{GUD\ only} = prevalence_{GUD} - proportion_{both}$

A similar calculation is performed for the proportion with a non-ulcerative STI:

$proportion_{non\ GUD\ only} = prevalence_{non\ GUD} – proportion_{both}$

The proportion with no STI is equal to one minus the proportion of the population in the other three states.

$proportion_{no\ sti} = 1 – proportion_{GUD} – proportion_{non\ GUD} – proportion_{both}$

The prevalence of ulcerative and non-ulcerative STIs is assumed to vary in direct proportion to the probability of STI infection.

$$prevalence_{GUD,y} = prevalence_{GUD,0} * ProbTrans_{GUD,y} / ProbTrans_{GUD,0}$$

$$prevalence_{non\ GUD,y} = prevalence_{non\ GUD,0} * ProbTrans_{GUD,y} / ProbTrans_{non\ GUD,0}$$

The probability of transmission of STIs is calculated with an equation similar to that used to calculate the probability of transmission for HIV. The equation is several ways. First, there is a single probability of transmission of the STI, it does not depend on HIV infection. Second, the number of contacts per year is divided by 12 to estimate contacts per month. Third, the monthly probability of STI transmission is multiplied by the average duration of and STI. The average duration is the weighted average of the duration of a treated and untreated STI.

$$ProbTrans_t = \{1 - \{p_p[1 - r(1 - f_r e)]^n + (1 - p_p)\}^{m/12}\} \times \{d_{treated} \times \text{proportion treated} + d_{untreated} \times (1 - \text{proportion treated})\}$$

P_s = probability of a person in target population becoming infected with the STI
p_p = STI prevalence in the partner population
r = the transmissibility of the STI
f_r = proportion of sexual contacts involving condom use
e = efficacy of condom use in preventing HIV transmission
n = number of sexual contacts per partner per year
m = number of partners per year
$d_{treated}$ = the duration, in months, of a treated STI
$d_{untreated}$ = the duration, in months, of an untreated STI
proportion treated = the proportion of STI cases that are treated

The proportion of STI cases that are treated is calculated from the impacts of the interventions as described in section C.2 above.

F. Infections averted and cost per infection averted

The number of infections averted in any year is the difference between the number of new infections that would occur if there were no new prevention funding and those that occur with the prevention interventions. The model calculates new infections in the absence of the prevention interventions by calculating the number of new infections that would occur if all prevention funding categories were set to their base year values.

$$\text{Infections averted} = \text{new infections}_{no\ prevention} - \text{new infections}_{with\ program}$$

The cost per infection averted is the total additional funding for prevention programs divided by the number of infections averted.

Cost per infection averted = additional funding for prevention / infections averted

G. Capacity sub-model

In the Capacity sub-model, the initial base year capacity sheet calculates the number of existing trained full-time equivalent (FTE) staff, based on the number of existing trained staff, time spent on program, and sick time, for the base year of the strategic plan, time t:

Existing capacity (in FTE) $_t$ = number of existing trained staff $_t$ * % time spent on program * (1 - % sick time)

Required capacity for each labor category for each year, including the base year, is calculated as the number of people that should be reached by the intervention, divided by the program reach:

Required capacity $_t$ = number of people to be reached $_t$ / program reach

The number of full-time equivalent staff to be trained is then the difference between existing capacity and required capacity, multiplied by the percentage that require the various types of training, for each labor category, for each year:

Training needs $_t$ = (Existing capacity $_t$ – Required capacity $_t$) * % requiring training

Existing capacity after the base year is a combination of previously existing capacity, those who have left employment, either through attrition or death, and newly trained staff, for each labor category, for each year:

Existing capacity $_{t+1}$ = Existing capacity $_t$ – Attrition $_{t+1}$ – Deaths $_{t+1}$ + Trained $_t$

The actual number of staff that need to receive the various types of training needs to be translated back into numbers from FTE terms, for each labor category, for each year:

Number of people to be trained $_t$ = Training needs (in FTE) $_t$ / (% time spent on program * (1 - % sick time))

The number of workshops that need to be held for each type of training is the actual number of people to be trained (not FTE), divided by the number of people that can be trained at a workshop, an assumption in the 'Characteristics' worksheet:

Number of workshops $_t$ = Number of people to be trained $_t$ / Number trained at each workshop

The total costs of training is the sum of the cost of each type of training workshop, multiplied by the number of workshops to be held, for each year:

Total cost $_t$ = Cost of pre-service workshop * Number of pre-service workshops $_t$) + (Cost of in-service workshop * Number of in-service workshops $_t$) + (Cost of continuing education workshop * Number of continuing education workshops $_t$)

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VIII. Acronyms and Abbreviations

AIDS	acquired immunodeficiency syndrome
ANC	antenatal clinics
ARV	anti-retroviral therapy
CSW	commercial sex worker
DHS	Demographic and Health Survey
FC	female condom
FSW	female sex worker
GC	gonococci
GDP	gross domestic product
GNP	gross national product
GUD	genital ulcer disease
HAART	highly active antiretroviral therapy
HIV	human immunodeficiency virus
IDU	injection drug user
IE&C	information, education, and communication
MeSH	medical subject headings in medical literature databases
MSM	men who have sex with men
NEP	needle exchange programs
NGO	nongovernmental organization
NGU	non-gonococcal urethritis
NSP	national strategic plan

NGU	non-genital ulcer sexually transmitted infection
OI	opportunistic infection
OVC	orphans and vulnerable children
PC-C	prospective cohort with a comparison group
PC-NC	prospective cohort without a comparison group
PCP	pneumocystis carinii pneumonia
PLWHA	people living with HIV/AIDS
PMTCT	prevention of mother-to-child transmission
PY	person years
RCS-C	repeat cross-sectional with a control group
RCS-NC	repeat cross-sectional without a control group
RCT	randomized controlled trial
RR	risk ratio
STI	sexually transmitted infection
UN	United Nations
UNFPA	United Nations Fund for Population Activities
URTI	upper respiratory tract infections
USAID	United States Agency for International Development
VCT	voluntary HIV counseling and testing

IX. Appendix A: Goals Literature Review

1. Introduction

In the ***Goals*** model, intervention effectiveness is defined as the impact of the prevention activities on behavior changes. In order to provide information on intervention effectiveness, a systematic review of the HIV/AIDS and sexually transmitted infections (STI) literature in the developing world was conducted. The literature review incorporated data from published and non-published studies to produce the default values used in the ***Goals*** impact matrix. Intervention study results can be used by program managers as guidance in selecting default values for impacts of prevention programs.

2. Search Strategy Methods

Between January and June 2001, a literature review of HIV/AIDS prevention interventions in developing countries was conducted and included eight stages:

- identifying reports of HIV/STI prevention interventions in developing countries using a systematic electronic search of peer-reviewed and non-reviewed articles. Medical databases included (using PubMed) Medline, AIDSline, Popline, as well as a selective review of EMBASE, BIOSIS, SCISEARCH, and SIGLE. Additionally, several websites were accessed including XIII International AIDS Conference, 2000 in Durban, South Africa; UNAIDS; DFID; Family Health International, The Futures Group International; and abstracts from global AIDS conferences such as The Third USAID HIV/AIDS Prevention Conference.
- searching the bibliographies of articles identified during the online searches for additional studies.
- reviewing final project reports and country program evaluations from various consulting firms.
- contacting study authors when additional data were needed.
- reviewing and classifying studies using a set of guidelines that were generated for the ***Goals*** model. Attention was paid to the setting, target group, outcomes, intervention, study design, the use of control groups and allocation methods, sample size, intervention location, and the results claimed.
- entering study information into an Excel spreadsheet bibliography (a full description of the search strategy and the spreadsheet of the complete

literature review is available on The Futures Group International web site at www.tfgi.com).

- generating descriptions of the fields and formal review of the intervention studies.
- pooling study outcomes to create estimates of intervention impacts using qualitative techniques.

3. Inclusion/Exclusion Criteria

Inclusion and exclusion criteria identified well-designed studies and those from which conclusions about the effectiveness of interventions can be drawn.

Inclusion:

Studies used for impact values were included if they:

1. defined an HIV/AIDS or STI prevention intervention in a developing world country
2. provided pre-and post-program measures
3. provided at least one behavioral (e.g., condom use, number of sex partners, age at first sexual activity, sexual contact with CSWs, changes in risky sexual or intravenous drug-using behavior), biological (e.g., STI/HIV incidence or prevalence rates, MIC), or economic (costs, benefit-cost, cost-effectiveness, or cost-utility) endpoint.

Exclusion:

Studies were excluded if they were:

1. conducted before 1981
2. reported as conference abstracts without data
3. reported without pre- post-intervention data
4. reported as attitudes and knowledge surveys only, or interventions with ethnographic data only.

However, there were some exceptions to these inclusion/exclusion criteria. For example, an STI treatment intervention conducted in the pre-HIV era (1967) was added because it was a well-designed study with clear biologic endpoints that are still relevant to the relationship of treatment on behavior change. However, not all relevant studies are included in this review. Although non-English speaking studies were not necessarily excluded, only one non-English (Spanish) intervention was used. It may be that studies published in languages other than English will result in significant articles being omitted from the literature review. (Dickensin et al., 1994).

4. Search Results

Data were entered into an Excel spreadsheet; data entry was validated by taking a random sample of 20% of the articles and rechecking that the data had been entered correctly. Behavioral evaluation data focused mainly on knowledge of infection, degree of multiple and type of partners (CSWs, casual, girlfriend, and/or wife), condom accessibility and use, type of sexual encounters, and intravenous drug-use (IDU). STI treatment studies focused on biologic and epidemiologic endpoints of STI incidence and prevalence, percent of population cured, condom use and accessibility, and treatment-seeking behavior. In many cases behavioral data points were established for groups about which there has been little or no data available before the intervention. Most of the behavioral evaluations collected data using combinations of surveys with individual or group-in-depth interviews or by combining quantitative with qualitative data. Therefore, statistical indicators were often complemented by detailed contextual data describing perceptions of peer social norms and sexual behavior. The studies used several different qualitative and quantitative methods such as semi-structured interview, free-listing, explanatory models, microbiological testing, and sentinel surveillance.

Two hundred and forty-one studies representing six categories of research design were retrieved from the literature search. Of those 241 studies, 89 (37%) were used to generate the Goals impact values. Study designs and regions for interventions used in the Goals impact matrix are shown in Table A1.

Table A1. Impact Matrix Studies by Design and Region

Study Design	Number of Studies
Randomized trials (controlled/non-controlled)	12
Quasi-experimental	6
Prospective cohort (with/without controls)	30
Cross-sectional	37
Other*	4
Regions**	
Asia	28
Latin American and Caribbean	18
Sub-Saharan Africa	42
Russia	1

*Includes cluster, crossover, retrospective record review, and case studies.
**Some studies used multiple regions.

5. Study Limitations

As with any literature search, "the quality of the data is limited by the quality of the studies" reviewed (Kunz and Oxman, 1998). Rigorous evaluation research design was not feasible or appropriate for every intervention. Such designs were used only in the case of a demonstration project, to test a new intervention, or to answer a specific research question. As a group, the studies suffered from various methodological inadequacies including:

- no or inadequate control group
- limited follow-up (< 6 months)
- intervention fatigue in which after a long intervention period, behavior change either remained the same or declined
- high attrition (with subsequent loss of statistical power when comparing two groups)
- self-reported data
- nonrandom allocation of study subjects
- lack of internal validity including confounding, information, and selection bias
- publication bias.

6. Results

A. Impact Estimates

The impact values estimated from the 89 selected studies are expressed in one of four behavior change categories: percent reduction in non-use of condoms, percent reduction in non-treatment of STIs, percent reduction in the number of sexual partners, and change in age at first sex (in years). The impact for each activity is a pooled estimate of several study results. However, the results of different studies are not homogenous; the studies used a mixture of instruments and endpoints to measure intervention outcomes. Therefore, the impacts represent an informed guess about the true population value for the pooled outcome variables. Impact values were generated by qualitatively evaluating outcomes as a function of study quality and design, population size, and generalizability. Results reported from the best studies, such as randomized controlled trials or prospective cohorts with large populations, were given more weight than those from less rigorous studies. Three reviewers independently assessed each study. Reviewer assessment of study effectiveness was contrasted with those provided by the authors themselves for the final values used in the ***Goals*** impact matrix.

B. Intervention Studies

The 89 studies used to generate the impact values were divided into 13 behavior change or STI treatment categories and stratified by high (CSWs and their partners), medium (multiple partners), or low risk (monogamous) groups in the matrix. Studies used to calculate values in the impact matrix are shown in the table below.

Table A2. Impact Matrix Studies by Intervention Category

Category	Subcategory	Author	Title	Publication
BEHAVIOR CHANGE	**Community mobilization**	Pauw J, Ferrie J, Villegas RR, Martinez JM, Gorter A, Egger M.	A controlled HIV/AIDS-related health education programme in Managua, Nicaragua	AIDS 1996;10:537-44
		Mashababe S, Mclean D, Gomo R, Wilson D, Sabatier R	Peer education to reduce STI/HIV transmission in Mutare, Zimbabwe	Int Conf AIDS 1998;12:691 (abstract no. 533/33516)
BEHAVIOR CHANGE	**Condom distribution/promotion**	Bhave G, Lindan C, Hudes E, et al.	Impact of an intervention on HIV, sexually transmitted diseases and condom use among sex workers in Bombay, India.	AIDS 1995;9:S21-30
		Celentano D, Bond K, Lyles C, et al.	Preventive intervention to reduce sexually transmitted infections: a field trial in the Royal Army	Arch Intern Med 2000;160:535-40
		Feldblum PJ, Kuyoh MA, Bwayo JJ, Omari M, Wong EL, Tweedy KG, Welsh MJ	Female condom introduction and sexually transmitted infection prevalence: results of a community intervention trial in Kenya	Ann Epidemiol 2000;10(6):339-46
		Ford NJ, Koetsawang S	Narrative explorations and self-esteem: research, intervention and policy for HIV prevention in the sex industry in Thailand	Int J Pop Geo 1999;5(3):213-33
		Fox LJ, Bailey PE, Clarke-Martinez KL, Coello M, Ordonez FN, Barahona F	Condom use among high-risk women in Honduras: evaluation of an AIDS prevention program	AIDS Educ Prev 1993 Spring;5(1):1-10
		Ford K, Wirawan D, Fajans P, Meliawan P, Macdonald K, Thorpe L.	Behavioral interventions for reduction of sexually transmitted disease/HIV transmission among female commercial sex workers and clients in Bali, Indonesia.	AIDS 1996;10:213-22
		Hanenberg R, Rojanapithayakorn W, Kunasol P, Sokal D	Impact of Thailand's HIV-control programme as indicated by the decline of sexually transmitted diseases	Lancet 1994;344:243-5
		Mills S, Benjarattanaporn P, Bennett A, et al.	HIV risk behavioral surveillance in Bangkok, Thailand: sexual behavior trends among eight population groups	AIDS 1997;11:S43-S51
		Ngugi EN, Plummer FA, Simonsen JN, et al.	Prevention of transmission of human immunodeficiency virus in Africa: effectiveness of condom promotion and health education among prostitutes	Lancet 1988;2:887-90
		Nelson KE, Celentano DD, Eiumtrakol S, Hoover DR, Beyrer C, Suprasert S, Kuntolbutra S, Khamboonruang C	Changes in sexual behavior and a decline in HIV infection among young men in Thailand	N Engl J Med 1996;335:297-303
		Rojanapithayakorn W, Hanenberg R	The 100% condom program in Thailand	AIDS 1996;10:1-7
		Wong ML, Chan KW, Koh D	A sustainable behavioral intervention to increase condom use and reduce gonorrhea among sex workers in Singapore: 2-year follow-up	Prev Med 1998;27(6):891-900

		de la Vega A, Suarez y Toricello E, de las Rosa Cedillos G, Hernandez Parra L, Ramos Hernandez E, Castro Reyes MA, Barney AN, Fox L	FEMAP education and AIDS prevention programme in a population with high--risk sexual behavior (Adaptation of the community health and family planning model)>	In: Family planning. Meeting challenges: promotion choices. The Proceedings of the IPPF Family Planning Congress, New Delhi, October, 1992. Senanayake P, Kleinman RL. Eds. Carnforth, England: Parthenon Publishing Group, 1993:325-34.
		Valdespino Gomez JL, Izazola Licea JA, Ramah M, Garcia L	Evaluation of key message to increase the use of condoms in sex workers. A quasi-experimental study	Presented at the 5th International Conferences on AIDS, Montreal, June 4-10, 1989. 6(19).
BEHAVIOR CHANGE	**Condom social marketing**	Family Health International (FHI)	Final report for the AIDSCAP Program in Cameroon: October 1992 to September 1996	Family Health International (FHI), 2000
		Meekers D	The effectiveness of targeted social marketing to promote adolescent reproductive health: the case of Soweto, South Africa	J HIV/AIDS Prev Educ Adolesc Children 2000, in press
		Meekers D	Going underground and going after women: trends in sexual risk behaviors among gold miners in South Africa	Int J STD & AIDS 2000;11:21-6
		Van Rossem R, Meekers D	An evaluation of the effectiveness of targeted social marketing to promote adolescent and young adult reproductive health in Cameroon	AIDS Educ Prev 2000, in press
BEHAVIOR CHANGE	**IDU**	Kumar M, Mudalier S, Daniels D	Community-based outreach HIV intervention for street-recruited drug users in Madras, India	Public Health Rep 1998;113:58-66
		Madray H, Sergeyev B, Rumyantseva TP, Oparina T, Volkanevsky VL, Broadhead RS, Heckathorn DD	Yaroslavl (Russia) harm-reduction project for drug injectors: impact results	Int Conf AIDS 1998;12:670-1 (abstract no. 33404)
		Robles RR, Colon H, Matos TD, finlinson HA, Munoz A, Marrero CA, Garcia M, Reyes JC	Syringe and needle exchange as HIV/AIDS prevention for injection drug users in Puerto Rico	Health Policy 1998;45:209-20
		Robles RR, Colon H, Marrero CA, Matos TD, Munoz A	Behavioral outcomes of AIDS community-based intervention for drug users in Puerto Rico	Int Conf AIDS 1994 Aug 7-12;10(2):272 (abstract no. PC0461)
		Vanichseni S, Choopanya K, Des Jarlais DC, Plangsringarm K, Sonchai Carballo M, Friedmann P, Friedman SR	HIV testing and sexual behavior among intravenous drug users	J Acquir Immune Defic Syndr 1992;5(11):1119-23
BEHAVIOR CHANGE	**MSM**	Haque A, Ahmed S	Community-based risks reduction approach among MSM: Bandhu Social Welfare Society	The XIII International AIDS 2000 Conference, Durban
		Mota M, Parker R, Lorenco L, Almeida V, Pimenta C, Fernandes MEL,	Sexual behavior and behavior change among men who have sex with men in Brazil, 1989-1994	Proceedings from the Third USAID HIV/AIDS Prevention Conference, Washington, DC, August 7-9, 1995

				(oral abstract no. A-39)
		Nagapp SRMN Jayaram, Janarthanam HAJ Amijikari	MSM intervention: does it create any impact	The XIII International AIDS 2000 Conference, Durban
		Pradeep K, Senthil K, Tawil O, O'Reilly K, Kantharaj K	An outreach program for HIV/AIDS prevention: risk reduction among men who have sex with men in Madras, India	Int Conf AIDS 1996 Jul 7-12;11(2):51 (abstract no. We.D.481)
		Zimmerman MA, Ramirez-Valles J, Suarez E, de la Rosa G, Castro MA	An HIV/AIDS prevention project for Mexican homosexual men: an empowerment approach	Health Educ Behav 1997;24(2):177-90
BEHAVIOR CHANGE	**Peer education**	Leonard L, Ndiaye I, Kapadia A, Eisen G, Diop O, Mboup S, Kanki P	HIV prevention among male clients of female sex workers in Kaolack, Senegal: results of a peer education program	AIDS Educ Prev 2000;12(1):21-37
		Laukamm-Josten U, Mwizarubi BK, Outwater A, Mwaijonga CL, Valdez JJ, Nyamwaya D, Swai R, Saidel T, Nyamuryekung'e K	Preventing HIV infection through peer education and condom promotion among truck drivers and their sexual partners in Tanzania, 1990-1993	AIDS Care 2000;12(1):27-40
		Ford K, Wirawan D, Suastina SS, Reed BD, Muliawan P	Evaluation of a peer education programme for female sex workers in Bali, Indonesia	Int J STD AIDS 2000 Nov;11(11):731-3
		S17	Silva S, de Moura SA	1998
		UNAIDS (Bangladesh - Shakti brothel)	Female sex workers HIV prevention projects	UNAIDS/00.45E (November 2000)
		UNAIDS (India Songachi Project)	Female sex workers HIV prevention projects	UNAIDS/00.45E (November 2000)
		UNAIDS (Papua New Guinea - Transex project)	Female sex workers HIV prevention projects	UNAIDS/00.45E (November 2000)
		Williams E, Lamson N, Efem S, Weir S, Lamptey P	Implementation of an AIDS prevention program among prostitutes in the Cross River State of Nigeria	AIDS 1992;6:229-242
		Asamoah-Adu A, Weir S, Pappoe M, Kanlisi N, Neequaye A, lamptey P	Evaluation of a targeted AIDS prevention intervention to increase condom use among prostitutes in Ghana	AIDS 1994;8:239-46
		Peterson C, Szterenfeld C, Alves AB	Monitoring of condom use by female sex workers in Rio de Janeiro and implications for participatory education in AIDS prevention	Proceedings from the Third USAID HIV/AIDS Prevention Conference, Washington, DC, August 7-9, 1995 (oral abstract no. A-42)

		Ngugi EN, Wilson D, Sebstad J, Plummer FA, Moses S	Focused peer-mediated educational programs among female sex workers to reduce sexually transmitted disease and human immunodeficiency virus transmission in Kenya and Zimbabwe	J Infect Dis 1996 Oct;174 (suppl 2):S240-7
		Van Dam J, Camprell CM, Williams BG, Mcphail C, Ndhlovu L	Interventions and behavior: a change for the better in Carletonville, S.A.	The XIII International AIDS 2000 Conference, Durban
BEHAVIOR CHANGE	**School-based**	Sweat M, Gregorich, S Sangiwa G, Furlonge C, Balmer D, Kamenga C, Grinstead O, Coates T'	Cost-effectiveness of voluntary HIV-1 counselling and testing in reducing sexual transmission of HIV-1 in Kenya and Tanzania	Lancet 2000;356:113-21
		Figueroa JP, Brathwaite AR, Wedderburn M, Ward E, Lewis-Bell K, Amon JJ, Williams Y, Williams E	Is HIV/STD control in Jamaica making a difference?	AIDS 1998;12 (suppl 2):S89-98
		Fitzgerald AM, Stanton BF, Terreri N, Shipena H, Li X, Kahihuata J, Ricardo IB, Galbraith JS, de Jaeger AM	Use of Western-based HIV risk-reduction interventions targeting adolescents in an African setting	J Adolescent Health 1999;25:52-61
		Fawole OF, Asuzu MC, Oduntan SO	A school-based AIDS education programme for secondary school students in Ibadan, Nigeria: a review of effectiveness	Int Conf AIDS 1998;12:196 (abstract no. 13558)
		Harvey B, Stuart J, Swan T	Evaluation of a drama-in-education programme to increase AIDS awareness in South African high schools: a randomized community intervention trial	Int J STD AIDS 2000;11:105-11
		Kinsman J	Reflections on a school-based AIDS education programme in rural Masaka, Uganda	SAfAIDS News Vol 8 No 1 March 2000
		Klepp K-I, Ndeki S, Leshabari M, Hanna P, Lyimo B	AIDS education in Tanzania: promoting risk reduction among primary school children	Am J Public Health 1997;87:1931-6
		Makelele PMT, Makelele Odimba MJ, Sukwa T, Magazani K, Malinda M, Bukasa A, Katumbutumbu JM, Tembele JC, Odimba BFK	Make framework a practical measurement tool for a rapid need assessment and evaluation of behavioral change in adolescents HIV prevention	The XIII International AIDS 2000 Conference, Durban
		Re MI, Pagani L, Bianco M	Female adolescents attitudes, behaviors, and HIV/AIDS risk perception in Argentina	Int Conf AIDS 1996 Jul 7-12;11(2):488 (abstract no. Pub.D.1326)
		Shuey DA, Babishangire BB, Omiat S, Bagarukayo H	Increased sexual abstinence among in-school adolescents as a result of school health education in Soroti district, Uganda	Health Educ Res 1999;14(3):411-419
		Stanton BF, Li X, Kahihuata J, et al.	Increased protected sex and abstinence among Namibian youth following a HIV risk-reduction intervention: a randomized, longitudinal study	AIDS 1998;12:2473-80
		Wedderburn	Knowledge, attitudes, beliefs, and practices (KABP) about HIV/AIDS among youth aged 12-14 in Jamaica	Int Conf AIDS 1998;12:191 (abstract no. 13527)

BEHAVIOR CHANGE	**VCT**	Bentley ME, Spratt K, Shepherd ME, et al.	HIV testing and counselling among men attending sexually transmitted disease clinics in Pune, India: changes in condom use and sexual behavior over time	AIDS 1998;12:1869-77
		Deschamps M-M, Pape JW, Hafner A, Johnston WD	Heterosexual transmission of HIV in Haiti	Ann Intern Med 1996;125:324-30
		Kamenga M, Ryder R, Jingu M, et al.	Evidence of marked sexual behavior change associated with low HIV-1 seroconversion in 149 married couples with discordant HIV serostatus: experience at an HIV counseling center in Zaire	AIDS 1991;5:61-7
		Machekano R, MacFarland W, Mbizvo MT, Bassett MT, Katzenstein D, Latif AS	Impact of HIV counselling and testing on HIV seroconversion and reported STD incidence among male factory workers in Harare, Zimbabwe	Cent Afr J Med 1998 Apr:44(4):98-102
		Muller O, Barugahare L, Schwartlander B, Byaruhanga E, Kataaha P, Kyeyune D, Heckmann W, Ankrah M	HIV prevalence, attitudes, and behaviour in clients of a confidential HIV testing and counselling centre in Uganda	AIDS 1992;6:869-874
		Muller O, Sarangbin S, Ruxrungtham K, Sittitrai W, Phanuphak P	Sexual risk behaviour reduction associated with voluntary HIV counselling and testing in HIV infected patients in Thailand	AIDS Care 1995;7(5):567-72
		MacNeil JM, Mberesero F, Kilonzo G	Is care and support associated with preventive behavior among people with HIV	AIDS Care 1999 Oct;11(5):537-46
		Pickering H, Quigley M, Pepin J, Todd J, Wilkins A	The effects of post-test counselling on condom use among prostitutes in The Gambia	AIDS 1993;7:271-3
		Voluntary HIV-1 Counseling and Testing Efficacy Study Group	Efficacy of voluntary HIV-1 counseling and testing in individuals and couples in Kenya, Tanzania, and Trinidad: a randomised trial	Lancet 2000;356:103-12
BEHAVIOR CHANGE	**Workplace program**	Ng'weshemi JZL, Boerma JT, Pool R, Barongo L, Senkoro K, Maswe M, Isingo R, Schapink D, Nnko S, Borgdorff MW	Changes in male sexual behaviour in response to the AIDS epidemic: evidence from a cohort study in urban Tanzania	AIDS 1996;10:1415-20
		Hearst N, Lacerda R, Gravato N, Hudes ES, Stall R	Reducing AIDS risk among port workers in Santos, Brazil	Am J Public Health 1999 Jan;89(1):76-8
		Wongsawat S, Pramanpol S, Ramasutra P,	Behavioral effects of HIV outreach communication and peer education to male laborers in factories in Bangkok, Thailand	Proceedings from the Third USAID HIV/AIDS Prevention Conference, Washington, DC, August 7-9, 1995 (oral abstract no. A-48)
BEHAVIOR CHANGE	**Youth-based**	Merati TP, Ekstrand ML, Hudes ES, Suarmiartha E, Mandel JS	Traditional Balinese youth groups as a venue for prevention of AIDS and other sexually transmitted diseases	AIDS 1997;11 (suppl 1):S111-9
STI TREATMENT	**STI treatment**	Family Health International (FHI)	Final report for the AIDSCAP Program in Nepal: August 1993 to July 1997	Family Health International (FHI), 2000
		Grosskurth H, Mosha F, Todd J, et al.	Impact of improved treatment of STDs on HIV infection in rural Tanzania: randomized controlled trial	Lancet 1995;346:530-6

Gorter AC, Sandiford P, Villabella C	A voucher scheme to improve access to health services for female sex workers reduces sexually transmitted infections	Int Conf AIDS 1998;12:638 (abstract no. 33228)
Harrison A, Karim SA, Lombard C, Lurie M, Ntuli N, Wilkinson D	Syndrome packets and health worker training improve sexually transmitted disease case management in rural South Africa: randomized controlled trial	AIDS 2000;14(17):2769-79
Laga M, Alary M, Nzila N, et al.	Condom promotion, sexually transmitted diseases treatment, and declining incidence of HIV-1 infection in female Zairian sex workers	Lancet 1994;344:246-8
Levine, WC, Revollo R, Kaune V, Vega J, Tinajeros F, Garnica M, Estenssoro M, Lewis JS, Higueras G, Zurita R, Wright-DeA Aguero L, Parejz R, Mirand P, Ransom RL, Zaidi AA, Melgar ML, Kuritsky JN	Decline in sexually transmitted disease prevalence in female Bolivian sex workers: impact of an HIV intervention project	AIDS 1998;12(14):1899-906
Moses S, Plummer FA, Ngugi EN, Nagelkerke NJD, Anzala AO, Ndnay-Achola JO	Controlling HIV in Africa: effectiveness and cost of an intervention in a high-frequency STD transmitter core group	AIDS 1991;5:407-11
Mulivanda T, Manoka AT, Nzila N, Way, St.Louis M, Piot P, Laga M	The impact of STD control and condom promotion on the incidence of HIV in Kinshasa prostitutes	Int Conf AIDS 1991 Jun 16-21;7(1):20 (abstract no. M.C.2)
Mpoudi NE, Torimiro JN, Manchester T, Abong T	An STD prevention program among men attending STD clinics in Yaounde, Cameroon	The AIDSCAP Electronic Library (Family Health International/The AIDS Control and Prevention Project (AIDSCAP), Durham, North Carolina)
Moses S, Kaul R, Nguge EN, Kimane S, Bwayo SS, Fonck K, MacDonald KS, Temmerman M, Plummer FA	A randomized placebo-controlled trial of monthly azithromycin to prevent sexually transmitted infections (STI) and HIV in Kenyan female sex workers FSWs: preliminary findings	The XIII International AIDS 2000 Conference, Durban
Ngugi E, Plummer FA, Costigan A, Moses S	Evaluation of impact of intervention on sex workers	The XIII International AIDS 2000 Conference, Durban
Uribe-Zuniga P, Brofman-Pertzovsky M, Ortiz-Aguirre V, Marchetti-Lamagni R, Garcia H, Ruiz-Badillo A	A strategy for HIV/AIDS prevention workers from Chiapas	among sexual
Wawer MJ, Sewankambo NK, Serwadda D, et al.	Control of sexually transmitted diseases for AIDS prevention in Uganda: a randomized community trial. Rakai Project Study Group	Lancet 1999;353:525-35
Coplan P, Okonofua FE, Ogunsakin D, Oronsaye F, Ogonor J, Collins S,, Kaufman J, Heggenhougen K	A randomized controlled trial of an intervention to improve treatment of STDs among Nigerian youth	XIII Internationl AIDS 2000 Conference, Durban
Forsythe S, Mangkalopakorn M, Chitwarakorn A, Masvichian N	Cost of providing sexually transmitted disease services in Bangkok	AIDS 1998;12 (suppl 2):S73-80

	Holmes KK, Johnson DW, Kvale PA, Halverson CW, Keys TF, Martin DH	Impact of a gonorrhea control program, including selective mass treatment, in female sex workers	J Infect Dis 1996;174 (suppl 2):S230-9
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X. Appendix B: Opportunistic Infections

The table below lists the average incidence of various OIs found in 30 different studies, along with the available costs for treating these conditions. The citations of the studies that were used are listed below the table. The drug treatment costs for each OI is calculated as the weighted average of the average incidence and the relevant cost figures.

WHO Stage/ Number	OI	Average Incidence	UNAIDS Cost* ($)	World Bank Cost**	Other
Stage 1					
1: ASY	Asymptomatic				
2: PGL	Lymphadenopathy	19.72%			
3: ARI	Acute retroviral infection	20.00%		3.12	
Stage 2					
4: WL	Minor weight loss	36.33%			
5: MCS	Minor mucocutaneous manifestations	20.76%		3.5	
6: HZV	Herpes zoster	6.36%	170		
7: URTI	Upper respiratory tract infections	15.33%		7.9	
Stage 3					
8: MWL	Major weight loss	27.13%			
9: DIA	Chronic diarrhea	26.76%		13	12
10: PYR	Prolonged fever	50.04%		0.6	
11: ORC	Oral candidiasis	34.63%	26.34	2	
12: HLP	Hairy leukoplakia	3.67%			
13: PTB	Pulmonary TB	30.83%	22.72	37	41
14: BAC	Bacterial infections	16.28%		60	
15: VVC	Vaginal candidiasis	2.50%			
Stage 4					
16: CAC	HIV wasting syndrome	34.70%			
17: PCP	PCP	13.63%?		8	
18: TOXO	Toxoplasmosis	11.05%	244	8	
19: CRS	Cryptosporidiosis	5.79%			
20: ISO	Isosporiasis				
21: CRC	Cryptococcosis	8.68%	1238	870.7	
22: CMV	Cytomegalovirus	22.93%	1160	717.88	
23: HSV	Herpes simplex	5.69%	45.82	140	
24: PML	Leukoencephalopathy	0.40%			
25: MYC	Mycosis	4.64%			
26: OEC	Esophagal candidiasis	6.95%		10	
27: MAI	Mycobacteriosis	3.04%	1860	717.88	
28: SAL	Septicaemia	4.20%		60	
29: ETB	Extrapulmonary TB	7.14%			
30: LYM	Lymphoma	4.46%			
31: KS	Kaposi's sarcoma	11.85%	29.71		

WHO Stage/ Number	OI	Average Incidence	UNAIDS Cost* ($)	World Bank Cost**	Other
32: ADC	HIV encephalopathy	6.22%	1283		

*UNAIDS Cost: "HIV-related opportunistic diseases," UNAIDS Technical update, October 1998 - used middle estimates
**World Bank Cost: "Confronting AIDS," p. 177, "Sub-Saharan Africa"

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XI. Appendix C: Capacity sub-model bibliography

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B1	Brazil	2002	Illustrative menu of partnership options in Brazil	January 2002. Available at www.unaids.org/partnership
B2	Baylor AIDS	2002	Personal interview.	Intl Conf AIDS. 2002 July 7-12.
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