



# Condom Requirements

## **A Computer Program for Projecting Condom Requirements**

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Spectrum System of  
Policy Models

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Software module developed by John Stover  
Manual written by John Ross and John Stover  
Futures Group

Developed in collaboration with the  
Commodity Management Unit of  
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# I.

## Introduction

### A. Description of the Spectrum System

Spectrum has been developed primarily by the POLICY Project, a USAID-funded activity implemented by the Futures Group in collaboration with RTI and CEDPA. This component on condom requirements was developed by the Futures Group with funding and guidance from the United Nations Population Fund (UNFPA). In particular, valuable inputs were received from Jagdish Upadhyay and Ravi Fernando of UNFPA.

#### 1. Components

- **Demography (DemProj)** – A program to make population projections based on (1) the current population, and (2) fertility, mortality, and migration rates for a country or region.
- **Family Planning (FamPlan)** – A program to project family planning requirements in order for consumers and/or nations to reach their goals of contraceptive practice or desired fertility.
- **Benefit-Cost** – A program for comparing the costs of implementing family planning programs, along with the benefits generated by those programs.
- **AIDS (AIDS Impact Model – AIM)** – A program to project the consequences of the AIDS epidemic.
- **Condom Requirements (CR)** – A program to forecast national condom requirements for both family planning and HIV/AIDS prevention, focusing on the critical groups at risk in the population.
- **Socioeconomic Impacts of High Fertility and Population Growth (RAPID)** – A program to project the social and economic consequences of high fertility and rapid population growth for sectors such as labor force, education, health, urbanization, and agriculture.

*Spectrum consolidates DemProj, FamPlan, Benefit-Cost, AIM, CR, RAPID, and PMTCT models into an integrated package.*

- **Prevention of Mother-to-Child Transmission (PMTCT)** –  
A program to evaluate the costs and benefits of programs to reduce mother-to-child transmission of HIV.

## 2. Software Description

Spectrum is a Windows-based system of integrated policy models. The integration is based on DemProj, which is used to create the population projections that support many of the calculations in the other components—FamPlan, Benefit-Cost, AIM, CR, RAPID, and PMTCT.

Each component has a similarly functioning interface, which is easy to learn and to use. With a little guidance, anyone who has a basic familiarity with Windows software will readily be able to navigate the models to create population projections and to estimate resource and infrastructure requirements. The accompanying manuals contain both instructions for users, and equations for persons who want to know exactly how the underlying calculations are computed.

### B. Uses of Spectrum Policy Models

*Policy models are designed to answer a number of “what if” questions. The “what if” refers to factors that can be changed or influenced by public policy.*

Policy models are designed to answer a number of “what if” questions relevant to entities as small as local providers of primary health care services and as large as international development assistance agencies. The “what if” refers to factors that can be changed or influenced by public policy.

Models are commonly computerized when analysts need to see the likely result of two or more forces that might be brought to bear on an outcome, such as a population’s illness level or its degree of urbanization. Whenever at least three variables are involved (such as two forces and one outcome), a computerized model can both reduce the burden of manipulating those variables and present the results in an accessible way.

Some of the policy issues commonly addressed by the Spectrum set of models include:

- the utility of taking actions earlier rather than later. Modeling shows that little in a country stands still while policy decisions are stalled and that many negative outcomes can accumulate during a period of policy stasis.
- the evaluation of the costs vs. the benefits of a course of actions. Modeling can show the economic efficiency of a set of actions (i.e., whether certain outcomes are achieved more

effectively than under a different set of actions), or simply whether the cost of a single set of actions is acceptable for the benefits gained.

- the recognition of interrelatedness. Modeling can show how making a change in one area of population dynamics (such as migration rates) may necessitate changes in a number of other areas (such as marriage rates, timing of childbearing, etc.).
- the need to discard monolithic explanations and policy initiatives. Modeling can demonstrate that simplistic explanations may bear little relationship to how the “real world” operates.
- the utility of “door openers.” A set of policies under consideration may not be acceptable to all stakeholders. Modeling can concentrate on favored goals and objectives and demonstrate how they are assisted by the proposed policies.
- The fact that few things in life operate in a linear fashion. A straight line rarely describes social or physical behavior. Most particularly, population growth, being exponential, is so far from linear that the results are startling. Modeling shows that all social sectors based on the size of population groups are heavily influenced by the exponential nature of growth over time.
- The fact that a population's composition greatly influences its needs and its well being. How a population is composed—in terms of its age and sex distribution—has broad-ranging consequences for social welfare, crime rates, disease transmission, political stability, etc. Modeling demonstrates the degree to which a change in age and sex distribution can affect a range of social indicators.
- the effort required to “swim against the current.” A number of factors can make the success of a particular program harder to achieve; for example, the waning of breastfeeding in a population increases the need for contraceptive coverage. Modeling can illustrate the need for extra effort—even if simply to keep running in place.

*A set of policies under consideration may not be acceptable to all stakeholders.*

### **C. Organization of the Model Manuals**

Each manual begins with a discussion of what the model does and why someone would want to use it. The manual also explains the data decisions and assumptions needed before the model can be run, and possible sources for the data. It defines the data inputs and outputs. The manual contains a tutorial, information on the methodology behind the model, a glossary, and a bibliography.

### **D. Information about the POLICY Project**

Spectrum has been developed primarily with funding from the POLICY project. It is a USAID-funded activity designed to create a supportive environment for family planning and reproductive health programs through the promotion of a participatory process and population policies that respond to client needs. To achieve its purpose, the Project addresses the full range of policies that support the expansion of family planning and other reproductive health services, including:

- national policies as expressed in laws and in official statements and documents;
- operational policies that govern the provision of services;
- policies affecting gender roles and the status of women; and
- policies in related sectors, such as health, education, and the environment that affect populations.

*The POLICY Project is implemented by the Futures Group in collaboration with Research Triangle Institute (RTI) and the Centre for Development and Population Activities (CEDPA).*

More information about the Spectrum System of Policy Models and the POLICY Project is available from:

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## **E. What is CR?**

Condom requirements (CR) have gained great prominence due to the global epidemic of AIDS. In many countries the use of condoms in the past for pregnancy prevention has been eclipsed by the larger numbers now required to provide protection against HIV infections. Some software programs are already devoted to the short-term problems of stocks and flows, but a separate software module is needed to forecast longer-term needs for both quantities and costs, which can help in understanding long-term trends and developing appropriate strategies. Wise policy and program approaches can be identified through comparisons of alternative approaches, and that becomes easier with computer simulations. For these purposes the CR module has been developed, focused at the national level. With a few adaptations it can also be used for regional applications.

## **F. Why Make Projections for Condoms?**

One of the most common reasons for estimating condom needs is to gauge the resource requirements to meet a national goal. National planners may wish to protect a certain proportion of a large population group such as young people against HIV infection, and a projection can show what that goal means in terms of future numbers to be protected, the quantities of condoms needed, and the costs implied. By showing the resources required to achieve any proposed goal, the projections can help planners choose goals that are attainable and meaningful.

Such an exercise is important for each of the significant groups in the population. The estimates for sex workers involve different considerations from those for youth, or for males having casual sex with girl friends. The plan can be specific about the likely costs and program implications for the future depending upon the goals chosen for each group.

Another important use of CR projections is the examination of alternative program configurations. Rather than simply project the

current configuration into the future, the analyst can ask, "What would happen if new program approaches were introduced to raise the proportion of sexual contacts in which condoms are used, especially in certain population groups?" That would change the current focus among the various groups, with new implications for costs, depending also upon the sizes of the groups involved and their coital frequencies.

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## II.

# Steps in Making Projections for Contraceptive Requirements

There are six key steps in making most population-based projections for the CR module. The amount of time spent on each step may vary, depending on the application, but most projection activities will include at least these six steps.

1. **Prepare a demographic projection.** You begin with a population projection prepared with DemProj. The DemProj manual contains instructions on the steps associated with this module. Note that DemProj includes the “EasyProj” option, which draws upon United Nations estimates to set up a projection automatically. If you prefer not to use EasyProj you must collect and enter a variety of demographic estimates to use instead. The first year and final year chosen for the DemProj projection will determine the span of the CR projection.
2. **Collect data.** You will need to obtain local studies that help to decide estimates for the sizes of certain population groups such as sex workers, the approximate coital frequency for each group, and the current percentage of sexual contacts in which condoms are already used. Since the projection will only be as good as the data on which it is based, it is worth the effort to collect and closely examine the available data before starting the projection.
3. **Make assumptions.** All projections require assumptions about the future changes in numerous inputs and in the goals chosen. These should be carefully considered and be based on reasonable selection guidelines.
4. **Enter data.** Once the base year data are collected and decisions are made about projection assumptions, the CR module can be used to enter the data and make a projection of condom requirements and costs.
5. **Examine projections.** Once the projection is made, it is important to examine it carefully. This includes consideration of the output indicators produced. Careful examination of these can act as a check to ensure that the base data and assumptions were understood and entered correctly into the

computer program. This careful examination is also required to ensure that the consequences of the assumptions are fully understood.

6. **Make alternative projections.** Many applications require alternative projections. Once the base projection has been made, the program can be used to quickly generate alternative projections by varying one or more of the model assumptions.



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## III. Inputs for the CR Module

The basic approach in the CR module is to identify the main subgroups in the population for whom condom use is important, such as sex workers or males having casual sex outside marriage. For each group, its numbers are multiplied by its coital frequency and by its proportion of sex acts covered by condoms. A wastage factor is added, to give the final total needed. Costs are determined by the average cost per condom. All data inputs pertain to the entire country being studied, but lacking such data the inputs may be based on local studies, on regional values, or on illustrative values mentioned below. The purposes of this chapter are to discuss each input, and to suggest ways to proceed when exact inputs are not easily available. A few tables are also included for certain inputs to give values found in various countries.

The CR module requires two inputs that are obtained from DemProj: the numbers of males 15–59 and females 15–49, both projected into the future. Another input, for the use of condoms for family planning by couples in union, can be obtained if you also use the FamPlan module, but it is simpler to obtain this input separately.

### A. Configuration Panel

In the Configuration panel, select the subgroups to be included in the analysis.

Standard ones include:

1. Sex workers (females)\*
2. Married men engaging in casual sex with women
3. Unmarried men engaging in casual sex with women
4. Men who have sex with men (MSM)
5. Married or in-union couples (for HIV protection)
6. Family planning users (for pregnancy protection)

If you do not want to include any of these groups simply select that group and click on the “Delete” button.

In addition you may wish to add other groups that are important in your country. Use the "ADD" button to add groups such as:

- Adolescents
- Police/military groups
- Traveling groups such as truck drivers.
- Partners of MSM
- Partners of intravenous drug users (IDUs)

Overlapping Groups: Be careful in choosing groups that overlap since that can cause double-counting. In using overlapping groups be sure to reduce their sizes to offset the overlap. This is especially true if you include adolescents as a separate group; in that case the numbers in certain other groups must be reduced, such as unmarried males engaging in casual sex.

\* Also, in some countries there are part-time, or "indirect" female sex workers who work in bars, etc., who have fewer clients than sex workers. If this group is important you can include it as "Other" and input a lower coital frequency than for sex workers.

## **B. Numbers in Each Group**

The DemProj projection automatically provides the number of males aged 15–59 and females aged 15–49, which are used for the standard groups 2, 3, 4, and 6 above. Therefore you only need to enter the base numbers for sex workers and males having sex with men (MSM), as well as any groups that you add.

Projections for the future numbers in each group are provided by DemProj for all the standard groups except for sex workers and MSM and any groups that you add. For those a simple way is to add a constant percentage for each year equal to the overall population growth rate, such as 2%. However, if the age distribution is unusual a more precise projection may be needed to reflect the rapidly increasing or decreasing numbers entering and leaving the reproductive age range. DemProj automatically allows for the groups based upon it; for the other groups you must be alert to this problem.

Here are suggestions for obtaining the numbers for sex workers and MSM:

(a) Sex workers: One rule of thumb is 1% to 4% of urban women aged 15–49. Countries vary greatly however, and judgment is required. In at least some countries sex workers have formed their own organization for self-protection, and it may provide estimates of the numbers of sex workers. Several public and private agencies

are concerned with sex workers and they may have numbers. Local surveys may also be helpful.

(b) Men who have sex with men (MSM): Local surveys or informal estimates may be available. One rule of thumb is 1% to 5% of males aged 15–59. Countries vary greatly however, and judgment is required.

### **C. Percentage Entry for Each Group**

A percentage figure must be entered for each group (except for sex workers, MSM, and any added groups), to adjust the DemProj numbers downward. This creates the relevant subgroups that should be using condoms.

(a) Married men engaging in casual sex (with women other than sex workers): DemProj gives the number of all males aged 15–59, and this must be adjusted downward to obtain the relevant group. The proportion married or in union may come from a national survey or from a recent census; if not refer to **Table 1** for women, as an approximation for men. Next, the proportion of married men having casual sex contacts may be obtained from a national survey; otherwise it must be estimated from any information available. You multiply the proportion married by the proportion with casual sex contacts and enter that as the input (enter it as a percentage).

The total number of males aged 15–59 is projected automatically by DemProj for each year; it will be multiplied by the percentage you enter for each future year.

As with other inputs alternative assumptions can be tried and the results examined to determine whether variations in the assumptions matter significantly in the final estimates.

(b) Unmarried men engaging in casual sex (with women other than sex workers): As above, DemProj gives the number of males aged 15–59, and this must be adjusted downward. The percentage unmarried is simply 100% minus the percentage married/in union (above). Then the proportion having casual sex contacts may be obtained from a survey; otherwise it must be estimated. You multiply the proportion unmarried by the proportion with casual sex contacts and enter that as the input (enter it as a percentage).

**Table 1. Proportion of females aged 15–49 married or in-union**

Afghanistan	0.794	Estonia	0.640
Albania	0.640	Ethiopia	0.718
Algeria	0.576	Fiji	0.640
Angola	0.640	Finland	0.640
Argentina	0.627	France	0.640
Armenia	0.640	French Guiana	0.640
Australia	0.640	French Polynesia	0.640
Austria	0.640	Gabon	0.640
Azerbaijan	0.640	Gambia	0.640
Bahamas	0.640	Georgia	0.640
Bahrain	0.640	Germany	0.640
Bangladesh	0.640	Ghana	0.703
Barbados	0.640	Greece	0.640
Belarus	0.640	Guadeloupe	0.640
Belgium	0.640	Guam	0.640
Belize	0.640	Guatemala	0.642
Benin	0.760	Guinea	0.840
Bhutan	0.640	Guinea-Bissau	0.640
Bolivia	0.620	Guyana	0.675
Bosnia and Herzegovina	0.640	Haiti	0.580
Botswana	0.391	Honduras	0.670
Brazil	0.601	Hungary	0.640
Brunei Darussalam	0.640	Iceland	0.640
Bulgaria	0.640	India	0.786
Burkina Faso	0.838	Indonesia	0.682
Burundi	0.672	Iran (Islamic Republic of)	0.733
Cambodia	0.640	Iraq	0.606
Cameroon	0.741	Ireland	0.640
Canada	0.640	Israel	0.640
Cape Verde	0.640	Italy	0.640
Central African Republic	0.694	Jamaica	0.730
Chad	0.782	Japan	0.640
Channel Islands	0.640	Jordan	0.558
Chile	0.565	Kazakhstan	0.660
China	0.714	Kenya	0.614
China, Hong Kong SAR	0.594	Kuwait	0.624
China, Macao SAR	0.640	Kyrgyzstan	0.700
Colombia	0.547	Lao People's Democratic Republic	0.640
Comoros	0.640	Latvia	0.640
Congo	0.562	Lebanon	0.640
Costa Rica	0.610	Lesotho	0.390
Côte d'Ivoire	0.651	Liberia	0.675
Croatia	0.640	Libyan Arab Jamahiriya	0.640
Cuba	0.621	Lithuania	0.640
Cyprus	0.640	Luxembourg	0.640
Czech Republic	0.640	Madagascar	0.628
Democratic People's Republic of Korea	0.640	Malawi	0.725
Democratic Republic of the Congo	0.758	Malaysia	0.590
Denmark	0.640	Maldives	0.640
Djibouti	0.640	Mali	0.848
Dominican Republic	0.592	Malta	0.640
East Timor	0.640	Martinique	0.640
Ecuador	0.670	Mauritania	0.615
Egypt	0.653	Mauritius	0.740
El Salvador	0.548	Melanesia	0.640
Equatorial Guinea	0.640	Mexico	0.610
Eritrea	0.667	Micronesia	0.640

**Table 1. Proportion of females aged 15–49 married or in-union (cont.)**

Micronesia (Federated States of)	0.640	Serbia and Montenegro	0.640
Mongolia	0.640	Sierra Leone	0.640
Morocco	0.553	Singapore	0.575
Mozambique	0.744	Slovakia	0.640
Myanmar	0.582	Slovenia	0.640
Namibia	0.416	Solomon Islands	0.640
Nepal	0.797	Somalia	0.640
Netherlands	0.640	South Africa	0.462
Netherlands Antilles	0.640	Spain	0.640
New Caledonia	0.640	Sri Lanka	0.586
New Zealand	0.640	Sudan	0.651
Nicaragua	0.680	Suriname	0.640
Niger	0.855	Swaziland	0.416
Nigeria	0.783	Sweden	0.640
Norway	0.640	Switzerland	0.640
Occupied Palestinian Territory	0.640	Syrian Arab Republic	0.640
Oman	0.640	Tajikistan	0.640
Pakistan	0.711	TFYR Macedonia	0.640
Panama	0.564	Thailand	0.593
Papua New Guinea	0.640	Togo	0.730
Paraguay	0.613	Tonga	0.640
Peru	0.583	Trinidad and Tobago	0.687
Philippines	0.596	Tunisia	0.552
Poland	0.640	Turkey	0.687
Polynesia	0.640	Turkmenistan	0.640
Portugal	0.640	Uganda	0.726
Puerto Rico	0.589	Ukraine	0.640
Qatar	0.640	United Arab Emirates	0.768
Republic of Korea	0.617	United Kingdom	0.640
Republic of Moldova	0.687	United Republic of Tanzania	0.670
Réunion	0.640	United States of America	0.640
Romania	0.640	United States Virgin Islands	0.640
Russian Federation	0.674	Uruguay	0.598
Rwanda	0.578	Uzbekistan	0.702
Saint Lucia	0.640	Vanuatu	0.640
Saint Vincent and the Grenadines	0.640	Venezuela	0.640
Samoa	0.640	VietNam	0.607
Sao Tome and Principe	0.640	Yemen	0.640
Saudi Arabia	0.640	Zambia	0.610
Senegal	0.681	Zimbabwe	0.618

Sources: United Nations, Levels and Trends of Contraceptive Use as Assessed in 1998, (Table 13); *DHS Comparative Studies* Nos. 10 and 21; Ross, Stover, and Willard, 1999.

As with married men above, the total number of males aged 15–59 is projected automatically in DemProj for each year, which will be multiplied by the percentage you enter for each future year.

(c) Married/in union couples: this group concerns the use of condoms by married couples for HIV protection, as distinct from the use for pregnancy protection, which is covered in the next group. Survey data show little correlation between the reported use of condoms for HIV protection and its use for pregnancy protection; therefore these two groups allow for the different rates of reporting for the two purposes.

DemProj automatically provides the number of females aged 15–49, which you must adjust for the percentage married. Enter the percentage married/in union from a recent survey or census, or use the figure in Table 1. The figure you enter will be further adjusted below for the percentage of sex acts in which condoms are currently used by married couples for HIV protection, which in many countries is quite low. Then input the future percentages according to any increases expected. Note again that all this pertains to the use of condoms for HIV protection. The next entry pertains to the use of condoms by couples for pregnancy protection. Both groups are included because, as noted, surveys show very little correspondence between the prevalence of condom use for pregnancy protection and for HIV protection.

(d) Family planning users: Some couples use condoms just for pregnancy prevention. Again, DemProj automatically provides the number of females 15–49, and this must be adjusted both for the proportion married/in union, and for the proportion using any kind of contraception. (Later, in the section for the proportion of sex acts in which condoms are used, you will enter the percentage of all contraception accounted for by condoms.) Refer to a national survey if one is available for this information; otherwise local surveys may help.

(If you wish you may use all women 15–49 rather than only married women; in that case enter here the percentage of all women using any contraceptive method. Then in the section below for the percentage of sex acts covered by condoms, enter the percentage of all use accounted for by condom use among all women rather than among married women. )

To repeat: in this section no percentages need to be entered for sex workers, MSM, or any groups that you add, since you already specified their final numbers in the first section for numbers.

#### **D. Coital Frequency for Each Group (number of acts per year)**

For each group in the analysis an estimate of coital frequency is required, both for the baseline year and for future years. (A simple procedure is to keep the frequency constant through time for each group; however, a program objective may be to encourage a reduction in sexual contacts by certain groups.) Enter the coital frequency for each group in the base year. You enter the estimates in terms of sex acts per year, but it may be easier to think in terms of acts per week or month. Some surveys provide coital frequency at least for married/in union couples, averaging about one to two times per week or 78 per year as a midpoint. For sex workers, an average of about three clients per day, five days a week, produces about 750 acts per year. The numbers will be much less for the other groups.

Helpful figures may come from surveys that contain questions pertaining to coital frequency, as shown in **Table 2**. By doing additional tabulations on the survey data set for the country of interest it may be possible to tabulate coital frequency for various subgroups of the population. In any case, alternative assumptions can be tried and the results examined for the sensitivity of the final numbers to each alternative, since some groups matter much more than others due to their sizes or frequencies of condom use.

**Table 2. Coital Frequency in Selected Countries. DHS Surveys**

Country	Monthly Frequency		
	All Sexually Active Married Women	Users of Coitus-Dependent Methods	Equivalent: No. Acts/Year*
<b>DHS I Data</b>			
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	--	--
<b>Mean</b>	<b>5.5</b>	<b>5.1</b>	<b>61</b>
<b>DHS II Data</b>			
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
<b>Mean</b>	<b>5.5</b>	<b>5.5</b>	<b>66</b>

\*Based on married women using coitus-dependent methods.

-- The 'n' was 10 or fewer women. Source: John Stover, Jane Bertrand, and James Shelton. "Empirically Based Conversion Factors for Calculating Couple-Years of Protection." *Evaluation Review*, Vol. 24, No. 1, Feb. 2000, pp. 3-46. Sage Publications, Inc. Table A6.



## E. Percentage of Acts with Condoms

For each group the percentage of sex acts covered by condom use must be entered for the base year and future years. Countries differ greatly in condom use, so each group must be considered separately in light of the available local information. Enter the percentage of sex acts in which condoms are used and then decide how to project the percentages into the future.

For the "Family Planning User" group you enter the proportion of married contraceptive users who rely upon condoms. In the earlier section for percentages you already entered the percentage of all women who are both married and use any contraceptive method. Here you enter the percentage of users who rely upon condoms. In combination with the DemProj number of all women the result is the number of married women who use condoms, which is automatically multiplied by coital frequency. (Unmarried women are accounted for already by men engaging in casual sex.)

Regarding data sources for this section on condom use, surveys often provide information not only for married couples and for casual sex by men but also for condom use with sex workers. Interviews with relevant government departments and with NGOs can also be good sources. **Tables 3 and 4 (final columns)** provide several indicators of condom use taken from national surveys.

To decide the future level of condom use for each risk group there are several options, depending on the purpose of the projection:

1) Constant rates. Current levels of use can be kept constant into the future. That will then illustrate how population growth and changes in risk group sizes alone will affect condom needs.

2) Comparison countries. Several realistic scenarios can be generated by using the figures in Table 3 to select levels of use from similar countries that have higher use rates. For example, the rates in Zimbabwe, Namibia, or Uganda may be selected as levels that could be achieved given sufficient funding, good logistics, and sufficient promotional support. Since these rates have been achieved somewhere, they are clearly possible at some point in the future.

3) Epidemic effect. In order to achieve the public health goal of significantly reducing the number of new HIV and STI infections, condom use rates need to reach high levels. For groups with many sexual partners, such as sex workers, use rates need to reach 60–80 percent to significantly reduce the risk of infection. In a study of resource requirements to combat HIV/AIDS in low and middle

income countries, Schwartlander et al.<sup>1</sup> estimated that effective condom use rates would need to rise to 60–80% among sex workers and among men who have sex with men, and to 60% for casual sexual contacts. Condom use is unlikely to rise to very high levels in marital sexual contacts, but should reach 10–30% for those couples where at least one partner has outside contacts.

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<sup>1</sup> B. Schwartlander, John Stover, N. Walker, L. Bollinger, J.P. Gutierrez, W. McGreevey, M. Opuni, S. Forsythe, L. Kumaranayake, C. Watts and S. Bertozzi. "Resource Needs for HIV/AIDS," *Science*, Vol 292, 20 June 2001. pps. 2434-2436.

**Table 3. Percent Reporting Condom Use and Commercial Sex, DHS Surveys**

	Condom use at last higher risk sex		Condom use at last sex with a spouse or cohabiting partner		Condom use at last sex with anyone		Commer- cial sex in last year	Condom use at last commercial sex, reported by client	
	Male	Female	Male	Female	Male	Female		Male	Female
<b>Sub-Saharan Africa</b>									
Benin 1996	21	9	4	1	9	2	17	-	-
Burkina Faso 1998/99	57	39	8	2	21	5	8	-	-
Cameroon 1998	29	15	5	3	16	6	20	-	-
Central African Rep. 1994/95	-	-	-	-	-	4	10	-	-
Cote d'Ivoire 1994	-	-	-	-	23	7	-	-	-
Cote d'Ivoire 1998	49	21	6	3	-	-	5	-	-
Ethiopia 2000	30	14	0	0	5	1	-	-	-
Ghana 1998	-	-	-	-	15	6	-	-	-
Guinea 1999	33	17	3	1	14	3	4	-	-
Kenya 1998	44	16	8	3	21	6	-	-	-
Madagascar 1997	-	-	-	-	-	1	-	-	-
Malawi 2000	39	29	6	3	14	5	7	41	-
Mali 1995/96	36	-	3	-	10	1	8	-	-
Mali 2001	33	15	1	1	9	2	-	-	-
Mozambique 1997	-	-	4	1	6	1	-	-	-
Namibia 2000	67	43	18	12	45	28	1	64*	-
Nigeria 1999	-	-	-	-	14	5	9	48	-
Rwanda 2000	51	15	1	1	6	1	1	-	-
South Africa 1998	-	16	-	7	-	12	-	-	-
Tanzania 1996	32	16	4	2	11	4	-	-	-
Tanzania 1999	34	22	5	4	16	8	-	-	-
Togo 1998	38	19	6	2	19	6	5	-	-
Uganda 1995	36	20	3	1	9	3	-	-	-
Uganda 2000/01	59	38	4	3	15	7	1	70*	-
Zambia 1996	40	20	8	5	20	8	21	-	-
Zambia 2001/02	44	33	10	8	19	12	9	45	-
Zimbabwe 1994	59	38	12	7	28	10	-	-	-
Zimbabwe 1999	70	43	7	4	28	9	5	82	-
<b>North Africa/ West Asia/Europe</b>									
Armenia 2000	44	20*	7	7	13	7	2	87*	-
<b>Central Asia</b>									
Kazakhstan 1999	58	22	8	4	20	7	1	-	-
<b>South &amp; Southeast Asia</b>									
Cambodia 2000	-	43*	-	1	-	1	-	-	-
Nepal 1996	-	-	-	3	-	-	-	-	-
Nepal 2001	45	-	6	4	6	-	0	-	-
<b>Latin America &amp; Caribbean</b>									
Bolivia 1998	-	-	6	3	14	5	-	-	-
Brazil 1996	54	32	7	6	25	11	3	59	-
Dominican Rep. 1996	44	12	2	2	20	4	11	-	-
Dominican Rep. 2002	50	25	1	2	20	6	8	74	-
Haiti 1994	-	-	-	-	-	-	2	-	-
Haiti 2000	25	16	3	2	14	6	6	34	-
Peru 2000	-	18	-	7	-	8	-	-	-
<b>Means</b>	<b>43.6</b>	<b>23.1</b>	<b>5.5</b>	<b>3.5</b>	<b>16.4</b>	<b>6.1</b>	<b>6.8</b>	<b>54.7</b>	

Source: ORC Macro HIV Survey Indicators Database.

**Table 4. Indicators for AIDS and Condom Use; All Women Regardless of Marital Status.  
DHS Surveys**

	% Who have heard of AIDS	% saying no way to avoid AIDS	% knowing no way to avoid AIDS	% making no change in sexual behavior to avoid AIDS	% who know about condom	% Used condom last sex last month	% used condom last sex earlier	% used condom for family planning
<b>Sub-Saharan Africa</b>								
Benin 1996	81.7	7.4	32.4	48.7	69.1	1.3	1.0	1.4
Benin 2001	95.5	16.9	40.3	-	-	-	-	-
Burkina Faso 1992/93	84.1	-	40.7	-	-	-	-	-
Burkina Faso 1998/99	87.2	9.0	29.9	47.0	76.6	2.6	2.2	3.2
Cameroon 1998	89.7	4.6	21.3	42.3	82.3	3.7	2.6	4.3
CAR 1994/95	92.9	14.6	-	22.8	66.5	2.9	1.7	1.6
Chad 1996/97	60.0	15.6	36.0	33.5	40.5	0.7	0.6	0.5
Comoros 1996	97.9	9.3	36.5	29.4	91.8	2.9	1.5	2.5
Cote d'Ivoire 1994	93.2	15.8	15.8	-	-	-	-	-
Cote d'Ivoire 1998/99	96.7	0.9	4.4	25.7	89.5	4.1	4.0	5.0
Eritrea 1995	72.2	4.8	19.4	58.3	54.7	0.8	0.7	0.5
Ethiopia 2000	84.7	6.3	15.9	-	-	-	-	-
Gabon 2000	97.7	7.0	18.8	2.2	96.6	8.4	6.4	9.4
Ghana 1993	94.7	-	-	-	-	-	-	-
Ghana 1998	96.7	5.4	19.5	21.3	90.5	2.8	3.0	3.3
Guinea 1999	94.9	8.9	17.0	14.4	61.5	1.5	0.8	1.5
Kenya 1998	99.0	8.5	18.1	22.6	94.7	3.0	2.6	1.8
Madagascar 1997	68.9	7.9	32.6	43.8	69.5	1.1	0.6	1.1
Malawi 1992	95.2	27.5	-	-	-	-	-	-
Malawi 2000	98.9	4.2	6.0	-	-	-	-	-
Mali 1995/96	76.7	8.7	27.7	50.2	65.3	1.1	0.9	0.9
Mali 2001	90.3	17.7	39.2	-	-	-	-	-
Mauritania 2000/01	76.3	24.0	1.4	-	49.3	1.6	0.6	0.8
Mozambique 1997	82.2	39.9	65.8	23.0	51.5	0.9	0.4	0.5
Niger 1998	54.6	7.4	30.7	54.4	64.9	0.7	0.4	0.3
Nigeria 1999	74.4	5.9	25.7	25.6	65.5	3.2	2.9	3.6
Rwanda 2000	99.6	0.8	3.9	-	-	-	-	-
Senegal 1992/93	81.1	8.3	32.4	-	-	-	-	-
Senegal 1997	-	4.2	21.2	-	-	-	-	-
South Africa 1998	96.7	2.5	2.5	-	-	-	-	-
Tanzania 1992	93.2	-	-	-	-	-	-	-
Tanzania 1996	97.0	11.8	35.9	18.1	81.1	2.3	1.1	1.5
Tanzania 1999	-	6.3	15.6	-	-	-	-	-
Togo 1998	95.5	9.0	28.7	47.5	91.2	2.8	2.9	3.9
Uganda 1995	98.9	9.6	13.6	-	80.8	1.6	1.5	1.7
Zambia 1996	99.6	8.6	16.3	19.9	94.1	3.8	4.6	4.0
Zambia 2001/02	99.3	6.2	14.9	-	-	-	-	-
Zimbabwe 1994	98.7	9.3	5.6	78.9	96.1	5.6	4.1	3.1
Zimbabwe 1999	96.5	5.3	13.7	-	-	-	-	-

**Table 4. Indicators for AIDS and Condom Use; All Women Regardless of Marital Status.  
DHS Surveys (cont.)**

	% Who have heard of AIDS	% saying no way to avoid AIDS	% knowing no way to avoid AIDS	% making no change in sexual behavior to avoid AIDS	% who know about condom	% Used condom last sex last month	% used condom last sex earlier	% used condom for family planning
<b>North Africa/West Asia/Europe</b>								
Egypt 2000	-	-	-	-	-	-	-	-
Jordan 1997	97.9	1.4	11.8	-	-	-	-	-
Turkey 1998	84.3	3.3	29.6	-	-	-	-	-
<b>Central Asia</b>								
Kazakhstan 1999	-	2.8	21.5	-	-	-	-	-
<b>South &amp; Southeast Asia</b>								
Bangladesh 1996/97	18.9	41.1	68.8	-	-	-	-	-
Bangladesh 1999/2000	-	12.0	53.0	-	-	-	-	-
Cambodia 2000	94.8	2.2	23.6	-	-	-	-	-
India 1998/99	40.3	17.5	32.7	-	-	-	-	-
Indonesia 1994	38.1	21.4	5.6	90.9	91.7	-	-	1.8
Indonesia 1997	51.5	18.6	4.5	88.7	86.0	-	-	1.1
Nepal 1996	26.8	8.2	21.8	92.2	97.5	4.0	1.1	3.7
Nepal 2001	49.6	6.5	24.0	-	-	-	-	-
Vietnam 1997	90.8	3.7	14.4	-	-	-	-	-
<b>Latin America &amp; Caribbean</b>								
Bolivia 1994	65.6	7.0	29.4	62.0	76.2	3.0	1.6	2.0
Bolivia 1998	78.7	6.2	19.4	50.8	89.2	3.4	1.8	3.4
Brazil 1991 <sup>(1)</sup>	95.4	-	30.5	-	-	-	-	-
Brazil 1996	99.6	1.7	9.5	82.1	99.4	6.9	4.0	5.5
Colombia 1995	98.8	3.2	9.7	81.9	98.4	4.5	3.1	4.1
Colombia 2000	98.5	1.8	8.5	-	-	-	-	-
<b>Dominican Republic 1996</b>								
Dominican Republic 1996	99.7	4.3	-	57.9	99.1	2.0	1.9	1.6
<b>Dominican Republic 1999</b>								
Dominican Republic 1999	-	4.8	10.0	-	-	-	-	-
Guatemala 1995	71.0	11.4	36.9	67.0	72.3	3.2	1.3	2.7
Haiti 1994/95	98.1	-	-	69.0	96.5	-	-	3.0
Haiti 2000	49.4	24.7	36.3	-	-	-	-	-
Nicaragua 1997/98	95.6	5.7	17.1	59.1	94.6	2.7	1.6	2.1
Peru 1996	89.2	6.7	21.9	68.1	94.3	4.6	2.2	4.7
Peru 2000	87.3	2.9	14.0	-	-	-	-	-

Source: ORC Macro. MEASURE DHS+ STAT Compiler. Accessed May 26, 2004.

## **F. Wastage**

Enter a percentage of all condoms that will never be used (wasted). This must take into account both (a) condoms given to people that are never used (discarded, etc.) and (b) condoms brought into the country that are wasted in the pipeline (lost, spoiled, expired past shelf life, etc.). Enter an estimate for the base year and decide how it may change in the future.

The two components of wastage are best considered separately. Regarding condoms given to people that are never used (discarded, etc.), much may depend upon the proportions that are purchased as contrasted with those given free. In some countries commercial sales or social marketing programs account for most condoms distributed, and since people are paying they are more likely to actually use more of them. In other countries most supplies are given free through the health system. In either case an estimate is needed for the proportion of all condoms that are put into the hands of people but are not actually used.

The other component of wastage exists within the distribution system itself, from port to facility or sales outlet. Some stocks expire, some are lost or are diverted to other countries, and some simply fill up the initial pipeline or expand the permanent pipeline reserves. All these are quite separate from short-term ups and downs in stocks and flows, which can be ignored in these long run projections.

## **G. Percentage of Female Condoms**

Enter the percentage of all condoms that will be female condoms. In most countries this is quite low, and because the cost is currently so much higher than for male condoms this entry will strongly affect the total cost estimate. Enter the base figure and any future changes. Perhaps the unit cost will decline in the future if production runs increase sufficiently.

If as in many countries the use of female condoms is negligible it can be ignored (set to zero). It is never a large figure, but in some countries it is expected to increase. However, the cost implications are currently very significant.

## H. Costs

Enter the average cost per male condom and per female condom for the base year and for future years. The average cost of condoms will depend heavily upon the source of procurement, whether national funds or donations. Prices vary by donor; for example, the prices paid by USAID are well above those paid by the UNFPA. This is true for the baseline year; it may change in future years depending upon shifts in which donors provide most condoms. The price paid by each donor should be multiplied by its share of the total, to obtain the average. Currently an average figure of about 3 US cents per male condom and 70 US cents per female condom may be used, but preferably the donor-specific costs will be obtained.

(You can state the cost in a local currency; in that case the final cost results will be in the same currency.)

Average condom prices paid by UNFPA and USAID in early 2004:

*For male condoms:* USAID: 4.95 US cents each; UNFPA: 2.0 US cents each.

*For female condoms* an average price currently is about U.S. \$ 0.70 (70 cents)

## I. Auxiliary Table

**Table 5** provides further data for a number of countries to give background information that may be helpful. It pertains to women who said they knew of AIDS, and tells what percentage had changed their behavior, e.g., by beginning to use condoms. All data are given according to marital status.

**Table 5. AIDS Prevention Behavior**

Percentage of women who know of AIDS by changes in behavior in order to avoid AIDS, by marital status.

	No change in sexual behavior	Did not start sex; kept virginity	Stopped all sex	Began using condom	Restricted to one sex partner	Reduced number of partners	Asked spouse to be faithful	No homo- sexual relations	Sample No.
<b>Benin 1996</b>									
Currently married	53.3	0.1	1.1	1.0	26.1	1.1	21.7	-	3,372
Formerly married	52.0	0.9	15.1	5.8	18.8	4.5	6.5	-	209
Never married	31.0	34.3	4.7	3.6	20.8	2.7	5.3	-	908
Total	48.7	7.0	2.5	1.8	24.7	1.6	17.7	-	4,488
<b>Burkina Faso 1998/99</b>									
Currently married	50.5	0.2	0.4	1.6	38.5	1.1	11.9	-	4,586
Formerly married	47.0	1.5	16.8	9.1	21.6	3.6	3.4	-	152
Never married	29.1	42.4	1.5	12.0	13.3	2.1	3.3	-	882
Total	47.0	6.9	1.1	3.4	34.1	1.3	10.3	-	5,619
<b>Cameroon 1998</b>									
Currently married	50.1	0.3	0.7	3.7	37.7	5.9	6.9	-	3,216
Formerly married	32.5	0.3	11.6	11.4	35.1	13.5	2.2	-	507
Never married	25.7	18.9	4.4	12.5	33.6	8.8	2.1	-	1,213
Total	42.3	4.9	2.7	6.7	36.4	7.4	5.2	-	4,936
<b>CAR 1994/95</b>									
Currently married	21.9	-	1.5	2.2	68.1	6.1	-	-	3,807
Formerly married	17.6	-	22.9	8.0	31.1	22.2	-	0.2	627
Never married	29.7	-	7.2	8.6	23.5	13.3	-	-	1,033
Total	22.8	-	5.0	4.1	55.4	9.3	-	-	5,466
<b>Chad 1996/97</b>									
Currently married	36.1	0.1	1.3	0.7	21.6	1.1	51.3	-	3,536
Formerly married	30.7	5.0	39.6	1.8	16.1	3.5	12.2	-	372
Never married	19.2	63.1	1.7	2.5	6.7	1.5	8.5	-	561
Total	33.5	8.4	4.5	1.0	19.2	1.4	42.6	-	4,470
<b>Comoros 1996</b>									
Currently married	40.0	0.5	1.1	5.6	44.1	4.7	-	-	1,594
Formerly married	33.8	2.3	13.5	8.6	31.5	9.0	-	-	222
Never married	14.1	61.5	1.3	3.8	9.1	1.1	-	-	1,169
Total	29.4	24.5	2.1	5.1	29.4	3.6	-	-	2,985
<b>Cote d'Ivoire 1998/99</b>									
Currently married	29.9	0.1	0.2	3.3	52.9	1.8	25.6	-	1,785
Formerly married	22.1	0.9	15.8	15.5	43.1	4.2	12.7	-	248
Never married	18.5	25.9	4.5	16.8	34.4	2.9	10.5	0.1	905
Total	25.7	8.1	2.8	8.5	46.3	2.3	19.8	-	2,939
<b>Eritrea 1995</b>									
Currently married	64.7	0.1	0.7	0.7	11.7	0.2	15.5	0.1	2,234
Formerly married	62.8	0.2	13.9	2.3	7.3	1.8	1.7	0.1	541
Never married	39.1	43.7	0.9	0.6	1.4	0.1	0.7	0.6	874
Total	58.3	10.5	2.7	0.9	8.6	0.4	9.9	0.2	3,649
<b>Gabon 2000</b>									
Currently married	1.9	-	5.1	27.2	26.8	3.9	7.0	0.1	3,248
Formerly married	1.6	-	17.4	41.6	14.0	7.3	4.8	-	805
Never married	3.0	-	11.9	40.5	14.7	4.4	3.3	0.1	1,987
Total	2.2	-	9.0	33.5	21.1	4.5	5.5	0.1	6,040



**Table 5. AIDS Prevention Behavior (cont.)**

Percentage of women who know of AIDS by changes in behavior in order to avoid AIDS, by marital status.

	No change in sexual behavior	Did not start sex; kept virginity	Stopped all sex	Began using condom	Restricted to one sex partner	Reduced number of partners	Asked spouse to be faithful	No homo- sexual relations	Sample No.
<b>Ghana 1998</b>									
Currently married	23.6	0.1	0.4	5.9	68.6	3.0	-	0.4	3,017
Formerly married	19.0	0.4	21.2	8.7	46.7	8.1	-	-	556
Never married	16.4	35.2	6.7	6.7	29.3	2.1	-	0.4	1,111
Total	21.3	8.4	4.3	6.4	56.7	3.4	-	0.4	4,683
<b>Guinea 1999</b>									
Currently married	15.5	0.8	2.0	2.6	69.0	8.9	28.1	0.4	5,256
Formerly married	12.9	1.2	11.8	6.8	60.7	13.2	15.4	0.4	234
Never married	8.2	51.7	2.4	6.8	27.2	5.9	10.4	0.1	919
Total	14.4	8.1	2.4	3.3	62.7	8.6	25.1	0.4	6,409
<b>Kenya 1998</b>									
Currently married	25.5	0.9	1.3	1.7	58.7	3.4	22.3	0.4	4,785
Formerly married	18.1	2.0	25.4	4.0	41.6	11.4	9.2	0.7	668
Never married	17.9	39.6	11.2	4.0	23.8	7.5	5.0	0.7	2,351
Total	22.6	12.7	6.3	2.6	46.7	5.3	16.0	0.5	7,804
<b>Madagascar 1997</b>									
Currently married	46.8	0.1	0.1	0.6	18.9	1.1	-	-	3,040
Formerly married	37.9	2.5	3.7	2.1	13.9	4.7	-	-	645
Never married	39.3	10.9	1.8	1.1	8.8	3.3	-	-	1,183
Total	43.8	3.0	1.0	0.9	15.8	2.1	-	-	4,867
<b>Mali 1995/96</b>									
Currently married	54.0	0.1	0.7	1.4	40.9	1.0	6.5	-	6,205
Formerly married	45.3	-	17.4	3.8	30.1	2.4	4.0	0.6	189
Never married	28.2	33.8	3.0	5.9	30.2	1.1	4.5	0.2	1,050
Total	50.2	4.9	1.5	2.1	39.1	1.0	6.1	0.1	7,443
<b>Mauritania 2000/01</b>									
Currently married	-	-	2.0	0.8	8.3	2.5	6.9	0.5	3,404
Formerly married	-	-	4.3	0.2	4.4	1.2	2.0	0.2	797
Never married	-	-	4.2	0.5	1.8	1.1	1.1	0.3	1,699
Total	-	-	2.9	0.7	5.9	1.9	4.5	0.4	5,900
<b>Mozambique 1997</b>									
Currently married	22.8	0.4	0.5	2.2	45.3	4.1	-	-	5,303
Formerly married	26.6	1.0	14.7	4.1	24.7	9.9	-	-	794
Never married	21.6	20.1	2.7	5.7	21.0	6.8	-	-	1,123
Total	23.0	3.5	2.4	3.0	39.3	5.2	-	-	7,220
<b>Niger 1998</b>									
Currently married	59.7	-	0.4	0.7	31.6	0.2	11.4	-	3,259
Formerly married	41.9	-	39.9	6.7	14.5	4.6	2.4	1.2	253
Never married	31.9	69.6	4.0	0.9	4.8	0.4	0.8	-	624
Total	54.4	10.5	3.4	1.1	26.5	0.5	9.3	0.1	4,137
<b>Nigeria 1999</b>									
Currently married	28.4	0.4	2.3	3.8	41.4	4.6	33.1	0.8	4,007
Formerly married	27.2	0.4	26.8	3.8	26.1	3.5	17.1	0.2	257
Never married	19.2	35.4	7.1	8.0	27.4	3.8	11.8	0.7	1,841
Total	25.6	10.9	4.8	5.1	36.5	4.3	26.0	0.7	6,105

**Table 5. AIDS Prevention Behavior (cont.)**

Percentage of women who know of AIDS by changes in behavior in order to avoid AIDS, by marital status.

	No change in sexual behavior	Did not start sex; kept virginity	Stopped all sex	Began using condom	Restricted to one sex partner	Reduced number of partners	Asked spouse to be faithful	No homo- sexual relations	Sample No.
<b>Tanzania 1996</b>									
Currently married	22.2	-	3.7	1.2	60.0	16.1	-	-	5,249
Formerly married	16.7	0.1	25.3	5.2	36.8	17.7	-	-	801
Never married	7.0	55.0	6.6	2.7	22.3	8.3	-	-	1,826
Total	18.1	12.8	6.6	2.0	48.9	14.5	-	-	7,876
<b>Togo 1998</b>									
Currently married	51.1	0.1	1.2	1.2	35.0	2.4	17.4	-	5,533
Formerly married	48.7	1.2	16.9	2.8	27.9	4.5	7.2	-	588
Never married	37.3	23.2	4.9	10.3	28.6	4.3	3.8	0.1	2,064
Total	47.5	6.0	3.3	3.6	32.9	3.1	13.2	-	8,186
<b>Uganda 1995</b>									
Currently married	-	-	0.6	1.0	57.6	3.0	-	-	5,082
Formerly married	-	-	38.8	3.1	28.5	5.6	-	-	816
Never married	-	-	27.8	5.5	16.3	2.5	-	-	1,094
Total	-	-	9.3	1.9	47.7	3.3	-	-	6,993
<b>Zambia 1996</b>									
Currently married	21.7	0.1	0.7	0.9	73.5	1.6	15.3	-	4,889
Formerly married	16.4	0.4	39.3	5.3	38.4	5.0	1.8	-	1,081
Never married	17.2	40.0	16.5	4.5	25.0	3.4	1.1	-	2,014
Total	19.9	10.2	9.9	2.4	56.5	2.5	9.9	-	7,986
<b>Zimbabwe 1994</b>									
Currently married	84.2	-	0.2	2.3	9.6	0.7	-	-	3,736
Formerly married	53.1	-	8.8	16.8	21.9	6.2	-	-	687
Never married	77.6	-	8.1	3.0	5.6	2.4	-	-	1,628
Total	78.9	-	3.3	4.2	9.9	1.8	-	-	6,051
<b>Indonesia 1994</b>									
Currently married	95.9	-	0.1	0.1	0.8	0.1	-	-	10,183
Formerly married	-	-	-	-	-	-	-	-	562
Total	90.9	-	0.1	0.1	0.8	0.1	-	-	10,745
<b>Indonesia 1997</b>									
Currently married	93.5	-	0.3	0.1	1.8	0.1	-	-	14,068
Formerly married	-	-	-	-	-	-	-	-	767
Total	88.7	-	0.3	0.1	1.7	0.1	-	-	14,835
<b>Nepal 1996</b>									
Currently married	93.3	-	0.2	0.9	2.3	0.1	-	-	2,149
Formerly married	72.1	-	16.6	-	-	-	-	-	114
Total	92.2	-	1.0	0.8	2.2	-	-	-	2,263
<b>Bolivia 1994</b>									
Currently married	86.0	-	1.6	1.0	4.8	-	-	0.1	3,309
Formerly married	78.5	-	9.3	2.3	4.3	-	-	-	464
Never married	15.2	-	2.7	0.8	2.6	-	-	-	1,859
Total	62.0	-	2.6	1.0	4.0	-	-	0.1	5,644

**Table 5. AIDS Prevention Behavior (cont.)**

Percentage of women who know of AIDS by changes in behavior in order to avoid AIDS, by marital status.

	No change in sexual behavior	Did not start sex; kept virginity	Stopped all sex	Began using condom	Restricted to one sex partner	Reduced number of partners	Asked spouse to be faithful	No homo- sexual relations	Sample No.
<b>Bolivia 1998</b>									
Currently married	74.3	-	1.7	2.5	16.7	-	-	-	4,964
Formerly married	60.3	-	14.4	8.5	16.7	-	-	-	672
Never married	11.9	-	3.1	1.9	4.5	-	-	-	3,172
Total	50.8	-	3.2	2.8	12.3	-	-	-	8,809
<b>Brazil 1996</b>									
Currently married	90.8	-	0.2	1.0	4.7	0.5	-	-	7,561
Formerly married	63.1	0.4	6.9	7.4	12.2	6.7	-	0.1	1,174
Never married	70.8	10.3	1.3	5.0	5.3	2.3	-	-	3,823
Total	82.1	3.2	1.2	2.9	5.6	1.6	-	-	12,558
<b>Colombia 1995</b>									
Currently married	90.6	-	0.3	1.8	2.8	0.2	0.9	-	6,038
Formerly married	70.9	0.2	9.4	5.1	7.2	1.1	0.1	-	1,440
Never married	71.6	9.3	2.5	4.7	3.7	0.4	0.1	-	3,533
Total	81.9	3.0	2.2	3.1	3.7	0.4	0.5	-	11,010
<b>Dominican Republic 1996</b>									
Currently married	69.6	0.2	0.4	0.9	9.3	0.8	17.2	-	4,961
Formerly married	52.5	6.3	14.5	4.7	11.8	3.7	6.7	-	1,284
Never married	34.2	59.7	1.6	0.7	2.5	0.5	0.3	-	2,148
Total	57.9	16.3	2.9	1.4	7.9	1.2	11.3	-	8,394
<b>Guatemala 1995</b>									
Currently married	92.5	-	1.1	0.7	1.0	0.1	-	-	5,565
Formerly married	84.6	-	4.9	4.4	1.9	0.1	-	-	702
Never married	6.4	-	0.7	0.1	0.2	-	-	-	2,544
Total	67.0	-	1.3	0.8	0.9	0.1	-	-	8,811
<b>Haiti 1994/95</b>									
Currently married	66.4	-	-	3.5	24.2	-	-	0.2	3,070
Formerly married	71.4	-	-	2.2	2.9	-	-	0.5	529
Never married	72.9	-	-	3.4	4.7	-	-	0.3	1,655
Total	69.0	-	-	3.3	15.9	-	-	0.3	5,254
<b>Nicaragua 1997/98</b>									
Currently married	76.8	0.5	0.9	2.2	9.1	0.3	9.0	-	7,686
Formerly married	47.2	17.0	24.9	2.4	4.1	0.4	3.4	-	2,281
Never married	23.5	72.6	1.3	0.3	0.7	-	-	-	3,066
Total	59.1	20.4	5.2	1.8	6.3	0.2	5.9	-	13,033
<b>Peru 1996</b>									
Currently married	74.3	0.1	0.7	0.9	1.8	0.1	28.5	-	14,741
Formerly married	62.4	3.7	13.3	1.9	3.1	0.5	5.6	-	1,929
Never married	59.2	23.6	2.6	1.3	0.9	0.2	1.8	-	9,154
Total	68.1	8.7	2.3	1.1	1.5	0.1	17.3	-	25,824

Source: ORC Macro, 2004. MEASURE DHS+ STATcompiler. <http://www.measuredhs.com>, April 29 2004.



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## **IV.** **Projection Outputs**

In Spectrum all outputs appear under the “Display” heading. Clicking on “Display” offers the following displays as graphs:

### **Numbers of condoms required (in millions)**

Male condoms required  
Female condoms required  
Total condoms required

### **Costs**

Cost of male condoms  
Cost of female condoms  
Total cost of all condoms

### **Summary Table**

In addition, a summary table gives the above outputs for each of the population groups. Any of the projected numbers can be moved into an Excel file to produce a specialized chart.



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# V.

## Program Tutorial

This tutorial covers the key steps in installing and running Spectrum and the Module for Condom Requirements. It assumes that you have an IBM-compatible computer running Windows 95 or higher and that you are familiar with the basic operation of Windows programs and terminology.

### A. Before You Get Started

First, you will need to run DemProj, part of the Spectrum system of policy models; please refer to its manual for more information. Then, you will need to collect data and make certain decisions before running the model. Refer also to Section II for an overall perspective on the six steps involved in a projection.

At the start you must decide which population groups to include, focusing upon groups that are at high risk of contracting HIV and that are large enough to significantly affect the quantities of condoms needed for the country. In nearly all countries the group of sex workers will be included, as well as males engaging in casual sex with women other than sex workers. Adolescents may be a group of special interest, as well as others. In addition to groups at risk of HIV you will also include the group of persons using condoms for family planning (pregnancy protection).

Where reliable data are not available you will need to make a best estimate, and then explore the consequences of alternative estimates for the overall counts of condoms needed. The data you will need include the following:

- The size of each group in the first year of the projection. If you include separate groups for married and unmarried men you will need the proportion married, and an estimate of the proportion of each group that has casual sexual contacts. The number of all men 15–59 comes from DemProj.
- The coital frequency of each group.
- The percentage of each group as needed, e.g., the percentage of females aged 15–49 who are married.

- The proportion of sexual contacts in which condoms are used, for each population group included.
- The proportion of all condoms that are female condoms, for each group (possibly negligible for most groups in most countries).
- An estimate of the proportion of all condoms entering the country that is wasted, either through pipeline losses or through non-use after persons receive them.

## **B. Installing the Spectrum Program**

The Spectrum program is distributed on floppy diskettes; it is also available through the Internet at <http://www.FuturesGroup.com>. However, it must be installed on a hard disk before it can be used.<sup>2</sup> Spectrum will run on any computer running Windows 95 or higher. It requires about 3MB of hard disk space.

To install the Spectrum program, start by inserting the "Install" CD-ROM into your CD-ROM drive, or downloading the Spectrum install file from the internet at [www.FuturesGroup.com](http://www.FuturesGroup.com). If you are installing from a CD-ROM, insert the CD-ROM into your CD-ROM drive and follow the instructions on the screen. If you are installing from a file you downloaded from the internet, simply double-click on the file and follow the instructions.

## **C. Creating a New Projection**

### **1. Starting the Spectrum Program**

To start Spectrum:

1. Click the "Start" button on the task bar.
2. Select "Programs" from the pop-up menu.
3. Select "Spectrum" from the program menu. Alternatively, you can use Windows Explorer to locate the directory `c:\spectrum` and double click on the file named `spectrum.exe`.

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<sup>2</sup> To remove the Spectrum program from your hard disk, run the `unwise.exe` program located in the Spectrum directory.



## 2. Opening a Demographic Projection

*Before using CR, you should use DemProj to prepare a demographic projection.*

*DemProj is part of the Spectrum System of Policy Models; for more information, consult its manual.*

CR in Spectrum requires a demographic projection prepared with DemProj. In a typical CR application, the demographic projection calculates all the normal demographic processes (births, deaths, migration, age distributions). All the population figures required (e.g., size of the adult population) are provided by DemProj. Therefore, you must begin by preparing a demographic projection using DemProj. For more information, consult the DemProj Manual for Spectrum that is a companion to this one, *DemProj: A Computer Program for Making Population Projections*.

One easy way to create a demographic projection is to use the EasyProj feature of DemProj. To use this feature, follow these steps:

1. Select "File" and "New projection" from the Spectrum menu.
2. In the "New projection" dialogue box, fill in the projection title, the first year of the projection and the last year of the projection. You may wish to set the first year of the projection to match the year of a national survey, to have a reliable base line.
3. Check the box next to "Contraceptive Requirements."
4. Click the "File name" button and enter a file name for this projection.
5. Click the "EasyProj" button and select your country from the country list. This will read the demographic data from a file based on the population estimates and projections from the United Nations Population Division.
6. Click "OK" to return to the dialogue box and click "OK" once more to complete the set-up process.
7. Select "File" and "Save as" from the Spectrum menu to save this projection.

The first step in preparing the CR projection is to open the above demographic projection that you prepared. To do this,

1. Select "File" from the menu bar.
2. From the pull-down menu that appears, select "Open projection."

3. Select the projection file from the “Open” dialogue box and press “Ok.” All pre-existing projections that can be loaded will be listed here.

### 3. Adding the CR Module to the Projection

Once the demographic projection is open, you need to change the configuration to indicate that the CR Module will be used. To do this, select “Edit” from the menu bar and “Projection” from the pull-down menu.

You will see the “Projection manager” dialogue box. It will look something like the display shown below.

The screenshot shows the "Projection manager" dialog box. At the top, there is a title bar with the text "Projection manager" and a close button (X). Below the title bar, there are three input fields: "Projection title" containing "Scenario 1", "First Year" containing "2000", and "Final Year" containing "2015". Below these is a "Projection file name" field containing "C:\spectrum\Data\Scenario 1.PJN". There is a checked checkbox for "Demographic Projection (DemProj)" and an "Easyproj" button. A section titled "Active modules" contains a list of checkboxes: "Adolescents (NewGen)", "Family planning (FamPlan)", "AIDS (AIM)", "RAPID", "Benefit-Cost", "PMTCT", "Goals", and "Condom Requirements" (which is checked). On the right side, there are "Ok" and "Cancel" buttons.

**Projection title:** This title will be printed at the top of all printed output and will be used to identify the projection if more than one projection is loaded at a time. You can change the title to reflect the projection you are about to prepare.

*If you want to change the projection file name, the years, or the demographic projection interval, you will need to do so in DemProj. The options in the Projection manager were set when the demographic projection was created with DemProj.*

*Once all the information is entered for this dialogue box, click on the "Ok" button. You can always return to this screen and change some of the information by selecting "Edit" from the menu bar and then "Projection" from the pull-down menu.*

**Projection file name:** Click on the left-hand box labeled "Projection file name"; that lets you then enter the name that will be used to store all data files associated with this projection. You cannot change the file name here. You can change it if you select "File" and "Save projection as" to save the projection with a new name.

**First year:** This is the first year of the projection, determined in the DemProj projection.

**Final year:** This is the final year of the projection, determined in the DemProj projection.

**Active modules.** These radio buttons (or options) let you select other modules that will be used with the population projection. For the CR Module you do not need to select any of them; they are entirely optional. You should select the "Condom Requirements" module by clicking on the check box next to the name; that allows you to include the module in the projection. Once all the information is entered for this dialogue box, click on the "Ok" button. You can always return to this screen and change some of the information by selecting "Edit" from the menu bar and "Projection" from the pull-down menu.

## **D. Entering the Projection Assumptions**

### **1. About the Editors**

Each editor in the CR Module is similar. At the very top of the screen, the variable name appears. At the bottom of the screen are the special edit keys. "Duplicate" allows you to copy information from one cell, column, or row to another; "Interpolate" to enter a beginning and ending number and have the computer calculate numbers for the intervening intervals; "Multiply" to multiply a cell, column, or row by a specific number; and "Source" to write notes indicating the source of the data for future reference.

#### **To use the "Duplicate" button,**

1. Highlight (select) the range (column, row, or cells to be affected). The first cell in the range should be the value you want to copy.
2. Be sure to extend the range to the last year by using the mouse (hold down the left button and drag the range) or the keyboard (hold down the shift key and use the arrow keys).

3. Click on the “Duplicate” key to copy the value at the beginning of the range to all the other cells in the range.

**To use the “Interpolate” button,**

1. Enter the beginning and ending values in the appropriate cells.
2. Highlight the entire range from beginning to end.
3. Click on the “Interpolate” key to have the values interpolated and entered into each of the in-between cells.

**To use the “Multiply” button,**

1. Highlight the range (column, row, or cells to be affected).
2. Enter the multiplier in the dialogue box.
3. Click “Ok” to accept. The entire range will be multiplied by the designated number.

**To use the “Source” button,**

1. Click on the “Source” button to open a small word processor window.
2. Enter the source of the data and make any special comments about the assumptions.
3. Click on “Close” to return to the editor.

This feature allows you to keep a record of the data sources and assumptions as you make the projections. This source information will be maintained with the data file and printed whenever you print the projection summary. It is **strongly** recommended that you use this feature to avoid later confusion.

*If you decide that you do not want to keep the changes you have just made, click the “Cancel” button in any editor. This will exit the editors and restore all inputs to their values before you entered the CR editor. Any changes made during the editing session will be lost.*

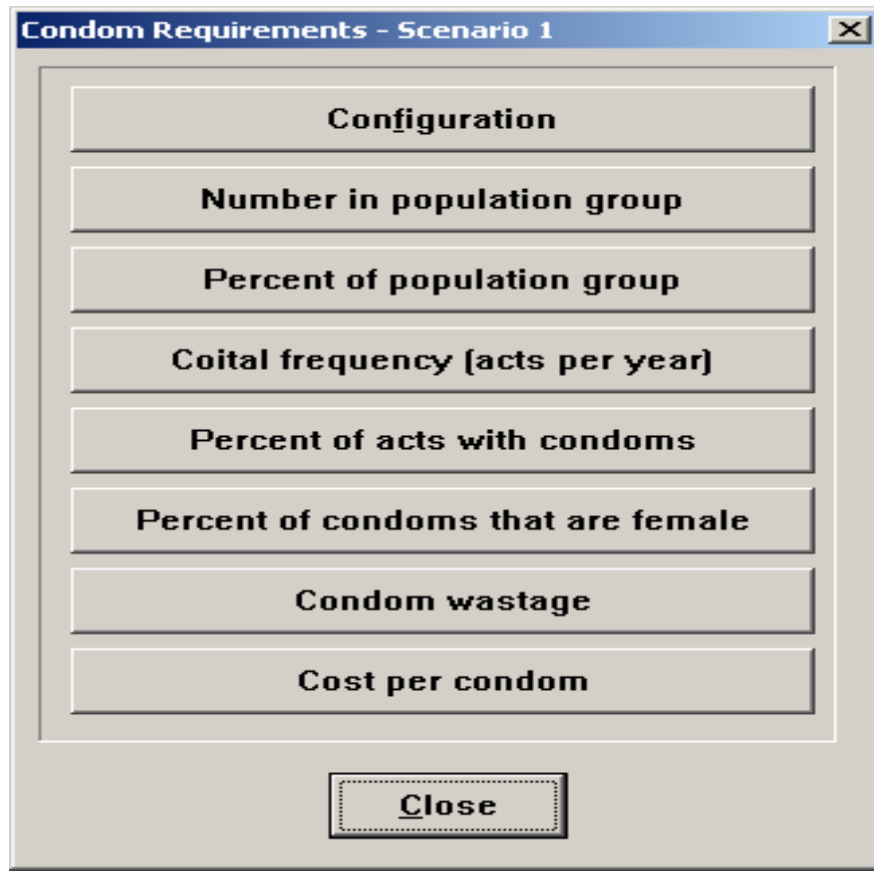
When you have finished entering data into an editor,

1. Click the “Ok” button to return to the “Condom Requirements” dialogue box.
2. Click the “Close” button to complete the editing process.

The “Cancel” button allows you to exit the editor without making any changes to the data.

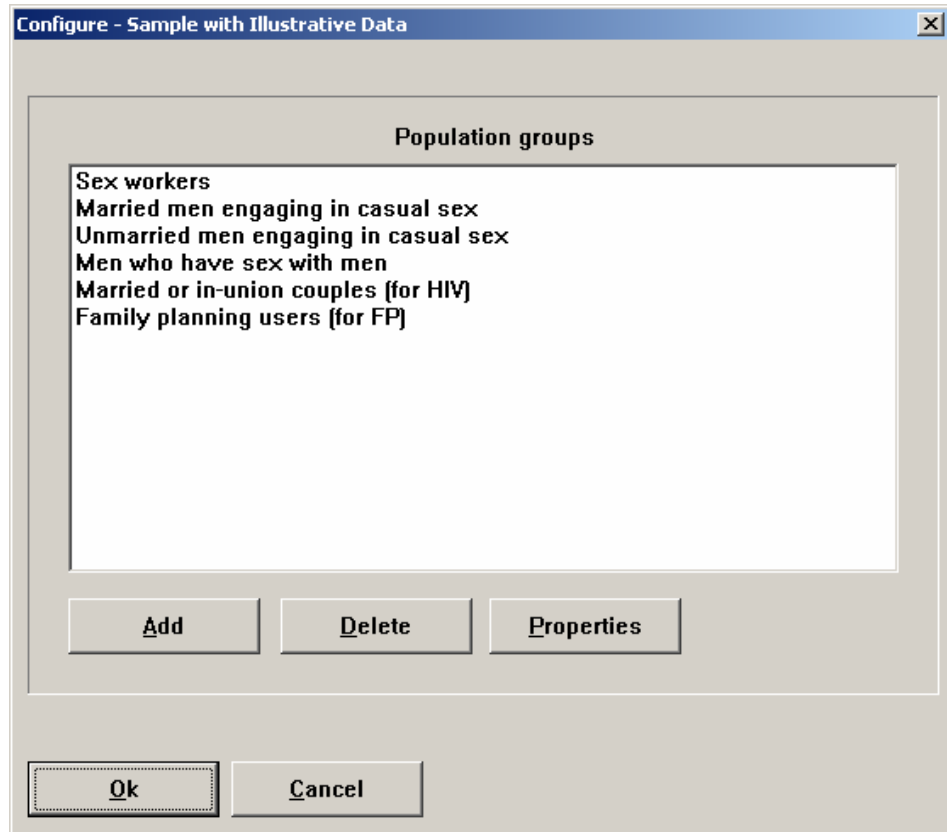
## **2. Specifying the CR Module Projection Parameters**

The assumptions for the projection are entered by selecting “Edit” from the menu bar and “Condom Requirements” from the pull-down menu. A dialogue box like the one shown below will appear.



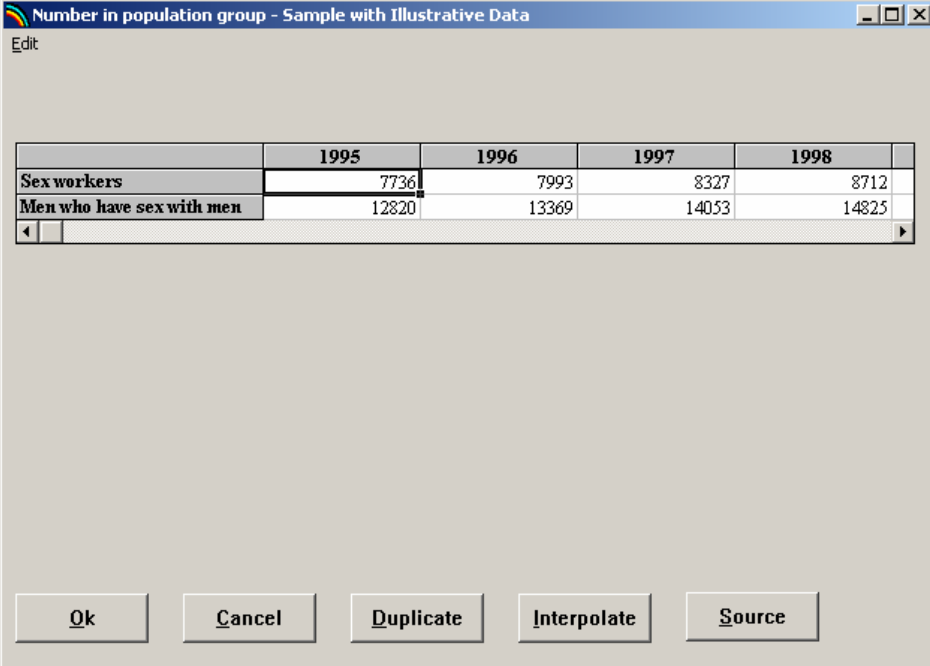
Now you will click on each of the topics listed and specify the inputs for it. The first three are shown below, for the Configuration, Numbers, and Percent buttons. The procedure is the same for the remaining items.

To start the first one click the button "Configuration." A configuration dialogue box, like the one shown below, will appear.



The six groups shown are the usual, or "standard" ones. If you do not wish to use one select it and click on the "Delete" button. If you wish to add any groups you can do so by clicking on the "Add" button. Leave this editor by clicking on the "Ok" button.

Next, click on the button for “Number in Population Group” and you will see the following:



	1995	1996	1997	1998
Sex workers	7736	7993	8327	8712
Men who have sex with men	12820	13369	14053	14825

Only two groups are shown here, with illustrative numbers for the first few years. Numbers for the groups not shown are provided automatically from DemProj. You can see these indicators by selecting “Display,” “Demography,” “Population,” and “Population 15–49.”

To leave this editor click on "Ok." Then click on the button for "Percent of Population Group," and you will see the following, with illustrative data shown for the first few years:

	2000	2001	2002	2003	2004	2005	2006
Married men engaging in casual sex	9.75	9.75	9.75	9.75	9.75	9.75	9.75
Unmarried men engaging in casual sex	10.50	10.50	10.50	10.50	10.50	10.50	10.50
Married or in-union couples	59.10	59.10	59.10	59.10	59.10	59.10	59.10
Family planning users	14.20	14.20	14.20	14.20	14.20	14.20	14.20

Here you enter the appropriate percentages for the baseline year and the changes expected in the future. Click "Ok" to leave this editor. (Note that the sex workers and MSM groups are omitted since the total numbers for them were already specified above.)

The procedure is similar for the remaining topics, from "Coital frequency" through to "Cost per condom."

Then click the "Close" button to leave all of the editors and return to the main program.



### 3. Leaving the Data Editors

To review, once you have entered all the necessary information,

*If you decide that you do not want to keep the changes you have just made, click the "Cancel" button in any editor. This will exit the editors and restore all inputs to their values before you entered the CR editor. Any changes made during the editing session will be lost.*

1. Leave any individual CR editor by clicking the "Ok" button in any of the editors. When you click the "Ok" button, the program will record your changes and return to the dialogue box.
2. Click the "Close" button to keep your work, and you will return to the main program.

### 4. Saving the Input Data

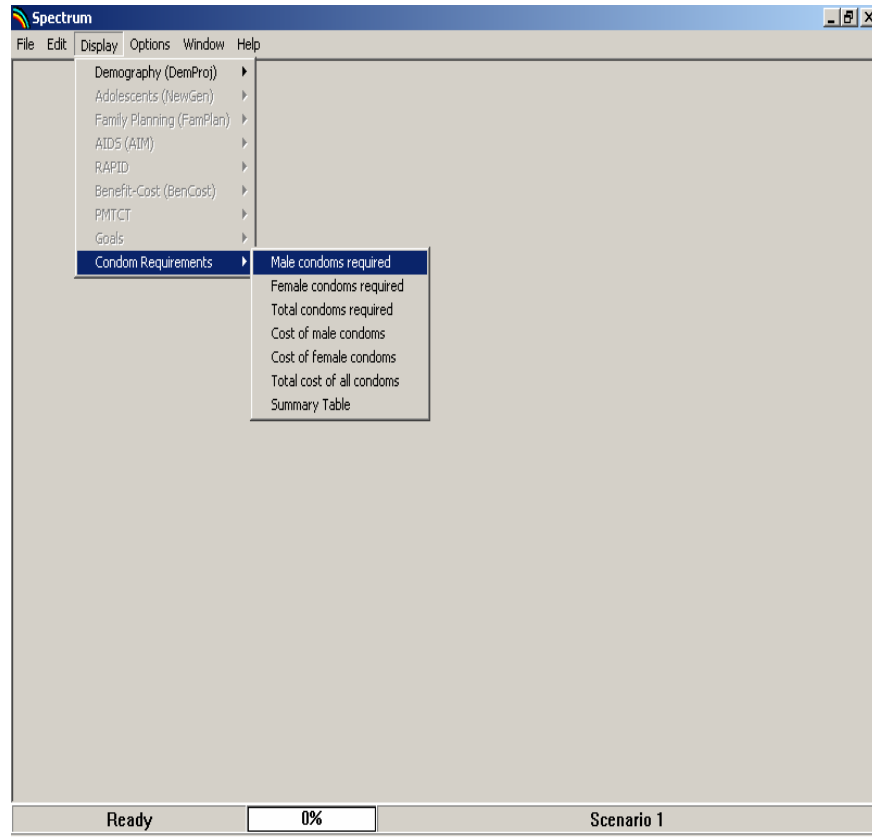
Once you have entered the projection assumptions, it is a good idea to save the data onto your hard disk. To do this, select "File" from the menu bar and "Save projection" from the pull-down menu. The data will be saved using the file name you specified earlier.

## E. Making the Projection

Whenever you enter data for a new projection or edit the assumptions, the CR Module will note that the data have been changed. The next time you try to display an indicator it will inform you that the data may have changed and ask if you want to recalculate the projection. Normally, you should answer "Yes" to this question. CR will then make the projection. This should take only a few seconds. Once the projection is made you will not be asked again if you want to do the projection unless you edit the assumptions.

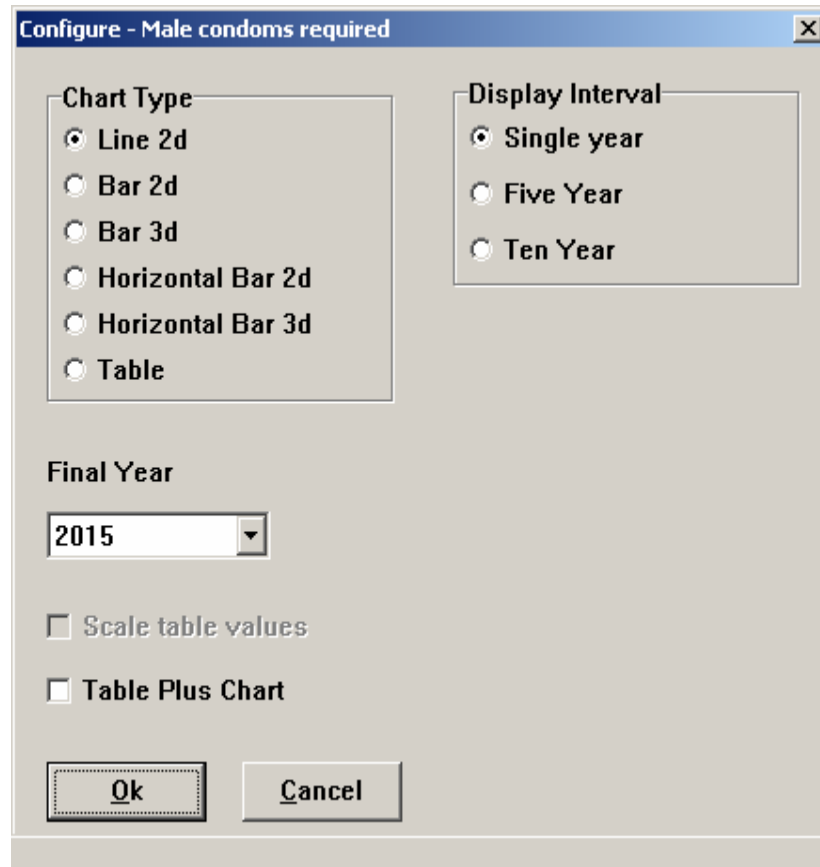
## F. Examining the Output

To see the results of the projection, select “Display” from the menu bar. From the pull-down menu select “Condom Requirements.” You will then see another menu showing the indicators available.



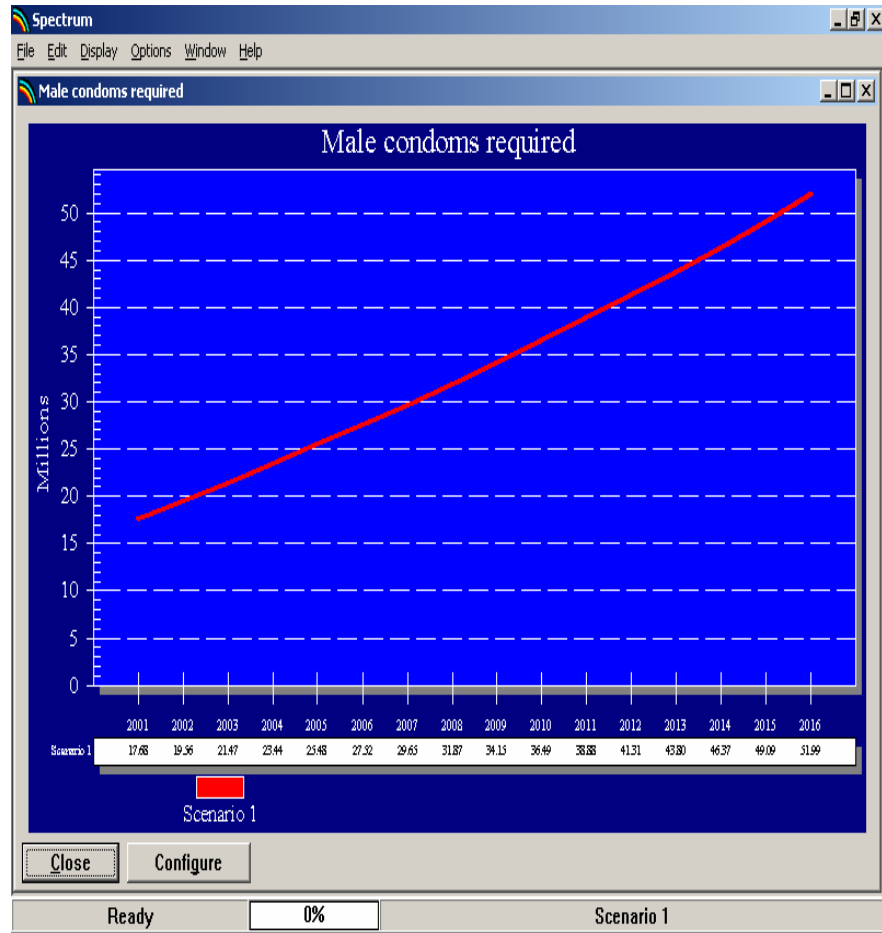
(The summary table contains the results for the individual population groups that you decided to use, and the data can be moved into Excel to produce specialized charts.)

As an example, choose the indicator for male condoms. Then you will see the “Display” dialogue box. It will look something like the one shown below.



The exact choices available will depend on the indicator you have selected. The display will normally be in single years, but you can change it to display every five or ten years. The chart type is also set through this dialogue box. Click on the button next to the type of display you want. Normally the display will show all the years in the projection. However, if you want to see only part of the projection, you can change the final year by selecting a different final year from the “Final Year” box.

Once you are satisfied with the type of display, click the “Ok” button, and the display will appear. It will look something like this:



All the projections that are currently in use will be displayed on the same graph.

You can change the configuration of the display by clicking the "Configure" button. You can also change the type of display by putting the mouse pointer anywhere inside the chart and clicking with the right mouse button.

To close the display, click on the "Close" button. However, you do not have to close the display immediately. You can choose to display another indicator, and it will appear on top of the first display. The first display will be covered but will still be there. You can return to any previous display that you have not closed by choosing "Window" from the menu bar and selecting the name of the display from the pull-down menu. From the "Window" selection you can also choose to tile or cascade all the existing display windows.

## 1. Graphs and Bar Charts

The CR Module will display a variety of graphs and bar charts including:

- Line charts
- Two- and three-dimensional bar charts (column charts)
- Two- and three-dimensional horizontal bar charts
- Two- and three-dimensional overlap bar charts (bars for multiple projections are shown on top of each other)
- Three-dimensional perspective bar charts.

To print the current (selected) chart, select "File" from the menu bar and "Print" from the pull-down menu.

## 2. Tables

The CR Module will also display data in the form of tables. In tables, each projection that is in use will be displayed in a separate column. You can scroll through the table to see all the years by using the PgUp and PgDn keys or by using the mouse.

To print a table, select "File" from the menu bar and "Print" from the pull-down menu.

## G. Saving the Projection

It is always a good idea to save the projection whenever you make a change to any assumptions. To save the projection without changing the name, choose "File" from the menu bar and "Save projection" from the pull-down menu.

To save the projection with a different name, chose "File" from the menu bar and "Save projection as" from the pull-down menu. You will then have a chance to specify a new file name for the projection. Normally when you save the projection with a new name you should also change the projection title. This step will avoid confusion if you have both projections loaded at the same time.

## **H. Opening an Existing Projection**

If you have already created a CR Module projection or are using a projection provided by someone else, you can immediately load that projection.

1. Select "File" from the menu bar.
2. Select "Open projection" from the pull-down menu.
3. Select the file you wish to use and click the "Ok" button to open the projection.

You can open more than one projection at a time, but no more than four. Just repeat these steps to load a second, third, or fourth projection. When you have more than one projection loaded, all projections will be displayed in the charts and tables. (The number of projections you can load at any one time is also limited by the amount of available memory in your computer.)

When you have more than one projection loaded, you will be asked to choose a projection when performing certain tasks, such as editing the assumptions. The program will display a list of the projection names, and you must choose the appropriate one from the list.

## **I. Closing a Projection**

To remove a projection that has already been opened,

1. Choose "File" from the menu bar and
2. "Close projection" from the pull-down menu. If you have more than one projection loaded, you will be asked to select which projection should be closed.

Closing a projection does not erase it from the hard disk. You can open that projection again at any time.

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# VI.

## Sample Applications

This chapter describes a typical application of the CR Module. It uses a data file from a recent country application, provided under the name SAMPLE for easy access and manipulation.

It is convenient to assume that a DHS survey or a similar survey will be available for an application of the CR module. We also assume that the projections of men and women of reproductive age (or other ages) are taken from a DemProj projection. Thus the user must first prepare the DemProj projection, as described above.

The basic model inputs for this example are shown in Tables 6 onward. A 15-year time frame is used starting with 2000 since that allows for the use of a recent DHS survey for basic data.

First is the list of the usual high-risk groups in the population:

**Table 6. The Standard High-Risk Groups**

Sex workers
Married men engaging in casual sex
Unmarried men engaging in casual sex
Men who have sex with men
Married or in-union couples
Family planning users

While additional groups can be added, for simplicity this example uses only the standard groups. (If one of the standard groups is of no interest just select that group and click on the “Delete” button.)

Next, figures must be entered for each group whose numbers are not automatically provided by DemProj. In this example sex workers were assumed to be 2% of urban women aged 15–49, but that will vary greatly across countries. Men who have sex with men were assumed to be ½% of all men aged 15–59; again this will vary. Figures for each future year were based upon the base numbers of males and females as projected in DemProj, together with the proportion urban for females as obtained from other sources.

**Table 7. Numbers of Groups Not Covered by DemProj**

	2000	2015
Sex workers	9,530	14,335
Men who have sex with men	16,430	26,607

Next, the percentage figures are entered for four of the groups, to help reduce the DemProj numbers of all males 15–59 and all females 15–49 to the relevant subgroups who need condom protection. (No entries are needed for sex workers or MSM since the final numbers were already entered above.)

As explained in the section above on Inputs, the entry for married men is the product of the proportion married and the proportion of married men engaging in casual sex. Similarly for unmarried men, you input the product of the proportion not married and the percentage engaging in casual sex. For married couples the entry is only for the percentage of all women 15–49 who are married; there is another entry below for the percentage of couples using condoms for HIV protection that considerably reduces this to the truly relevant group. For family planning users the entry is the product of the percentage of females who are married and the percentage who use any contraceptive method; a later entry under condom use adjusts this by the percentage of all users who rely upon condoms. (The advantage of this is that it offers separate entries in projections for the percent using any method and the share of that for condoms.)

**Table 8. Percentage Entries**

Population Group	2000	2015
Married men engaging in casual sex	9.75	9.75
Unmarried men engaging in casual sex	10.50	10.50
Married or in-union couples	59.10	59.10
Family planning users	14.20	14.20

Next, the annual coital frequency is entered for each group. In this example the frequency is kept constant through the years, but it can be reduced for certain groups such as married men engaging in casual sex, to reflect the effect of public education.

It is difficult to know the coital frequency of each group, but for sex workers one might assume three contacts a day for five days a week, times 50 weeks, for a total of 750. For married men an outside contact every other week may be reasonable as an example, and



once a week for unmarried men. The frequency for MSM may be lower. Married couples in surveys average about one to two times a week or about 78 a year. There may be local studies, and some country-specific information may be found by interviewing personnel in government and in private agencies.

**Table 9. Coital Frequency (acts per year)**

<b>Population Group</b>	<b>2000</b>	<b>2015</b>
Sex workers	750	750
Married men engaging in casual sex	25	25
Unmarried men engaging in casual sex	50	50
Men who have sex with men	15	15
Married or in-union couples	78	78
Family planning users	78	78

Next come the entries for the percentage of acts in which condoms are used. Here we assume an improvement over time, so that condom use becomes more prevalent. The upward trend from 2000 to 2015 is assumed to be linear, but it can take any form depending upon the expectations of the action agencies involved.

**Table 10. Percentage of Acts in Which Condoms are Used**

<b>Population Group</b>	<b>2000</b>	<b>2015</b>
Sex workers	30	70
Married men engaging in casual sex	30	65
Unmarried men engaging in casual sex	30	60
Men who have sex with men	30	75
Married or in-union couples	3	5
Family planning users	5	10

Next, simply for illustration, we assume that 0.1% of all condoms are female condoms, increasing to 1.5%. In many or most countries the current percentage is negligible, but this may increase if the unit price declines with enlarged production quantities.

**Table 11. Percent of All Condoms that are Female**

Population Group	2000	2015
Sex workers	0.10	1.50
Married men engaging in casual sex	0.10	1.50
Unmarried men engaging in casual sex	0.10	1.50
Men who have sex with men	0.10	1.50
Married or in-union couples	0.10	1.50
Family planning users	0.10	1.50

Next, an entry is needed for the percentage of all condoms entering the country that is wasted. As explained in the Inputs chapter, there are two components: pipeline wastage of all types, and user wastage, that is, condoms actually received by individuals that are never used. Here we assume some improvement, so that wastage declines from 11% to 7%. This entry is the same for all groups.

**Table 12. Wastage Assumption**

Population Group	2000	2015
All Groups	11	7

Finally, the costs of male and female condoms must be entered. The initial costs shown represent an approximate average for different donors, based upon USAID and UNFPA current experience. For simplicity the male cost is kept constant, but with enlarged production the unit female cost may decline.

**Table 13. Costs of Male and Female Condoms (in U.S. cents)**

	2000	2015
Male Condom	3.0	3.0
Female Condom	71.7	60.0

**Results:**

The above sets of inputs produce results in the forms explained in the "Outputs" section, both for numbers of condoms required and for their costs. The following table shows five-year results (the software can also give one-year results).

**Table 14. Numbers of Condoms Required and Their Costs, 2000-2015**

	2000	2005	2010	2015
<b>Male condoms required</b>				
Sex workers	2,377,738	3,973,950	5,817,352	7,931,896
Married men engaging in casual sex	2,664,427	4,401,489	6,462,880	8,885,747
Unmarried men engaging in casual sex	5,738,766	9,100,917	13,050,054	17,666,336
Men who have sex with men	81,986	146,270	223,721	315,478
Married or in-union couples	4,871,336	6,889,078	9,114,479	11,607,859
Family planning users	1,950,732	3,009,522	4,211,443	5,578,058
Total	17,684,984	27,521,226	38,879,928	51,985,372
<b>Female condoms required</b>				
Sex workers	2,380	22,649	60,738	120,790
Married men engaging in casual sex	2,667	25,085	67,478	135,316
Unmarried men engaging in casual sex	5,745	51,869	136,254	269,031
Men who have sex with men	82	834	2,336	4,804
Married or in-union couples	4,876	39,263	95,163	176,769
Family planning users	1,953	17,152	43,971	84,945
Total	17,703	156,852	405,941	791,655
<b>Total condoms required</b>				
Sex workers	2,380,118	3,996,599	5,878,091	8,052,687
Married men engaging in casual sex	2,667,094	4,426,574	6,530,358	9,021,063
Unmarried men engaging in casual sex	5,744,510	9,152,786	13,186,308	17,935,366
Men who have sex with men	82,068	147,104	226,057	320,282
Married or in-union couples	4,876,212	6,928,341	9,209,642	11,784,628
Family planning users	1,952,685	3,026,674	4,255,414	5,663,003
Total	17,702,686	27,678,078	39,285,868	52,777,028
<b>Cost of male condoms</b>				
Sex workers	71,332	119,219	174,521	237,957
Married men engaging in casual sex	79,933	132,045	193,886	266,572
Unmarried men engaging in casual sex	172,163	273,028	391,502	529,990
Men who have sex with men	2,460	4,388	6,712	9,464
Married or in-union couples	146,140	206,672	273,434	348,236
Family planning users	58,522	90,286	126,343	167,342
Total	530,550	825,637	1,166,398	1,559,561
<b>Cost of female condoms</b>				
Sex workers	1,707	15,356	38,812	72,474
Married men engaging in casual sex	1,912	17,008	43,119	81,190
Unmarried men engaging in casual sex	4,119	35,167	87,066	161,418
Men who have sex with men	59	565	1,493	2,883
Married or in-union couples	3,496	26,620	60,809	106,062
Family planning users	1,400	11,629	28,098	50,967
Total	12,693	106,345	259,396	474,993
<b>Total cost of all condoms</b>				
Sex workers	73,039	134,574	213,332	310,431
Married men engaging in casual sex	81,845	149,053	237,005	347,762
Unmarried men engaging in casual sex	176,282	308,195	478,568	691,408
Men who have sex with men	2,518	4,953	8,204	12,347
Married or in-union couples	149,636	233,293	334,244	454,297
Family planning users	59,922	101,915	154,441	218,309
Total	543,242	931,982	1,425,794	2,034,554

Over the 15 year period the total number of condoms required annually rises from 17.7 million to 52.8 million, a three-fold increase. This reflects both population growth and the assumption of an increase in the percentage of sex acts in which condoms are used.

Costs increase by a larger factor: to 3.75 times the initial cost compared with 2.98 times for numbers. The reason is that the proportion of all condoms that are female is assumed to increase from 0.1 percent to 1.5 percent, and this overrides the assumed fall in the price of each female condom. Thus total expenditure is sensitive to the relative proportion of female condoms.

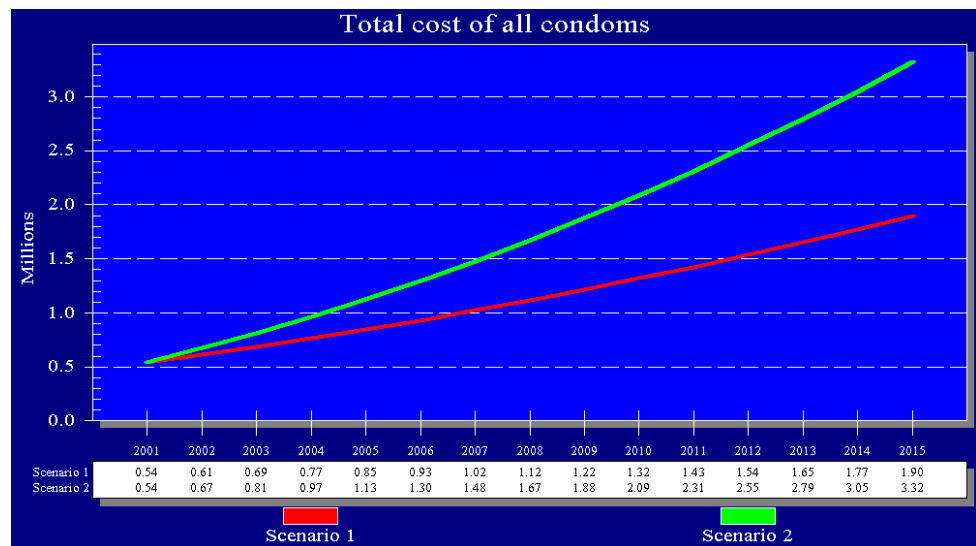
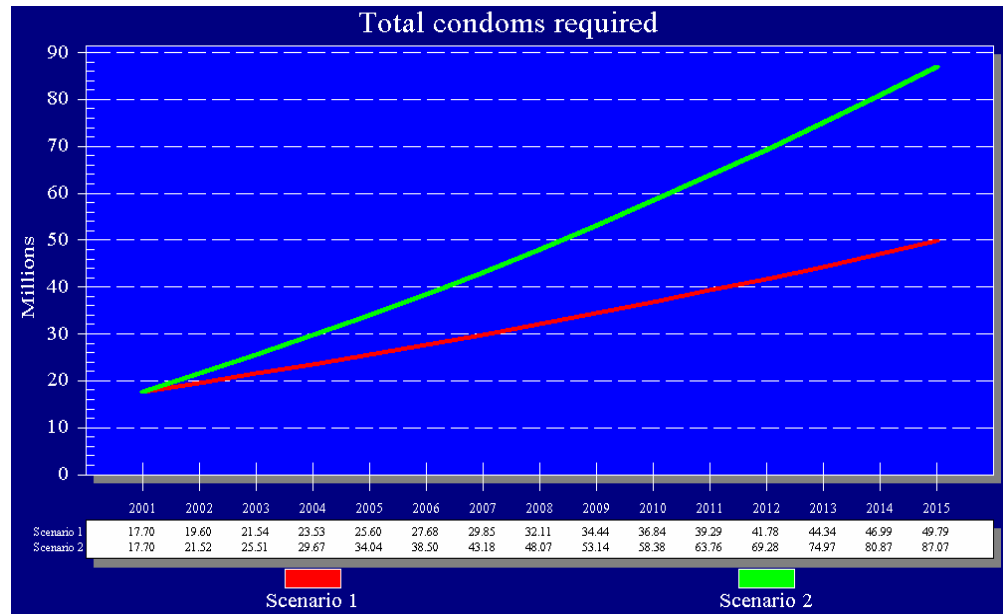
### Results for a stronger scenario

We can modify the inputs to represent sharper upward trends for condom use. Supposing two scenarios, the first for the above inputs for the percentage of sex acts in which condoms are used, and the second for more optimistic trends to the year 2015, the comparisons appear as follows. (The upward trends are assumed to be linear.)

**Table 15.**  
**Two Scenarios for Percentage of Sex Acts in Which Condoms are Used**

	% in 2000 (Baseline)	% in 2015 Scenario 1	% in 2015 Scenario 2
Sex workers	30	70	95
Married men engaging in casual sex	30	65	85
Unmarried men engaging in casual sex	30	60	80
Men who have sex with men	30	75	85
Married or in-union couples	3	5	15
Family planning users	5	10	20

The following two figures show the year-by-year trends for total condoms and total costs for the two scenarios.



By the end of the first five years, in 2005, the number of condoms required is 34 million rather than 25.6 million, and the accompanying annual cost is US\$ 1.13 million rather than US\$ 0.85 million. By the year 2015 the differences are of course considerably greater. Note that such increases reflect the underlying population growth in numbers of males and females, as well as any changes in other inputs.

While costs are shown to rise in the above example, there can be cost savings if programs are successful in reducing high-risk sexual contacts. When the percentage of married and unmarried men engaging in casual sex declines, that results in fewer condoms required in these projections, with lowered costs. Such savings can help offset the educational costs directed to behavior change.

#### **A. Exploring Alternate Program Configurations**

In addition to the suggestions above, a variety of other program configurations can be usefully explored for their management implications. Usually there is a combination of modified program activities rather than just one. Efforts to have sex workers use more condoms can be accompanied by educational efforts to reduce high risk behavior, as well as activities to encourage dual protection through the use of both condoms for HIV and other contraceptive methods for highly reliable protection against pregnancy. The software makes it convenient to explore such combinations.

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# VII. Methodology

The following section describes the equations used in the CR Module. They pertain to the outputs of condoms required and to the costs of the condoms, with breakdowns for the various population groups.

## A. Equations for Condom Numbers Required

The number of male or female condoms needed for each group is a function of six inputs: the number of persons in the base group, the percentage of the group that is relevant, the coital frequency of that group, the proportion of sexual contacts in which condoms are used, the proportion of all condoms that are male (or female), and the wastage factor.

For each group the equations produce the number of male condoms, female condoms, and total condoms required. Additional equations produce the all-group figures.

For example, to obtain the number of male condoms needed for married men engaging in casual sexual contacts, the equation follows, keeping the symbols quite simple:

$$[1] N = B \cdot R \cdot F \cdot S \cdot Ma \cdot W$$

where:

N = the number of condoms required

B = the base number of men aged 15–59

R = the proportion married times the proportion of married men engaging in casual sex, to define the relevant group among men aged 15–59

F = the coital frequency of this group

S = the proportion of sexual contacts in which condoms are used

Ma = the proportion of condoms that are male condoms (use  $F_e$  for female condoms)

$W = e$  wastage factor

The number of female condoms for the same group is obtained from the same equation, simply substituting  $F_e$  for  $M_a$ .

The number for each subsequent year is produced by similar equations, using the inputs specified for each year.

Notes on the "R" values: The "R" variable is always a percentage that reduces the size of "N" to the relevant subgroup. Enter a different "R" percentage for each group:

Sex workers: no percentage is entered for sex workers since the total number of sex workers is entered directly as a separate input.

Married men engaging in casual sex: the percentage to enter is the product of the percentage of males 15–59 who are married, and the percentage of those who engage in casual sex.

Unmarried men engaging in casual sex: the percentage to enter is the product of the percentage of males 15–59 who are unmarried, and the percentage of those who engage in casual sex.

Men having sex with men (MSM): as with sex workers, no percentage is entered since the total number is entered directly as a separate input.

Married or in-union couples: enter the percentage of females 15–49 who are married or in union. This is modified later for the percentage of couples who use condoms for HIV protection.

Family planning users: enter the percentage of married females 15–49 who use any contraceptive method. (This produces the number of all users, and that is reduced to the number of condom users in the "S" value, which in this case is the proportion of all users who rely on condoms for pregnancy protection (not HIV protection).

To make the notation more exact the following symbols are used:

$N_{m_i}$  the number of male condoms in group  $i$

$N_{f_i}$  the number of female condoms in group  $i$

$N_i$  the number of all condoms in group  $i$



$N_m$  the number of male condoms in all groups

$N_f$  the number of female condoms in all groups

$N$  the number of all condoms (grand total)

Therefore for any group  $i$  the number of male condoms required is:

$$[2] \quad N_{m_i} = B_i \cdot R_i \cdot F_i \cdot S_i \cdot M_{a_i} \cdot W$$

(Note that the wastage factor "W" is the same for every group.)

For any group  $i$  the number of female condoms required is:

$$[3] \quad N_{f_i} = B_i \cdot R_i \cdot F_i \cdot S_i \cdot F_{e_i} \cdot W$$

For any group the total number of condoms required, both male and female, is:

$$[4] \quad N_i = N_{m_i} + N_{f_i}$$

**For all groups**, the number of male condoms required is the simple sum of the numbers for the individual groups:

$$[5] \quad N_m = \sum(N_{m_{i-n}}) \quad \text{for all groups } i \text{ through } n$$

For all groups, the number of female condoms required is the simple sum of the numbers for the individual groups:

$$[6] \quad N_f = \sum(N_{f_{i-n}}) \quad \text{for all groups } i \text{ through } n$$

For all groups, the total for both male and female condoms (the grand total) is a simple sum:

$$[7] \quad N = N_m + N_f$$

## **B. Equations for Costs**

Costs are based simply upon the cost per male condom and the cost per female condom, which you input for each year and which are the same for all groups. Then the numbers of male and female condoms (above) are multiplied by the male and female costs per condom. The following assumes that all costs are stated in U.S. dollars, but you can use another currency if you wish.

The symbols and equations parallel those for numbers of condoms, using the following:

$C_{m_i}$  = cost for male condoms in group  $i$

$C_{f_i}$  = cost for female condoms in group  $i$

$C_i$  = total cost for group  $i$

$C_m$  = cost for male condoms in all groups

$C_f$  = cost for female condoms in all groups

$C$  = total cost, all groups

$P_m$  = per piece cost for male condoms (same for all groups)

$P_f$  = per piece cost for female condoms (same for all groups)

In any group  $i$  the cost for male condoms is:

$$[8] \quad C_{m_i} = N_{m_i} \cdot P_m$$

In any group  $i$  the cost for female condoms is:

$$[9] \quad C_{f_i} = N_{f_i} \cdot P_f$$

In any group  $i$  the total cost for all condoms is:

$$[10] \quad C_i = C_{m_i} + C_{f_i}$$

**For all groups**, the cost for male condoms is the simple sum of the costs for the individual groups:

$$[11] \quad C_m = \sum_i (C_{m_{i-n}}) \text{ for all groups } i \text{ through } n$$

For all groups, the cost for female condoms is the simple sum of the costs for the individual groups:

$$[12] \quad C_f = \sum_i (C_{f_{i-n}}) \text{ for all groups } i \text{ through } n$$

For all groups, the cost for all condoms (grand total) is:

$$[13] \quad C = C_m + C_f$$

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How do you plan to use Spectrum? \_\_\_\_\_

What additions to Spectrum would you like to see? \_\_\_\_\_

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