PSI HIV Heterosexual Transmission Health Impact Estimation Sub-Model

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PSI shares its models with all interested individuals or organizations. Please note that the models are updated periodically based on the latest available epidemiological, demographic, intervention effectiveness, and utilization data. As a result, numbers used in this document should be considered illustrative only. They show how the model works, but they are likely to have changed since the time of writing.

For more information or the latest model updates, contact Hongmei Yang at hyang@psi.org.

# Contents

Development of the DALY Model for Estimating the Health Impact of PSI Products and Services ....................... 4

PSI DALY Calculator .................................................................................................................................................. 5

Section 1: Principle and Structure of the Model .................................................................................................... 6

Section 2: Estimating Country Specific Disease Burden ........................................................................................ 7

Section 3: Estimating the Health Impact of PSI Interventions ............................................................................. 9

Section 4: Parameters & Sources .......................................................................................................................... 12

References ............................................................................................................................................................... 17
Introduction

Development of the DALY Model for Estimating the Health Impact of PSI Products and Services

International public health nongovernmental organizations (NGOs) and other implementers and practitioners of health policy in developing countries find themselves at a crossroads. The issue of monitoring and evaluation has grown beyond its traditional role as an internal management tool and has become a tool for accountability for agencies charged with responsibility for funding and monitoring health interventions. This change occurred partly because new, large-scale funders such as the Global Fund and the Gates Foundation themselves need more effective measures to be accountable for the use of their resources. Additionally, many organizations were drawn together by their focus on the Millennium Development Goals (MDG).

Along with these changes, there has been movement toward a consensus regarding the method of measuring health impact across developing countries. The aim of this effort is to create a more objective component to use in prioritizing program activities and allocating resources. The disability-adjusted life year (DALY) is the result of this effort. The primary purpose of the DALY is to act as an umbrella measure to compare both the true burden of different diseases across different regions of the developing world, and to better estimate the cost-effectiveness of various interventions aimed at reducing that burden. The first phase of the DALY creation process was undertaken by the Disease Control Priorities Project (DCPP), which developed a series of documents designed to both estimate and explain the full burden of various diseases around the world (www.dcp2.org).

The second phase of the DALY creation process involved estimation of the cost-effectiveness of the interventions available to address the diseases. This phase has been more difficult to accomplish because of the conceptual distance between the people charged with evaluating health interventions and the people charged with implementing them. The number of studies estimating the relative cost-effectiveness of public health and clinical interventions in developing countries that incorporate measurement of health outputs using DALYS has increased substantially since the first DCPP report in 2000. However, publication of well-designed field trials is only half the story.

The belief that cost-effectiveness of public health interventions can be influenced by the methods and mechanisms employed, as well as scale, is a large part of the reasoning behind this work. The overall intent is to develop models that will better enable programmers to estimate the cost-effectiveness of public health interventions that are undertaken in practice on a large scale.
PSI DALY Calculator

PSI is developing a series of tools to evaluate the health impact of its interventions and services around the world. The model at the core of this toolkit will estimate: a) the burden of each disease or condition addressed in the countries in which PSI works, and b) the health impact and incremental costs associated with implementation of PSI’s interventions.

The first stage in this process is the development of a functioning (and evolving) mathematical model that estimates the burden of disease and the relative impact of PSI projects in specific countries, for six disease groups or health areas. They are: HIV, family planning, malaria, diarrheal disease, nutrition, and maternal health. The models are currently linear and deterministic, but future intention is to incorporate stochastic data inputs/outputs and non-deterministic relationships between variables. Shown below is a graphical representation of the working components of the model. Each disease area is treated slightly differently because of the nature of the infection or its symptoms, variations in the availability of data, and the complexity of outcomes.
Section 1: Principle and Structure of the Model

1.1 Principle of the math model

The math model is built based on Bernoulli probability theory (Gray, et al., 2001; Mastro, et al., 1994; Satten, et al., 1994). For each HIV seronegative person, the probability of being infected through heterosexual contacts during the study period (1 year) is modeled as $P = 1 - (1 - p \times \lambda)^m$, where $p$ is the probability of each person meeting an HIV-positive partner and $m$ represents the number of partners in a year. $\lambda$, the probability of HIV transmission within a discordant partnership, is equal to $1 - (1 - \gamma)^n$, where $\gamma$ refers to per-act infectivity and $n$ represents the number of sexual contacts with each partner. Substituting the latter into the former results in an equation, $P = 1 - (1 - p \times (1 - (1 - \gamma)^n))^m$, which shows that the probability of infection through heterosexual contacts is associated with the number of sexual partners and the number of sexual contacts with each partner. There are evidences that these behaviors vary with the type of sexual partner, the above equation is therefore modified by considering three types of sexual partners (i.e., regular, casual, and commercial). The modified full equation estimating the probability of infection through heterosexual contacts is expressed as:

$$P = 1 - \prod_{i=\text{regular, casual, commercial}} (1 - P_i) = 1 - \prod_{i=\text{regular, casual, commercial}} (1 - p_i \times (1 - (1 - \gamma_i)^n_i)^m_i)$$

We assume that the probability of being infected during each sexual contact is independent, and that the probability of being infected by each sexual partner is independent. We also assume that the probability of each individual meeting an HIV-infected partner is equal to the prevalence of HIV among the partner population.

A number of factors may influence the per-act infectivity of HIV transmission, including STD infection status within the partnership, HIV infection stage of the infected partner, circumcision status of the male partner, and condom usage during sexual intercourse. Per-act infectivity is therefore adjusted by considering the effects of such cofactors in various probabilistic combinations that an HIV-negative individual may encounter while having sex with an HIV-positive partner.

1.2 Structure of the model

The model is expected to estimate both burden of disease (BOD) and health impact of PSI interventions (i.e., products and services). BOD is expected for the purpose of testing the reliability of the model by comparing the BOD to that reported by the UNAIDS. It is measured through number of new infections and loss of disability adjusted life years (DALYs). Health impact of PSI interventions is measured through new infection averted per unit of product or service and DALYs gained per unit of product or service.

To achieve this, the model is designed to have two components: baseline (i.e., a scenario when there are no PSI products/services available) and follow up (i.e., a scenario when PSI products/services are programmed in the population). The baseline component assumes no incremental interventions, and gives us an estimate of the potential disease burden of HIV that would be accrued in a given year in terms of new infections with HIV and DALYs lost due to HIV/AIDS. The follow up component runs to estimate the reduction in risk of being infected by incorporating various PSI products/services in terms of sales, population level coverage, and/or
other features. The products/services directed at reducing the spread of HIV include male condoms, female condoms, voluntary counseling and testing (VCT) and male circumcision (MC).

Due to the heterogeneity of sexual behaviors which are associated with HIV heterosexual transmission, study population is divided into five risk groups (i.e., population categories) as defined by total number of partners in the past year. BOD and health impact are estimated for each of the risk groups. The five risk groups are as follows:

- Low Risk (total partners in the past year = 1)
- Medium Risk (total partners in the past year = 2)
- High Risk (total partners in the past year = 3-4)
- Very High Risk (total partners in the past year = 5-9)
- Highest Risk (total partners in the past year ≥ 10)

Section 2: Estimating Country Specific Disease Burden

2.1 Parameters with country specific data

Four types of parameters can be country-specific and they are demographic, epidemic, sexual behavioral and condom use parameters. Demographic parameters include population size and proportion of sexually active people in the country. Sexual behavioral parameters include number of sexual partners by type in the past year and number of sexual contacts with each partner by type in the past year. Condom use parameter includes percentage of sexual contacts with each partner type protected by a condom. Epidemic parameters include HIV prevalence and STD prevalence among different population and male circumcision rate.

As sexual behavioral data are not readily available for many countries, they are set as defaults for all countries in the model. The default values are obtained from combined data of three studies (PSI TRaC surveys) conducted among general population aged 15 to 49 in Angola, Zambia and Zimbabwe. For the epidemic parameters, since data on HIV prevalence among commercial sex workers and STD prevalence among general adults and commercial sex workers are not readily available for most PSI countries, functional relationships between them and the empirically sourced adult HIV prevalence are identified and formulated.

The function for HIV prevalence among commercial partners is stated as follows (where \( R_g \) is the adult HIV prevalence and \( R_c \) is the HIV prevalence in CSWs):

- For a Sub-Saharan African country, \( R_c = R_g \times (0.625 + \frac{35.987}{R_g \times 100}) \);
- For an Asian country, \( R_c = R_g \times 1.17 \);
- For a Latin American and Caribbean country, \( R_c = R_g \times (2.198 + 2.715 \times R_g \times 100) \).

The function for STD prevalence among general adults is stated as below (where \( R_g \) is the adult HIV prevalence and \( S_g \) is the STD prevalence among general adults):

\[
S_g = R_g \times 4.6 \times (100 \times R_g)^{-0.382}
\]

STD prevalence among commercial partners is set at 80% for all PSI countries at this moment.
2.2 Estimating disease burden of HIV/AIDS

The model starts by taking the demographic data from the specific country being studied, and uses this to estimate the number of sexually active people within the country at the time of the baseline year. Each population is then broken down into the five risk groups according to total number of sexual partners.

For individual in each risk group the model runs a scenario where for that individual there are $X$ sexual partners by type and $Y$ sexual contacts with each of the three types of partner. The risk of infection is dependent on number of sexual contacts, male circumcision rate, HIV prevalence and STD prevalence rate amongst that individual and each type of partners, and also the likelihood of the partner being in the acute stage of HIV infection. In addition a baseline probability level of condom use is assumed for each sexual contact based on the type of partner. The resulting likelihood of infection within each risk group is then multiplied by the size of the sexually active population within that risk group, to get an estimate of the total number of new infections of HIV in the time period studied (one year). For each risk group the model runs as below:

The final stage of the modeling process is the translation of the estimated number of new infections into a total equivalent figure for burden measured in DALYs. For this process the methodology is followed from the original DCPP report published in 2000, incorporating any updates from the more recent DCPP version 2 published in 2005. We assume that an infected person lives an average of 10 years with HIV and another two years with AIDS before death.

For more details on the parameters used and their sources, see Section 4.
Section 3: Estimating the Health Impact of PSI Interventions

The second component of the model involves estimating the impact of each intervention on alleviating the burden from HIV/AIDS in that specific population. Since different intervention has impact on different drivers of risk of infection, we describe this component by products/services.

3.1 Condom Sales

Demographic parameters needed in the baseline scenario are not needed in the follow-up scenario. Instead, sales related parameter (i.e., market share of PSI branded condoms) is needed. Epidemic & sexual behavioral parameters remain the same as in the baseline scenario. Condom use parameter differs from that in the baseline since condom sales program aims at increasing percentage of sexual contacts protected by a condom.

For each individual in each risk group the model runs a scenario where for that individual there are the same number of sexual partners and the same number of sexual contacts with each type of partners as in the baseline scenario. Probability of condom use for each sexual contact at follow-up is a function of that in the baseline and market share of PSI condoms. The resulting likelihood of infection within each risk group is then subtracted from that in the baseline scenario, to get an estimate of the reduction in risk of infection per person per year. Number of PSI condoms consumed per person per year is estimated based on sexual activities and condom use data. Dividing the reduction in risk of infection per person per year by the number of PSI condoms consumed per person per year yields the estimate of new infection averted per condom. For each risk group the model runs as below:

**Representation of intervention – Condom Sales**

- **Baseline: No PSI condoms available**
  - Baseline condom usage
  - Risk of having sex with an HIV+ partner
  - Risk of infection per act
  - Sexual activity w reg.

- **Follow-up:** PSI condoms available
  - Follow-up condom usage: equals to that in baseline divided by (1 - market share of PSI condoms)
  - Risk of having sex with an HIV+ partner
  - Risk of infection per act
  - Sexual activity w reg.

**Reduction in risk of infection**

**Number of PSI condoms used per person**

**New infection averted per condom**

**Health impact output: New infection averted per condom**
The final stage of the modeling process is the translation of the estimated number of new infections averted per condom into an equivalent figure measured in DALYs gained per condom. An infected person is assumed to live an average of 10 years with HIV and another two years with AIDS before death.

### 3.2 Voluntary Counseling and Testing (VCT)

Demographic parameters needed in the baseline scenario are not useful in the follow-up scenario. Instead, service related parameter (i.e., number of people who receive our VCT service) is needed. Among the epidemic, sexual behavioral and condom use parameters, VCT is assumed to have impacts on the following. For more detail, please see Table in Section 4.6.

- Decrease in condom non-use
- Decrease in STD prevalence
- Decrease in number of regular partners among discordant couples
- More years of life for HIV positive clients due to seeking ART treatment

According to David Dowdy’s review report, people change their sexual behaviors after receiving VCT, but at variant levels. Clients who are tested to be HIV positive, negative, or clients who receive VCT as discordant couple change their sexual behaviors differently. Therefore, VCT clients are grouped into the following four categories and the model runs for each of the categories. Within each category, five risk groups and three sexual relationships are still considered.

- Clients who are tested to be HIV positive and receive VCT as individual or discordant couple;
- Clients who are tested to be HIV negative and receive VCT as individual or discordant couple;
-Clients who are tested to be positive and receive VCT as discordant couple;
- Clients who are tested to be negative and receive VCT as discordant couple.

For HIV negative clients, probability of being infected is estimated for both baseline and follow-up based on levels of various parameters (i.e., sexual behavioral, epidemic, and condom use). For HIV positive clients, probability of transmitting HIV to negative partners is estimated for both scenarios as well.

For individual in each category and each risk group, the model runs a scenario where for that individual there are $X$ amount of increase in condom usage, $Y$ amount of decrease in STD rate, and $Z$ amount of decrease in number of regular partners if the individual is from discordant couples. The resulting likelihood of infection within each risk group is then substracted from that in the baseline scenario, to get an estimate of the reduction in risk of infection per person per year. For each risk group the model runs as below:
The final stage of the modeling process is the translation of the estimated number of new infections averted per VCT into an equivalent figure measured in DALYs gained per VCT. An infected person is assumed to live an average of eight years with HIV and another two years with AIDS before death. HIV positive clients are assumed to live 2.2 years longer (than they would be if they don’t get VCT) due to seeking ART treatment.

### 3.3 Male Circumcision (MC)

Demographic parameters needed in the baseline scenario are not needed in the follow-up scenario. Instead, service related parameter (i.e., number of people who receive our MC service) is needed. Epidemic, sexual behavioral and condom use parameters all remain the same as in the baseline scenario. Mixed results have been reported from limited studies about the protective efficacy of MC on preventing female partners from being infected and whether people will be more likely to engage in risky sexual behaviors after being circumcised (Auvert et al., 2005; Bailey et al., 2007; Gray et al., 2007; Turner et al., 2007). We therefore assume at this moment that MC has no protective effect against female partner being infected and there is no disinhibition in sexual behaviors after the circumcision. We also assume that the protective efficacy is the same for men circumcised at different age as biologically it makes sense that as long as it occurs before HIV exposure, circumcision would offer the same degree of protection against HIV and STIs regardless of the age at which it was done. The only difference between the baseline and the follow-up is that the follow-up runs a scenario in which all the male partners are circumcised.

Men who come in for a circumcision may be HIV-negative, positive or with unknown infection status. Those who are HIV positive are not included in the model to produce DALYs averted since they have already been infected and MC has no protection against infection of their female partners. Those who are HIV negative and
those with unknown status are the two categories considered.

For individual in each category and each risk group, the model runs a scenario for both baseline and follow-up where for that individual there are $X$ partners, $Y$ sexual contacts, and $Z$ sexual contacts with a condom. The resulting likelihood of infection within each risk group is then subtracted from that in the baseline scenario, to get an estimate of the reduction in risk of infection per person per year. For each risk group the model runs as below:

**Representation of intervention – MC**

The final stage of the modeling process is the translation of the estimated number of new infections averted per MC per year into an equivalent figure measured in DALYs averted per MC per year. An infected person is assumed to live an average of 10 years with HIV and another two years with AIDS before death.

Since once a male gets circumcised, he will benefit from the service for the rest of his sexually active years. We therefore assume the lifespan of a circumcision is 20 years. The lifespan benefit per MC in terms of new infection averted and DALYs averted are then obtained by summing up the benefit at current year and lasting benefit discounted at 3% per year over 20 years.

**Section 4: Parameters & Sources**

Deterministic data points for parameters used in the model and their sources are listed below.
4.1 Risk group sexual activity data

Sexual behavior (i.e., number of partner by type and number of sexual contacts with each partner by type) and proportion of people in each risk group are obtained from a combined data of three PSI TRaC surveys among general population (aged 15-49) in Angola, Zambia and Zimbabwe.

<table>
<thead>
<tr>
<th>% of sexually active</th>
<th>Group</th>
<th>% among sexually active</th>
<th>Partner Type</th>
<th>average no. of partner /yr</th>
<th>average no. of sexual acts /partner/yr</th>
</tr>
</thead>
<tbody>
<tr>
<td>82.2% 5297/7135</td>
<td>Low risk (1 partner)</td>
<td>77.3%</td>
<td>regular</td>
<td>0.854</td>
<td>58.75</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>casual</td>
<td>0.139</td>
<td>43</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>commercial</td>
<td>0.0072</td>
<td>-</td>
</tr>
<tr>
<td></td>
<td>Med risk (2 partners)</td>
<td>11.2%</td>
<td>regular</td>
<td>0.958</td>
<td>70.18</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>casual</td>
<td>0.931</td>
<td>40.9</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>commercial</td>
<td>0.1112</td>
<td>24</td>
</tr>
<tr>
<td></td>
<td>High risk (3-4 partners)</td>
<td>5.3%</td>
<td>regular</td>
<td>0.997</td>
<td>69.78</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>casual</td>
<td>1.763</td>
<td>25.2</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>commercial</td>
<td>0.5015</td>
<td>24</td>
</tr>
<tr>
<td></td>
<td>Very High risk (5-9 partners)</td>
<td>3.7%</td>
<td>regular</td>
<td>1.054</td>
<td>55.89</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>casual</td>
<td>2.769</td>
<td>21.5</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>commercial</td>
<td>2.269</td>
<td>25.2</td>
</tr>
<tr>
<td></td>
<td>Highest risk (10+ partners)</td>
<td>2.5%</td>
<td>regular</td>
<td>4.092</td>
<td>31.5</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>casual</td>
<td>4.74</td>
<td>18.7</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>commercial</td>
<td>9.315</td>
<td>36</td>
</tr>
</tbody>
</table>

Baseline condom usage

Condom usage rates are assumed to be 8%, 32% and 48% in regular, casual, and commercial relationships, respectively. The rates apply to all PSI countries.

4.2 Epidemiologic Information (selected):

HIV prevalence rate for general adults are obtained from “WHO/UNAIDS Epidemiological Fact Sheets on HIV/AIDS”. Adult STD prevalence and HIV prevalence among CSWs are obtained based on functions of adult HIV prevalence.

<table>
<thead>
<tr>
<th>Country</th>
<th>Adult HIV prevalence (%)</th>
<th>CSW HIV prevalence (%)</th>
<th>Adult STD prevalence (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>SSA</td>
<td>5.9</td>
<td>39.7</td>
<td>13.8</td>
</tr>
<tr>
<td>LCA</td>
<td>0.5</td>
<td>1.8</td>
<td>3.0</td>
</tr>
<tr>
<td>Nigeria</td>
<td>3.9</td>
<td>38.4</td>
<td>10.7</td>
</tr>
<tr>
<td>Kenya</td>
<td>6.1</td>
<td>39.8</td>
<td>14.1</td>
</tr>
<tr>
<td>Madagascar</td>
<td>0.5</td>
<td>36.3</td>
<td>3.0</td>
</tr>
<tr>
<td>Zimbabwe</td>
<td>20.1</td>
<td>48.5</td>
<td>29.4</td>
</tr>
<tr>
<td>Myanmar</td>
<td>1.3</td>
<td>22.1</td>
<td>5.4</td>
</tr>
<tr>
<td>India</td>
<td>0.9</td>
<td>15.3</td>
<td>4.3</td>
</tr>
</tbody>
</table>
Male circumcision rates

Country-specific male circumcision rates are drawn from the published work by Williams et al. (2006).

4.3 Biological information:

In Europe and North America, studies of serodiscordant couples typically have revealed a per-act infectivity of 0.001 (range: 0.0001-0.0015) (De Vincenzi, 1994; Downs & De Vincenzi, 1996; Leynaert, et al., 1998; Peterman, et al., 1988; Royce, et al., 1997; Wiley, et al., 1989). Similarly, a study of monogamous couples in Rakai, Uganda, found that the average per-act infectivity was 0.0011 (Gray, et al., 2001). We therefore select 0.0005 as the transmission probability per sexual contact during asymptomatic stage when both partners are absent from STDs.

Transmission probability per act during acute infection period when partners are absent from STDs: 0.0047 (Pilcher et al., 2004)

Effect of STD infection on HIV transmission: 5 (Rottingen et al., 2001 and Satten et al., 1994)

4.4 Disease related information:

Acute period of infection: 54 days (Pilcher CD et al., 2004)

Duration of HIV: 10 years; YLD weight: 0.135 (DCPP)

Duration of AIDS: 2 years; YLD weight: 0.505 (DCPP)

Age of infection: 26 years old for low, 25 for medium, and 24 for all high risk groups

Life span: 81.25 years for both men and women

4.5 Efficacy of Products/ Intervention:

Protective efficacy of condoms: 90% (Pinkerton et al., 1997)

Protective efficacy of male circumcision: 60% (Auvert et al., 2005; Gray et al., 2007; Bailey et al., 2007)
4.6 Parameter recommendations for the impact of VCT in the PSI DALY calculator (abstracted from Dowdy report 2008):

<table>
<thead>
<tr>
<th>Parameter/Population</th>
<th>Recommended Value*</th>
<th>Sensitivity Range</th>
<th>Notes</th>
<th>Method of Calculation</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Number of sex partners</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>General population</td>
<td>No effect of VCT</td>
<td></td>
<td></td>
<td>No preponderance of evidence for effect among 10 studies (10;14;25;27;29-34)</td>
</tr>
<tr>
<td>Discordant couples</td>
<td>No effect of VCT</td>
<td></td>
<td>Consider alternative scenario where 47% of discordant couples reduce their number of regular sex partners by 1 (i.e., subtract 0.47 from the mean number of regular sex partners, for members of discordant couples).</td>
<td>Weighted** average of effect among two studies (10;19) that found substantial rates of abstinence within discordant couples after receiving VCT</td>
</tr>
<tr>
<td><strong>Number of sex acts per partner</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>General population</td>
<td>No effect of VCT</td>
<td></td>
<td></td>
<td>No preponderance of evidence for effect among 3 studies (3;30;33)</td>
</tr>
<tr>
<td><strong>Relative decrease in condom non-use</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>HIV-negative clients</td>
<td>13%</td>
<td>0–81%</td>
<td></td>
<td>Weighted** average of effect among 15 studies (10;14;16;18;21;22;24;25;27-34)</td>
</tr>
<tr>
<td>HIV-positive clients</td>
<td>40%</td>
<td>0–81%</td>
<td></td>
<td>Weighted** average of effect among 10 studies (10;15;16;21;22;29-31;33;34)</td>
</tr>
<tr>
<td>Discordant couples</td>
<td>69%</td>
<td>55–87%</td>
<td>Refers to within-couple sex acts only.</td>
<td>Weighted*** average of effect among 6 studies (10;17-20;22)</td>
</tr>
<tr>
<td><strong>HIV incidence</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>HIV-negative clients</td>
<td></td>
<td></td>
<td>Consider equally-likely alternative that VCT does not decrease HIV incidence in this population (i.e., no behavior change in HIV-negatives)</td>
<td>Based on 3 studies (26;32;34) that found no decrease in HIV incidence in HIV-negative patients receiving VCT</td>
</tr>
</tbody>
</table>
## Relative decrease in prevalence of sexually transmitted infections

| All VCT clients | 39% | 0–63% | Insufficient data to disaggregate by HIV status or ulcerative vs. non-ulcerative disease | Weighted** average of effect among 5 studies (10;14;21;28;30) |

## Duration of VCT effect

| HIV-negative clients | 12 months | 6–24 mos. | Consider repeat VCT at 6-month intervals to sustain initial effects | Estimate; no study has evaluated effect of single VCT beyond 6 months. However, five studies (10;12;24;30;31) found an effect at 6 months, including one (10) that showed sustained effect at 12 months with 2 VCT sessions at 0 and 6 months. |

| HIV-positive clients | lifetime | decrease to 12 mos. | Estimate; two studies (20;33) show sustained effect at 18-23 months post-VCT, with no evidence of decline over time since VCT (33). |

| Discordant couples | lifetime of relationship | decrease to 12 mos. |

## Psychological and social consequences of VCT

| All VCT clients | do not include | Few data to inform values; methodologically problematic |

## Early treatment of HIV

| HIV-positive clients | 2.2 years of life gained | 1.5–5.2 years | Incorporate DALY weight assuming HIV-positive, on antiretrovirals; do not assume any reduction in transmission | Based on single mathematical model of VCT deployment (42). Lower bound reflects U.S. estimate (39), most likely value reflects 70% antenatal clinic coverage, and upper bound reflects 0% antenatal clinic coverage. |

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* Comparing the incremental benefit of VCT to no VCT (e.g., pre-VCT versus post-VCT, or populations accessing VCT to those that do not)

** Weighted by the square root of study sample size
References


Rottingen JA, Cameron DW, Garnett GP. A systematic review of the epidemiologic interactions between classic sexually transmitted diseases and HIV. How much really is known? Sexually Transmitted Diseases 2001; 28: 579-597


