P4O
planning for outcomes

A Brief Guide To The

Planning for Outcomes (P_4O) Model

An innovative model for estimating the impact of removing injectables from the contraceptive method mix.

2018 version

Introduction

Some observational studies have raised concerns about a link between the use of progestogen-only injectable contraceptives, particularly depot medroxyprogesterone acetate (DMPA), and the risk of HIV acquisition. These data are reported in a recent systematic review, which estimated a 40% increased risk of HIV associated with DMPA use. In 2017, the World Health Organization changed the Medical Eligibility Criteria for injectable use among women at high risk for HIV from a 1 (no restrictions) to a 2 (advantages generally outweigh the risks). The ongoing Evidence for Contraceptive Options and HIV Outcomes (ECHO) trial is comparing DMPA, levonorgestrel implant, and copper intrauterine device (IUD) use on risk of HIV acquisition, with results expected in 2019. Depending on the evidence obtained from the ECHO trial, injectable availability could be reduced in countries with high HIV burden.

This modeling work was conducted to assess how restrictions on DMPA use could affect HIV and maternal and child health indicators, and what it might take to compensate for such restrictions.

An innovative model

The *Planning for Outcomes (P_4O) Model* is focused on near-term – rather than long-term - dynamic impacts of a shift in the method mix. The model uses method-specific pregnancy rates and country-specific method mix data. Further, the model estimates impact on all women of reproductive age, not just those married or in unions.

The *P_4O Model* features an interactive interface that allows adjustments to the following inputs:

- Country
- Assumed risk (Hazard Ratio [HR]) for HIV infection with injectable use, relative to no contraceptive method
- % of injectable users who stop using the method
- % of previous injectable users who adopt other methods
- How women are reallocated to the existing method mix
- Other inputs of user's risk (e.g. risk of HIV during pregnancy)

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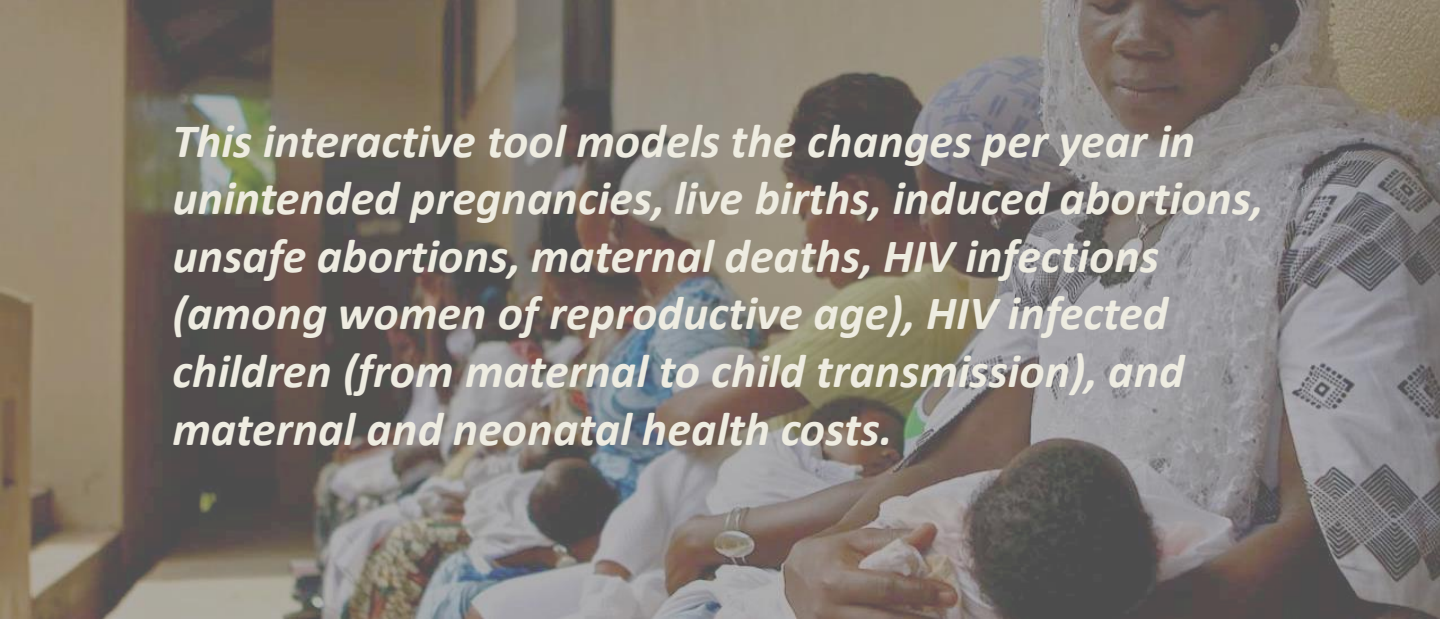
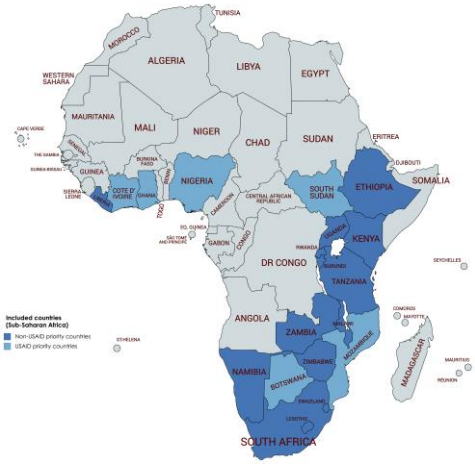


This interactive tool models the changes per year in unintended pregnancies, live births, induced abortions, unsafe abortions, maternal deaths, HIV infections (among women of reproductive age), HIV infected children (from maternal to child transmission), and maternal and neonatal health costs.

Country selection



Countries selected for the model had a high prevalence of injectable use as a proportion of the modern contraceptive method mix, and an adult HIV prevalence greater than 1%. Seven USAID priority countries (highlighted in light blue in the map to the left) were also included.

In total, 22 countries including 20 in Sub-Saharan Africa, Cambodia (USAID priority country) and Haiti met criteria for inclusion.

You can run the model to look at results by individual country, by all countries, or by all sub-Saharan African countries.

Primary data sources

Data	Source
Contraceptive prevalence	Demographic and Health Surveys [1]; Multiple Indicator Cluster Surveys [2]; Performance Monitoring and Accountability 2020 surveys [3]
Pregnancy rates	Contraceptive Technology [4]; Family Planning Global Handbook [5]; Adding It Up (AIU): Investing in Contraception and Maternal and Newborn Health, 2017 (Guttmacher Institute)[6]
Probability of MTCT	Kuznik et al. (2012) [7]; WHO [8]
HIV prevalence and ART coverage	UNAIDS [9]
Maternal mortality	MSI Impact2 calculator (v.4) [10]
Maternal and neonatal health costs; Live births and abortions	AIU[6]

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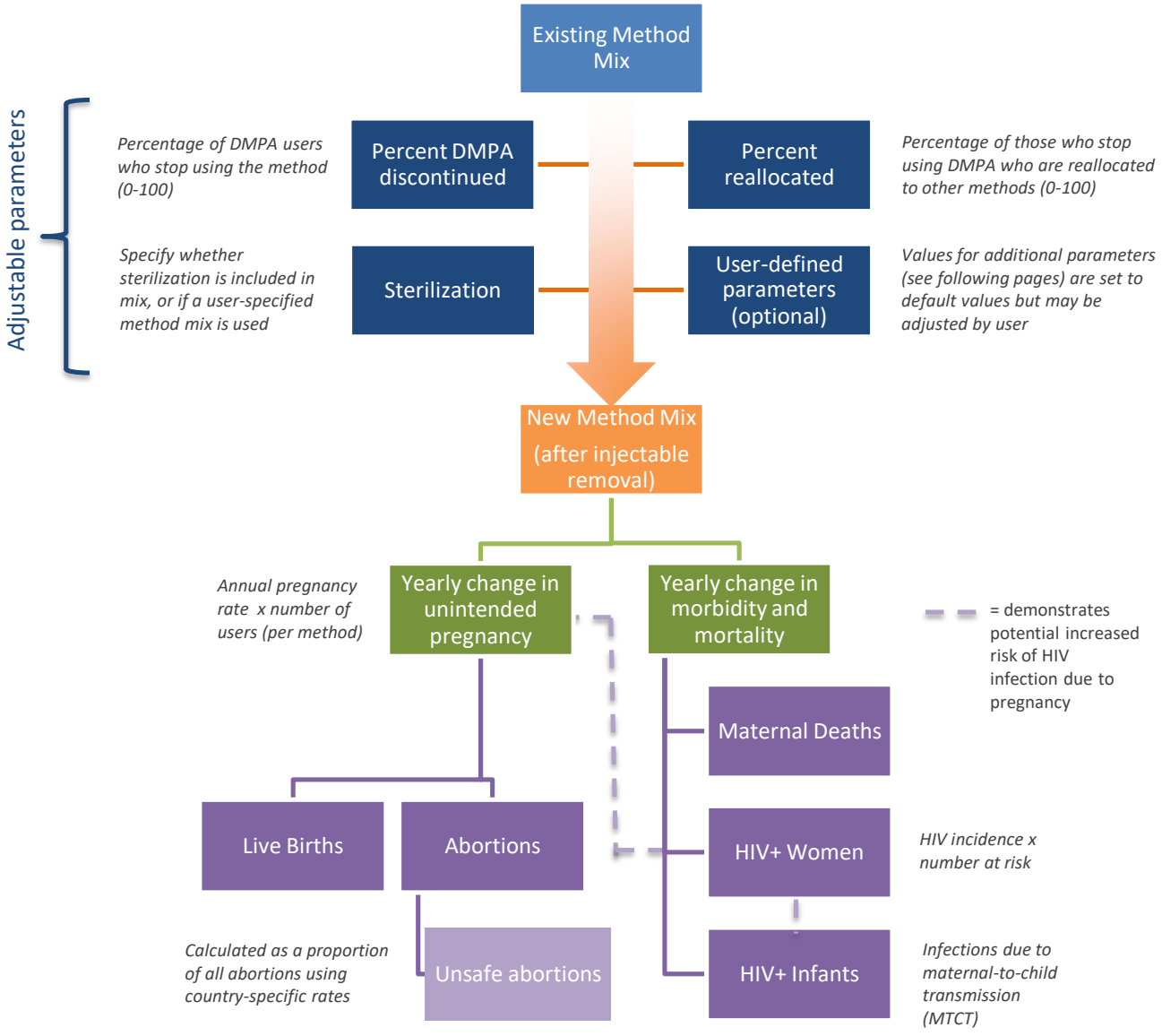
Model overview

The modeling tool allows three options for how injectable contraceptives are replaced in a country:

1. In proportion to the existing, country-specific distribution of other modern methods after excluding **injectables.***
2. In proportion to the existing distribution of other modern methods after excluding **injectables or permanent methods**
3. According to a user-specified mixture of non-injectable methods.

**Calculations for option 1 are described in formulae document.*

How the model works



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Key Assumptions

- No distinction between DMPA and different types of injectables (i.e. Intramuscular DMPA, subcutaneous DMPA, or norethindrone enanthate [NET-EN])†
- For each country, the pooled HIV incidence among women using contraception is a fixed fraction (default: 10%) of HIV prevalence among WRA§11
- Condom users have additional protection against HIV (default: condoms are 85% effective) §12
- Women using modern contraception or with an unmet need due to withdrawal of DMPA have at most one unintended pregnancy per year
    - stop using method while pregnant
    - contribute either 12 months of risk-time during pregnancy/post-partum (if live birth) or 6 months of risk-time (no live birth)
        - default: no differential risk of HIV during pregnancy (except due to discontinuation of condoms or injectable use §13

†Per current WHO MEC.
§Assumptions may be modified by user.

Limitations

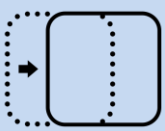
P_4O is intended to help policy makers, family planning and HIV program planners, and other stakeholders understand the potential impact of a change in injectable contraceptive prevalence on pregnancy and HIV outcomes. As with any model, flawed or implausible assumptions ('Inputs Panel') can lead to flawed or implausible outputs ('Impact Panel'). As such, FHI 360 does not take responsibility for the use or misuse of P_4O. Furthermore, P_4O possesses the following additional limitations:

Limited to 22 countries

Does not consider changes over time to:

Focuses on near-term consequences of reduced injectable use

Population size

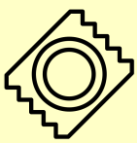


Further shifts in the method mix

New interventions to prevent or treat HIV

Does not target key populations (i.e. female sex workers, discordant couples)

Does not consider impact of PrEP or condom use, which may differ by contraceptive method



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A stepwise guide to using the model

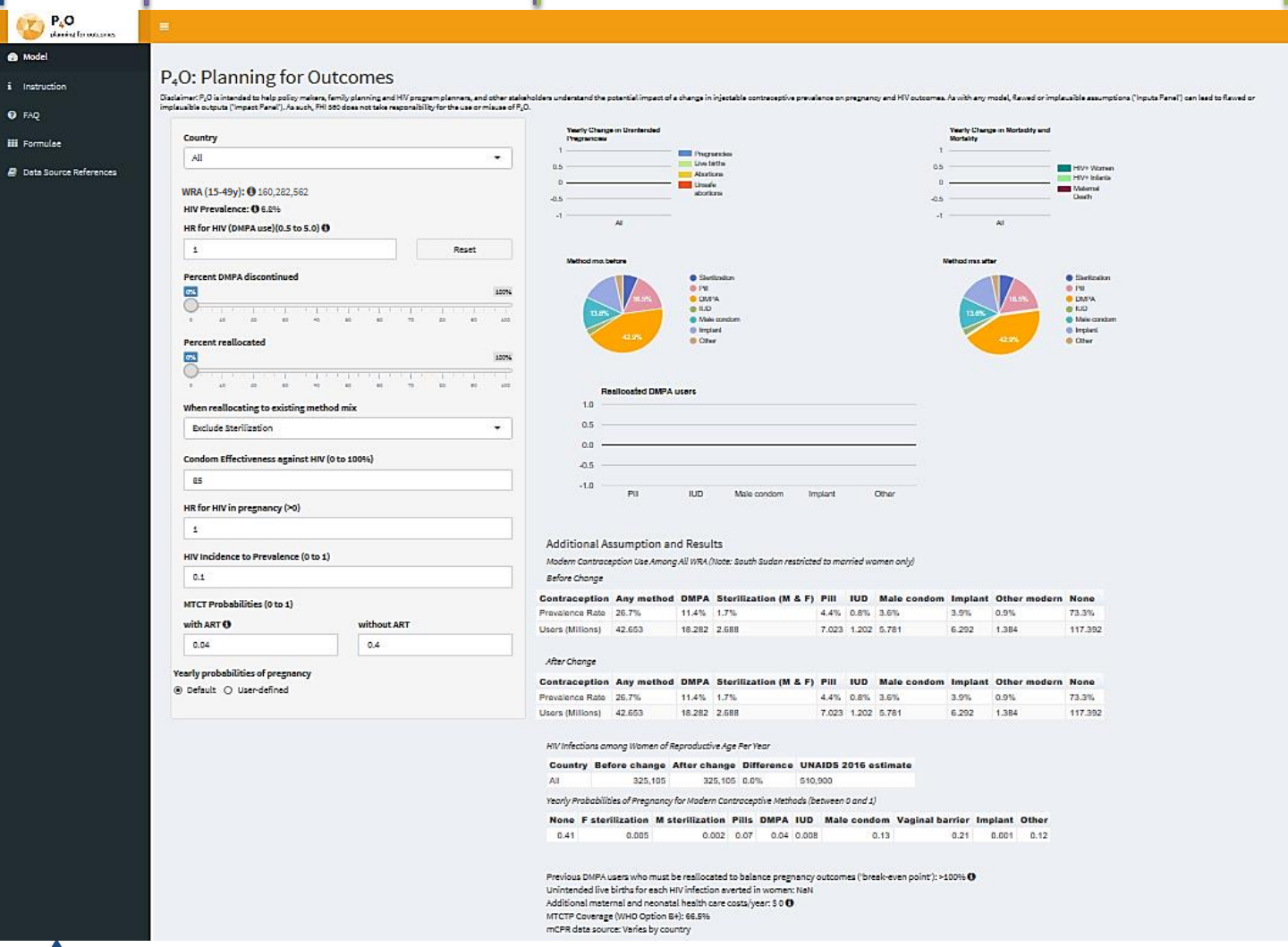
The following pages provide a basic overview of how to use the *P_4O Model*. The interactive model is freely accessible at the following website: https://planning4outcomes.ctiexchange.org/ .

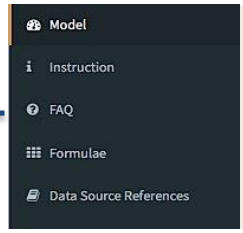
Below is a screenshot of the model. The screen is divided into three main sections, featured below.

Navigation panel

Inputs panel

Impact panel





The navigation panel allows the user to navigate between:

- The interactive model
- Frequently asked questions
- Formulae used in the model
- Data source references
- This introductory guide

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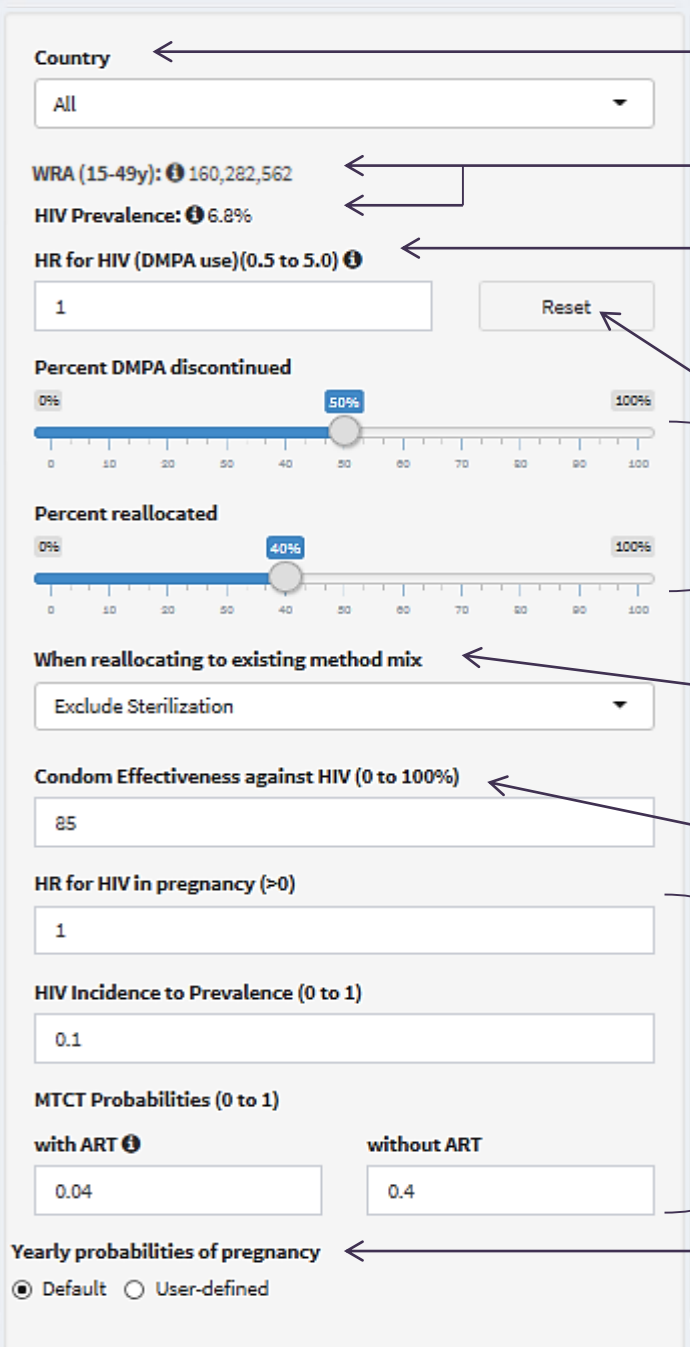
Inputs panel

The grey inputs panel allows the user to modify model parameters. For definitions and more information, hover your mouse over the white boxes and info icon.

The following model parameters are displayed in the panel:



Country – Drop-down menu allows for selection of all countries, all sub-Saharan African countries, or one country at a time.

WRA (15-49 y) and **HIV prevalence** are the total number of women of reproductive age and overall HIV prevalence in the country(ies) selected. These are not modifiable inputs.

HR for HIV (DMPA use) – The default for this input is 1.0. Any value between 0.5-5.0 may be entered into the white box.

Reset – This button will reset all numeric parameters to default values.

% DMPA discontinued/reallocated – Slide these bars to the percentage of DMPA you wish to remove from the current modern contraceptive method mix, and to the percentage of those former DMPA users you wish to assume are reallocated to the existing method mix.

When reallocating to existing method mix – the user is able to choose between excluding and including sterilization, or indicating a user-specified method mix (see following page for details).

Condom Effectiveness against HIV – Any value between 0-100 may be entered in the white box.

HR for HIV in pregnancy – Any value greater than 0 may be entered in the white box.

HIV incidence to prevalence and **MTCT Probabilities** – Any value between 0-1 may be entered in the corresponding white boxes.

Yearly probabilities of pregnancy – If "default" is selected, the yearly probabilities of pregnancy are the values presented in Family Planning: A Global Handbook for Providers (2018 update). If "user-defined" is selected, a box appears which can be altered by the user (see following page).

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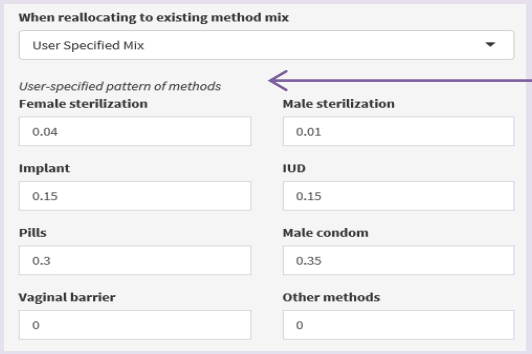
User-defined parameters

For two of the previously defined inputs, the user has the option to designate “user-defined” parameters instead of default values. If selected, the boxes below will appear.



The user may alter how previous DMPA users are reallocated by changing the percentage reallocation per method. Note, the user-specified method mix must equal 100%. An error message will appear if the method mix does not equal 100%.

Yearly probabilities of pregnancy are pre-loaded with default values. The user can change the assumed probabilities by entering new values in the white boxes.

Impact panel

The Impact panel shows how outcomes are impacted based on the inputs in real time. Some outcomes are depicted graphically, whereas others are summarized in a tabular form. The following graphs and tables serve as an example to demonstrate impact if we assume the HR for HIV (DMPA use) is 1.4 and 50% of existing injectable users discontinue and 40% of discontinuers are reallocated in Kenya, without changing additional default parameters.

Yearly change in unintended pregnancies, live births, induced abortions, and unsafe abortions (a subset of induced abortions), yearly changes in morbidity and mortality, as well as both the modern contraceptive method mix at baseline and after changing inputs are depicted graphically.

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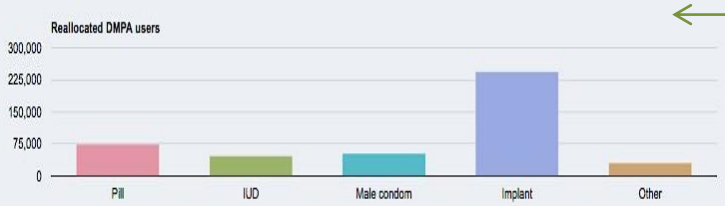
Impact panel, continued.



Additional Assumption and Results

Modern Contraception Use Among All WRA (Note: South Sudan restricted to married women only)

Before Change

Contraception	Any method	DMPA	Sterilization (M & F)	Pill	IUD	Male condom	Implant	All other	None
Prevalence Rate	44.2%	19.4%	1.9%	3.8%	2.4%	2.7%	12.6%	1.5%	55.8%
Users (Millions)	5.091	2.228	0.224	0.437	0.280	0.305	1.445	0.173	6.416

After Change

Contraception	Any method	DMPA	Sterilization (M & F)	Pill	IUD	Male condom	Implant	All other	None
Prevalence Rate	38.4%	9.7%	1.9%	4.4%	2.8%	3.1%	14.7%	1.8%	61.6%
Users (Millions)	4.423	1.114	0.224	0.511	0.327	0.357	1.688	0.202	7.085

HIV Infections among Women of Reproductive Age Per Year

Country	Before change	After change	Difference	UNAIDS 2016 estimate
Kenya	32,578	29,905	-8.2%	25,000-45,000

Yearly Probabilities of Pregnancy for Modern Contraceptive Methods (between 0 and 1)

None	F sterilization	M sterilization	Pills	DMPA	IUD	Male condom	Vaginal barrier	Implant	Other
0.41	0.005	0.002	0.07	0.04	0.008	0.13	0.21	0.001	0.12

Previous DMPA users who must be reallocated to balance pregnancy outcomes ('break-even point'): 98.9%
Unintended live births for each HIV infection averted in women: 51.7
Additional maternal and neonatal health care costs/year: $ 10,447,623
MTCTP Coverage (WHO Option B+): 80.0%
mCPR data source: PMA 2016

The number of previous injectable users reallocated to other modern contraceptive methods and methods to which they are reallocated are also graphically depicted. In this example, most previous injectable users are reallocated to implants (243,816 previous users) followed by contraceptive pills (73,832).

The following outcomes are shown in tables:

- The modern contraceptive prevalence rate and number of users of each method at baseline and after changing inputs.
- The number of HIV infections among women of reproductive age at baseline and after changing inputs.
- The yearly probabilities of pregnancy used in the model calculations for modern contraceptive methods.

A few additional outcomes are depicted at the bottom of the page. Of note, the "break-even point" describes the percentage of previous injectable users who need method reallocation to balance pregnancy outcomes.

Impact interpretation

We hope this model attracts a variety of users with diverse interests – such as healthcare policy makers, ministry of health officials, commodities procurers, advocacy groups, family planning and HIV program planners, funders, and those with general interest in global family planning. As such, we expect interest in particular results will vary depending on the user.

In the example above, one may highlight the impact of DMPA discontinuation on implant use in Kenya. Our model predicts 243,816 previous DMPA users will reallocate to the implant. Family planning programs may use this information to determine whether key factors (i.e. local demand and knowledge, supply, service provision) and other implicated costs are adequately addressed to prepare for this transition.

Ultimately, we hope this model underscores the potential impact of injectable removal from the method mix and serves as a tool to better prepare for potential changes in response to emerging evidence (i.e. from the ECHO trial) about the true risk of acquiring HIV associated with DMPA use.

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Key Takeaways

As the world awaits results clarifying the relationship between DMPA use and HIV acquisition, it is important for programs to begin considering downstream implications. In most realistic scenarios (i.e. less than perfect replacement of DMPA with equally or more effective methods), the HIV prevention benefits from decreases in injectable use are outweighed by negative maternal-child health impacts.

Though there may be ***fewer*** cases of HIV acquisition among women if DMPA increases risk, there are substantial ***increases*** in unintended pregnancies and related outcomes, including: abortions, maternal deaths, and infants with HIV.

Increasing access to highly effective, long-acting reversible contraceptives (LARCs) such as the IUD or implant could help mitigate the impact of reduced injectable prevalence on unintended pregnancy outcomes. However, increased access to LARCs has ***substantial*** programmatic, financial, and logistical challenges.

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