

A shortcut to timely, cost-effective interventions for HIV

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South Africa is home to the largest HIV epidemic in the world with a total of 5.6 million people living with HIV. Large-scale clinical trials evaluating combination methods of prevention and treatment are often prohibitively expensive and take years to complete. In the absence of such trials, mathematical models can help assess the effectiveness of different HIV intervention combinations, as demonstrated in a new study by Elisa Long and Robert Stavert from Yale University in the US. Their findings appear in the *Journal of General Internal Medicine*.

Currently 60 percent of individuals in need of treatment for HIV in South Africa do not receive it. The allocation of scant resources to fight the HIV epidemic means each strategy must be measured in terms of cost versus benefit. A number of new clinical trials have presented evidence supporting a range of biomedical interventions that reduce transmission of HIV. These include voluntary [male circumcision](#) – now recommended by the [World Health Organization](#) and Joint United Nations Programme on HIV/AIDS as a preventive strategy – as well as vaginal microbicides and oral pre-exposure prophylaxis, all of which confer only partial protection against HIV. Long and Stavert show that a combination portfolio of multiple interventions could not only prevent up to two-thirds of future HIV infections, but is also cost-effective in a resource-limited setting such as South Africa.

The authors developed a mathematical model accounting for disease progression, mortality, morbidity and the heterosexual [transmission of HIV](#) to help forecast future trends in the disease. Using data specific for

South Africa, the authors estimated the health benefits and cost-effectiveness of a "combination approach" using all three of the above methods in tandem with current levels of antiretroviral therapy, screening and counseling.

For each intervention, they calculated the HIV incidence and prevalence over 10 years. At present rates of screening and treatment, the researchers predict that HIV prevalence will decline from 19 percent to 14 percent of the population in the next 10 years. However, they calculate that their combination approach including male circumcision, vaginal microbicides and oral pre-exposure prophylaxis could further reduce HIV prevalence to 10 percent over that time scale – preventing 1.5 million [HIV infection](#) over 10 years – even if screening and antiretroviral therapy are kept at current levels. Increasing antiretroviral therapy use and HIV screening frequency in addition could avert more than 2 million HIV infections over 10 years, or 60 percent of the projected total.

The researchers also determined a hierarchy of effectiveness versus cost for these intervention strategies. Where budgets are limited, they suggest money should be allocated first to increasing male circumcision, then to more frequent HIV screening, use of vaginal microbicides and increasing antiretroviral therapy. Additionally, they calculate that omitting pre-exposure prophylaxis from their combination strategy could offer 90 percent of the benefits of treatment for less than 25 percent of the costs.

The authors conclude: "In the absence of multi-intervention randomized clinical or observational trials, a mathematical [HIV epidemic](#) model provides useful insights about the aggregate benefit of implementing a portfolio of biomedical, diagnostic and treatment programs. Allocating limited available resources for HIV control in South Africa is a key priority, and our study indicates that a multi-intervention HIV portfolio could avert nearly two-thirds of projected new HIV infections, and is a

cost-effective use of resources."

More information: Long, E.F. and Stavert, R.R. (2013). Portfolios of biomedical HIV interventions in South Africa: a cost-effectiveness analysis. *Journal of General Internal Medicine*. [DOI 10.1007/s11606-013-2417-1](https://doi.org/10.1007/s11606-013-2417-1)

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