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Working to end HIV by empowering young women

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SCIENCE is not an individual pursuit but involves large study teams and collaborations between scientists within and between countries who work together synergistically towards a shared goal.

It needs substantial human and financial resources. It is also a slow process that often takes over a decade for pivotal studies to be completed. It more often involves failure than success. So in addition to imagination, ideas, creativity and out-of-the-box thinking you need patience, persistence, perseverance and fortitude.

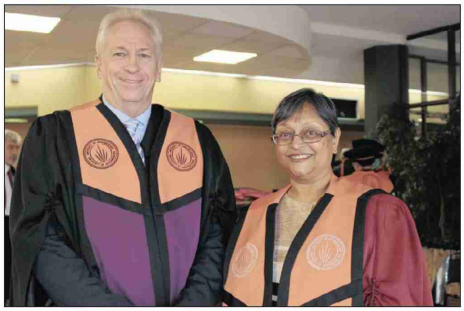
Excellence of course is non-negotiable and some serendipity favours the prepared mind. Some may argue that this applies to anything that is worthwhile pursuing and they are probably right.

I want to provide you with a quick overview of the global HIV epidemic. In 2015 we had about 37 million people living with HIV. Antiretroviral treatment has changed the face of HIV/Aids from a disease that is inevitably fatal to one that is chronic and manageable, yet we still continue to see about 1 million people dying from Aids.

Of greatest concern is that we continue to see about 2 million new infections, translating to just over 5 500 infections each day. Significantly, about 70% of the people living with HIV are in Africa.

Through advocacy, science and investments like the global fund for Aids, TB and Malaria and the Pepfar programme we've made remarkable progress on access to treatment. Indeed, we are starting to exceed our targets set for how many people are getting initiated on treatment. However we are lagging desperately in terms of preventing new HIV infections.

We cannot treat our way out of the epidemic, and particularly sexual transmission of HIV has remained one of our biggest challenges. Between 2013 and 2015 we've seen zero reduction in new infections.



University of Johannesburg executive dean for the Faculty of Health Sciences Professor André Swart and Professor Quarraisha Abdool Karim at the graduation ceremony.

South Africa is home to less than 1% of the global population but has 19% of all HIV infections in the world. South Africa ranks number one in terms of people living with HIV. What we see is a diversity of epidemics within and between provinces, with KwaZulu-Natal the worst affected.

In 1990, my husband and I undertook the first population-based survey in KwaZulu-Natal, which was piggybacked on to the malaria control programme, enabling us to include people from birth all the way to old age.

What we found was that from birth up to age 14, HIV infection was rare in both boys and girls. When we get to age 15 to 19 years, HIV remains rare in boys.

We start to see HIV infection in young men 20 to 24 years of age, peaking around 25 to 29 years. In contrast, in young women aged 15 to 19 years, the HIV prevalence is in excess of 6% and we continue to see high rates of HIV infection in women across their life course. By now you would have figured out that these young girls are getting infected from men who are four or more years older than them.

It is this age sex difference in HIV acquisition that continues to drive this epidemic. If men 25 and above were only having sex with women 25 and above we would see an end to this epidemic, but as long as we have these two different cohorts of young women under the age of 25 and over 25 having sex with men 25 and older, we will see HIV continuing to spread.

This age sex difference is common across Africa but worst in southern and Eastern Africa. Indeed, across Africa, 15- to 24-year-old women have up to six times more infection compared to their male peers. More recent data, from a survey of young boys and girls in their second and third year in high school in 2010 is that HIV infection remains rare in young boys up to age 20.

In contrast to the boys, by age 15 we already see a prevalence of 2.6% in girls and this prevalence doubles with every two years of advancing age to where by age 20, one in four is infected with HIV. This gives you some indication of what a high priority it is to prevent HIV infection in women.

In surveys we undertake annually among pregnant women in the seven primary health care clinics in our rural district, which is one of the highest burdened districts in South Africa, by age 16 one in 10 is infected with HIV. By age 18 it's one in five, by age 20 it's one in 3 and by age 24 it's every other women.

This HIV data needs to be considered against the fact that Africa is the only continent in the world where more than 60% of the people are under the age of 30, so when we have these high rates of teen pregnancy and HIV infection, we are talking about cutting short the lives of women before they have reached adulthood, curtailment of schooling, and being caught up in vicious cycles of poverty and dependency.

These are our future teachers, nurses, carers; these are the people who bring social cohesion to society; these are our scientists, our leaders and so by now I hope you are convinced as I am that preventing HIV infection in young women is absolutely essential.

Young men acquiring HIV in their mid-twenties also means that Africa is losing an important resource – its young men and women. Not only is it essential to prevent HIV in young women, but it's also essential to end Aids.

Prevent

While it's clear that young women bear a disproportionate burden of infection, when we look at what is available to prevent infection – abstinence, behaviour change, male and female condoms, medical male circumcision – well, for those women who have to survive because their parents have died and they have younger siblings to support, or where food security is a higher priority, or for any number of reasons they are becoming sexually active, and for those who do not have the ability to negotiate safer sex practices with their partner (whether its voluntary sex or involuntary coerced sex where gender-based violence is common), what do you have to offer them?

Nothing! So this has been the impetus for our focus on women-initiated technologies, also called microbicides.

In 1993 we did one of the first microbicide studies. Little did we realise then that we would spend the next 11 years testing multiple products and time after time be met with failure. We became experts at failing and each failure was very publicly shared. But we kept on, learnt a lot from each failure and each time we failed we reflected on why and tried again.

In 2004, while providing antiretroviral treatment to Aids patients and seeing the benefits of antiretrovirals and reflecting on lessons on use on ARVs to prevent HIV transmission from infected mothers to infants, we had the idea to use antiretrovirals to prevent HIV infection in women.

We had gained experience in a drug called Tenofovir that had a good safety profile and was very effective in treating Aids patients. We were able to get a donation of the drug and put it into a gel and tested it in HIV uninfected urban and rural women to see if we could prevent HIV infection.

This was the Caprisa 004 trial that demonstrated for the first time that antiretrovirals used by uninfected women can prevent HIV infection – we showed an overall 39% reduction in HIV infection, 54% in women who were very adherent to gel use and 74% where high Tenofovir drug levels where measured.

We had a bonus finding in this particular study in that we also established that Tenofovir prevented genital herpes (HSV-2), one of the most common sexually transmitted infections. We were able for the first time to show a 51% reduction in new HSV-2 infections with the same product.

These results were presented at the International AIDS Conference in Vienna and simultaneously published in the journal of Science in 2010, 30 years after our first population based survey.

These findings marked a new era of optimism in HIV prevention and the paper was voted as one of the top papers in the journal Lancet and one of the top 10 breakthroughs in science in that year.

Subsequently, many other studies followed, and in 2015 the World Health Organisation released in their latest guidelines the inclusion of daily use of Tenofovir-containing agents as prophylaxis as part of combination prevention.

But preventing HIV infection in women would prove more challenging. Antiretrovirals are very anti-HIV specific but they need to be used to be effective and what we learnt was that women were not always able to be adherent. We have turned our attention to look at products that are less user dependent and these include two monthly injections of antiretrovirals, and sub-dermal implants containing antiretrovirals.

One of our really exciting findings is the discovery of a young women who became HIV infected in one of our studies and her body was able to produce powerful antibodies that are effective against about 80% of the circulating viruses.

We are about to test these antibodies to see if they can protect HIV uninfected people to remains uninfected, and if it works we will have a new prevention option that could be administered twice a year and will also have more insights on how to develop an effective vaccine.

We hope that with our collective efforts – with advocacy, with good science, with government and donor investments – that we can individually and collectively change the picture to one where HIV no longer poses a threat to us.

● This is an extract from a speech delivered this week by Karim, thescientific director at Caprisa, after the University of Johannesburg conferred an honorary degree, Doctor Litterarum et Philosophiae (honoris causa) on her for her pioneering contributions in understanding the evolving HIV epidemic.