

Understanding the HIV challenge in South Africa

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Author

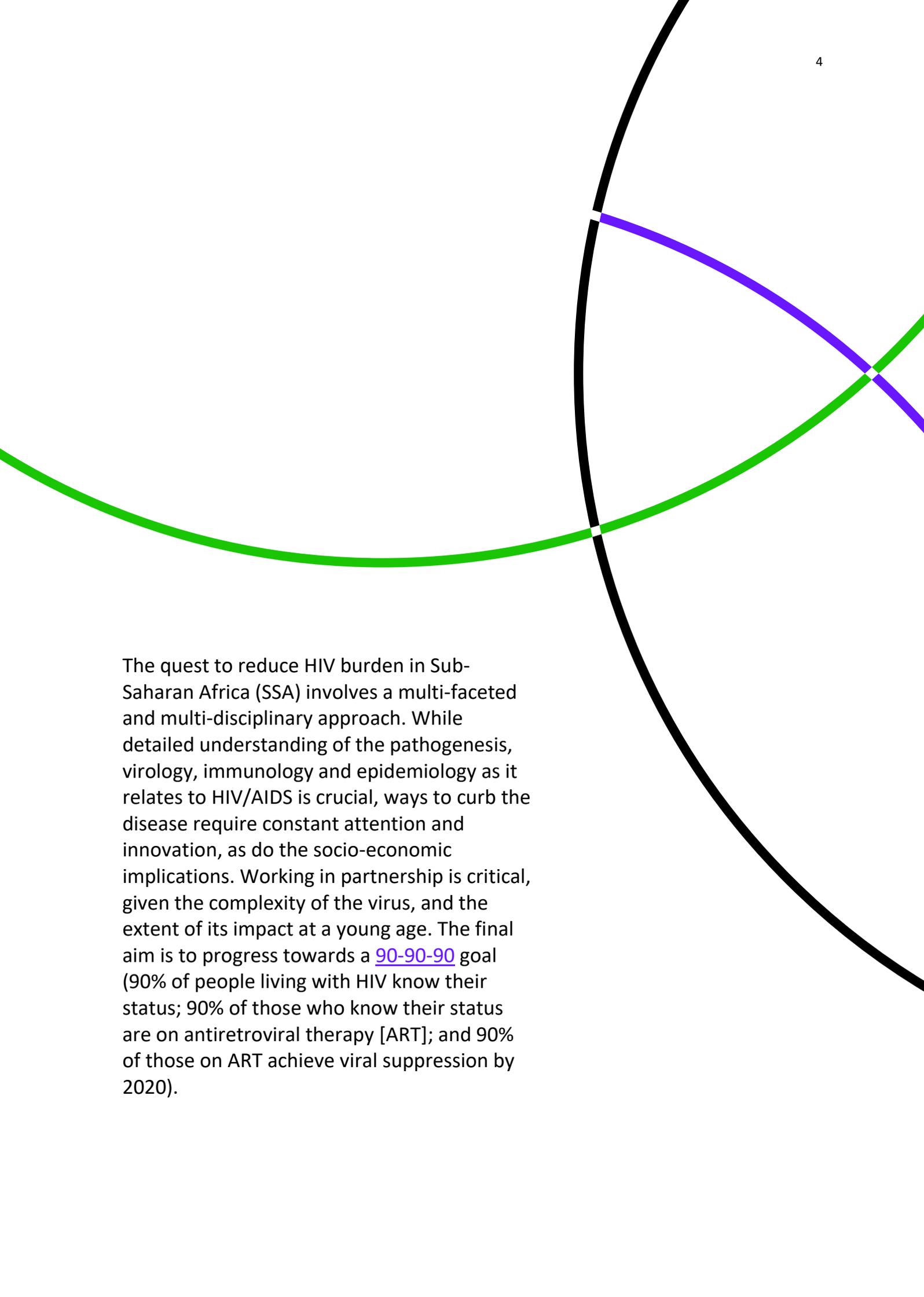
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Shyama Ghosh, PhD, is a molecular biologist and science editor for the Incidence and Prevalence Database, Clarivate Analytics. Based in Antwerp, Belgium, she enjoys working in the interphase between academics and industry. Shyama has contributed several thought leadership articles on cutting-edge research questions. With a background in immunology, Shyama received her Ph.D. from the Vrije Universiteit Brussels, Belgium.

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The quest to reduce HIV burden in Sub-Saharan Africa (SSA) involves a multi-faceted and multi-disciplinary approach. While detailed understanding of the pathogenesis, virology, immunology and epidemiology as it relates to HIV/AIDS is crucial, ways to curb the disease require constant attention and innovation, as do the socio-economic implications. Working in partnership is critical, given the complexity of the virus, and the extent of its impact at a young age. The final aim is to progress towards a [90-90-90](#) goal (90% of people living with HIV know their status; 90% of those who know their status are on antiretroviral therapy [ART]; and 90% of those on ART achieve viral suppression by 2020).

This report provides an overview of HIV incidence and prevalence in Sub-Saharan Africa (SSA) countries, with a focus on South Africa (SA). Disease projections provide an estimate of the growing number of new HIV infections and of people living with HIV/AIDS. HIV-caused deaths and disability in SA were defined using comparators based on global burden of disease (GBD) regional classifications, and an overview of SA’s health service utilization.

Across SSA, HIV control involved the successful use of antiretrovirals (ARVs) that were studied for efficacy in numerous clinical trials. A profile of the clinical studies undertaken in the various SSA countries was tabulated, followed by a visualization of the various public-private partnerships active in sponsoring HIV trials, and the drug pipeline interventions studied. In SA, young women contract HIV at much higher rates than young men. The use of pretransmission interventions may aid in reducing these discrepancies, while awareness and education will curb disease spread.

HIV Incidence

Within Africa, new HIV infections (incidence) ranged from 790,000 (eastern and southern Africa) to 410,000 (western and central regions), in 2015. Overall incidence rates (per 158.

Focusing on SSA alone, significant heterogeneity was noted, with 74,670 cases diagnosed in the central region, 618,520 in the eastern areas, 444,710 in the western parts and a markedly high 710,050 cases detected in the southern section. For selected SSA countries, incidence rates (shown in Fig.1.), confirmed that South Africa (SA) still accounted for [a third of all new HIV infections](#) in southern Africa.

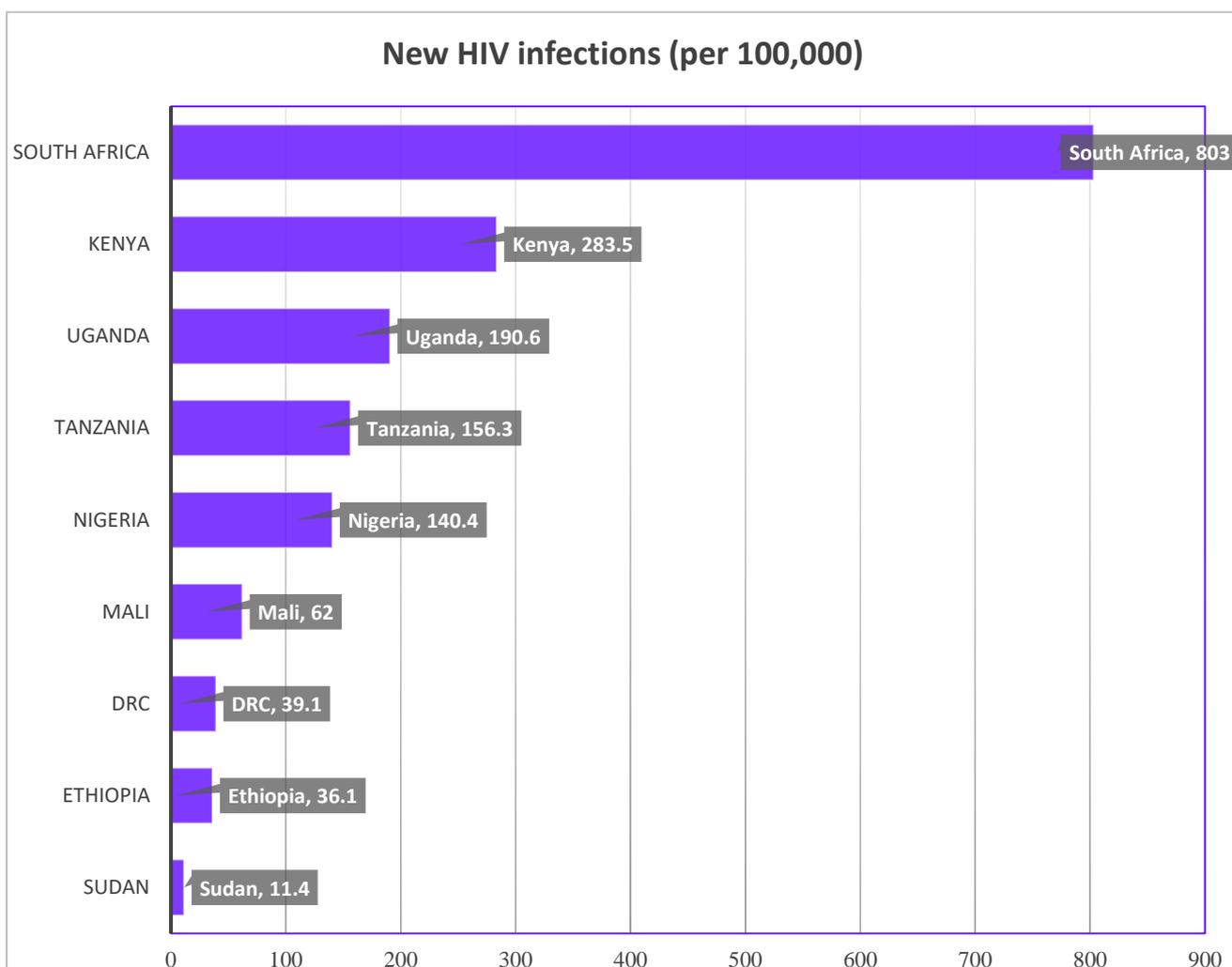


Figure 1 : HIV incidence rates (per 100,000) reported for year 2015 in separate SSA countries

Source : The [Incidence and Prevalence Database, Clarivate Analytics](#)

Projecting HIV incidence values can give an impression of the disease burden in the coming years. Figure 2 depicts the projected HIV incidence (number of new cases) for SSA (2013-2038). Five years of historical data and 20 years of projected data are shown, with population data obtained from the U.S. Census Bureau.

The projection set indicates that while the total HIV diagnosed cases will continue to grow in the next 20 years, SA and Nigeria in particular will bear significant burden of morbidity and mortality. Corresponding data was also available for Mali and Sudan, but the annual number of new HIV cases was comparatively smaller (Mali: 9,901 in year 2013, projected incidence estimated at 19,833 in year 2038; Sudan: 3,973 in year 2013, projected incidence estimated at 5,915 in year 2038).

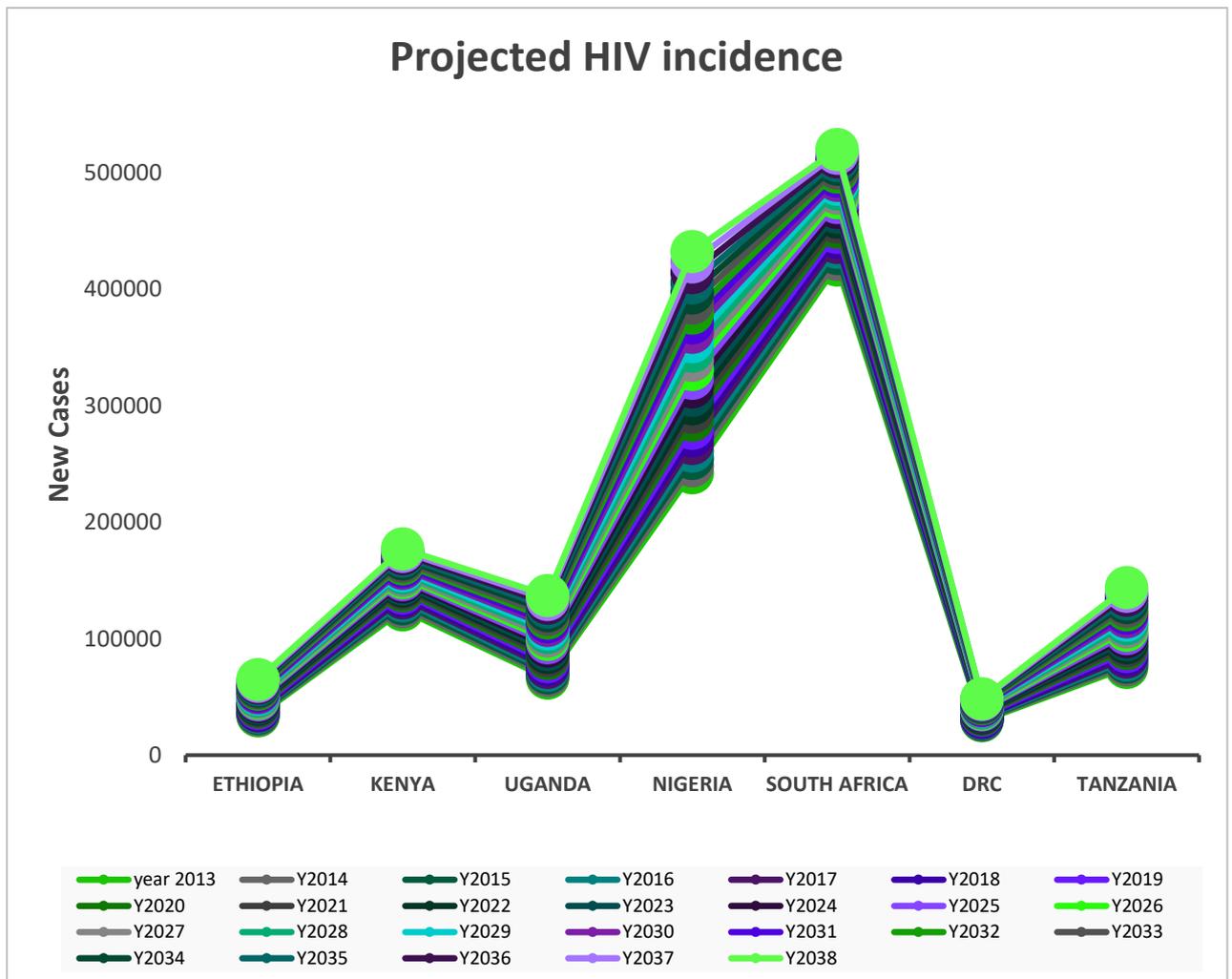


Figure 2: Projected HIV incidence (number of new cases) for SSA (2013-2038)
 Source: The [Incidence and Prevalence Database, Clarivate Analytics](#)

HIV prevalence

For the year 2015, the number of people living with HIV or HIV/AIDS was reported at 19.4 million for eastern and southern Africa and 6.1 million for the western and central regions. Overall, prevalence rates (per 100,000) for persons with HIV or HIV/AIDS in Africa was reported at 2,669. The corresponding rates for individual countries are shown in Figure 3.

With regard to SSA (2015 data), 24.7 million were affected (1,176,440 cases in the central region, significantly higher numbers of 10,437,570 and 11,408,430 cases in the eastern and southern section, respectively, and 6,417,100 cases in the western parts).

In SA, HIV prevalence remained high (18.9%) among the general population, while varying markedly among different regions – up to 12.2% in Kwazulu Natal compared with 6.8% and 5.6% in Northern Cape and Western Cape, respectively.

HIV prevalence rates were reportedly high among children and young women. In 2016, an estimated 320,000 children (aged 0 to 14) were living with HIV in SA, only 55% of whom were receiving treatment.

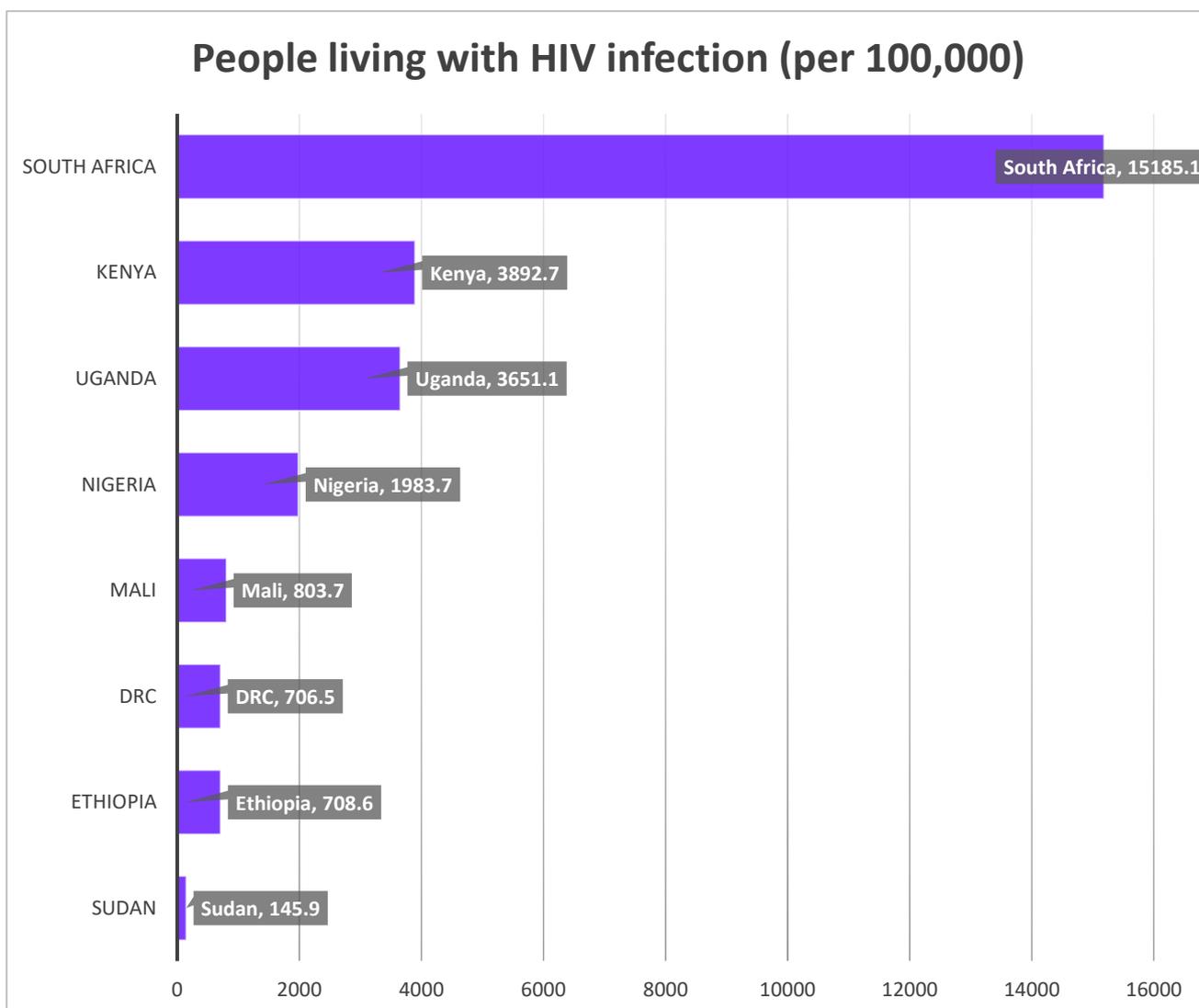


Figure 3: HIV prevalence rates (per 100,000) reported for year 2015 in separate Sub Saharan Africa countries
Source: The [Incidence and Prevalence Database, Clarivate Analytics](#)

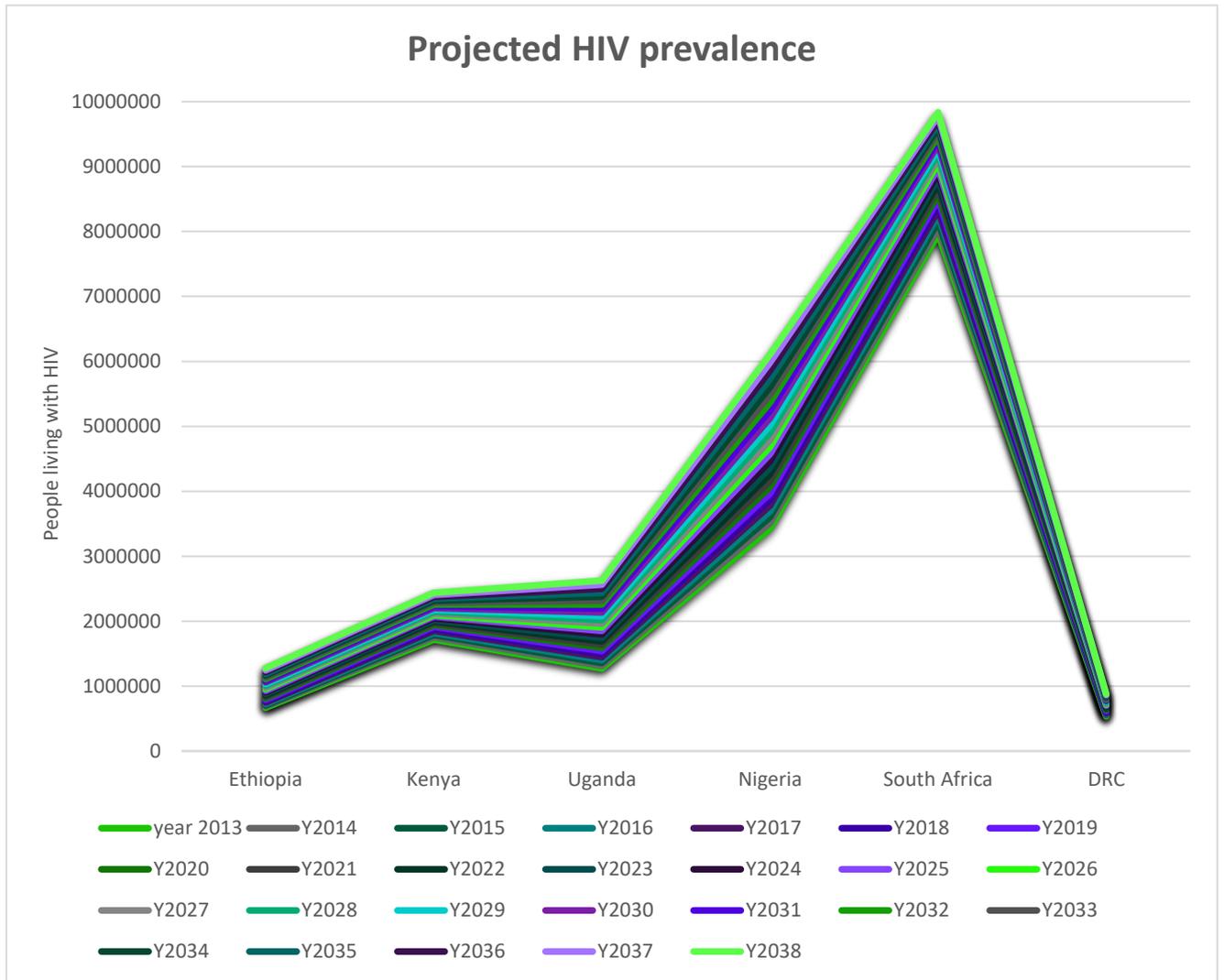


Figure 4: Projected HIV prevalence (number of persons living with HIV or HIV/AIDS) for SSA (2013-2038)
Source: The [Incidence and Prevalence Database, Clarivate Analytics](#)

The projection set shows an increasing number of people living with HIV and HIV/AIDS over the next 20 years (Figure 4), with significantly higher numbers in SA and Nigeria. Corresponding data was also available for Mali and Sudan, although the annual numbers were comparatively lower

(Mali: 128,342 in year 2013, projected prevalence estimated at 257,091 in year 2038; Sudan: 50,843 in year 2013, projected prevalence estimated at 75,698 in year 2038).

Mortality and morbidity

Overall, and also among all communicable diseases, HIV infection caused the highest number of deaths in SA. It is also responsible for the highest number of premature deaths as well as disability in the country. In 2016, up to 110,000 South Africans died from AIDS-related illnesses.

How do causes of death and disability compare to those in other locations?

Tabulating the top 10 causes of death and disability (DALYs) in SA presented the following list : HIV/AIDS, lower respiratory infection (most common were pneumonia and bronchitis), diabetes, road injuries, inter-personal violence, tuberculosis, ischemic heart disease, cerebrovascular disease, diarrheal disease and sense organ diseases.

Figure 5 shows a comparison of DALYs across SA and another representative country, China.

Upon comparing SA with China, significant differences were noted for the DALYs caused by HIV infection, lower respiratory infection, diabetes, tuberculosis and diarrheal diseases.

A mean comparison group was also generated that was based on global burden of disease (GBD) regional classifications, known trade partnerships and socio-demographic indicators. Rates for each of the above mentioned diseases in SA were significantly higher than that of the mean comparison group, except for ischemic heart disease and cerebrovascular disease.

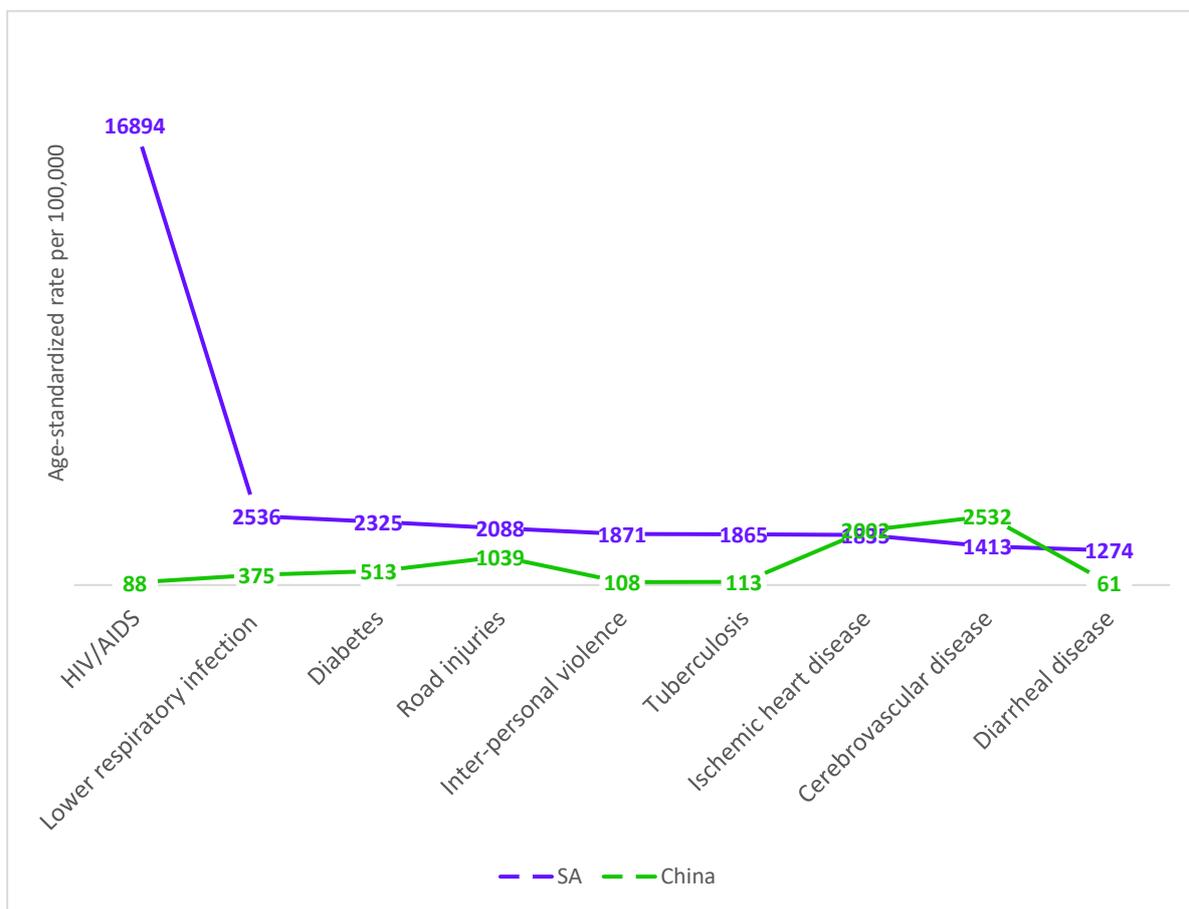


Figure 5: Top 10 causes of death and disability (DALYs), with numerical reporting of age-standardized rates per 100,000 (year 2016).

Source: <http://www.healthdata.org/south-africa>

Health service utilization

Testing and awareness

Significant steps have been undertaken to increase the number of people getting tested for HIV in recent years. SA is now almost meeting the first of the 90-90-90 targets, with 86% of people aware of their status (an increase from 66.2% in 2014).

Mother-to-child HIV transmission

Breastfeeding has been implicated in mother-to-child HIV transmission. Recent years noted the marked decline in new infections among South African children (from 25,000 in 2010 to 12,000 in 2016). This is mainly due to the success of [prevention of mother-to-child transmission](#) (PMTCT) programs. The rate of mother-to-child transmission stood at 1.3% in 2017, down from 3.6% in 2011; putting SA on track for eliminating mother to child transmission.

Age and PrEP

HIV prevalence among young women in SA is nearly four times that of men their age. In 2016, young women age 15-24 made up 37% of new infections in the country. To try and reduce this high rate of infection, young women and adolescent girls at high risk of HIV infection were offered pre-exposure prophylaxis (PrEP), antiretroviral drugs to protect HIV-negative people from infection. While PrEP regimen involves a once-a-day pill, trials (Desmond Tutu HIV Foundation) are ongoing to test a [slow-release vaginal ring](#) to which PrEP is added for the dual function of reducing HIV contraction risk besides birth control.

Antiretroviral (ART) program

SA has the largest antiretroviral treatment (ART) program in the world. While 56% of infected adults are on antiretroviral treatment, corresponding value among children is 55%. SA's ART services have undergone dramatic expansion in recent years, in keeping with the World Health Organization's (WHO) changing guidelines. In 2016, South Africa implemented «test and treat» whereby everyone with a positive diagnosis was eligible to start treatment. This has meant that the number of people eligible for treatment has increased from 3.39 million in the middle of 2015 to 7.1 million in 2016 – more than doubling in just one year.

The success of the ART program is evident in the increases in national life expectancy, rising from 61.2 years in 2010 to 67.7 years in 2015

HIV clinical trials

HIV treatment has been facilitated by the appropriate planning of clinical trials in both children and adults. The top 20 countries with the highest number of HIV clinical trials in SSA were reported in Figure 6.

More than 657 clinical trials were reported, with 348 HIV studies reported for SA, followed by 144 in Uganda, 76 in Kenya and 69 in Tanzania. Nigeria reported 14 clinical studies.

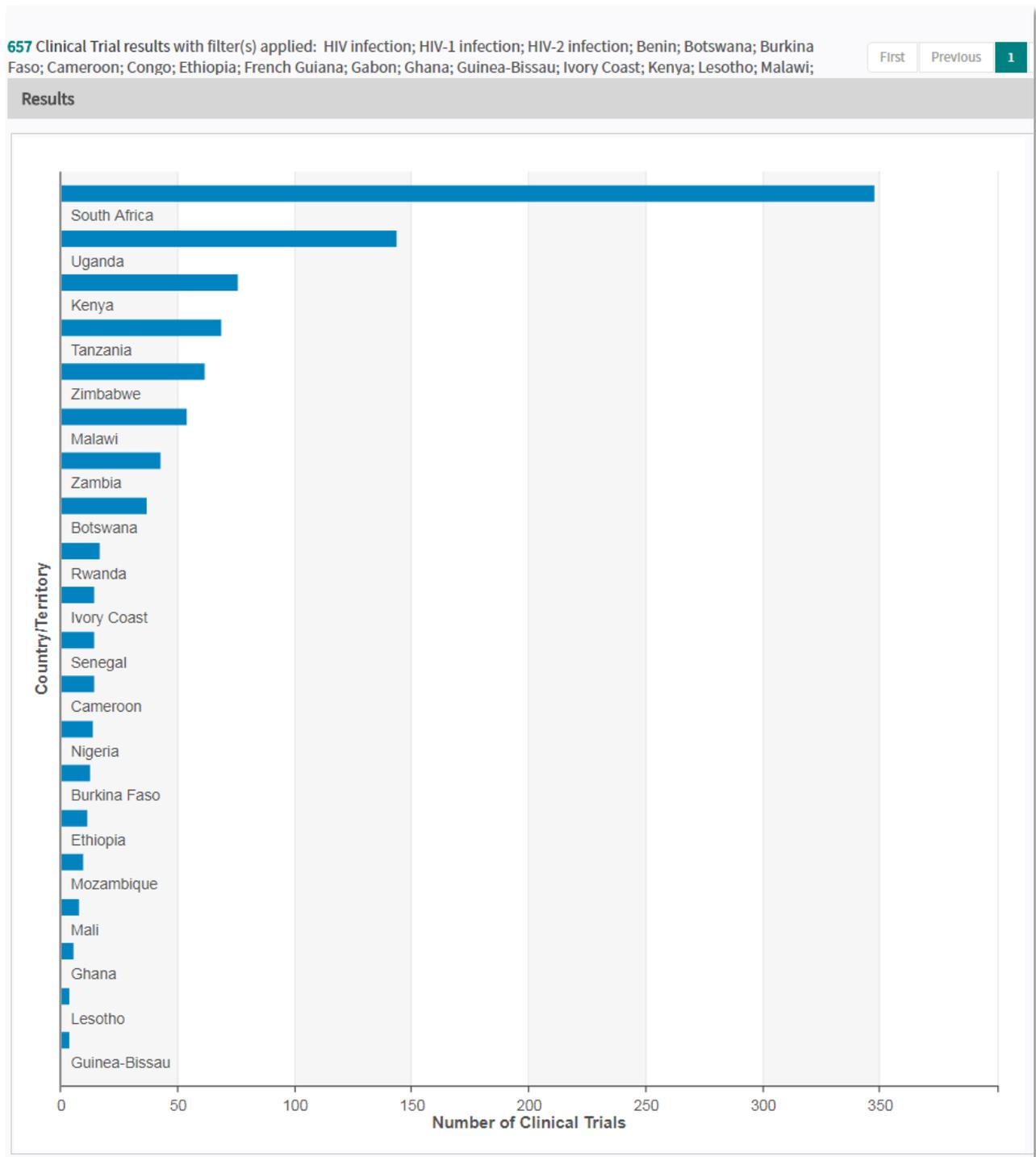


Figure 6: Top 20 countries with the most HIV clinical trials in SSA
 Source: [Cortellis Clinical Trials Intelligence, Clarivate Analytics](#), May 31, 2018

Public-private partnerships

In SSA, [public-private partnerships](#) are exemplified by the National Institute of Allergy and Infectious Diseases (NIAID)-funded HIV Vaccine Trials Network (HVTN). The network is sponsoring several clinical trial sites, such as the HIV vaccine efficacy trials termed as the Imbokodo and the phase IIb/III HVTN 702 study. Imbokodo is a new phase IIb proof-of-concept study, enrolling 2,600 HIV-negative women, age 18-35 years; the first participants have already received vaccinations at various clinical research sites in SA, while regulatory processes are underway to conduct the study in Malawi, Mozambique, Zambia and Zimbabwe.

The prime boost vaccine strategy being tested in Imbokodo includes utilizing “mosaic” immunogens – vaccine components inserted in an Adenovirus type 26 vaccine platform designed to induce immune responses against a wide variety of global HIV strains – combined with a protein vaccine boost. Results from Imbokodo are expected in 2021.

Results from the ongoing phase IIb/III [HVTN 702](#) study, which launched late last year and is enrolling HIV-negative men and women in South Africa, are expected in late 2020.

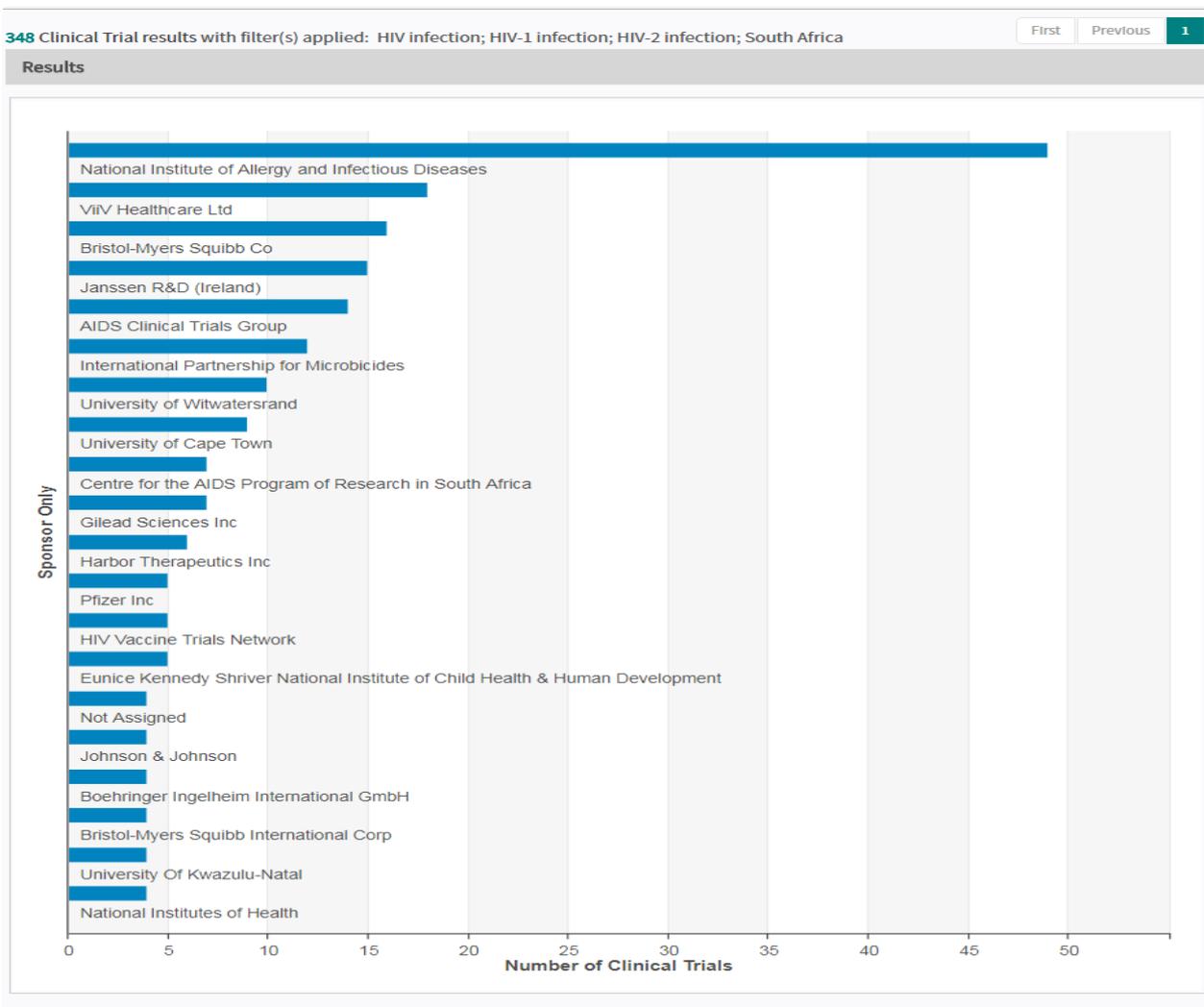


Figure 7: Top 20 sponsors for HIV clinical trials conducted in SA are listed here

Source: [Cortellis Clinical Trials Intelligence, Clarivate Analytics](#), May 31, 2018

SA has been involved in up to 49 HIV trials sponsored by the NIAID. The University of Witwatersrand, University of Cape Town and the University of KwaZulu-Natal have sponsored 10, nine and four HIV clinical trials, respectively, in the country. (See Figure 7.)

Costs

The country’s ART efforts have been largely financed from its own domestic resources. In 2015, SA was investing more than \$1.34 billion annually to run its HIV programs. The National Strategic Plan (NSP) outlined that treatment and care made up the biggest proportion of the costs.

Despite having the world’s largest procurement program, antiretrovirals have cost SA more than other low and middle income countries.

This is about to change now, with SA negotiating better prices for ARVs in recent years. In September 2017, UNAIDS announced a breakthrough pricing agreement, which will allow the single pill regime of Dolutegravir to be sold at around \$75 per person per year, in South Africa and 90 other low and middle income countries. The NSP has also outlined plans to roll-out Dolutegravir.

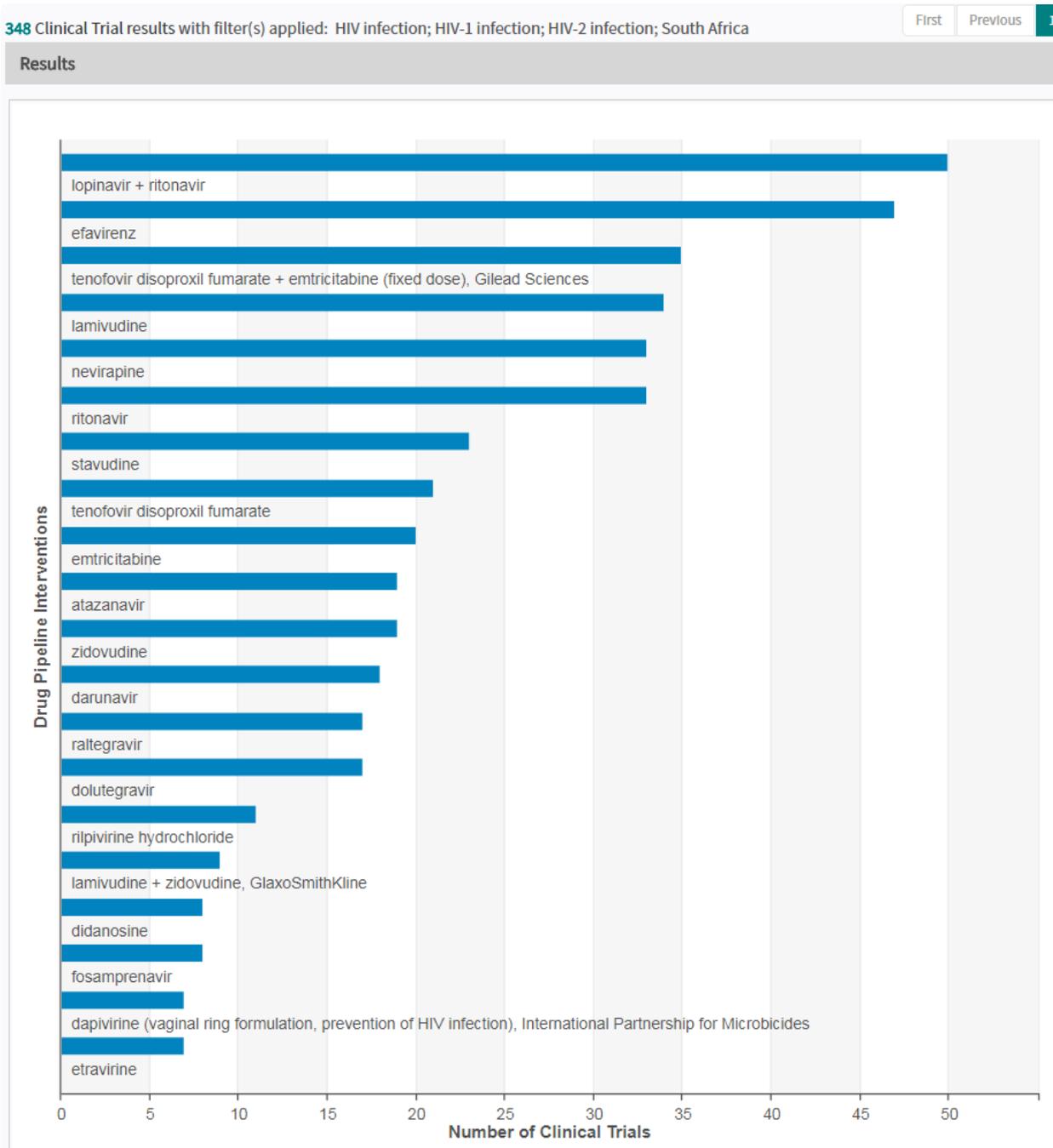


Figure 8: Drug pipeline interventions studied in HIV clinical trials in SA. Top 20 results depicted here. **Source:** [Cortellis Clinical Trials Intelligence, Clarivate Analytics](#), May 31, 2018

Closing remarks

Recent years have seen SA making great strides to tackle its HIV epidemic. Moreover, these efforts are now largely funded from SA's own resources. HIV prevention initiatives are significantly impacting mother-to-child transmission rates, which have fallen dramatically. Also, new HIV infections overall have fallen by half in the last decade. Yet, despite running the world's biggest HIV treatment program, currently only about half of the roughly 7 million HIV-positive people in SA have access to ARVs. While SSA countries like Zimbabwe, Malawi and Zambia have almost reached the 90-90-90 goal, the UNAIDS has reported 86-65-56 corresponding values for SA.

Within SSA, local governments need to explore strategies to expand treatment programs, as there are still many others to cure. ART coverage among children living with HIV has notably improved since 2010, yet, in 2016, only 43% of the estimated 2.1 million children living with HIV were receiving ART. Without access to HIV care and treatment, such infants face an exceptionally high mortality (about 30% in the first year of life; 50% by their second year of life). Many of these HIV-related deaths can be avoided by identifying HIV infection early and initiating ART rapidly.

At the same time further disease research is necessary. Networks such as the SANTHE (Sub-Saharan African Network For TB/HIV Research Excellence) aim to shape and drive locally relevant basic, clinical and translational research in Africa. Both from the research and clinical viewpoint, the ultimate goal is to prevent HIV transmission through early detection of infection, immediately followed by ART and the elimination of the HIV epidemic.

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[The Incidence and Prevalence Database, Clarivate Analytics](#)

[Cortellis Clinical Trials Intelligence, Clarivate Analytics, May 31, 2018](#)

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