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CENTRE FOR THE AIDS PROGRAMME OF RESEARCH IN SOUTH AFRICA

Using science, technology and innovation to deliver better results in the prevention, care and treatment of HIV/AIDS

CSTD High-level roundtable on STI and health, 18 May 2021

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science & innovation Department: Science and Innovation REPUBLIC OF SOUTH AFRICA

CAPRISA hosts a DST-NRF Centre of Excellence in HIV Prevention

NRF National Research Foundation

UNAIDS

CAPRISA is the UNAIDS Collaborating Centre for HIV Research and Policy

saMRC advancing life

CAPRISA hosts a MRC HIV-TB Pathogenesis and Treatment Research Unit

CAPRISA hosts a DoH-MRC Special Initiative for HIV Prevention Technology

health Department: Health REPUBLIC OF SOUTH AFRICA

COLUMBIA UNIVERSITY | MAILMAN SCHOOL of PUBLIC HEALTH

UNIVERSITY OF KWAZULU-NATAL INYUVESI YAKWAZULU-NATALI

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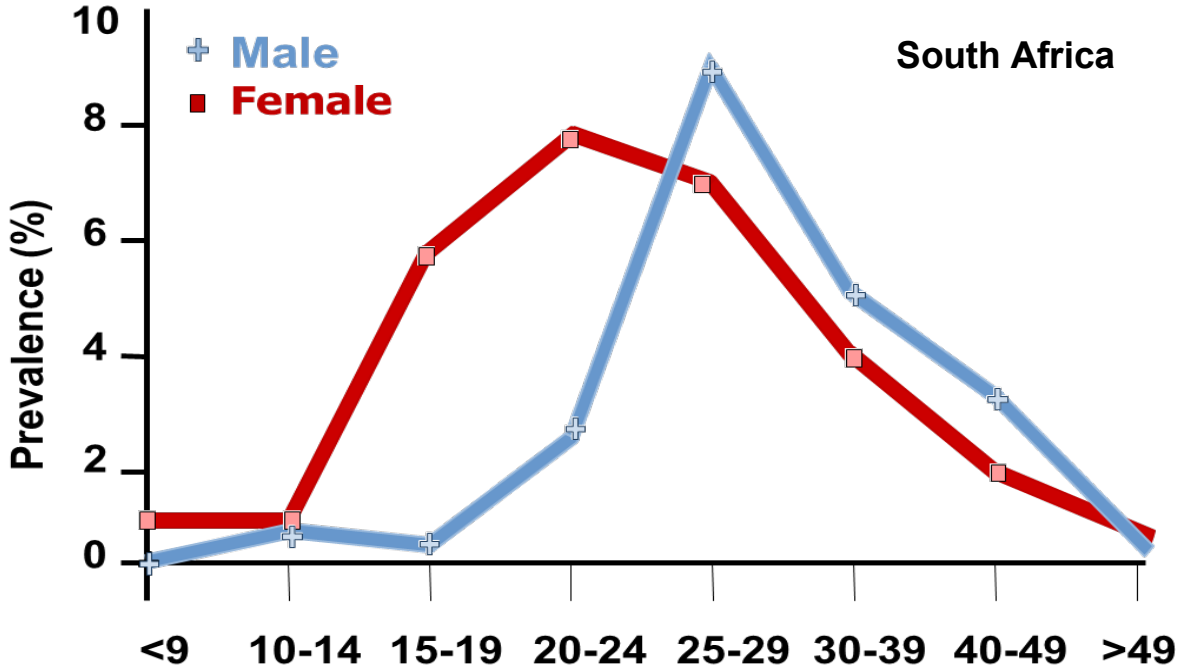
High risk of HIV in young women in sub-Saharan Africa : 1 in 4 infections globally!

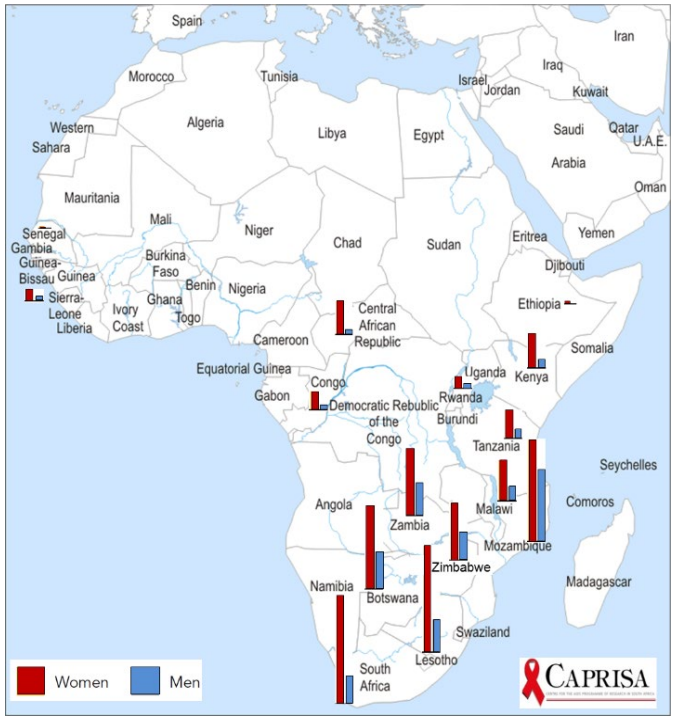
Seroprevalence of HIV infection in rural South Africa

AIDS 1992, **6**:1535-1539

Quarraisha Abdool Karim, Salim S. Abdool Karim, Bipraj Singh*, Richard Short† and Sipho Ngxongo‡

AIDS





1990: One of the earliest community-based HIV surveys in Africa

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Phylogenetics reveals “The Cycle of HIV Transmission”

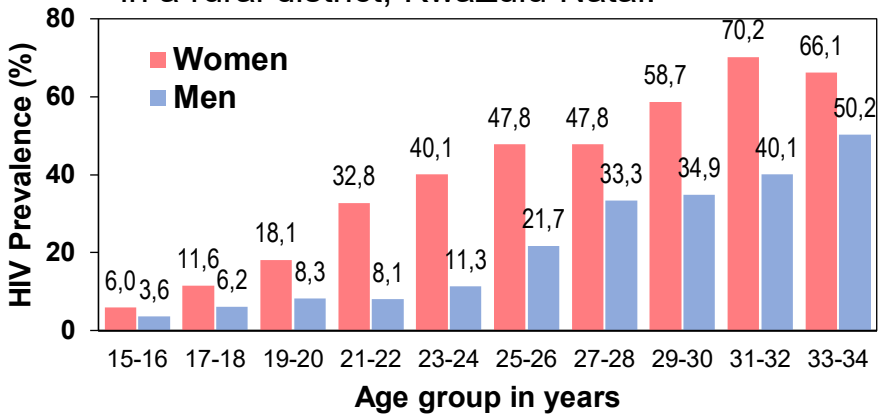
Community-based HIV prevalence in KwaZulu-Natal, South Africa: results of a cross-sectional household survey

Ayesha B M Kharsany, Cherie Cawood, David Khanyile, Lara Lewis, Anneke Grobler, Adrian Puren, Kaymarlin Govender, Gavin George, Sean Beckett, Natasha Samsunder, Savathree Madurai, Carlos Toledo, Zawadi Chipeta, Mary Glenshaw, Sara Hersey, Quarraisha Abdool Karim

Transmission networks and risk of HIV infection in KwaZulu-Natal, South Africa: a community-wide phylogenetic study

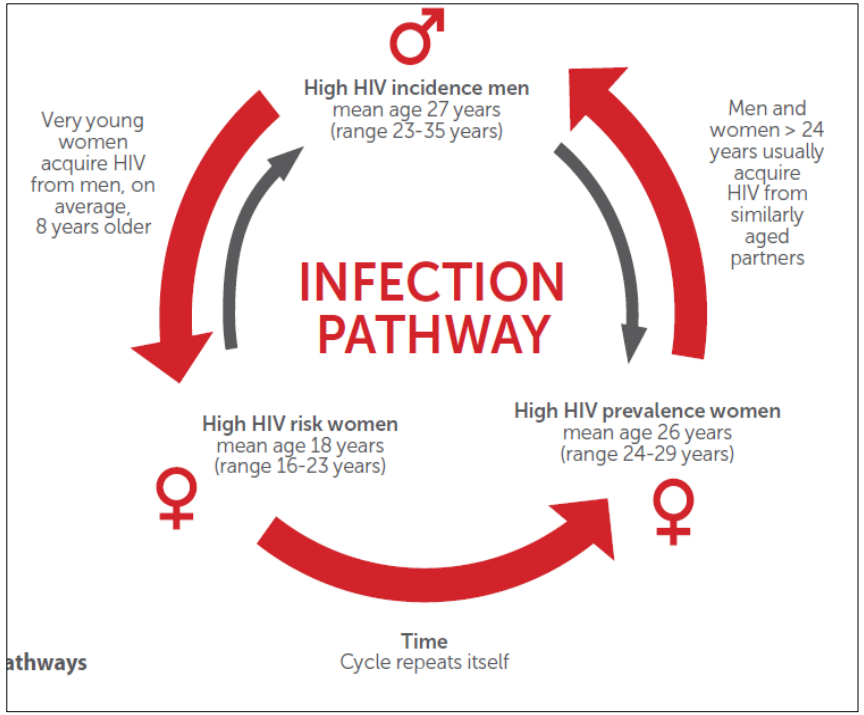
Tulio de Oliveira, Ayesha B M Kharsany*, Tiago Gräf, Cherie Cawood, David Khanyile, Anneke Grobler, Adrian Puren, Savathree Madurai, Cheryl Baxter, Quarraisha Abdool Karim, Salim S Abdool Karim*

Community survey in 9,812 men and women in a rural district, KwaZulu-Natal:



- Overall 36% HIV positive
- 44% in women vs 28% in men

Women age group	Age difference with male partners
16-20	**11.5 yrs**
21-25	7.0 yrs
26-30	1.5 yrs
31-35	1.7 yrs
36-40	0.7 yrs



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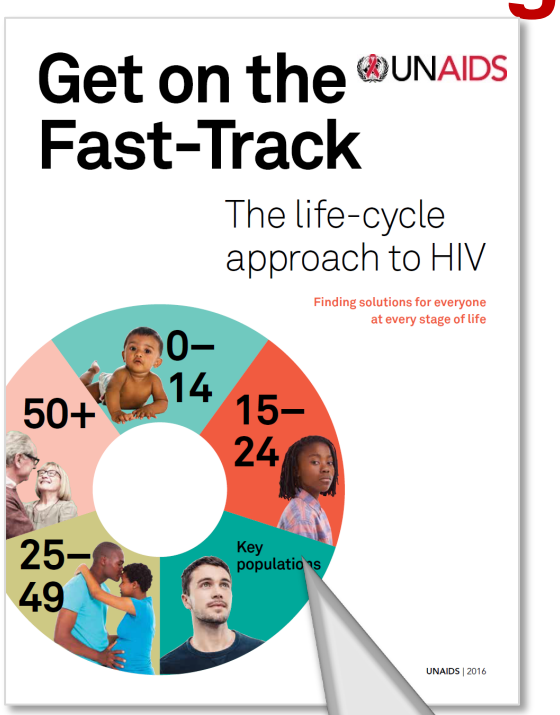
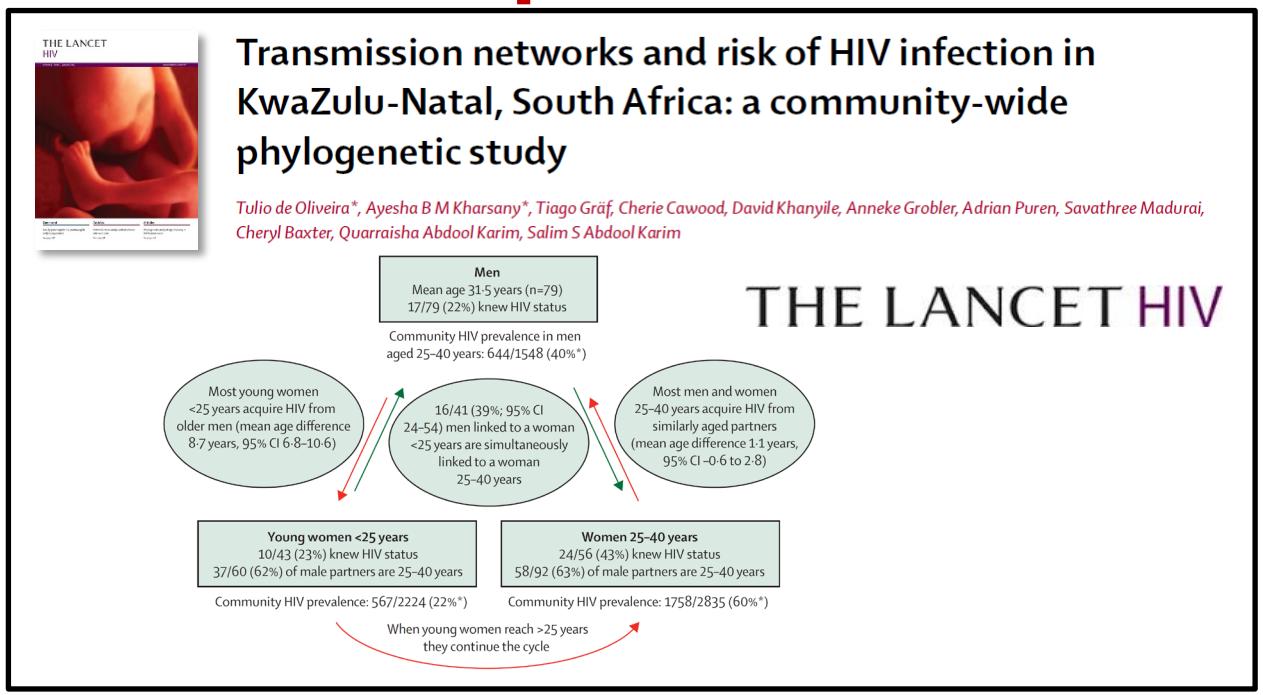
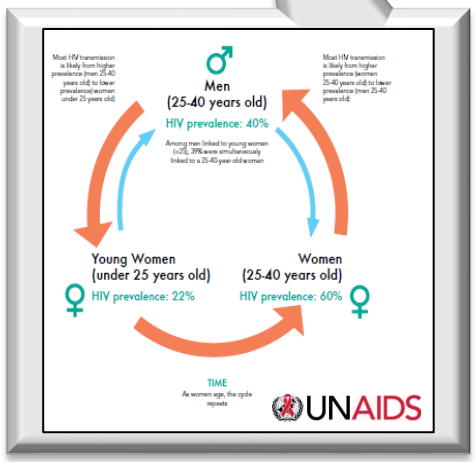
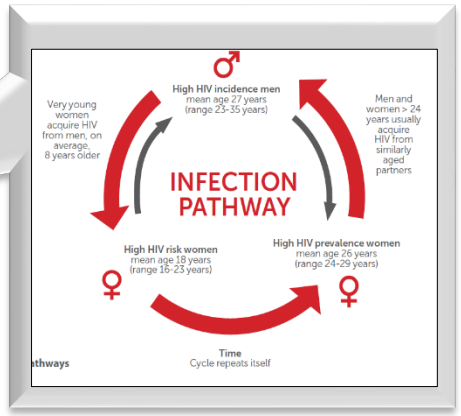
Molecular surveillance shaping the global & local HIV response









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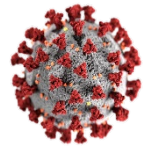
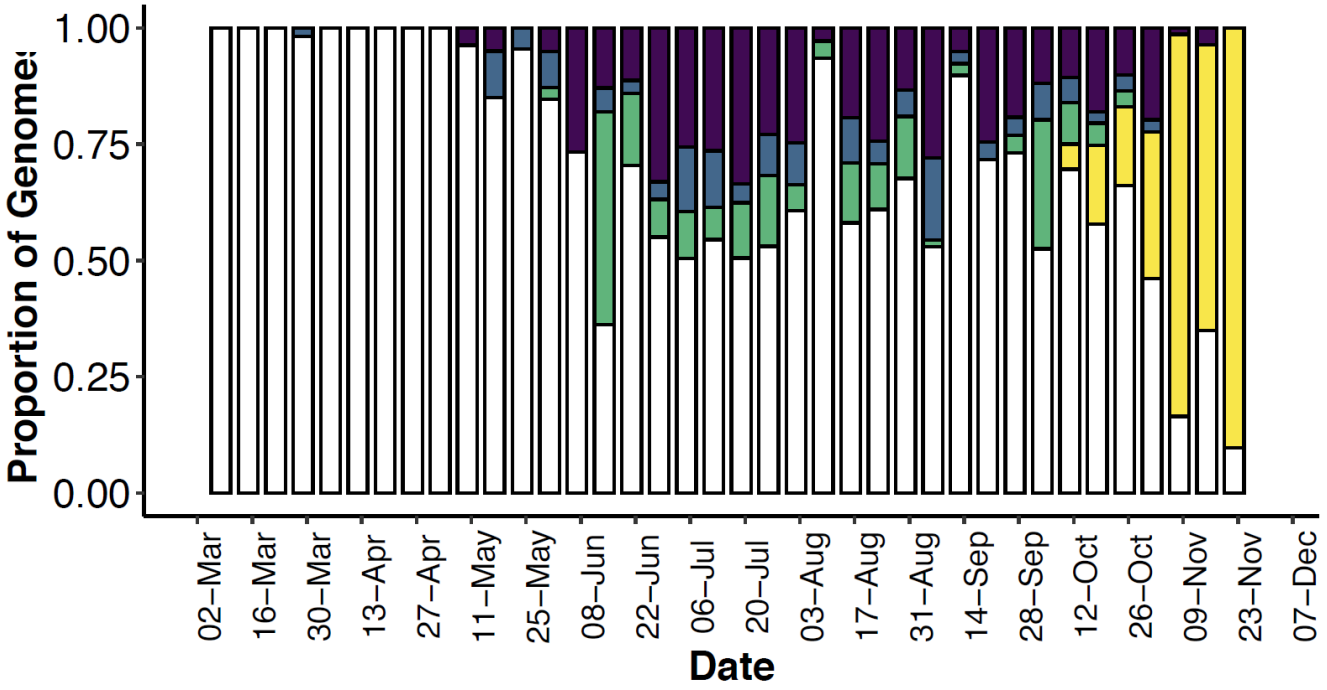
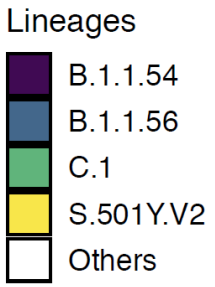
Molecular Surveillance enables rapid detection of emergence of new variant of SARS CoV-2 S.501Y.V2

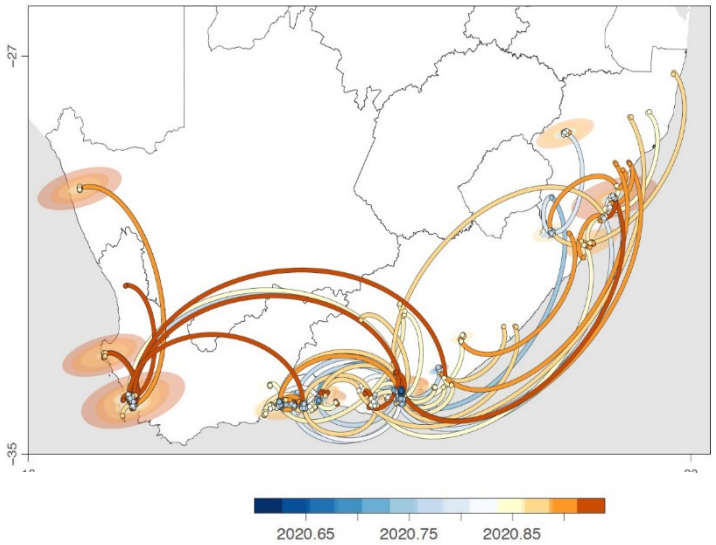
Emergence and rapid spread of a new severe acute respiratory syndrome-related coronavirus 2 (SARS-CoV-2) lineage with multiple spike mutations in South Africa

Fonseca[1,2], Jennifer Giandhari[1], Deelan Doolabh[5], Sureshnee Pillay[1], Emmanuel James San[1], Nokukhanya Msomi[6], Koleka Mlisana[7,8], Anne von Gottberg[9,10], Sibongile Walaza[9,11], Mushal Allam[9], Arshad Ismail[9], Thabo Mohale[9], Allison J Glass[10,12], Susan Engelbrecht[13], Gert Van Zyl[13], Wolfgang Preiser[13], Francesco Petruccione[14,15], Alex Sigal[16,17,18], Diana Hardie[19], Gert Marais[19], Marvin Hsiao[19], Stephen Korsman[19], Mary-Ann Davies[20,21], Lynn Tyers[5], Innocent Mudau[5], Denis York[22], Caroline Maslo[23], Dominique Goedhals[24], Shareef Abrahams[25], Oluwakemi Laguda-Akingba[25,26], Arghavan Alisoltani-Dehkordi[27,28], Adam Godzik[28], Constantinos Kurt Wibmer[9], Bryan Trevor Sewell[29], José Lourenço[30], Luiz Carlos Junior Alcantara[2,3], Sergei L Kosakovsky Pond[31], Steven Weaver[31], Darren Martin[4,5], Richard J Lessells[1,8], Jinal N Bhiman[9,10]*, Carolyn Williamson[5,8,19]*, Tulio de Oliveira[1,8,32]*









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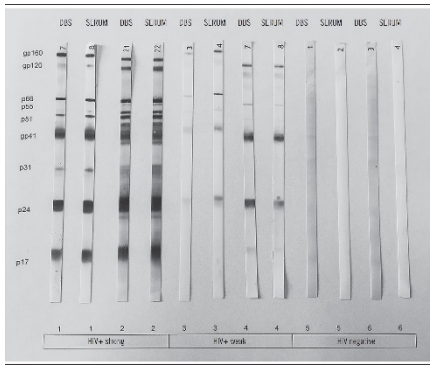
Rapid point-of-care diagnostics enhance access to care and prevention

HIV



Western blot

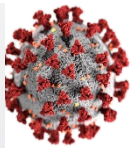
Rapid point-of-care test

- Testing for HIV initially cumbersome – ELISA needed to be confirmed by WB
- Rapid evolution in technology – rapid PoC antibody test
- Testing important gateway to prevention and treatment

COVID-19

Laboratory-based PCR

Rapid point-of-care test



- Rapid sequencing of SARS-CoV-2 → quickly established PCR testing
- Rapid evolution in technology – rapid PoC PCR, antibody or antigen test now available
- Testing is the gateway to quarantine / isolation and treatment

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Improving HIV & STI Care with POC Technology

THE LANCET HIV

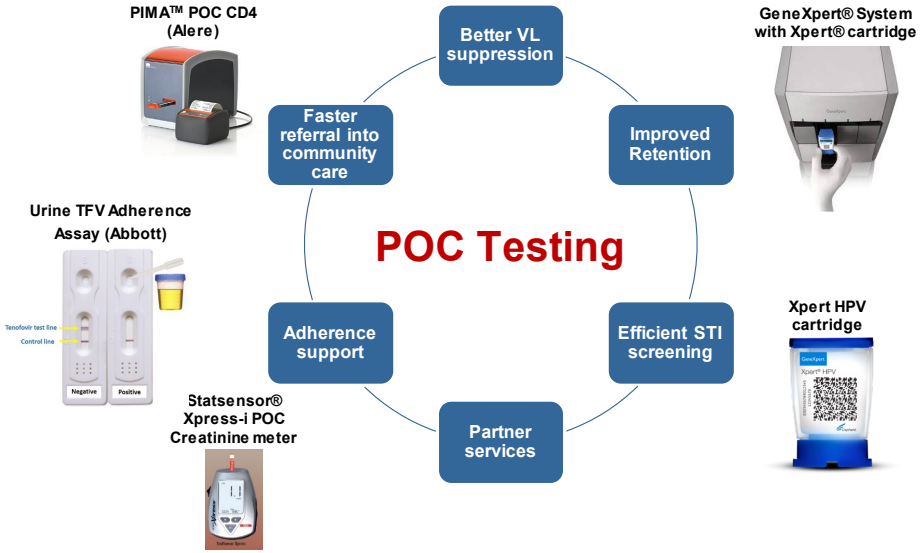
Point-of-care HIV viral load testing combined with task shifting to improve treatment outcomes (STREAM): findings from an open-label, non-inferiority, randomised controlled trial

PK Drain, J Dorward, LR Violette, J Quame-Amaglo, KK Thomas, N Samsunder, H Ngobese, K Mlisana, P Moodley, D Donnell, RV Barnabas, K Naidoo, SS Abdool Karim, C Celum, N Garrett

THE LANCET HIV

Cost-effectiveness of point-of-care testing with task-shifting for HIV care in South Africa: a modelling study

M Sharma, E Mudimu, K Simeon, A Bershteyn, J Dorward, LR Violette, A Akullian, SS Abdool Karim, C Celum, N Garrett, PK Drain.



World Health Organization

GUIDELINES

UPDATED RECOMMENDATIONS ON

HIV PREVENTION, INFANT DIAGNOSIS, ANTIRETROVIRAL INITIATION AND MONITORING

'Point-of-care viral load may be used to monitor treatment among people living with HIV receiving ART.'

UNIVERSITY of WASHINGTON

NATIONAL HEALTH LABORATORY SERVICE

ETHEKWINI MUNICIPALITY

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Advances in HIV treatment: Enhancing access to and affordability of treatment

In the 1990s

Today

Up to 20 pills daily, taken at different intervals throughout the day

A single pill per day, delivering multiple drugs

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Credit: Jonathan Jansen. https://randomhighfives.wordpress.com/2011/03/08/awesome-south-africa/

Achieving an AIDS-free generation

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Using science, technology and innovation to deliver better results in the prevention, care and treatment of HIV/AIDS

Quarraisha Abdool Karim

Excellencies and Distinguished Participants, it is an honour and privilege to have the opportunity to address you today on "using science, technology and innovation to deliver better results in the care and treatment of HIV/AIDS". I thank the organisers for this opportunity.

In the time allocated to me I will focus on three examples to illustrate how science, technology and innovation has enhanced our responses to HIV/AIDS. Of note, is how these HIV investments have enabled rapid pivoting in response to Covid-19 and underscores the importance of STI investments to enhance health outcomes and be better prepared for future pandemics.

By way of context, globally in 2019 there were 1.7 million new HIV infections in 2019, about 3 times more than the 500 000 2020 target set by UNAIDS as part of reaching the UN Ending AIDS as a public health goal by 2030. Importantly 70% of these infections are in sub-Saharan Africa. A unique characteristic of the HIV epidemic in SSA is that young women acquire HIV infection 5-7 years before men. Indeed, young women 15-24 years have up to 6 times more infection compared to their male peers. About 60% of new infections and people living with HIV are in Eastern and Southern Africa where the epidemics are described as generalized, hyperendemic epidemics reflecting the high rates of new infections that continue to occur in the general population despite the high HIV prevalence.

The first example illustrates how phylogenetics/molecular surveillance has enabled us to better understand the transmission cycle in South Africa that is home to 20% of the global burden of infection despite having <1% of the global population. Surveillance is key for monitoring the evolving HIV epidemic, identifying risk factors, enables prioritising of targeted interventions and monitoring the impact of interventions. The use of phylogenetics through sequencing of viruses from recently infected individuals in a population based survey in one of the highest HIV burden health districts in eastern and southern Africa where the overall HIV prevalence is 36% and by age 30, 70% of women and 40% of men are already infected with HIV enabled us to reveal the cycle of transmission wherein young women <25 years acquire HIV from men >25 years who are acquiring HIV from women >25 years and also infecting women >25 years. Breaking this cycle of transmission is key to achieving epidemic control. These data shared with UNAIDS shaped the 2016 "get on the fast track – life cycle approach to HIV" and is one of the key goals of the South African 2017-2022 HIV strategy shaping responses to the epidemic with smarter targeting of interventions impacting both prevention and treatment efforts. This type of molecular surveillance applied to covid-19 enabled the rapid detection of the SARS CoV-2S.501Y.V2 variant of concern that generated the second surge of infections in South Africa and spreading aggressively in Africa and has implications for the selection of Covid-19 vaccines to be used in these settings.

The second example is about enhancing HI diagnostics. Laboratory diagnostics play an important role in identifying those infected with HIV enabling appropriate triaging into prevention or treatment services I addition to tracking the magnitude of the epidemic and temporal trends. For most of the 1990s it took over two weeks to confirm if someone was infected with HIV or not. In the early 2000's with the development of rapid point of care diagnostics that could be performed by non-professional health care workers in primary care clinics and generating results within minutes; enabled rapid diagnosis and identification of HIV infected individuals transforming PMTCT and treatment efforts. These rapid, on-site point of care diagnostics that require very little to no laboratory infrastructure has enabled task shifting and same day initiation of ARV treatment

enabling millions more to be initiated on ARV treatment and has resulted in substantial reduction in mother to child transmission of HIV. The array of rapid point of care diagnostics continues to expand and now includes viral load testing to monitor the maintenance of therapeutic success in AIDS patients on ARV treatment.

The third and final example is anti-retrovirals for treatment of AIDS patients. In 1995, Dr David Ho announced the outcome of triple antiretroviral therapy for treatment of AIDS that transform AIDS from an inevitably fatal condition to one that is chronic and manageable. Until about 2003, this was only accessible to those in industrialized countries. In those early days up to 20 pills needed to be taken by those with AIDS and different intervals in the day and the costs were in excess of $10,000 (US) per month making it unaffordable and inaccessible to the majority living with HIV notably in sub-Saharan Africa. Mechanisms like GFATM and PEPFAR facilitated access to ARV treatment in sub-Saharan Africa. Today these three drug combinations are administered in a single, once a day tablet bu nurses at primary health care clinics and over 28 million of the approximately 38 million people living with HIV are on treatment on a pill a day that costs about 1 dollar (USA) a day making access to these life-saving drugs a reality for many more millions of people across the globe including the 70% living with AIDS in sub-Saharan Africa making the possibility of an AIDS-free generation a reality!

The global solidarity and leadership that enabled these lifesaving ARVS to be accessible to those in need including in LMICs is an excellent example today for equitable global access to Covid-19 vaccines.