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Workshop report

Ending AIDS as a public health threat by 2030: Scientific Developments from the 2016 *INTEREST Conference* in Yaoundé, Cameroon

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The underpinning theme of the 2016 *INTEREST Conference* held in Yaoundé, Cameroon, 3–6 May 2016 was ending AIDS as a public health threat by 2030. Focused primarily on HIV treatment, pathogenesis and prevention research in resource-limited settings, the conference attracted 369 active delegates from 34 countries, of which 22 were in Africa. Presentations on treatment optimization, acquired drug resistance, care of children and adolescents, laboratory monitoring and diagnostics, implementation challenges, HIV prevention, key populations, vaccine and cure, hepatitis C, mHealth, financing the HIV response and emerging pathogens, were accompanied by oral, mini-oral and poster presentations. Spirited plenary debates on the UNAIDS 90-90-90 treatment cascade goal and on antiretroviral pre-exposure prophylaxis took place. Joep Lange career guidance sessions and grantspersonship sessions attracted early career researchers. At the closing ceremony, the Yaoundé Declaration called on African governments; UNAIDS; development, bilateral, and multilateral partners; and civil society to adopt urgent and sustained approaches to end HIV by 2030.

Introduction

The goal to end AIDS as a public health threat by 2030 [1] was the underpinning theme of the *10th International Workshop on HIV Treatment, Pathogenesis, and Prevention Research in Resource-Limited Settings* (2016 *INTEREST Conference*) held in Yaoundé, Cameroon, 3–6 May 2016. The meeting attracted 369 active delegates from 34 countries of which 22 were in Africa (Cameroon, South Africa, Nigeria, Cote D'Ivoire, Kenya, Uganda, Zambia, Zimbabwe, Botswana, Ghana, Senegal, Tanzania, Benin, Burkina Faso, Congo, Gabon, Guinea, Liberia, Malawi, Namibia, Rwanda and Swaziland). Spirited plenary debates on the UNAIDS 90-90-90 (90-90-90 refers to the targets of 90% of people living with HIV knowing their serostatus, 90% of those who know they are HIV-positive being on antiretroviral treatment [ART] and 90% of those on ART

achieving viral suppression. This translates into 73% of all people living with HIV being virally suppressed) treatment cascade goal for 2020 [2] and on antiretroviral pre-exposure prophylaxis (PrEP) took place. There were presentations on treatment optimization, acquired drug resistance, care of children and adolescents, laboratory monitoring and diagnostics, implementation challenges, HIV prevention, key populations, vaccine and cure, hepatitis C, mHealth, financing the HIV response and emerging pathogens [3].

In addition to oral, mini-oral and poster presentations, early morning Joep Lange research career guidance sessions saw mid-career and senior investigators explain how they got started on a research career and give advice on how to get funded, choose a mentor and get published. Parallel research grantspersonship sessions were presented by ANRS (France Recherche Nord & Sud Sida-hepatites); Fogarty International Center, US National Institutes of Health; and EDCTP (European & Developing Countries Clinical Trials Partnership).

HIV in Cameroon

Cameroon's Minister of Public Health, André Mama Fouda, opened the conference. Dr JB Elat, Permanent Secretary of the National AIDS Programme, presented an overview of HIV in Cameroon. HIV prevalence in 2011 was 4.3%, with urban populations and women disproportionately affected: 5.6% of women versus 2.9% of men. Compared to the general population, men who have sex with men (MSM) have 8–14× higher (24–44%), truck drivers have 5× higher (16%) and female sex workers (FSW) have 6× higher (36%) HIV prevalence. Clients of FSW account for 36% of new HIV infections annually. After Cameroon's ART programme began in 2000, HIV prevalence fell by 20% between 2004 and 2011 from 5.5% to 4.3%. Prenatal consultations for prevention of mother-to-child transmission (PMTCT) increased steadily from 2009, with attendance reaching 74% in 2015. Between 2005 and 2015, the number of people on ART increased 10-fold and approximately 7,000 children now receive ART. In 2015, 882,639 Cameroonians were tested for HIV. Cameroon aims to increase access to HIV testing and treatment services, reduce stigma, strengthen supply chains, tailor HIV prevention for key populations and build civil society capacity. Poor retention in care remains a weak link in Cameroon's progress towards 90-90-90 [4].

Achieving 90-90-90

Passionate debate presenting opposing viewpoints on 90-90-90 saw pessimists emphasize factors preventing achievement of the Fast-Track Initiative targets: insufficient resources (human, infrastructure, financial), inability to reach all people living with HIV (PLHIV) and retain them in care, risk of emerging drug resistance and international donor fatigue. Optimists highlighted the 17 million PLHIV on ART globally, opportunities to halt the HIV epidemic now and examples of countries close to achieving 73% viral suppression targets. Although achieving 90-90-90 is judged desirable, during the debate more conference participants became convinced the proposed time frame is too short.

The first 90: HIV testing

More than 150 million HIV tests are conducted in low- and middle-income countries annually and although the goal of diagnosing 90% of PLHIV is achievable, testing must be performed with 100% accuracy because of the profound consequences of misdiagnosis at both the individual and population level [5]. Outreach programmes are necessary for marginalized, stigmatized, often criminalized and hard to reach key populations. Community-based testing can reach healthy people early in their infection and link them to care [6]. Identifying all HIV+ children and adolescents requires case-finding approaches for chronic HIV survivors, intensified facility-based testing and decentralized and simplified HIV testing at point of care [7].

The second 90: ART

The World Health Organization recommends ART be offered immediately to everyone diagnosed with HIV infection, regardless of their $CD4^+$ T-cell count measuring immune status [8]. Globally, 17 million people (46% of PLHIV) are on ART [9]. Voluntary licensing is enabling generic companies to provide antiretroviral (ARV) drugs in effective, well tolerated, and quality-assured individual or combination formulations for 100–130 USD per year. Voluntary licensing of drugs such as dolutegravir and tenofovir alafenamide may reduce this cost to 60 USD/year; however, more efficacy and safety data in pregnant women and HIV–TB-coinfected patients are needed [10]. Robust supply chains are essential to prevent stock-outs and ensure continuity of ART. Fulfilling high-income countries' commitment to spend 0.7% of gross national income on overseas development assistance [11] can assist resource-limited countries but increasing domestic health-care funding in sub-Saharan Africa to reach the Abuja target of 15% of annual government expenditures being devoted to health will reduce donor dependency and facilitate sustainable programmes [12]. Building on the global success of generic ART, generic versions of drugs for tuberculosis, cancer and hepatitis B and C could facilitate drug access for people in resource-limited settings around the world at very affordable prices.

The third 90: viral suppression

Tracking viral suppression requires rapid scale-up of viral load monitoring, necessitating improved efficiencies in sample collection, transportation and laboratory performance; timely transmission of results to clinics and patients; and rapid appropriate action [13]. Treatment retention in Africa at 36 months is estimated at only 65% [14]. Poor adherence leads to drug resistance [15], requiring effective interventions, including mHealth and group delivery, to support retention in care and adherence. Innovations must be anchored in a comprehensive understanding of the multiple barriers facing people on ART, including adolescents who have important retention and adherence challenges.

The WHO recommends that ART scale-up be accompanied by high-quality HIV drug resistance surveillance, achieved by investing in human and laboratory resources, innovative and efficient technical approaches, robust supply chains and quality assurance measures. Political and community commitment is needed to overcome limited laboratory capacity in sub-Saharan Africa and support studies identifying suitable ARV options. These include the ultra-deep pyrosequencing work showing that protease inhibitors and maraviroc are likely to be effective in young Cameroonian children (the author of this abstract received the Joep Lange award for the top-scoring abstract by an African scientist at the *10th INTEREST Conference*) [16], as are protease inhibitors in Ugandan children [17].

HIV prevention

More than 10 million voluntary medical male circumcisions (VMMC) have been performed, with high adult MC prevalence countries moving to establish sustainable VMMC HIV prevention programmes focused on early infant and early adolescent MC [18].

PrEP with ARV drugs has achieved regulatory approval in South Africa and Kenya, following WHO guidance recommending PrEP when HIV incidence is 3% or more [8]. Follow-on studies and demonstration projects of oral PrEP among serodiscordant couples and MSM have shown higher adherence than in trial settings, possibly because people know that they are taking an effective product [19]. Novel products and delivery options under investigation include injectables that would be taken every 2 to 3 months, vaginal gel and ring formulations, and monoclonal antibodies. PrEP works for anyone experiencing a high risk of HIV exposure during a specific time of his or her life. A debate on whether Africa was ready for PrEP persuaded some who were sure it was ready to wonder whether regulatory, logistical, equity and other issues had all been adequately addressed. Importantly, PrEP implementation requires intensified investment in HIV testing strategies across Africa, which would result in the increased knowledge of serostatus that can improve entry into the 90-90-90 treatment cascade.

Vaccine and cure

The search for a vaccine, following the promising results of RV 144 [20], includes active and passive approaches to HIV prevention. Clade-specific trials in South Africa and elsewhere are part of the pox-protein public-private partnership (P5) evaluating pox-protein candidates. Hypothesis-generating Phase IIb trials are underway of passive immunisation strategies involving monoclonal antibodies using trivalent and tetravalent vectors to obtain broader coverage against HIV [21]. Research to understand differences in viral reservoirs with implications for cure strategies has found that Ugandans without HIV infection have increased immune activation and lymph node pathology that resembles early HIV infection among patients in Minnesota, USA [22]. If they acquire HIV in an environment where life-long exposure to various pathogens already predisposes them to high levels of T-cell activation, they may develop a larger HIV reservoir leading to persistent immune activation, subsequent lymph node fibrosis and reduced immune reconstitution. Pre-existing T-cell activation thus may account for population differences in responsiveness to immune therapy strategies, with fibrosis limiting diffusion of therapeutic agents into lymph nodes where the virus replicates.

Key populations

Success in bringing down HIV prevalence among sex workers in Rwanda, Burkina Faso, Kenya and Namibia highlights data gaps on successful interventions among men involved in sex work, regular partners of female sex workers and girls under 18 years who receive money or goods in exchange for sexual services. Exciting new developments include studies of PrEP use, integration of HIV and sexual and reproductive health services, and use of mobile technology, social media and biometric measures to assist in studying mobile sex work populations. Striking data on the use of heroin, tramadol and other opioids have led to the African Union Plan of Action on Drug Control that recognizes the burden of HIV and hepatitis C among people who inject drugs in Africa. Political barriers to holistic harm reduction remain for illicit drugs and for alcohol, a psychoactive substance with dependence-producing properties that has been strongly linked to HIV risk in Africa and around the world [23]. MSM have high HIV risks and continue to be criminalized in many African countries, making it difficult to reach

them with services. In eight African countries, between 25 and 65% of these men aged 18–19 years are meeting male sexual partners online [24], suggesting that social media and mobile platforms could help increase their access to HIV prevention and treatment.

Emerging pathogens – lessons learned for and from HIV

The Ebola epidemic of 2014–2015 and epidemics of re-emerging pathogens, such as Zika and Lassa Fever, have shown that high-quality studies can run alongside the outbreak response, but health-care systems must be strengthened now before more epidemics occur. Designing and running Ebola clinical trials proved challenging in Guinea, Liberia and Sierra Leone. In Guinea, a 'ring vaccination' trial design was used to evaluate a vaccine candidate, with real-time modifications to take account of the rapidly changing epidemic and logistical issues [25]. The impact of favipiravir on Ebola virus disease was evaluated in a single arm, proof-of-concept trial that found it well-tolerated but could not draw firm conclusions about efficacy [26]. Ideally, outbreaks of emerging and re-emerging pathogens should be anticipated and potential drugs and vaccines for them investigated on an ongoing basis so that efficacy trials can be initiated quickly when an outbreak occurs. Engaging stakeholders, including community stakeholders, at all stages of a clinical trial contributes to robust trial design, facilitates trial conduct by addressing rumours and enhancing participant retention, and helps ensure ownership of the results for action [27]. Addressing ethical issues is key to ensuring that studies are conducted ethically, communities support them and post-trial legacies are assured [28]. Robust public health infrastructure, appropriate legislation and community involvement were key in containing an Ebola outbreak of 20 cases in Nigeria and subsequent health-care system investments have upgraded disease surveillance, research infrastructure and treatment facilities [29].

Conclusions

Although ART coverage in sub-Saharan Africa increased from 24% in 2010 to 54% in 2015, reaching a regional total of 10.3 million people [9], late diagnosis of HIV infection, loss to follow-up and poor ART adherence contributed to 790,000 people dying of AIDS-related causes in 2014. New adult HIV infections remain a concern: 25% are adolescent girls and young women and more than 20% are from key populations. An estimated 25.5 million people are living with HIV in sub-Saharan Africa, with women accounting for 56% [9]. There has been a 48% decline in new HIV infections among children in the 21 Global Plan priority countries [30], but 190,000 African children acquired HIV infection in 2014 [31].

The *10th INTEREST Conference* heard a call for leadership and activism among HIV investigators and physicians to show global solidarity with PLHIV worldwide and to ensure that resources are used effectively. Sub-Saharan Africa loses over 150 billion USD/year through illicit financial flows [32], corruption and money laundering [12]. This money could replace international donations and fund health care throughout the continent. At the closing ceremony, the Yaoundé Declaration [33] (Additional file 1) was read out, calling on African governments; UNAIDS; development, bilateral, and multilateral partners; and civil society to adopt urgent and sustained approaches to end HIV by 2030 [34,35].

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Disclosure statement

All 12 authors reviewed previous drafts of the manuscript and approve its contents. None of the authors have a conflict of interest, with the exception of CABB of the company Virology Education that provided logistical support for the conference.

Additional file

Additional file 1: The Yaoundé Declaration can be found at https://www.intmedpress.com/uploads/documents/3939_Hankins_Addfile1.pdf

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