

ORIGINAL RESEARCH

Impact of coronavirus disease (COVID-19) on HIV testing and care provision across four continents

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Abstract

Objectives: The coronavirus disease (COVID-19) pandemic has been associated with severe disruptions in health care services, and nonpharmacological measures such as social distancing also have an impact on access to screening tests and on the long-term care of patients with chronic conditions globally. We aimed to describe the impact of the COVID-19 pandemic on HIV testing and treatment and to describe strategies employed to mitigate the impact of COVID-19 on HIV care.

Methods: In this retrospective cohort study, we used secondary data from the AIDS Healthcare Foundation (AHF) Global Quality Program from 44 countries in four continents (Asia, Latin America and the Caribbean, Europe and Africa), and compared information on HIV testing, percentage of positive results, number of in-person appointments, and number of new enrolments in HIV care from 1 January 2020 to 31 August 2020 with the equivalent period in 2019.

Results: Despite marked inter-country heterogeneities, we found that COVID-19 was associated with a significant reduction in HIV testing, an increase in the percentage of positive tests, a reduction in the number of in-person consultations and a reduction in the number of new enrolments in care, despite the implementation of several mitigation strategies. The impact of COVID-19 differed across continents and key populations.

Conclusions: Our findings suggest that, in the years to come, health care services must be prepared to respond to the impact of COVID-19 on HIV testing and care. Providers and facilities should build on the lessons learned so far to further improve mitigation strategies and establish care priorities for both the pandemic and the post-pandemic periods.

KEYWORDS

coronavirus disease (COVID-19), differentiated care, HIV care, HIV testing, public health

Rick and Odoke contributed equally to this work.

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INTRODUCTION

The coronavirus disease (COVID-19) pandemic has been associated with a massive burden for health care across the world. The impact of COVID-19 extends beyond the large number of individuals with the disease, affecting patients with other acute or chronic conditions and leading to widespread interference with health systems [1,2].

Direct disruptions are caused by depletion of health care resources, including, but not limited to: (1) overloading of emergency care units; (2) reassignment of providers to new COVID-19 out-patient units and wards; (3) staff reductions caused by sick leave; (4) reduced provision of essential health services; (5) excessive demands on laboratories performing molecular tests for severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2); (6) restrictions on mobility affecting health care providers [1,3,4]. In addition, COVID-19 has also been causing indirect disruptions resulting from nonpharmacological measures such as physical distancing and mobility restrictions [5].

As patients have been formally told to stay at home in view of the high transmissibility of SARS-CoV-2, most nonurgent consultations or procedures have been cancelled or postponed. As a consequence, patients have been less likely to undertake timely screening tests, and more likely to seek care with delay, potentially increasing disease severity and complications [1,6].

The pandemic has also affected the long-term care of patients with chronic conditions, including noncommunicable diseases and HIV [1,3]. A number of mitigation strategies, such as telemedicine and home delivery of services, have been proposed to reduce the negative effect of the pandemic on these patients [1,4]. However, it is expected that ramifications of COVID-19 will still hit a large number of individuals indirectly affected by the pandemic [7,8].

The impact of COVID-19 on health outcomes of patients with chronic conditions has been denominated a “second hit” [2] and is likely to disproportionately affect vulnerable populations [2,9,10].

The AIDS Healthcare Foundation (AHF) is a nonprofit organization that has been providing HIV testing, prevention and care in 44 countries for more than 30 years. In this study, we aimed to describe the impact of the COVID-19 pandemic on HIV testing, the percentage of positive tests, the number of in-person appointments and the number of new enrolments for HIV care in AHF facilities. We also describe strategies employed in different continents to mitigate the COVID-19 impact on HIV care.

METHODS

In this retrospective cohort study, we used secondary data from the AHF Global Quality Program and compared

records from 1 January 2020 to 31 August 2020 with the equivalent period in 2019 in order to estimate the impact of the COVID-19 pandemic. The AHF Global Quality Program sites referred to in this publication are located in 44 high HIV burden countries in the following regions: Africa [11], Latin America and the Caribbean [12], Asia [10] and Europe [9]. In these countries, AHF supports mostly governmental HIV care and treatment (C&T) facilities (664) and runs its own HIV C&T facilities (33). In addition to HIV testing in 522 of these C&T facilities, AHF supports another 437 HIV-testing sites that are not facility based, such as partner-run test programmes, community-based testing, walk-in facilities and hot-spot testing (421), and AHF stand-alone rapid test programmes (26). Overall data from these 949 testing sites/programmes are reported monthly to the AHF Global Quality Program.

The following indicators were included in this analysis: the number of HIV tests, and the percentage of positive tests both overall and per type of vulnerability; the number of in-person appointments; and the number of new enrolments for HIV care. Although country-level information was initially retrieved, we present aggregated data per continent as they demonstrates the impact of COVID-19 more comprehensively. We use descriptive statistics including counts and percentages. Differences in the number of HIV tests, number of positive tests, number of consultations and number of new enrolments in HIV care comparing 2019 and 2020 were generated, and the percentage reduction/increase was calculated as a simple proportion taking the difference as the numerator and the 2019 count as the denominator, along with the 95% confidence interval (CI) calculated using STATA version 15.1 (StataCorp LP, College Station, TX). In order to explore whether the impact of COVID-19 on testing and on the percentage of positive tests was higher in subgroups of vulnerable populations, we conducted individual analyses for men who have sex with men (MSM), transgender people, migrants, sex workers, people who inject drugs (PWID) and inmates in prisons.

Data from the AHF Global Quality Program include only de-identified, aggregated information. This study has been approved by the Global Quality Program steering committee with informed consent exemption.

RESULTS

Impact of COVID-19 on the number of HIV diagnostic tests and the percentage of positive results

We obtained data on the number of HIV tests performed and the number of positive results between 1 January 2020

TABLE 1 Impact of coronavirus disease (COVID-19) on HIV tests and the percentage of positive tests between January and August

	Number of tests in 2019	Number of tests in 2020	% reduction in number of tests (95% CI)	% positive tests in 2019	% positive tests in 2020	% increase in % positive tests (95% CI)
African countries	1 680 381	1 114 608	34.67 (33.60–33.74)	3.65	3.73	2.19 (0.95–4.27)
South Africa, Uganda, Zambia, Rwanda, Ethiopia, Kenya, Eswatini, Nigeria, Sierra Leone, Lesotho, Zimbabwe, Malawi, Mozambique						
European countries	204 610	151 019	26.19 (26.00–26.38)	3.39	4.88	43.95 (38.60–49.42)
Ukraine, Russia, Estonia, Lithuania, Georgia, Greece, Portugal, the Netherlands, UK						
Asian countries	610 897	370 131	39.41 (39.29–39.53)	2.39	2.73	14.23 (10.06–19.31)
India, Cambodia, China, Vietnam, Nepal, Thailand, Myanmar, Indonesia, the Philippines, Laos						
Latin American and Caribbean countries	253 432	140 344	44.62 (44.43–44.82)	3.76	4.48	19.15 (15.30–23.50)
Mexico, Guatemala, Argentina, Dominican Republic, Peru, Haiti, Jamaica, Brazil, Chile, Colombia, Trinidad and Tobago						
Overall	2 749 320	1 776 102	35.40 (35.34–35.46)	3.36	3.68	9.52 (6.61–13.18)
MSM	164 743	95 851	41.82 (41.58–42.06)	6.16	6.34	2.92 (1.74–4.58)
Transgender people	6191	2919	52.85 (51.60–54.10)	7.91	10.55	33.37 (30.09–36.78)
Migrants	127 410	74 776	41.31 (41.04–41.58)	1.76	2.87	63.07 (55.48–70.21)
Sex workers	68 005	28 051	58.75 (58.38–59.12)	3.19	3.96	24.14 (19.54–29.22)
PWID	39 647	35 390	10.74 (10.43–11.05)	6.28	9.37	49.04 (45.07–53.03)
Inmates	29 748	30 398	–	3.63	2.83	–

CI, confidence interval; MSM, men who have sex with men; PWID, people who inject drugs.

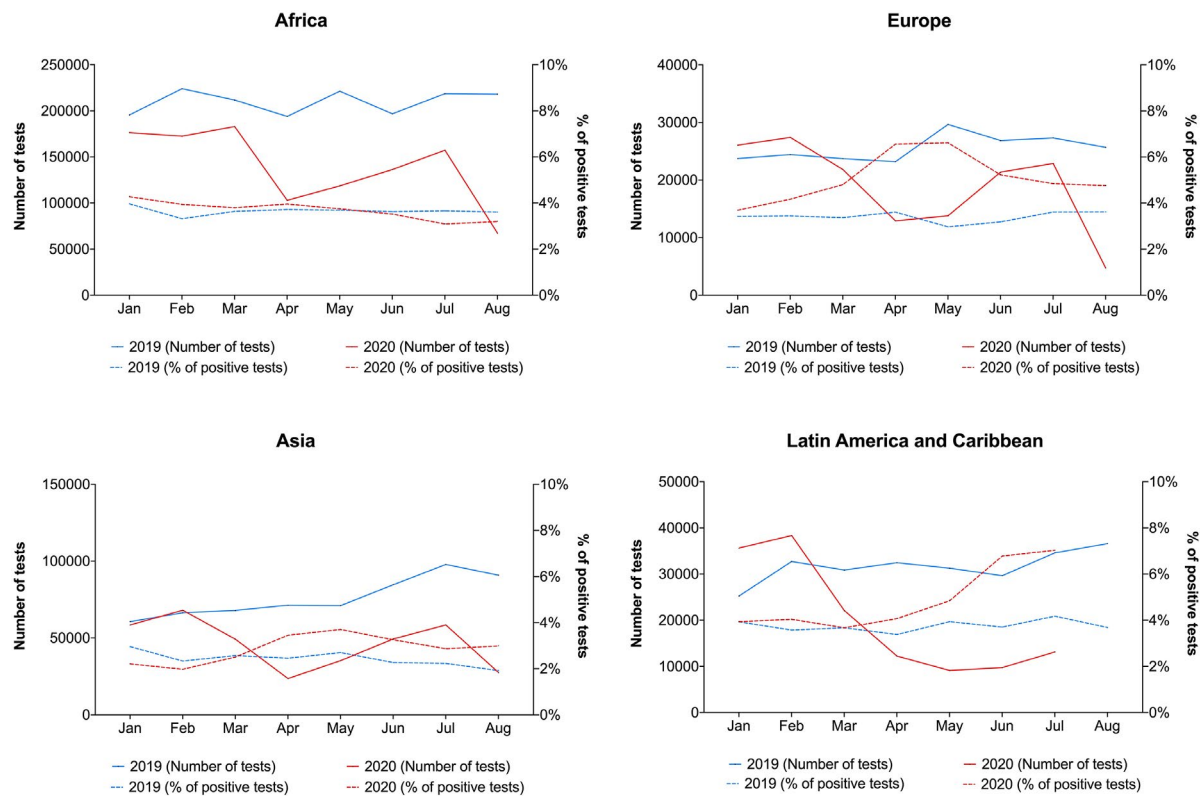


FIGURE 1 Monthly impact of COVID-19 on HIV tests and percent positives between January and August by continent

to 31 August 2020 from 44 countries in four continents as described in Table 1. We observed a reduction in the number of tests comparing 2020 with 2019 in all four continents, ranging from 26.19% in Europe to 44.62% in Latin America and the Caribbean, for an overall reduction of 35.40%. In Latin America, COVID-19 had the highest impact on the number of HIV tests performed during the pandemic. Marked heterogeneity was observed comparing test performances in the countries within each continent. In Europe, all countries saw a decrease in the number of tests, ranging from -12% (Russia) to -410% (Estonia). In Africa, the range of change in the total number of tests performed was -135% (Zambia) to $+30\%$; only Ethiopia ($+30\%$) and Mozambique ($+15\%$) saw an increase in the number of tests. For Asia, the change in the total number of tests performed ranged from -368% for Indonesia to $+80\%$ for Thailand; Nepal, Cambodia and Myanmar also had large decreases in the number of tests performed (85%, 65% and 74%, respectively), while Laos saw an increase in the number of tests (61%). In Latin America and the Caribbean, the change in the total number of tests performed ranged from -465% in Mexico to $+59\%$ in Colombia.

We found an increase in the percentage of positive tests in all continents, ranging from 2.19% in Africa to 43.95% in Europe (overall increase 9.52%), suggesting that targeted testing strategies may have been used during the

COVID-19 pandemic, with potential prioritization of individuals at higher risk or those presenting AIDS-related symptoms. European countries had the highest increase in the percentage of positive results during the pandemic period. Assessment of the number of tests and the percentage of positive results by subgroups of vulnerable populations showed that MSM, transgender people, migrants, sex workers, and PWID had reductions in the number of tests, varying from 10.74% to 52.85%; the increase in the percentage of positive tests in these subgroups varied between 2.92% and 63.07%. Only among inmates did we notice a slight increase in the number of tests and a reduction in the percentage of positive results comparing the 2020 and 2019 data. Figure 1 shows the monthly numbers of HIV tests performed and the percentages of positive results per continent; the impact of the COVID-19 pandemic correlates more clearly with the timing of local occurrence of cases in Europe and Latin America.

Impact of COVID-19 on total number of consultations for people living with HIV and new enrolments in HIV care

Countries in Africa and Latin America had, respectively, 7.14% and 24.31% reductions in the number of in-person

TABLE 2 Impact of coronavirus disease (COVID-19) on the numbers of consultations for people living with HIV and new enrolments in HIV care between January and August

	Number of consultations in 2019	Number of consultations in 2020	% reduction in number of consultations (95% CI)	Number of new enrolments in 2019	Number of new enrolments in 2020	% reduction in number of new enrolments (95% CI)
African countries	2 077 027	1 928 714	7.14 (7.11–7.18)	157 821	93 435	40.80 (40.55–41.04)
European countries ^a	308 906	336 168	–	14 779	19 030	–
Asian countries	916 628	952 214	–	66 347	45 083	32.05 (31.69–32.41)
Latin American countries ^b	601 106	455 001	24.31 (24.20–24.41)	54 516	23 845	56.26 (55.84–56.68)
Overall	3 903 667	3 672 097	5.93 (5.91–5.96)	293 463	181 393	38.19 (38.01–38.36)

^aIncludes data from Ukraine, Russia and Estonia only.

^bExcludes Chile (which had available data only from March 2020 onwards).

consultations comparing 2020 with 2019 (Table 2). European and Asian countries had a slight increase in the number of consultations in 2020. We found a wide inter-country variability for the number of in-person consultations in all continents, ranging from +21% in Ethiopia to –27% in Eswatini in Africa; +31% in Thailand to –66% in Indonesia in Asia; +32% in Haiti to –89% in Peru in Latin America and the Caribbean; +13% in Russia to –18% in Estonia in Europe.

African, Asian and Latin American countries had reductions in the number of new enrolments varying between 32.05% and 56.26%, whereas European countries saw an increase in the number of new enrolments in care comparing 2020 with 2019. Overall, health facilities had a 5.93% reduction in the number of consultations, and a 38.19% reduction in the number of new enrolments comparing 2020 with 2019. We found a marked inter-country variability in the number of new enrolments. In Africa, nine countries had a decrease (maximum –134% in Malawi) and four countries had an increase in new enrolments (maximum +31% in Ethiopia). In Latin America, there was a marked decrease in Haiti (–435%), Peru (–176%) and Argentina (–137%), whereas Brazil, El Salvador and Panama had increases in new enrolments (37%, 56% and 69%, respectively). For Asia, the highest rates of decrease were observed in Cambodia, Myanmar and the Philippines (–51%, –83% and –215%, respectively), with Indonesia (79%), Laos (18%) and China (1%) seeing an increase. In Europe, Ukraine saw a marked decrease in enrolments (–80%), whereas enrolments in Russia increased (+21%).

Figure 2 shows the monthly impact on the number of in-person consultations and new enrolments in care. Interestingly, despite the increase in the overall number of in-person consultations in the January–August period in Europe, the plot shows a clear reduction in the number of consultations in European countries in March, April and May, corresponding to the period of the highest occurrence of COVID-19 cases and severe social distancing measures. In addition, the number of new enrolments in care in Asia increased after April 2020, potentially representing the enrolment of patients who had been expecting consultations during the peak of local COVID-19 cases. In Latin America, Figure 2 shows a clear impact of COVID-19 on both in-person consultations and new enrolments in care after March 2020, corresponding to the period of highest occurrence of COVID-19 cases locally.

Mitigation strategies used in HIV facilities during the COVID-19 pandemic

Table 3 shows strategies that have been implemented in order to reduce the negative impact of COVID-19 in health facilities according to observed or anticipated challenges.

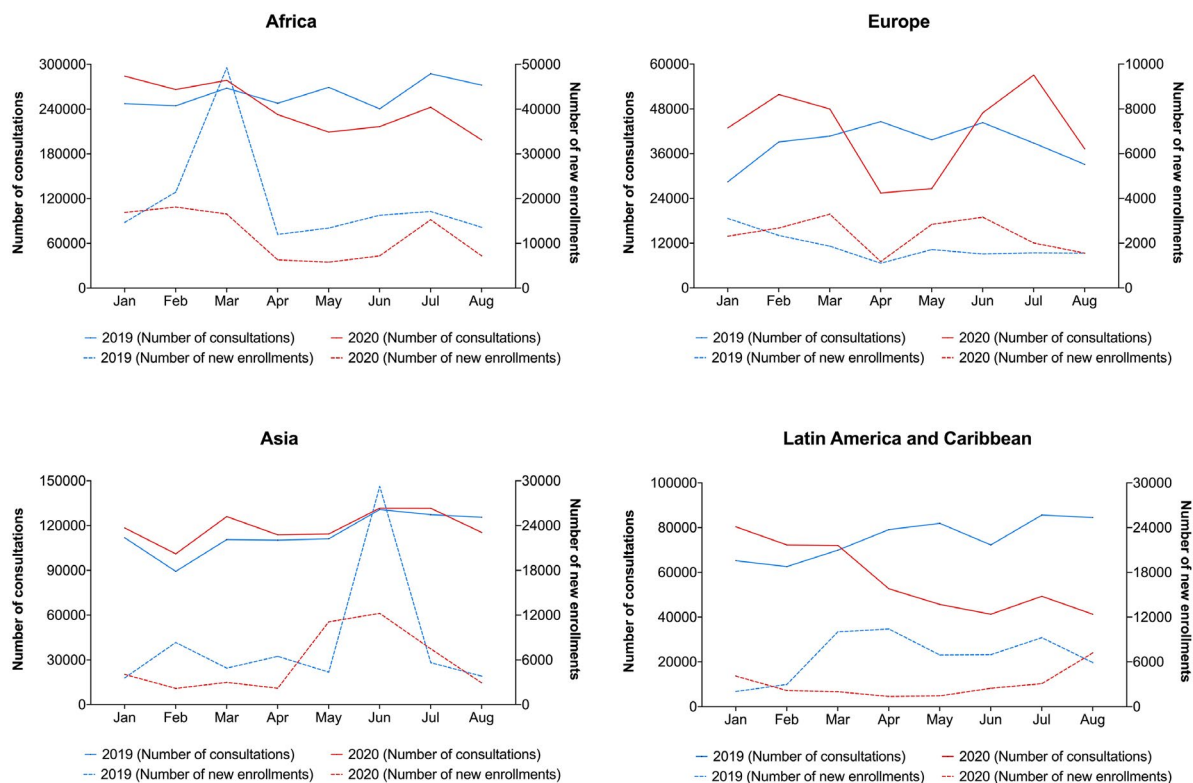


FIGURE 2 Monthly impact of COVID-19 on number of consultations for people living with HIV and new enrolments in HIV care by continent

AHF used existing infrastructure and a lot of creativity to provide additional support to clients, concerning both HIV care and COVID-19 prevention. Solutions were tailored to local needs and changed over time as new difficulties emerged and the exchange of ideas allowed improvements in mitigation strategies.

DISCUSSION

In this retrospective cohort study including data from AHF facilities in 44 countries and four continents, we showed that the COVID-19 pandemic period between January and August 2020 impacted significantly on HIV testing, the percentage of positive tests, the number of consultations and the number of new enrolments in care, despite the implementation of several mitigation strategies. Although many authors have conjectured on the impact of COVID-19 on health outcomes of patients with chronic conditions, few studies to date have documented this effect in a wide range of geographical and social settings.

In a recent report from The Joint United Nations Programme on HIV/AIDS (UNAIDS), including monthly data from 25 countries, the total number of people living with HIV (PLHIV) who were receiving antiretroviral therapy (ART) remained stable between April and September 2020. Aligned with our findings, UNAIDS also showed a

reduction in HIV testing in 16 out of 19 countries, and a decline in ART initiation in 28 out of 29 countries [13]. UNAIDS also estimated that approximately 26 million people were on ART as of June 2020, representing a 2.4% increase since the end of 2019; this contrasts with the 4.8% increase observed between January and June 2019 [13].

Our study had a few limitations. We used secondary data originally collected by AHF-supported sites and facilities for administrative purposes, including only aggregate data, which may be affected by incomplete or inaccurate information. Information for August 2020 on the number of tests and the percentage of positive results in Latin America was still pending in our database at the time at which we performed these analyses. We were not able to assess the impact of COVID-19 on the access to condoms, post-exposure prophylaxis and pre-exposure prophylaxis (PrEP) among populations at risk for HIV acquisition. Although some studies have shown a decline in PrEP use potentially attributable to reductions in sexual exposure [12], disruptions in health services may impact the provision of testing, prevention and care, and the final impact on the transmission dynamics of HIV and other sexually transmitted infections is difficult to predict [11]. We also acknowledge the need to conduct further analyses for a better understanding of access to HIV care using data disaggregated by key populations. Finally, our study failed to describe the impact of COVID-19 on the prevention of

TABLE 3 Mitigation strategies used in HIV facilities during the coronavirus disease (COVID-19) pandemic

Observed problem	Mitigation strategy/action taken
Decreased access to clinic because of mobilization restrictions, curfew, lockdowns and fear	<ol style="list-style-type: none"> Implementation of: <ul style="list-style-type: none"> Multi-month dispensation of antiretrovirals; pre-packed medications Clinical consultations via telephone/video conference; hotline; social media/text messaging to improve adherence Extended clinic hours Alternative drug delivery: community delivery, delivery via postal/courier, home delivery or pick-up Mobile clinics used to reach clients Distribution of PPE to facilities Reorganization of client flow including physical distancing, use of PPE and scheduled appointments Staff working from home were asked to call clients and encourage attendance at appointments Clinics operating extended hours, except during curfew
Reduced income because of economic crisis	Food and hygienic packages provided free of charge for the most vulnerable clients
Reduced number of people tested for HIV	<ol style="list-style-type: none"> Enhanced focused testing strategies for key populations, including sexual partners of index patients, pregnant women in antenatal care, exposed infants, symptomatic clients (for HIV, other STIs and tuberculosis) and clients with malnutrition Scale-up of HIV self-testing
Lower retention in care	<ol style="list-style-type: none"> Linkage personnel called clients and encouraged resumption of care Extended clinic hours Implementation of clinical consultations via telephone/video conference
Reduced of number of clients with access to HIV viral load testing	<ol style="list-style-type: none"> Community sample collection Prioritization of clients for viral load measurement (those without T CD4 count or viral load measurement in the past 6 months)

Abbreviations: PPE, personal protective equipment; STI, sexually transmitted infection.

mother-to-child HIV transmission and voluntary medical male circumcision.

The negative impact of COVID-19 on HIV care could have been even worse if client-centred strategies prioritized by AHF had not been used. Restrictions caused by COVID-19 accelerated innovations in HIV care services such as HIV self-testing, multiple months' dispensation of antiretrovirals, community-led services, and alternative drug delivery. Such innovations proved to be essential, yet insufficient to mitigate the detrimental effect of the ongoing pandemic [13].

Despite the efforts to provide treatment and care for PLHIV, as well as testing and prevention tools for vulnerable populations during the pandemic, COVID-19 is likely to have a huge impact on these services in the coming years [14]. The consequences of the disruption of health systems will include an increase in new infections that may continue for decades, as well as a resurgence in the rates of AIDS and mortality corresponding to individuals who failed to access testing [10] and those who had delayed access to HIV care. It is also likely that the

COVID-19 pandemic will impact clients' access to other laboratory tests such as CD4 count, HIV viral load, and diagnostic tests for syphilis, malaria and tuberculosis [9,10]. Facilities should be prepared to respond to an increase in the number of HIV late presenters (with initial CD4 count < 200 cells/ μ L), a rise in the number of tuberculosis cases, and an upsurge in sexually transmitted infections, including complications such as congenital syphilis. Sexual and reproductive health and antenatal care are also likely to be severely affected, with potential impacts on pregnancy outcomes and on prevention of mother-to-child transmission of HIV and syphilis. Women, children/adolescents and other vulnerable and neglected populations are at higher risk for detrimental impacts of the COVID-19 "second hit" [15,16].

Although the COVID-19 pandemic reduced the number of in-person visits, raising concerns about the continuum of care, it also accelerated the development of alternative options for health care provision, including telemedicine, scheduled facility-based appointments, home-based appointments, extended ART dispensation/

refill, ART dispensation at satellite clinics, and home delivery of drugs. Although we have developed innovative strategies in order to overcome the ongoing sanitary crisis, some of these strategies could be preserved to improve retention in care, as the innovations may be more convenient for clients and providers, reducing queues and long waiting times. Before the COVID-19 pandemic, many of these potential alternatives seemed unmanageable to both health services and health providers; we now witness a rapid transformation of health care technologies, which eventually may improve routine patient care while also being affordable, feasible and sustainable [17].

Providers and facilities should build on the lessons learned so far to further improve mitigation strategies, enabling health care services to provide the best possible prevention and care services to clients. Simultaneously, in the face of overloaded and understaffed facilities, local coordinators should establish care priorities for both the pandemic and the post-pandemic periods – for instance, prioritizing clients with no clinical appointments or without a laboratory test (viral load and/or CD4 count) for > 6 months; vulnerable clients with no access to an HIV test (key populations, sexual partners of an index patient, pregnant women and exposed infants); those presenting symptoms of advanced HIV disease, other sexually transmitted infections or tuberculosis; and patients with comorbidities. In addition, all precautions against SARS-CoV-2 infection should be maintained while the pandemic is still ongoing; these include screening of symptomatic clients and those with exposure to confirmed/suspect cases; physical distancing; universal use of face masks and other personal protective equipment; hand hygiene; and use of telemedicine or other remote technologies whenever possible [18]. We also recommend actively tracing clients who fail to attend clinical consultations or ART refill visits; enhancing support groups for those most in need (even virtually); providing an HIV self-test as an alternative to facility-based testing [19]; and creating alternative routes for delivery of ART for clients who work in essential activities and are exposed to extraordinary demands during the pandemic.

We are hopeful that the ongoing COVID-19 vaccination will also help HIV services recover from the substantial impact of the pandemic [20]. Nevertheless, until large-scale vaccination coverage is achieved, collective global efforts that prioritize vulnerable patients may enable the COVID-19 pandemic to be used as an opportunity to improve the response to the HIV epidemic.

In conclusion, our results show that COVID-19 has had significant impacts on HIV testing, the percentage of positive tests, the number of consultations and the number of

new enrolments in care globally. In order to mitigate the detrimental impacts of the pandemic on HIV care, strategies to improve access to diagnosis and treatment are essential for both the pandemic and the post-pandemic periods.

ACKNOWLEDGEMENTS

We thank the health care workers in AHF facilities who made tremendous efforts to keep assisting PLHIV and provided data for this study.

CONFLICTS OF INTEREST


VIAS is the University of Sao Paulo principal investigator for the Janssen COVID-19 vaccine trial. She also received fees for a lecture on COVID-19 vaccines from Bayer Pharmaceuticals. The remaining authors have no conflicts of interest to declare.

AUTHOR CONTRIBUTIONS

Conception of study: ASB, FR, VIAS; data extraction: WO, JH; data analysis: VIAS; manuscript writing: all authors .

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How to cite this article: Rick F, Odoke W, van den Hombergh J, Benzaken AS, Avelino-Silva VI. Impact of coronavirus disease (COVID-19) on HIV testing and care provision across four continents. *HIV Med*. 2022;23:169–177. doi:[10.1111/hiv.13180](https://doi.org/10.1111/hiv.13180)