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Intersecting epidemics: COVID-19 and HIV in sub-Saharan Africa. A systematic review (2020-2022)

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ORIGINAL ARTICLE

Intersecting epidemics: COVID-19 and HIV in sub-Saharan Africa. A systematic review (2020-2022)

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Abstract. There has been significant progress with regards to winning the fight against HIV globally, particularly due to the introduction of antiretroviral therapy (ART). COVID-19 threatened to derail gains in the fight against HIV. As we have started to see with studies on COVID-19 and HIV, there is a need to 'provide an in-depth view' in understanding the dynamics between the two epidemics, especially in sub-Saharan Africa. We, therefore, undertook a systemic review of existing literature to synthesize the effects of COVID-19 on the utilization of HIV services in sub-Saharan Africa, the literature on the risks associated with HIV during the COVID-19 pandemic, and lastly, the innovations and strategies adopted to continue receiving treatment in sub-Saharan Africa. We conducted a systematic review of studies published between 2020 and April 2022. We searched for relevant sub-Saharan studies in the following databases: PubMed, Google Scholar, J-STOR, and Science Direct. The review followed the Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) guidelines. The search identified 647 papers, and after screening, 41 were in line with the inclusion criteria and were included in the review. There was evidence of the negative effects of COVID-19 on reducing HIV testing, ART treatment, and HIV prevention services. There is evidence pointing to the need for people living with HIV to be prioritized for COVID-19 vaccinations. Innovations and strategies implemented to mitigate the effects of COVID-19 on HIV services include community-based ART distribution, multi-month ART dispensing, the use of digital technologies, and the use of the already existing HIV infrastructure to fight COVID-19. It is still imperative that future studies explore the predictors of utilization of HIV services in the advent of COVID-19.

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Introduction

More than forty years since the start of the HIV epidemic, about 79.3 million people have become infected with HIV globally. The HIV epidemic has claimed approximately 36.3 million lives from AIDS-related illnesses over the past four decades (1). There has been significant progress in fighting HIV, particularly due to the introduction of antiretroviral (ARV) therapy. However, in the year 2020; around 1.5 million people who were newly infected with HIV globally, showing the need of continued efforts to fight the spread of the disease. Eastern and Southern Africa contributed approximately 670,000 of these new infections; whilst West and Central Africa added nearly 200,000 new infections. Henceforth, more than 50% of the new HIV infections came from Sub-Saharan Africa. By the year 2020, more than 27 million people globally were on antiretroviral therapy (ARV) (1). Around sixty-seven percent of these people living with HIV are in Sub-Saharan Africa; with almost 16 million residing in Eastern and Southern Africa and 3.5 million in Central and West Africa. The coming in of COVID-19 posed a new threat to the fight against the HIV epidemic; particularly in Sub-Saharan Africa which carries the greatest burden of the disease. Recent studies have documented intensified risk amongst people living with HIV after contracting COVID-19 (2,3). There were also COVID-19 lockdowns and restrictions pronounced by governments as response measures to reduce the spread of the disease. Unfortunately, that has disrupted access to Sexual Reproductive Services (4,5). Consequently, HIV treatment has been disrupted as more priority was given to reducing the spread of COVID-19.

In the advent of the new pandemic, scholarly studies linking HIV and COVID-19 are needed particularly in highly affected regions like Sub-Saharan Africa which constitutes approximately 67% of people living with HIV. As literature

on HIV and COVID-19 is relatively new, in-depth view from systemic review are a crucial need. There is, thus, a greater need to gain insight into knowledge that has been discovered recently concerning COVID-19 in terms of risk among people living with HIV, utilization of HIV services and innovations for continuity of HIV services. Gaining insight into the intersections between HIV and COVID-19 in Sub-Saharan Africa will help to inform the development of evidence-based interventions for the region in responding to the two epidemics.

Therefore, this systematic review was undertaken with the aim of gaining in-depth understanding of the effects of COVID-19 on utilization of HIV services. It also explored on the risks associated with HIV during the COVID-19 pandemic as well as innovations and strategies adopted to continue receiving treatment. Specifically, the review employed a qualitative approach to systematically describe and review existing literature linking HIV and COVID-19. It explored the risk of HIV and COVID-19 comorbidity in sub-Saharan Africa, examining the utilization of HIV services and evaluating innovations and strategies adopted for the continuity of such services.

Materials and methods

Protocol and registration. The protocol was registered with the PROSPERO international prospective register of systematic reviews under registration number CRD42021278730. The final review was reported following the PRISMA 2020 statement (6).

Summary of methods. This is a qualitative systematic review of literature linking HIV and COVID-19 in sub-Saharan Africa. The inquiry underwent three main phases of adapting the framework for conducting reviews as presented by Arksey and O'Malley (7). The first phase involved identifying the research question whilst perusing relevant literature. Secondly, the researchers went through the process of selecting the literature that matched using inclusion and exclusion criteria. The third phase involved collating, summarizing it into themes, and reporting the results.

Eligibility criteria. The inclusion and exclusion criteria which was developed for this review aimed to identify researches accurately and then pick out the relevant studies.

Inclusion criteria

Study design. The review included clinical and non-clinical studies which used focus group discussions to interrogate data and make sense of the emerging information. It also included cross-sectional studies, cohort designs, technical reports and systemic reviews in examining in full or in part; the relationship between COVID-19 and HIV.

Outcomes. Three main outcomes were synthetized in this review. Firstly, the research synthesized knowledge about COVID-19 and HIV comorbidity risk. Secondly, it explored on the utilisation of HIV services during COVID-19 restrictions and lockdown periods. Thirdly, it explored the innovations and strategies implemented to ensure continuity of services during lockdown periods.

Study setting. The review focused on studies conducted in Sub-Saharan Africa. These included southern, western, eastern and central African countries which are south of the Sahara Desert.

Time. The review was limited to studies published between January 1, 2020, and April 30, 2022, in the databases consulted. Data was collected between August 2022 to November 2022.

Language. Only studies published in English were included.

Exclusion criteria. Theoretical studies and researches outside sub-Saharan Africa were excluded.

Search strategy

Electronic databases. The electronic databases which were searched included PubMed, Google Scholar, J-STOR and Science direct databases. Geographical restriction was applied to Sub-Saharan Africa region whilst language choice was confined to English. The PubMed search query is presented in Table I.

Study selection. An extensive title screening was performed first. During the title screening, researchers uploaded the literature search in Mendely Desktop version 1.19.4 (8). Secondly, deduplication of studies from the Mendeley library was done to ensure that the researchers remained with unique studies. Thirdly, abstract screening was conducted. Through Abstract screening, the inclusion was determined to the full text review. At the last stage of full text review, the researchers remained only with studies that met the inclusion criteria.

Ethics and dissemination. This systematic review was exempted from ethics approval because the work was carried out on published scholarly documents that already existed. The study will also contribute to a DPhil thesis in Demography and Population studies at the University of Witwatersrand, Johannesburg, South Africa.

Data extraction. Our search retrieved 671 publications. The identification of studies flow chart is presented in Fig. 1. The final Mendeley database was shared for abstract screening; using three independent reviewers. These three extracted the data in the targeted search engines. As a guide, researchers used a systematised data extraction sheet. This data extraction sheet captured information such as the reference, aim and location. The Mendeley referencing software was used to identify and remove duplicates, of which 264 duplicates were removed. The remaining 410 studies went for title and abstract screening. Through this screening 224 studies were excluded. The main reasons why these were excluded included, no focus on HIV although they had Covid-19 effects, no focus on sub-Saharan African countries and Some showing other comorbidities of Covid-19 and TB, Malaria, hypertension and not HIV. Of the 41 studies that were selected for full text screening, the 41 were included for the review. Regarding assessment of individual reviews, two researchers independently assessed the reviews for quality. The measurement tool that was used to asses was the Assess Systematic Reviews 2 (AMSTAR 2).

Table I. PubMed search query.

Concept	Key search items	Subject headings
COVID-19	'COVID-19'[All Fields] OR 'COVID-19'[MeSH Terms] OR 'COVID-19 Vaccines' [All Fields] OR 'COVID-19 Vaccines'[MeSH Terms] OR 'COVID-19 serotherapy' [All Fields] OR 'COVID-19 serotherapy'[All Fields] OR 'COVID-19 Nucleic Acid Testing'[All Fields] OR 'covid-19 nucleic acid testing'[MeSH Terms] OR 'COVID-19 Serological Testing'[All Fields] OR 'covid-19 serological testing' [MeSH Terms] OR 'COVID-19 Testing'[All Fields] OR 'covid-19 testing'[MeSH Terms] OR 'SARS-CoV-2'[All Fields] OR 'sars-cov-2'[MeSH Terms] OR 'Severe Acute Respiratory Syndrome Coronavirus 2'[All Fields] OR 'NCOV'[All Fields] OR '2019 NCOV'[All Fields]	Covid-19
HIV	'hiv'[MeSH Terms] OR HIV[Text Word]	HIV
HIV testing	'hiv testing'[MeSH Terms] OR HIV testing[Text Word]	HIV Testing
HIV treatment	'anti-retroviral agents'[All Fields] OR 'anti-retroviral agents'[MeSH Terms] OR Antiretroviral[Text Word]) AND ('therapy'[Subheading] OR 'therapeutics'[MeSH Terms] OR therapy[Text Word])	HIV treatment

Characteristics of articles reviewed. Regarding the first pillar of the systemic review, we reviewed 21 studies (described in Table II) that were focused on effects of COVID-19 on HIV services in sub-Saharan Africa. These studies provided insights from the following 20 countries Burkina Faso, Ethiopia, Nigeria, Uganda, Kenya, Rwanda, Cameroon, Zambia, South Africa, and Botswana, Tanzania, Angola, Burundi, Ivory Coast, Democratic Republic of Congo (DRC), Eswatini, Ethiopia, Mozambique, South Sudan, Malawi, and Zimbabwe. Commons studies in this pillar were primary studies, desk reviews and modelling studies. Regarding the second pillar, we reviewed 11 studies (described in Table III) for COVID-19 and HIV risk amoung people living with HIV. These mainly came from Zambia, Nigeria and South Africa. Common studies under this pillar were primary studies and desk reviews. In the last pillar, 9 studies (described in Table IV) with data and perspectives on innovations for continuity of HIV services during the COVID-19 pandemic from Ivory Coast, Democratic Republic of Congo (DRC), Eswatini, Ethiopia, Liberia, South Africa, Togo, Uganda and Zambia. Common studies under this pillar were desk reviews.

Results

Effect of COVID-19 on HIV services utilization. Studies on the effect of COVID-19 are presented in Table II.

HIV testing. HIV testing presents an entry point to ensuring that all people living with HIV are put on lifelong antiretroviral treatment (ARV) in order to live healthier lives. However, HIV testing services were among the services most impacted by COVID-19 in Sub-Saharan African countries (9-11). In Homa bay and Kisumu counties of western Kenya, it was noted that both HIV testing and partner notification for clients in the community were affected. This occurred because home testing was halted due to COVID-19 restrictions (9). Moreover, health care workers who used to follow up eligible clients for HIV testing in the community had to refer them for the services at the facility. This would then factor in issues of distance, affordability of transport or fear of contracting COVID-19. In south-western Uganda, HIV testing was negatively impacted in two major ways. COVID-19 restrictions of movement prevented access to services and also the issue of stigma related to the disease amongst health care workers. Moreover, in 11 sub-Saharan countries; data covering over twelve months showed a temporary lapse of HIV services which then improved as measures to ensure continuity of HIV testing and treatment services were instituted (12). This concurred with studies in 65 South African primary health facilities where an estimated 48% decrease in HIV testing was observed in April 2020. It was associated with COVID-19 lockdown (13). A similar finding showed reduction of HIV testing in Zambia, Malawi and South Africa. Recovery of HIV testing services was only realised after the easing of lockdown restrictions (11). Between April and June 2020, there was a significant reduction in HIV testing volumes by 50% in South Africa, 35% in Malawi and 22% in Zambia (11).

HIV treatment services. Considerable gains have been realised in HIV treatment across the globe. HIV treatment services ranging from Art refills and viral load monitoring among others have been severely affected by the advent of COVID-19 (9,14). In western Kenya, the time frame of viral testing process increased from 1 to 2 weeks to several months due to diversion of laboratory facilities for COVID-19 prioritisation (9). There have been reduced opportunities for client and health care worker clinic interactions as clients were referred direct to pharmacies for drug collection (9). In Burkina Faso, Nigeria and Ethiopia; health care providers noted that 18% of people living with HIV faced difficulties in accessing HIV treatment services (14). More so; in Nigeria, Kenya, Tanzania and Uganda, a temporary decrease in HIV clinic visits was recorded (15). Issues concerning food security among people living with HIV were also noted as affecting adherence to treatment (15). Similarly, as restrictions eased; ART initiations gradually improved towards pre-lockdown levels in Rwanda,

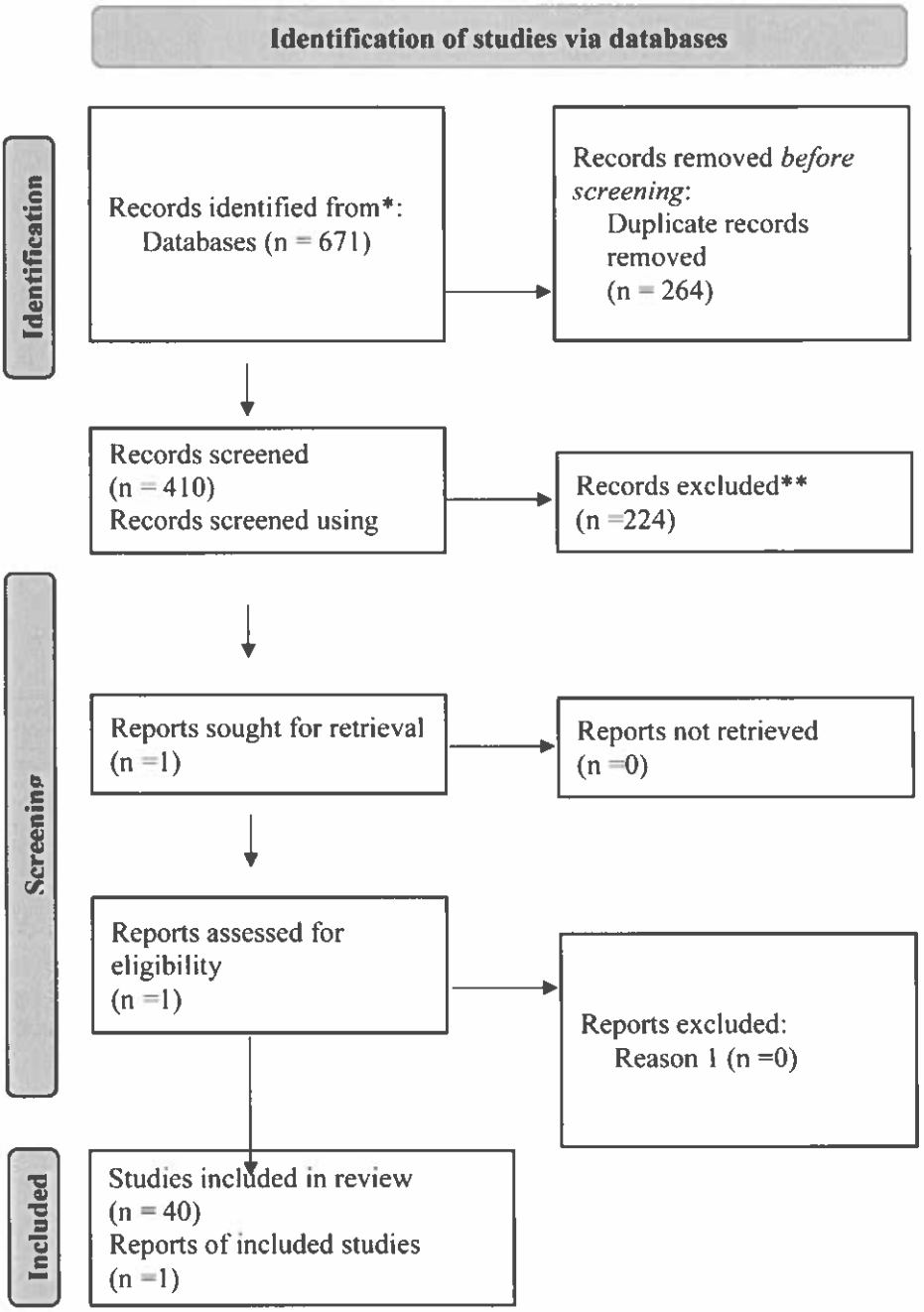

Figure 1. Identification of studies flow chart.

Kigali (13). There was an observed association between place of residence and ART collection (13).

In a study that focused on people living in slum dwellings across Nigeria and Kenya, findings showed that there were barriers to HIV related services that included increased cost of health care, reduced household income and fear of COVID-19 infection. The affected services included screening for hypertension, HIV related issues as well as tuberculosis among others (16). In 65 South African primary health facilities, there was a notable median decrease from 571 ART initiations a week before COVID-19 lockdown restrictions to 375 a week post lockdown period. However, the same study noted no significant changes in the number of ART refill collection visits.

Regarding the proximity of residences to health facilities, people living with HIV who resided within Kigali utilised their ART refill appointments in comparison with 35% who stayed outside Kigali (17). Being diagnosed in World Health Organisation clinical stage I was then associated with meeting the ART refill appointment at 48%; with 56 and 22% for patients in clinical stages 3 and 4 respectively (17). The effect of access to isoniazid-preventive therapy (TPT) during the COVID-19 period has been documented (18). TPT is particularly important in preventing tuberculosis in people living with HIV. In Uganda, a decline in the initiation of TPT by 75% in the first two weeks of April 2020 was recorded (18). More so, there was a recorded diversion of HIV and TB commodities production in preference of COVID-19 items (19,20).

Table II. Utilization of HIV services in the advent of COVID-19 in sub-Saharan Africa.

Author/year (Refs.)	Title	Study location	Focus/Aim of Study	Socio demographic profile	Methodology	Sample size	Findings	Gaps
Lagat *et al* 2020 (9)	Impact of the COVID- 19 Pandemic on HIV Testing and Assisted Partner Notification Services, Western Kenya	Western Kenya	The study was aimed at investigating the impact of Covid-19 on clinics providing assisted partner notificati on HIV services in western Kenya	Males, Females	Retrospective programmatic data	2089 Female indexes	• Partner notification and HIV testing for clients in the community was affected as home testing was halted due to Covid-19 restrictions. • Turn-around of viral results increased from 1 to 2 weeks to several months due to diversion of laboratory results for Covid-19. • Reduced opportunities for client and health care worker clinic interactions as clients were referred direct to pharmacy for drug collection	The study relies mostly on programme data and service provider perceptions without interviewing the clients aimed at receiving the services.
Ponticiello *et al* 2020 (10)	'Everything is a Mess': How COVID-19 is Impacting Engagement with HIV Testing Services in Rural south-western Uganda	South-western Uganda	To describe the impact of COVID-19 on uptake of HIV testing in south-western Uganda	Males and Female ≥18 years	Qualitative in-depth Interviews	20	• In south-western Uganda, HIV testing was negatively impacted in two ways which include Covid-19 restriction and preventing access of services • It was noted that there was Covid-19 related stigma among the health care workers.	The study sample of 20 was relatively too small to generalise the study
Assefa *et al* 2021 (14)	Reported Barriers to Healthcare Access and Service Disruptions Caused by COVID-19 in Burkina Faso, Ethiopia, and Nigeria: A Telephone Survey	Burkina Faso, Ethiopia, and Nigeria Uganda	To assess the effects of Covid-19 pandemic on healthcare services from the perspectives of healthcare providers (HCPs) and community members.	Health Care Providers Community Members	Telephone Survey	900 health Care Providers 1797 Community members	• Health Care Providers noted that 18% of clients had difficulty in accessing HIV treatment	Health service was interruption through self-reports only may introduce some level of bias.

Table II. Continued.

Author/year (Refs.)	Title	Study location	Focus/Aim of Study	Socio demographic profile	Methodology	Sample size	Findings	Gaps
Bell *et al* 2020, (18)	Predicting the Impact of COVID-19 and the Potential Impact of the Public Health Response on Disease Burden in Uganda		To predict the impact of covid-19 on the disease burden	Men, Women	Retrospective Study	-	• A decline in new HIV case identification by 75% in April 2020 • A decline in the initiation of isoniazid-preventive therapy to prevent tuberculosis in people living with HIV by 75% in April 2022	HIV data on impact of Covid-19 on services was for a relatively short period of time (2 weeks), hence the situation could have subsequently changed in shorter periods of time as well.
Umviligihozo *et al* 2022, (19)	Sub-Saharan Africa prepared ness and response to the COVID- 19 pandemic : A perspective of early career Africans	Uganda, Kenya, Rwanda, Camero on, Zambia, South Africa, and Botswana	To document public health interventions implemented in seven sub-Saharan African countries on preparedness and response to the Covid-19 outbreak.	Men, Women	Review of publicly available information	-	• Interruption of pre-existing programmes such PrEP for prevention of HIV programmes	
Dear *et al* 2021, (15)	Transient Reductions in Human Immunodeficiency Virus (HIV) Clinic Attendance and Food Security During the Coronavirus Disease 2019 (COVID-19)	Nigeria, Kenya, Tanzania and Uganda	To observe transient decreases in human immuno deficiency virus (HIV) clinic visit adherence and food security among persons living with	Men, Women	Cohort study	2666	• A temporary decrease in HIV clinic visits	The participants that were enrolled had a unique access to care during thepandemic, hence the study findings may not be representative of the general population.

Table II. Continued.

Author/year (Refs.)	Title	Study location	Focus/Aim of Study	Socio demographic profile	Methodology	Sample size	Findings	Gaps
	Pandemic for People Living with HIV in 4 African Countries		HIV early in the pandemic, and an increase in viral suppressi on later in the pandemic					
Harris *et al* 2021, (12)	Effects of the Coronavirus Disease 2019 Pandemic on Human Immunodeficiency Virus Services: Findings from 11 Sub-Saharan African Countries	Angola, Burundi Camero, on, Cote d'Ivoire, DRC, Eswatini, Ethiopia, Kenya, Mozambique, South Sudan and Zambia	To document the effect of Covid-19 on HIV services	Men, Women	Retrospective cohort study	1059 supported health facilities	• In 11 sub-Saharan countries data tracked over 1 year showed a transient effect on HIV services which was then followed by a recovery in important measures related to the HIV testing and treatment.	The study included selected health facilities and may not be representative of all health facilities in the 11 countries.
Ahmed *et al* 2020, (16)	Impact of the societal response to COVID-19 on access to healthcare for non-COVID- 19 health issues in slum communities of Bangladesh, Kenya, Nigeria and Pakistan: results ofpre-COVID and COVID-19 lockdown stakeholder engagements	Bangladesh, Kenya, Nigeria and Pakistan	To compare access to Health care for non-Covid-19 conditions in the pre and post Covid-19 periods in slum communities.	Men, Women	Qualitative stakeholder engagements	860 community leaders, residents and health care workers	• Perspectives showed that among slum dwellers, barriers that include increased cost of health care, reduced household income, fear of Covid-19 infection were among the reasons that impacted access to services during the Covid-19 era. • The affected services included screening for hypertension, HIV, tuberculosis among others.	The study is based on perspectives of the stakeholders.

Table II. Continued.

Author/year (Refs.)	Title	Study location	Focus/Aim of Study	Socio demographic profile	Methodology	Sample size	Findings	Gaps
Thirumalaisamy *et al* 2021, (26)	COVID-19 and syndemic challenges in 'Battling the Big Three': HIV, TB and malaria	Sub-Saharan Africa Sub-	To bring the effects of Covid-19 on Africa with already high incidences of HIV, TB and Malaria	Male, Female	Desk review	-	• The study predicted an intensification of the burden of HIV infections, malaria and tuberculosis if Covid-19 cases are not curtailed.	The study is a desk review
Chanda-Kapata *et al* 2022, (20)	Tuberculosis, HIV/AIDS and Malaria Health Services in sub-Saharan Africa-A Situation Analysis of the Disruptions and Impact of the COVID-19 Pandemic	Saharan Africa	To reflect on the COVID-19 related disruptions on the Tuberculosis, HIV/AI DS and Malaria routine health services across Africa	Male, Female	Desk review	-	• Covid-19 led to diversion of diversion of resources from HIV, Malaria and TB services	The study is a desk review
Coker *et al* 2021, (21)	Things must not fall apart: the ripple effects of the COVID-19 pandemic on children in sub-Saharan Africa	Sub-Saharan Africa	To highlight the impacts of Covid-19 on children in sub-Saharan Africa	Children	Desk review	-	• The study noted the highly likelihood of pandemic restrictions and service disruptions as impacting children living with HIV services such as psychosocial support, leading to poor adherence, deterioration of mental health, and greater HIV-related morbidity and mortality for children.	The study is a desk review
Britta *et al* 2020, (25)	Understanding the impact of interrupti ons to HIV services during the COVID-19 pandemic: A	South Africa, Malawi, Uganda	To Zimbabwe, and explore the impact of disruptions on HIV outcomes	Male, Females	Use of a mathematical model to examine how impact is affected by model assumptions	-	• A three-month interruption for 40% of those on ART could cause a similar number of additional deaths as those that might be saved from COVID-19 through social distancing. • An interruption for more than 6-months could cause the 90% of	The model did not take into consideration any interaction between HIV, or ART status and covid-19 infection

Table II. Continued.

Author/year (Refs.)	Title	Study location	Focus/Aim of Study	Socio demographic profile	Methodology	Sample size	Findings	Gaps
	modelling study						individuals on ART for nine number of HIV deaths to exceed the number of COVID-19 deaths	hence people living with HIV are not assumed to be more or less likely to acquire or die of Covid-19
Dorward *et al* 2021, (13)	The impact of the COVID-19 lockdown on HIV care in 65 South African primary care clinics: an interrupted time series analysis	South Africa	To measure the impact of the 2020 national COVID-19 lockdowns on HIV testing and treatment in KwaZulu -Natal, South Africa	Males, Females	Interrupted time series analysis	-	• In South Africa, lockdown was associated with an estimated 47.6% decrease in HIV testing in April, 2020 • ART initiations decreased from a median of 571 per week before lockdown to 375 per week after lockdown • However, there was no marked change in the number of ART collection visits • As restrictions eased, HIV testing and ART initiations gradually improved towards pre-lockdown levels	The study did not take into account influences of viral load to complete the HIV care continuum
Jewell *et al* 2020, (48)	Potential effects of disruption to HIV programmes in sub-Saharan Africa caused by COVID-19 Results: from multiple mathema tical models	Sub-Saharan Africa	To predict the potential effects of disruption to HIV programmes in sub- Saharan Africa caused by COVID-19: results from multiple mathema tical models	Males, Females	The study used five models of HIV epidemics [Goals, Optima HIV, HIV Synthesis, an Imperial College London model, and Epidemiological Modeling software (EMOD)] to estimate the effect of various	-	• A 6-month interruption of supply of antiretroviral therapy (ART) drugs across 50% of the population of people living with HIV who are on treatment would be expected to lead to a 1·63 times increase in HIV-related deaths over a 1-year period compared with no disruption. • Interruption to condom supplies and peer education would make populations more susceptible to increases in HIV incidence.	The model outputs were depended on the data that was available which may e not have been always compete.

Table II. Continued.

Author/year (Refs.)	Title	Study location	Focus/Aim of Study	Socio demographic profile	Methodology	Sample size	Findings	Gaps
					potential disruptions to HIV prevention, testing, and treatment serviceson HIV-related deaths and new infection			
Davey *et al* 2020, (23)	Contracting HIV or Contracting SAR-Co V-2 (COVID-19) in Pregnancy? Balancing the Risks and Benefits	South Africa	To document the risks and benefits of contracting HIV or Covid-19 in pregnancy	Male, Female	Desk review	-	• HIV preexposure prophylaxis (PrEP) in pregnancy had been halted in various areas in light of the potential risk of Coronavirus exposure amongst pregnant women. • However, it has been argued that benefits outweigh the risks in this population. Advocacy was made for continued PrEP enrolment, drug provision and adherence counselling in HIV infected and uninfected; patients pregnant and breastfeeding women at high risk of HIV acquisition in South Africa. It was concluded that continuing with our retention and prescription was ideal.	The study is a desk review
Pierre *et al* 2020, (17)	Attendance to HIV Antiretro viral Collection Clinic Appointments During COVID-19 Lockdown. A Single Centre Study in Kigali, Rwanda	Rwanda	To document attendance on HIV related collections during the Covid-19 lockdown	Male, Female	Retrospective study	382	• There was an association between place of residence and attendance. Peoplestaying within Kigali attended scheduled ART collection clinic appointments during the lockdown period compared to 35% among those living outside Kigali. • There was an association between WHO clinical stage and attendance status. 48% in WHO clinical stage 1	The study is a single centrer study, hence it may be difficult to generalise.

Table II. Continued.

Author/year (Refs.)	Title	Study location	Focus/Aim of Study	Socio demographic profile	Methodology	Sample size	Findings	Gaps
							attended scheduled ART collection clinic appointments during the lockdown period compared to 56% and 22% among those in WHO clinical stage 3 and 4 respectively	
Stover *et al* 2020, (27)	Estimation of the Potential Impact of COVID-19 Responses on the HIV Epidemic: Analysis using the Goals Model	Malawi, Mozam bique, Uganda, Zimbabwe	To comparat ively analyse the effects of 3 and 6-month disruptions in health services as a result of COVID-19	Male, Female	Study applied an existing HIV simulation model	-	• Disruptions to primary prevention programmes such as male circumcision, HIV behaviour change programmes and condom distribution would have small but transitory effects on new infections that might be more than offset by reductions in commercial and multi-partner sex due to lock downs.	The authors admit that the assumption of no casual or commercial sexduring the stay-at-home period may over-estimate the reduction in incidence.
Snyman *et al* 2021, (29)	COVID-19 in Africa: pre-existing immunity and HIV	Africa	To highlight the effect preexposure to other human coronavi ruses might have on SARS-CoV-2 infection and disease course and the possibility of cross-reactivity when performing diagnostic testing or surveilla nce for SARSCo V-2 using immunoassay	Male, Female	Desk review	-	• The impact of HIV on Covid-19 infection is not yet completely understood but evidence suggests that uncontrolled HIV negatively impacts Covid-19 clinical outcomes	The study is a desk review

Table II. Continued.

Author/year (Refs.)	Title	Study location	Focus/Aim of Study	Socio demographic profile	Methodology	Sample size	Findings	Gaps
Mwananyanda *et al* 2021, (49)	Covid-19 deaths in Africa: prospective systematic postmortem surveilla nce study	Zambia	To measure the fatal impact of Covid-19 in an urban African population	Male, Female	Cross sectional study		• The five most common comorbidities among people who died of Covid-19 were tuberculosis (22; 31%), hypertension (19; 27%), HIV/AIDS (16; 23%), alcohol misuse (12; 17%), and diabetes (9; 13%).	The study was limited by the completeness and accuracy of medical chart data
Fernandez *et al* 2021, (50)	HIV treatment/ retention in sub-Saharan Africa before and during the Covid-19 pandemic	Sub-Saharan Africa	To assess the potential loss to follow-up (LTFU) across PEPFAR countries in SSA before and during the pandemic in order to determine the impact of COVID-19 on HIV clinical treatment	Male, Female	Cross sectional study	740,112	• The proportion of ART clients who were lost to follow up rose from 4.9 and 5.3% between quarter 1 and Quarter 2 of 2020 in 18 countries of Sub-Saharan Africa.	
Murewanhema 2020, (22)	HIV and Sub-Saharan African Women in the COVID-19 Era and beyond	Sub-Saharan Africa	To discuss the factors that put women from Sub-Saharan Africa at differential risk of HIV acquisiti on, and the possible impacts of the COVID-19 pandemic on HIV care and prevention	Women	Desk review	-	• Women from SSA remain at substantial risk of HIV acquisition, especially the younger ones between 15 and 24 years of age. Factors that predispose them to an increased risk of HIV infection may be aggravated by the COVID-19 pandemic	The study is a desk review

Table III. Risk of COVID-19 among people living with HIV in Sub-Saharan Africa.

Author/year (Refs.)	Title	Study location	Focus/Aim of Study	Socio demographic profile	Methodology	Sample size	Findings	Gaps
Nepomuceno *et al* 2020, (32)	Vulnerable groups at increased risk of COVID-19 in sub-Saharan Africa: The case of the HIV population	Sub-Saharan Africa	To highlight the potential risk profile for Covid-19 in high HIV prevalence settings of Sub-Saharan Africa	Males, Females	Retrospective	-	• HIV infected patients are potentially at greater risk of dying due to Covid-19, considering that it is so because of influenza • HIV infected populations are potentially a vulnerable group at increased risk of Covid-19	The study pillars on inferring to previous finding; for example, on the risk of influenza on the HIV population. No actual data was collected on therisk of Covid-19 in sub-Saharan Africa.
Himwaze *et al* 2021, (33)	Post-mortem examination of Hospital Inpatient COVID-19 Deaths in Lusaka, Zambia-A Descriptive Whole-body Autopsy Series	Lusaka, Zambia	To define the gross pathology and histological features of COVID-19	Males, Females, Aged 15-85	Descriptive post-mortem examination study of inpatient Covid-19 related deaths	29	• Among the 29 autopsies, common co-morbidities included HIV were 28% (8/29)	The study sample of 29 is relatively small to generalise the findings elsewhere.
Bell *et al* 2021, (34)	Relative Burdens of the COVID-19, Malaria, Tuberculosis, and HIV/AIDS Epidemics in Sub-Saharan Africa	Sub-Saharan African countries	To examine the disease burden of Covid-19, Malaria, Tuberculosis, and HIV/AIDS.	Men, Women	Retrospective Study	1,523,1 87 (all mortality)	• In South Africa and Lesotho, tuberculosis, HIV/AIDS, and malaria individually dominated COVID-19 mortality until age 65 to 69 years, after which COVID-19 dominated HIV/AIDS	The data analysis may be marred with some completeness issues as COVID-19 mortality data is incomplete.
Mandala *et al* 2021, (31)	SARS-CoV-2 and HIV-1: Should HIV-1-Infected Individuals in	Sub-Saharan Africa	To find out if people living with HIV should be a priority group	Men, Women	Desk review	-	• There is need of prioritising COVID-19 vaccination for those living with HIV-1 in Sub-Saharan Africa (SSA)	It is a desk review

Table III. Continued.

Author/year (Refs.)	Title	Study location	Focus/Aim of Study	Socio demog raphic profile	Methodology	Sample size	Findings	Gaps
	Sub-Saharan Africa Be Considered a Priority Group for the COVID-19 Vaccines?		for the COVID-19 Vaccines.					
Boulle *et al* 2020, (3)	Risk Factors for Coronavirus Disease 2019 (COVID-19) Death in a Population Cohort Study from the Western Cape Province, South Africa	South Africa	To examine risk factors for COVID-19 death in sub-Saharan Africa and the effects of human immunodeficiency virus (HIV) and tuberculosis on COVID-19 outcomes are unknown	Men, Women	Populati on cohort study	3,460,9 32	• HIV was associated with COVID-19 mortality • Current and previous diagnosis of tuberculosis were associated with Covid-19 deaths	The study lacked data for other risk factors such as socioecono mic status and smoking.
Venturas *et al* 2021, (36)	Comparison of outcomes in data HIV-positive and HIV-negative patients with COVID-19	South Africa	To ascertain whether people living with HIV have worse outcomes compared to HIV negative patients with Covid-19	HIV positive and HIV negative adults	Retrospective analysis	384 (108 HIV-Positive and 276 HIV-negative	• In comparison of HIV negative and HIV positive clients, although the median 4C score was higher in HIV positive patients, there was no significant difference with regards to mortality • More so, although not statically significant; HIV-positive patients who died were younger than their HIV-negative counterparts	The referred to only hospitalized cases

Table III. Continued.

Author/year (Refs.)	Title	Study location	Focus/Aim of Study	Socio demog raphic profile	Methodology	Sample size	Findings	Gaps
Anjorin *et al* 2021, (51)	Comorbidities and the COVID-19 pandemic dynamics in Africa	Africa	To explore of the impact of differences in the epidemiology of key comorbidities as they relate to Covid-19.	Male, Female	Deskreview	-	• With regards to HIV the study also ascertained that there is currently no epidemiological relationship between HIV and COVID-19. However, people living with HIV have been regarded a vulnerable group for covid-19	The study is a desk review
Govender *et al* 2020, (52)	Systemic DPP4/CD26 is associated with natural HIV-1 control: Implications for COVID-19 susceptibility	South Africa	To evaluate soluble DPP4 (sDPP4) levels and activity in plasma of 131 HI infected and 20 HIV-uninfected South African individuals.	Male, Female	Cross-sectional study	131 HI infected and 20 HIV-uninfected	• HIV-1 controllers and progressors may have implications for risk and treatment of COVID-19 in people living with HIV.	The study did not have data for BMI and glucose for the clients sampled.
Phiri *et al* 2021, (28)	Spread of COVID-19 in Zambia: An assessment of environmental and socioeconomic factors using a classification tree approach	Zambia	To understanding the association of COVID-19 cases with environmental and socioeconomic factors in Zambia	Male, Female	Cross-sectional study	-	Areas with high rates of human immuno-deficient virus (HIV) infection had relatively high chances of having many COVID-19 cases when compared to areas with low HIV rates.	The data on age groups and socioeco nomic situation was not available
Chanda *et al* 2021, (53)	COVID-19 Severity and COVID-19-Associated Deaths Among Hospitalized	Zambia	To find out if COVID-19 Severity and COVID-19-Associated Deaths we	Male, Female Among Hospitalised	Cross-sectional study	443	HIV infection was not independently associated with worse outcomes among patients hospitalised for COVID-19 in Zambia	Data complet eness was a limitation because clinicians who were responsi ble for data collection were also responding to other

Table III. Continued.

Author/year (Refs.)	Title	Study location	Focus/Aim of Study	Socio demog raphic profile	Methodology	Sample size	Findings	Gaps
	Patients with HIV Infection Zambia, March-December 2020		related Patients with HIV Infection					urgent demands.
Osibogun *et al* 2021, (35)	Outcomes of COVID-19 patients with comorbidities in southwest Nigeria	Nigeria	To identify comorbidities that predict death among a large sample of COVID-19 patients from Nigeria	Male, Female	Retrospe ctive analysis	2184 laboratory confirmed cases of COVID-19	• Compared to patients without these comorbidities, patients with hypertension were 2.21 times more likely to die from COVID-19, patients with diabetes were 3.69 times more, those with renal disease were 12.53 times further, those with cancer were 14.12 times more likely to die while those with HIV were 12.21 times were more likely to die of COVID-19	Documented comorbidities were basedon self-reporting which could result in underest imation

Table IV. Innovation for continuity of HIV services during the advent of COVID-19.

Author/year (Refs.)	Title	Study location	Focus/Aim of Study	Socio demographic profile	Methodology	Sample size	Findings	Gaps
	Accceleration of differentiated service delivery for HIV treatment in sub-Saharan Africa during COVID-19	Sub-Saharan African countries	The study sought to summarise four ways in which differentiated service delivery (DSD) for HIV treatment has been accelerated during COVID-19 in policy and implementation in Sub-Saharan Africa	Male, Females	Retrospective analysis of publicly available data	-	• In response to Covid-19 HIV service delivery in response to COVID-19, the following countries increased Multi month dispensing of ARVs to reduce clinic consultations: Cote D' Ivoire,Democratic Republic of Congo (DRC), Eswatini, Ethiopia, Liberia, South Africa, Togo, Uganda and Zambia • Cote d'Ivoire,Eswatini, Ethiopia, Kenya, Lesotho, Mozambique, South Africa, South Sudan, Tanzania, Uganda and Zimbabwe emphasized community-based models for ART delivery within their HIV guidance during COVID-19 • In HIV guidance in response to COVID-19, a few countries (Cote D'Ivoire, Liberia and South Africa were the countries that emphasized the need to align refills for all medications among people living with HIV.	The data used for this synthesis were limited to what was publicly available and were likely incomplete.
Zakumumpa *et al* 2021, (42)	Dispensing antiretroviral during Covid-19 lockdown: re-discovering community-based ART delivery models in	Eastern Uganda	The study sought out to explore health-system resilience at the sub-national level in Uganda with regard to	Health team leaders, ART clinic managers, representatives of PEPFA R implem enting organis ations, recipients of	qualitative case-study of eight districts purposi vely selected	99	Five broad strategies for distributing antiretroviral during 'lockdown' emerged in our analysis: accelerating • home-based delivery of antiretroviral, extending multi-month dispensing from three to six	Patients who participated in the study may be representative of those who had means to overcome the transport barriers.

Table IV. Continued.

Author/year (Refs.)	Title	Study location	Focus/Aim of Study	Socio demographic profile	Methodology	Sample size	Findings	Gaps
	Uganda		strategies for dispensing antiretroviral during Covid-19 lockdown	HIV care			months for stable • patients; leveraging the Community Drug Distribution Points (CDDPs) model for ART refill pick-ups at outreach sites • in the community; increasing reliance on health information systems, including geospatial technologies, to support • ART refill distribution in unmapped rural settings. District health teams reported leveraging Covid-19 outbreak response funding to deliver ART refills to homesteads in rural communities.	
Nyoni 2020, (43)	COVID-19-Compliant Strategies for Supporting Treatment Adherence Among People Living with HIV in Sub-Saharan Africa	Sub-Saharan Africa	To document COVID-19-Compliant Strategies for Promoting ART Adherence	Males, Females	Desk review	-	• Treatment supporters cost effective means of having community based ART • Using digital health interventions to provide • Cash transfers proved more effective than food distribution for nutritional programmes among people living with HIV	The study is a desk review
Amimo 2020, (45)	What does the COVID-19 pandemic mean for HIV, tuberculosis, and malaria control?	Sub-Saharan Africa	To examine the potential implications of COVID-19 on the control of major epidemic diseases in Africa (HIV, TB and Malaria)	Male, Female	Desk review	-	• The current measures to control COVID-19 neglect important and complex context-specific epidemiological, social, and economic realities in Africa. COVID-19 responses at country level should include measures to protect vulnerable and under-served segments of society	The study is a desk review

Table IV. Continued.

Author/year (Refs.)	Title	Study location	Focus/Aim of Study	Socio demographic profile	Methodology	Sample size	Findings	Gaps
Brault 2021. (44)	Leveraging HIV Care Infrastructures for Integrated Chronic Disease and Pandemic Management in Sub-Saharan Africa	Sub-Saharan Africa	To proffer the deployment of an integrated service delivery model to fight covid-19 and other pandemics	Male, Female	Desk review	-	• Existing infrastructure for fighting HIV/TB/Malaria such as PEPFAR and Global Fund need to pivot towards integrated care inclusive of a wider swathe of non-communicable diseases and pandemic threats.	The study is a desk review
Golin (2020)	PEPFAR's response to the convergence of the HIV and COVID-19 pandemics in Sub-Saharan Africa	Sub-Saharan Africa	To review PEPFAR's COVID-19 technical guidance and provides country-specific examples of programme adaptions in sub-Saharan Africa.	Male, Female	Desk review	-	• Utilising the adaptive, data-driven programme approaches in facilities and communities established and supported by PEPFAR provides the opportunity to strengthen the COVID-19 response while protecting theimmense gains spanning HIVprevention, testing and treatment	The study is a desk review
Wilkinson 2020. (38)	The time is now: expedited HIV differentiated service delivery during the COVID-19 pandemic	Sub-Saharan Africa	To document the need for expediting differentiate service delivery in the advent of covid-19	Male, Female	Desk review	-	• Expanding access to differentiated service delivery to people living with HIV is a good way to disrupt the effects of Covid-19 on HIV treatment access	The study is a desk review
Grimsrudm, 2021. (39)	Silver linings: how COVID-19 expedited differentiated service delivery for HIV	Sub-Saharan Africa	To proffer strategies on how to expedite19 expedited and differentiated service delivery	Male, Female	Desk review	-	• Strategies for expedited differential service delivery include expanding into community based services.	The study is a desk review

Table IV. Continued.

Author/year (Refs.)	Title	Study location	Focus/Aim of Study	Socio demographic profile	Methodology	Sample size	Findings	Gaps
			for HIV during the Covid-19 pandemic					
Stover, 2021 (30)	The risks and benefits of providing HIV services during the COVID-19 pandemic	Sub-Saharan Africa	To apply HIV simulation models (Goals, HIV Synthesis, Optima HIV and EMOD) in order to estimate the benefits of continuing HIV services	Male, Female	Desk review	-	• Maintaining these HIV services could lead to additional COVID-19 deaths of 0.002 to 0.15 per 10,000 clients	COVID-19 is a new disease, so models are also new and relatively untested in projecting into the future.

Services for women and children. Children living with HIV have also been affected by the pandemic. Studies noted that restrictions and service disruptions caused by the pandemic impacted on children living with HIV. Services affected included; but were not limited to adherence counselling, psychosocial support and mental health support (21). On the other hand, women in sub-Saharan Africa remain at substantial risk of HIV acquisition, especially younger ones between 15 and 24 years of age. Factors that predispose them to an increased risk of HIV infection may be aggravated by the COVID-19 pandemic; including economic vulnerability due to the lockdown restrictions (22).

HIV Prevention services. HIV preexposure prophylaxis (PrEP) in pregnancy had been halted in various areas because of the potential risk of Corona virus exposure for pregnant women (23). However, it was argued that the benefit completely outweighed the COVID-19 risk. Henceforth, there was advocacy for continued PrEP use, and PrEP services among HIV infected or uninfected pregnant women as well as breastfeeding women that were at high risk of being infected by HIV (23).

Modelling the impact on HIV services during COVID-19 pandemic. Modelling studies also aided in projecting the impact of COVID-19 on HIV services (24,25). Studies predicted an intensification of the burden of HIV infections and tuberculosis cases if COVID-19 cases are not curtailed (26). In one modelling study carried out in South Africa, Zimbabwe, Uganda and Malawi; an interruption of 3 months for 40% of those on ART would in turn lead to similar additional number of recorded deaths. Moreso, an interruption of 6 to 90% of the people living with HIV for a period of 9 months would in turn make the number of HIV deaths to exceed those of COVID-19 (25). In another modelling study, a similar picture was found. An interruption of 6 months in ART supply in at least 50% of the population of people living with HIV would be expected to lead to a 1·63 times increase in HIV-related deaths in sub-Saharan African countries (25). More so; with regards to HIV prevention programmes, the interruption in condom supplies and peer education would make populations more susceptible to HIV transmission and new infections (25). In addition, it was predicted that disruptions to prevention programmes would have temporary negative effects to the increase of new infections (26). Primary prevention programmes include; but are not limited to condom distribution, voluntary medical male circumcision and other HIV behavior change programmes (27).

Risk of COVID-19 among people living with HIV in Sub-Saharan Africa. HIV and COVID-19 comorbidity studies which were reviewed are presented in Table III.

HIV and COVID-19 comorbidity. Current studies have reported no epidemiological relationship between HIV and COVID-19. However, people living with HIV are regarded as a vulnerable group for COVID-19; hence the need to ensure that they are vaccinated to guard against fears of heightened risk (28). The impact of HIV on COVID-19 infection is not yet well understood, but the available evidence points to the

fact that uncontrolled HIV may negatively affect COVID-19 clinical outcomes (29). In South Africa, a study ascertained that HIV-1 controllers and progressors may have significant implications for the risk and treatment of COVID-19 among people who are living with HIV (30). As such, it has been recommended that there is need to make people living with HIV a priority group for COVID-19 vaccination (31).

HIV infected people are potentially at greater risk of dying due to COVID-19; considering their susceptibility to influenza (32). Thus, HIV infected populations are a vulnerable group to negative COVID-19 outcomes. In Zambia, findings of a study looking at 29 autopsies showed that 28% (8/29) of the deaths had co-morbidities that included HIV (33). In a related study carried out in Lesotho and South Africa, HIV, tuberculosis and malaria were the predominant factors of COVID-19 mortality (34). In a population cohort study of 3 460 932 participants, HIV was associated with COVID-19 related mortality (3). Moreover, current and previous diagnosis of tuberculosis were associated with COVID-19 deaths (3). In a study in Zambia, HIV was among the top five comorbidities among the people who died of COVID-19. In another study conducted in Nigeria, there was comparison of patients without comorbidities and those with HIV. The study found out that patients with comorbidities were 12 times more likely to die from COVID-19 (35). In comparison to HIV negative and HIV positive clients, it was discovered that although the median 4C score was higher in HIV positive patients; there was no significant difference with regards to mortality (36). In addition, although it was not statistically significant; the study found out that people living with HIV who passed on were younger than those who were HIV-negative (37). In Zambia, areas with higher HIV infection rates had greater chances of having higher COVID-19 infection rates (28).

Risk of offering HIV services during the COVID-19 pandemic. Other studies have also documented the dangers of continuing to offer services during the COVID-19 pandemic. In terms of risk, it was modeled that maintaining HIV services would also in some way lead to additional COVID-19 deaths which were occurring at 0.002 to 0.15 per 10,000 clients (30).

Responses to the effect of COVID-19 on HIV in Africa. Innovations for continuity of HIV services during the advent of Covid-19 are presented in Table IV.

Community ART delivery. Expanding access to differentiated service delivery to people living with HIV was a good way of disrupting the impact of COVID-19 on access to HIV treatment services (38). Strategies for expedited differential service delivery include expanding into community based services (39). Some strategies which were COVID-19 compliant included proffering treatment adherence, having treatment supporters and providing cost effective means of community-based ART [47]. In response to COVID-19, HIV service delivery increased in the dispensing of ART to Ivory Coast, the Democratic Republic of Congo, Ethiopia, Eswatini, South Africa, Liberia, Togo, Zambia and Uganda (40). Home-based delivery of antiretroviral (ARV) drugs was a strategy utilised in Uganda. It leveraged the Community Drug Distribution Points model for ART refill at designated pick up points in the communities (41).

Multi-month ART dispensing. In the Ivory Coast, Ethiopia, Eswatini, Kenya, Mozambique, Lesotho, South Africa, South Sudan, Uganda, Tanzania and Zimbabwe; community-based models for delivering ART in the community were prioritised. These countries combined it within their HIV guidance during COVID-19 (42). More so, South Africa, Ivory coast and Liberia prioritised the need to align refills for all medications among people on ART (40). In addition, Uganda went to the extent of increasing multi-month dispensing from three to six months for stable clients (42).

Digital interventions. The use of digital health interventions to provide psychosocial support to people living with HIV was another innovation introduced during the pandemic. Cash transfers have also proved to be more effective than food distribution for nutritional programmes among people living with HIV (43). In Uganda, there was notable use on health information systems. Their use included employment of geospatial software in order to enhance ART refill distribution in areas which had not been mapped such as rural areas (42).

Utilizing existing HIV infrastructure to fight COVID-19. Existing infrastructure for fighting HIV, TB or malaria which was provided by donors such as PEPFAR and Global Fund need to be utilised in responding to pandemics such as COVID-19(44). Infrastructure provided by the programmes enhanced the practice of being adaptive and a strong emphasis on data-driven programme approaches which gives an opportunity to strengthen the COVID-19 response activities (41).

Protecting vulnerable populations. Measures to control COVID-19 that were instituted portray realities in Africa, especially through protecting vulnerable population (44,45). Hence it was recommended that COVID-19 responses should include measures that protect vulnerable population in the society such people living with disability and children among others (45).

Discussion

On the 11th of March 2020, the World Health Organisation (WHO) declared COVID-19 a global pandemic (46). This systematic review of the intersection of COVID-19 and HIV was prompted by compelling reports which surfaced in the public health space pertaining the impact of COVID-19 on HIV service provision. Governments worldwide initiated a multitude of strategies to reduce the spread of COVID-19 in communities, but these had unintended and unwanted repercussions for society. Health care was one such activity which was negatively affected. Lockdowns resulted in severe loss of economic activity, job losses, closure of manufacturing industries, halts placed on import and exports which resulted in a shortage of medical equipment, products and stock-outs on vital medication in clinics. Questions arose pertaining the impact of COVID-19 on what was an already ailing health system in many developing countries, including those in sub-Saharan Africa.

This systematic review found a wealth of studies had been conducted on an array of themes related to HIV and COVID-19. Studies included in the review were used to answer research questions which aimed to examine the risks associated with HIV and COVID-19, the impact COVID-19 would have on HIV related services and inquire on what systems were in place to mitigate the regression on the gains which had been made in the prevention of HIV infections, provision of ART and the uninterrupted delivery of psychosocial care for people living with and affected by HIV/AIDS.

Findings suggest that COVID-19 had a significant impact on the ability to deliver HIV testing services and support as we know it. Sub-Saharan African countries are the most affected by the HIV/AIDS epidemic but regulations during the peak of COVID-19 transmission resulted in a break in services. The results from our review show that referrals to testing had dwindled or stopped as health facilities were prioritising COVID-19 related illnesses (9). Our review also shows that lockdowns restricted movements of individuals who were uncertain about the availability of health care services in general, but HIV testing was negatively reduced due to these containment measures implemented by governments. Fear also played an important component in the reduction of clients who were tested and initiated onto ART as community members were afraid of being infected with COVID-19 in the health care facility. The studies reveal a drop in the rate of HIV testing during this period. Community health service provisions have been noted to be a good way of creating an enabling environment for the improved utilisation of HIV services (47-53). This review has found evidence that community HIV testing activities were halted in the advent of COVID-19 restrictions. This therefore paused a significant effect with regards to slowing down treatment of the HIV positive clients.

Access to ART was equally affected by the COVID-19 pandemic. The researchers noted that utilisation of HIV treatment services such as ART refill, viral load monitoring and access to TB preventative treatment was not spared by COVID-19. Factors such as curtailing of movements, stigma, diversion of HIV resources to COVID-19 cumulated to limited access of ART services; particularly in the peak of the pandemic in period 2020-2022. Studies which were reviewed in this research demonstrated how adherence to ART had taken a dip and therefore drastic measures were taken by public health professionals through mechanisms such as dispensing ART medication for a 6-month period to avoid any defaulters. A differentiated model of delivery was seen in some of the studies reviewed, where treatment was dispensed outside the traditional clinic or hospital facilities. Initiatives such as home deliveries of medication were also noted as strategies initiated as a response to the gap in access to ART seen across already compromised public health care. This review again highlighted innovative solutions which were quickly initiated. They included the use of technology to provide non-contact counseling services which proved to be helpful when social distancing was encouraged. With the drastic impact on household food security in poor households, governments resorted to cash transfers to ensure that the dire economic impact of the pandemic lockdowns could be cushioned. Previous studies had shown the importance of food for ART adherence and that the reduced household income was a threat to ART maintenance.

Another component of our investigation was to gauge the extent of vulnerability of HIV positive individuals towards morbidity and mortality related to COVID-19 infection. Our findings suggest that HIV/AIDS increased the likelihood of adverse COVID-19 outcomes. Comorbidities such as tuberculosis, hypertension and diabetes were seen to pose an increased risk of mortality, but our findings show that the risk is highest amongst those who are HIV positive. This expedited the need to dispel myths and misconceptions about COVID-19 vaccines, it is vital for government campaigns to provide targeted messaging to encourage those most vulnerable to mortality to be vaccinated.

Our review has some limitations. Due to the heterogeneity of included studies, a meta-analysis could not be conducted. Lastly, we only selected studies published in the English language. It is therefore possible that studies in other languages; particularly from French speaking nations in West Africa, were missed.

Conclusions

Our study has demonstrated that there is a relationship between COVID-19 and HIV. During the peak of transmission, HIV/AIDS related services were heavily compromised; which prompted the health system to adjust traditional service provision. Decades of systematic effort and gains towards the prevention, care and treatment of HIV/AIDS suffered. The results from this systematic review presented sufficient evidence that individuals who were HIV positive were more vulnerable to mortality related to COVID-19 infection than those who were HIV negative. Our findings suggest that government interventions and mass campaigns should continue to target and encourage individuals with comorbidities to receive a COVID-19 vaccinate in order to reduce their risk of mortality. Governments should continue to leverage on differentiated health care services; not only in response to COVID-19 and HIV, but in order to promote an efficient service delivery such as the community-based pick-up points which reduce the likelihood of those lost due to travel barriers to follow up. Many under-resourced public health facilities are plagued with overcrowding. Implementing COVID-19 innovations such as telephonic psychosocial services, home deliveries for older persons and those living with disabilities, accessing mobile services which can also provide youth-friendly sexual and reproductive health services in school will alleviate the burden on health facilities. With the evidence provided, many lessons are available for the governments to adapt in the provision of holistic services.

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Data and materials are available from the corresponding author upon request.

Contributions

TT, conceived the idea for this paper; TT, MP, RP, MVS, AD, OA, CO, contributed screening and data extraction. All authors contributed to the subsequent interpretation, edits and final decision to submit the manuscript.

Conflict of interest

The authors declare no potential conflict of interest.

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