

Opportunities and Challenges for HIV/AIDS and Non-Communicable Diseases Integration: A Systematic Review of Different Models of Integrated Care

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Abstract It is evident that HIV and Non-Communicable diseases (NCD) programs often intersect. However, HIV services are stand alone and decentralized making it attractive to patients in peripheral facilities, and retaining them in care. In contrast, NCD care is provided using a centralised model, with the majority of care provided by hospitals. Patients have limited access and commonly present late with symptoms of complications. Therefore, HIV/NCD integration would strengthen the health systems capacity to address the full range of needs for HIV patients, at both the population and individual level. This systematic review explores the pertinent opportunities and challenges for HIV/NCD integration in comparison to different models of integrated care. Twenty studies with some conducted in America, Africa and Asia that heavily relied on primary data and implied that HIV/NCD integration increases the utilization of healthcare services and improve health outcomes were examined. Three studies reported increased utilization and improved outcomes through a population-based model of integrated care, however, reported challenges with linkage to care, loss to follow up and low levels of male involvement. Seventeen studies reported on individual models of integrated care which translated into impressive health outcomes including efficiency gains in staffing, increased coverage, improved medication adherence, and high rates of retention in care. One study reported on a case management approach that was found to be more effective when supporting integrated services for depressed HIV patients. The review findings show that intense efforts are needed to improve male involvement, invest in point of care technologies, reduce the return visit rates and provide streamlined care to reduce the loss to follow up for individual-based models of integrated care. There is diversity in integration models combining HIV and NCD services, and they have the potential in yielding positive patient and service delivery outcomes when implemented within appropriate contexts.

Keywords HIV/AIDS, Non-Communicable Diseases, Models of integration, Opportunities, Challenges

1. Introduction

The World Health Organisation (WHO) defines integration in healthcare systems as “bringing together inputs, delivery, management and organization of services related to diagnosis, treatment, care, rehabilitation and health promotion” to “improve access, quality, user satisfaction and efficiency” [1,2]. Moreover, the WHO recognises the importance of integrated care and recently developed a ‘Framework on integrated people-centred health services’ calling for fundamental change in the funding, management, and delivery of health services [3]. The compelling reasons

to integrate healthcare services include the fact that the underlying determinants of the major health challenges are similar and synergistic. The key beneficiaries of health services are often the same, integration of care minimizes duplication of scarce resources, and promotes efficiency [4]. Integrating healthcare also improves the effectiveness of outcomes and enhances the sustainability of health, social and environmental goals broadly [5].

In 2019, 38 million people in the globe were living with HIV, 1.7 million people became newly infected with HIV, while 690,000 people died from AIDS-related illnesses [6]. Non-communicable diseases (NCDs), also known as chronic diseases cause 71% of all deaths globally. More than 15 million people aged between 30 and 69 years die every year from an NCD and 85% of these “premature” deaths occur in low- and middle-income countries [7]. The disability-adjusted life year (DALY) burden from NCDs was

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estimated to be 37% in low-income countries in 2015 [8]. NCDs, including cardiovascular disease, diabetes, cancer, and mental health problems, are common among people living with HIV (PLHIV) and threaten the progress of HIV treatment programs [9]. This can be attributed partly to HIV infection [10,11] and the complications of long-term antiretroviral therapy [12–14].

HIV services are stand-alone and are vertically delivered. Besides, they are decentralized and delivered by task shifting, which enables the treatment of many patients [15]. In contrast, health service coverage for NCDs remains very low [16,17]. The interventions for NCDs are rarely included in national primary care packages and are often paid for via out-of-pocket medical payments, which can lead to catastrophic health expenditure and impoverishment [18].

The global AIDS response is primarily donor-supported and addresses HIV and common opportunistic infections, with limited focus on other conditions [19]. Consequently, there are significant gaps in the cascade of care for NCDs in countries that are on track to meeting the aspirational 90-90-90 targets [20]. There is a need to coordinate efforts and achieve synergies to benefit patients. The epidemiologic transition and double disease burden from chronic infections and Non-communicable diseases (NCDs) worldwide require re-engineering of healthcare delivery systems [21]. HIV/NCD integration is the coordination, co-location, or simultaneous delivery of HIV and NCD services to people who need them when they need them [9].

Various models and approaches to integrated care have been applied based on different objectives. Individual models of integrated care deal with individual coordination of care for high-risk patients with multiple conditions, to facilitate the appropriate delivery of health care services and overcome fragmentation between providers [22]. Case management is an example of an individual model of integrated care. It ensures coordination of a patient's care through the assignment of a case manager who assesses the patient's and carer's needs, develops tailored care plan, organizes and adjusts care processes accordingly, monitors the quality of care and maintains contact with the patient and carer. A patient-centred medical home is another example. It is physician-directed and provides care that is accessible, continuous, comprehensive, coordinated and delivered in the context of family and community [23].

Disease-specific integrated care models provide better integration of care for people with certain diseases and long-term conditions such as diabetes mellitus, cardiovascular diseases, chronic obstructive pulmonary disease (COPD) and bronchial asthma [24–28]. The chronic care model is one such model that aims to meet the needs of people with chronic illnesses and provide a comprehensive framework for the organization of health services to improve their outcomes. It suggests a shift from acute, episodic and reactive care towards care that embraces longitudinal, preventative, community-based and integrated approaches

[29].

Population-based models of integrated care shifts the healthcare system from a narrow model of acute care targeted at the individual patient, to one that focuses on the health and overall wellness of the broader population it serves [30]. Kaiser Permanente (KP) is one such model and is based on stratification of the population and supply of different services based on needs. It ensures the population receives promotion and prevention services to control exposure to risk factors. The majority of chronic care patients receive support for self-management of their illness and high-risk patients receive disease and case management, which combines self-management and professional care [23].

While these models of integrated care aim to achieve continuity of care and address the complex needs of patients with chronic conditions, there is a lack of clarity in the actual degree of integration and the bottlenecks experienced specifically in the context of HIV/NCD integration. To date, documentation of health system challenges and opportunities presented for HIV/NCD integration using different models is limited. As such, this systematic review sought to unravel the pertinent opportunities and challenges for HIV/NCD integration using different models of integrated care.

2. Methods

This systematic review explored the opportunities and challenges of HIV/NCD integration using different models of integrated care. The Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) guideline [31] for systematic reviews design was adopted during the search for research articles in English. This systematic review was not registered with PROSPERO.

Search strategy

A systematic search for published literature in English was conducted on PubMed and Google Scholar. References of retrieved articles and reports were screened to identify additional studies. Publication date, or publication status restrictions were not imposed. Non-empirical studies (commentaries, editorials, etc.), conference abstracts based on tertiary data, and studies that did not examine HIV/NCD integration were excluded from the review. The keywords used in the search were HIV, integration and chronic diseases and their synonyms. The following Medical Subject Heading (MeSH) terms were used: 'HIV' and/or 'Acquired Immunodeficiency Syndrome' combined with one or more of the terms 'hypertension', 'heart diseases', 'cardiovascular diseases', 'diabetes', 'cancer', 'lung disease', 'pulmonary disease, chronic obstructive', 'asthma', 'mental health', 'depression' and 'primary health care. Additionally, we used the non-MeSH search terms 'non-communicable diseases' and 'out-patient department and integration'.

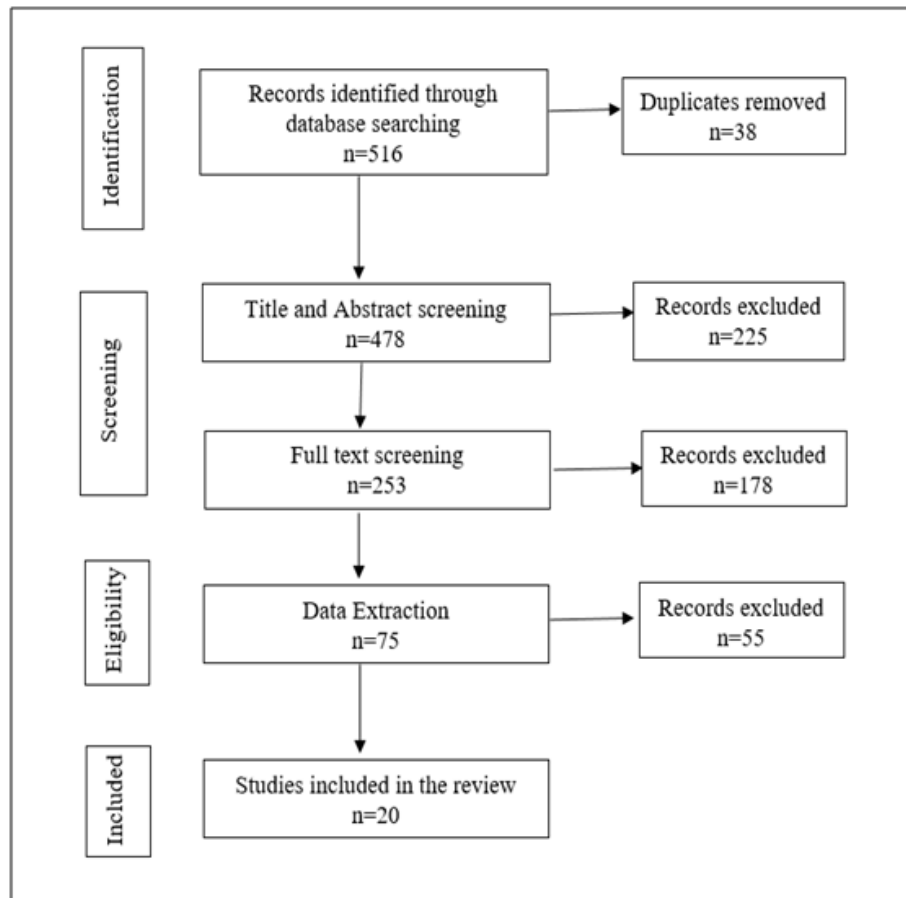


Figure 1. Study flow diagram

Study eligibility

The following inclusion criterion were considered for all publications and reports;

- **Population:** HIV positive patients presenting with NCDs. There were no geographical restrictions (Globally).
- **Intervention:** Integration of HIV/NCD healthcare services.
- **Comparator:** There was no comparator for this review.
- **Outcome:** The outcome measures were the available opportunities for implementation of various integration models and the challenges experienced with the implementation of these models.

All studies that reported on the effects of different models of HIV/NCD integration using quantitative, qualitative and mixed methods were included specifically including the following:

- Studies reporting actual integration experiences.
- Studies reporting screening or treatment for HIV within a service targeting other NCD or vice versa.
- Studies describing services provided in health facilities or the community and concerning any adult population.

Exclusion criteria

Full texts and abstracts were excluded if

- They were not primary studies e.g. reports, literature

reviews.

- They did not describe HIV/NCD integration.
- Studies published in languages other than English.

Study selection

Two individuals independently reviewed these articles. Titles and abstracts of the identified selected studies were screened to exclude duplicates and studies not relevant to the topic. The eligible titles and abstracts were then reviewed in full text.

Data Extraction

Full-text articles that fit the inclusion criteria were extracted into a matrix (MS Excel file) for the following implementation-related content: title, author, publication year, country, disease condition, integrated care model, challenges and opportunities. All disagreements were re-examined jointly and appropriate corrections made for all studies included in the review. All information related to the study objective was then presented in narrative form.

Assessment of methodological quality

Assessment of the risk of bias in included studies was done using the recommended risk of bias tools. The reviewed literature was then summarised after the team was convinced that the evidence was certain using the Grading of Recommendations Assessment, Development and Evaluation (GRADE) tool [32].

Table 1. Summary of findings

No.	Author and publication year	Title	Country	Objective	Disease condition	Integrated care model	Challenges	Opportunities
1	Chamie <i>et al.</i> 2012	Leveraging Rapid Community-Based HIV Testing Campaigns for Non-Communicable Diseases in Rural Uganda	Uganda	1) To test the feasibility and diagnostic yield of integrating NCD and other communicable disease services into a rapid, high-throughput, community-based HIV testing and referral campaign for all residents of a rural Ugandan parish. 2) To determine rates and predictors of post-campaign linkage to care by disease	HIV, malaria, TB, hypertension and diabetes	Population-based model of integrated care	1. Linkage to care after a referral was insufficient and undermines the benefits of early diagnosis 2. Low participation by males 3. Referral to different health facilities for HIV and NCD care	The campaign reached 74% of adults in a community of 6,300 people rapidly (in five days) with efficient, high-throughput (95 minutes/person) use of point-of-care diagnostics. It identified a high burden of undiagnosed diseases using active case finding. It overcame barriers to diagnosis and referral that are shared by multiple diseases in resource-limited settings e.g., community participation, field laboratory infrastructure, access to trained counsellors, and referral services
2	Govindasamy <i>et al.</i> 2013	Linkage to HIV, TB and Non-Communicable Disease Care from a Mobile Testing Unit in Cape Town, South Africa	South Africa	To determine the yield of newly diagnosed HIV, tuberculosis (TB) symptoms, diabetes and hypertension, and to assess CD4 count testing, linkage to care as well as correlates of linkage and barriers to care from a mobile testing unit.	HIV, TB, Hypertension, Diabetes	Population-based model of integrated care		The yield of newly diagnosed HIV infection (5.5%) was high from this mobile unit and this platform can be used to effectively identify TB suspects (10.1%) and diagnose diabetics (0.8%) and hypertensives (58.1%). The proportion of those who ever linked to HIV care in this study (60.0%) is also higher than those ever linked to care in previous studies
3	Janssens <i>et al.</i> 2007	Offering integrated care for HIV/AIDS, diabetes and hypertension within chronic disease clinics in Cambodia	Cambodia	To describe the experience and outcomes of offering integrated care for HIV/AIDS, diabetes and hypertension within the setting of chronic disease clinics.	HIV/AIDS, diabetes and hypertension	Individual models of integrated care		Through integration, staff could effectively assume a multidisciplinary role and that skills to manage patients who need to start a lifelong treatment were relevant to and effective for both HIV/AIDS and diabetic care. Doctors adapted to the role of chronic diseases specialists and gradually adopted a patient-centred approach. Adherence support counsellors, a

No.	Author and publication year	Title	Country	Objective	Disease condition	Integrated care model	Challenges	Opportunities
4	Kagaruki <i>et al.</i> 2014	Magnitude and risk factors of non-communicable diseases among people living with HIV in Tanzania: a cross-sectional study from Mbeya and Dar es Salaam regions	Tanzania.	To explore and establish information on the magnitude, distribution of NCDs risk factors among people living with HIV (PLWHIV) which is scarce in Tanzania.	HIV, Hypertension and diabetes mellitus	Individual models of integrated care	Loss to follow up due to the need for a return visit to obtain fasting blood samples. There were low participation levels among males	new function in the health-care system that was created with expanding HIV/AIDS care, are valuable in supporting adherence and lifestyle changes for diabetics. At 24 months of care, 87.7% of all HIV/AIDS patients were alive and inactive follow-up. For diabetes patients, this proportion was 71%. Of the HIV/AIDS patients, 9.3% had died and 3% were lost to follow-up, while for diabetes this included 3 (0.1%) deaths and 28.9% lost to follow-up. Of all diabetes patients who stayed more than 3 months in the cohort, 90% were still in follow-up at 24 months.
5	Pfaff <i>et al.</i> 2010	Early experiences integrating hypertension and diabetes screening and treatment in a human immunodeficiency virus clinic in Malawi	Malawi	To describe the early experiences of integrating hypertension and diabetes screening and treatment in a human immunodeficiency virus clinic in Malawi	Hypertension, Diabetes	Individual models of integrated care	1) The routine workload was inadvertently shifted from nurses to clinic officers. 2) Waiting time initially increased but then decreased to the pre-integration level. 3) Clinical officers were often unaware that patients went home without NCD drugs. Avoidable extra clinic visits occurred due to monthly dispensing of NCD drugs as opposed to 2- to 3-month intervals in concert with supply. 4) Measuring blood pressure on every visit was simple to implement but created additional	1. Task shifting using expert clients to perform screening supported existing human resources. 2) leverage the well-funded HIV programme to the lesser-funded NCD programme and draw on lessons from the HIV programme, including strong monitoring and evaluation, consistent drug supply and task shifting.

No.	Author and publication year	Title	Country	Objective	Disease condition	Integrated care model	Challenges	Opportunities
6	Wroe <i>et al.</i> 2015	Leveraging HIV platforms to work toward comprehensive primary care in rural Malawi: The Integrated Chronic Care Clinic	Malawi	1) increase access to care for NCD patients, (2) maximize efficiency given the severe human resource shortages, and (3) replicate strong HIV outcomes for patients with other chronic conditions.	HIV, TB, DM, HTN, Asthma, Epilepsy, Heart failure, Malnutrition	Individual models of integrated care	workload. 5) Separate diabetes screening was a duplication of work and led to some patients being missed. 1. Initial increase in workload for nurses following integration 2. Long patient time in a clinic of approximately 2hrs	1. Decentralized care worked to enhance follow-up. 2. Integrated data collection designed to increase ease of patient management by minimizing redundancy 3. Clear patient flow and health provider roles improved efficiency 4. Private-public partnership to supplement funding for NCD drugs
7	Kabala <i>et al.</i> 2015	Medication Adherence Clubs: a potential solution to managing large numbers of stable patients with multiple chronic diseases in informal settlements	Kenya	To assess the care of hypertension, diabetes mellitus and/or HIV patients enrolled into Medication Adherence Clubs (MACs).	HIV, DM or HTN	Individual models of integrated care	1. Drop-out experienced due to the need for a return visit 2. Male involvement levels were low.	1. Improved patient attendance due to time flexibility 2. Availability of protocols for care provision enhanced adherence to nurse-led consultations
8	Daughters <i>et al.</i> 2010	ACT HEALTHY: A Combined Cognitive-Behavioral Depression and Medication Adherence Treatment for HIV-Infected Substance Users	United States of America	To examine the integration of combined depression and HIV medication adherence treatment program	HIV, substance abuse and Depression	Individual models of integrated care	1. There were challenges with assuring confidentiality and making clients feel comfortable returning to the residential treatment centre for outpatient follow-ups 2. Inconsistency in homework completion due to difficulty with time management in their real-world settings, low motivation, and poor physical health (e.g., low energy)	1. Reduced depression rates, initiation of a Highly active antiretroviral therapy (HAART) regimen, and HIV medication adherence across all cases 2. Increased behavioural activation and environmental reward in two out of three cases
9	Adams <i>et al.</i> 2012a	Feasibility of nurse-led antidepressant medication management of depression in an HIV clinic in Tanzania	Tanzania.	To test the feasibility of a task-shifting model of measurement-based depression care in an HIV clinic	HIV and depression	Individual models of integrated care	Follow-through of antidepressant prescription dosing recommendations by the prescriber was low. Limited availability of antidepressants was also noted.	Retention was high and fidelity of the care manager to the MBC protocol was exceptional.

No.	Author and publication year	Title	Country	Objective	Disease condition	Integrated care model	Challenges	Opportunities
10	Husbands <i>et al.</i> 2007	Case management community care for people living with HIV/AIDS (PLHAs)	Canada	To assess a case management approach used to support integrated services developed in a service organization to support HIV patients	HIV and depression	Individual models of integrated care	Case management does contribute to reducing risk-taking behaviours in PLHAs with depression.	1. Those who were very depressed benefited the most from case management which markedly improved their physical, social and mental health functioning, and reduced their risk behaviours. Very depressed PLHAs receiving case management had a 45% improvement in social function compared with 27% deterioration by very depressed PLHAs directing their use of services. 2. There was an economically important, though not statistically significant, \$3,300 per person per annum lower expenditure for all services used by People Living with HIV/AIDS (PLHAs) who received case management, which more than offset the cost of the case managers (\$3,300 x 38PLHAs \$125,400 per year on average in lower expenditures among the 38 PLHAs receiving case management).
11	Weaver <i>et al.</i> 2009	Cost-effectiveness analysis of integrated care for people with HIV, chronic mental illness and substance abuse disorders	United States of America	To evaluate the cost-effectiveness of integrated HIV primary care, mental health, and substance abuse services among triply diagnosed patients.	HIV mental health and substance abuse	Individual models of integrated care	The results of this randomized controlled trial did not demonstrate that the integrated interventions significantly affected the health service costs or quality of life of triply diagnosed patients. There was a decrease in the total average monthly cost of the health services intervention group: \$3,235 to \$3,052; control group: \$3,556 to \$3,271 though not statistically significant	For both groups, the percentage attributable to hospital care decreased significantly (intervention group: 37% at baseline to 28%, $P < 0.001$; control group: 32% to 29%, $P < 0.001$)
12	Winiarski <i>et al.</i> 2005	Outcomes of an inner-city HIV mental health programme integrated with primary care and	United States of America	To evaluate the effectiveness of an HIV mental health program integrated with primary care that emphasized cultural responsiveness	HIV mental health and substance abuse	Individual models of integrated care		1. There was a reduction in mental health problems [F (1, 58) = 8.22, $P < 0.01$] 2. There was a reduction in HIV symptoms [F (1, 34) = 8.67, $P < 0.01$]

No.	Author and publication year	Title	Country	Objective	Disease condition	Integrated care model	Challenges	Opportunities
		emphasizing cultural responsiveness						<p>3. There was a decrease in alcohol use [F (1, 37) = 15.21, P < 0.01] and cocaine use [F (1, 79) = 7.03, P < 0.01]</p> <p>4. There was improved social functioning [F (1, 83) = 4.35, P < 0.05]</p> <p>5. Treatment group used mental health services at a higher rate than</p>
13	Kwarisiima et al. 2019	Hypertension control in integrated HIV and chronic disease clinics in Uganda in the SEARCH study	Uganda	<p>1) characterize the patient population and HTN control over time among adult residents who linked to HTN care using an integrated chronic care delivery model that offered treatment for both HTN and HIV disease and</p> <p>2) evaluate predictors of HTN control over time.</p>	HIV and Hypertension	Individual models of integrated care	<p>1. Problems with linkage to care. Blood pressure was controlled in slightly less than half (46%) of all follow-ups visits due to more frequent clinic visits precipitated by drug stock-outs.</p>	<p>1. Hypertension care was integrated into HIV clinic visits preventing redundant visits and HIV-infected patients also received extensive counselling about daily medication adherence and retention support which may have led to increased adherence among HIV-infected patients.</p>
14	Lemmon and Shuff 2001	Effects of mental health centre staff turnover on HIV/AIDS service delivery integration	United States of America	<p>1. To investigate the effect of mental health centre staff (MHCS) turn-over on HIV and AIDS service delivery integration across three service delivery components: primary health care, mental health services, and HIV and AIDS dedicated care coordination</p>	HIV and Mental Health	Individual models of integrated care	<p>1. Mental health service providers were aware of who other network providers are, but integration broke down at the level of implementation in terms of contacts, exchange of information and referrals. Integrative efforts focused on care coordination with little to no evidence of bidirectionality.</p>	<p>1. Higher staff turnover rates had no negative impact on integration, except for within-centre services.</p>
15	Odafe et al 2013	Integrating cervical cancer screening with HIV care in a district hospital in Abuja, Nigeria	Nigeria	<p>To document the programmatic experience of integrating cervical cancer screening using Visual Inspection and Acetic Acid (VIA) into HIV care as well as to describe patients' characteristics associated with positive VIA findings amongst HIV+ women.</p>	HIV and cervical cancer	Individual models of integrated care	<p>1. Out of a total of 52 VIA positive women, 35 (67.3%) could not access further care at the tertiary site due to cost leading to loss to follow up</p>	<p>1. Increased uptake of cervical cancer screening among the HIV positive women</p>

No.	Author and publication year	Title	Country	Objective	Disease condition	Integrated care model	Challenges	Opportunities
16	Huchko et al. 2011	Building capacity for cervical cancer screening in outpatient HIV clinics in the Nyanza province of western Kenya	Kenya	To evaluate outcomes of cervical cancer screening within HIV care and treatment clinics in Kenya	HIV and cervical cancer	Individual models of integrated care	<p>1. The main challenges reported were related to infrastructure limitations (lack of water, electricity and supplies; and long waits in the clinic) and perceived patient barriers.</p>	<p>1. Increased uptake of cervical cancer screening among the HIV positive women (87% of the 4186 women were offered screening) 2. During the first 3 years of the program, 28 (90%) clinical officers underwent training in VIA and colposcopy. Three medical officers and 5 clinical officers were trained in LEEP. Staff reported a high level of satisfaction with their training and their role in implementing cervical cancer screening in the clinic</p>
17	Moon et al. 2012	Implementation of cervical cancer screening using visual inspection with acetic acid in rural Mozambique: successes and challenges using HIV care and treatment programme investments in Zambezia Province	Mozambique	To describe successes and challenges of implementing nested cervical cancer screening into family planning clinics at select sites also receiving PEPFAR support for antiretroviral therapy (ART) rollout	HIV and cervical cancer	Individual models of integrated care	<p>1. Health manpower shortages, equipment problems, poor paper record systems and a limited ability to follow-up patients inhibited the quality of the cervical cancer screening services.</p>	<p>1. Nurses screened 4651 women (more than double the target number) over the first year of program functioning, in partnership with FGH for program technical assistance and access to HIV programmatic resources. Before initiation of this service, there were no available cervical screening or colposcopy services and no cryotherapy or LEEP treatment for cervical precancerous lesions in Zambezia Province.</p>
18	Sacks et al. 2011	Modified therapeutic community aftercare for clients triply diagnosed with HIV/AIDS and co-occurring mental and substance use disorders	United States of America	To evaluate an integrated therapeutic community aftercare program in which clients were taught to coordinate service components (HIV + mental health + substance abuse) and integrate their treatment	HIV, Mental health and substance abuse	Population-based model of integrated care	<p>1. Moderate treatment effects in terms of substance use and mental health favouring participants in the intervention group in the High propensity stratum (Hedge's g = -0.34, P < 0.002)</p>	<p>1. Subjects who continued MTC treatment in aftercare reported greater gains or sustained the improvements acquired during residential treatment</p>
19	Talama et al 2020	Improving uptake of cervical cancer screening services for women living with HIV and	Malawi	To achieve the target of screening 80% of eligible HIV-positive women screened for cervical cancer (571 out of the 749	HIV and cervical cancer	Individual models of integrated care	<p>1. Due to high patient volumes, limited space and the existing integration of HIV and NCD services, it was not possible to integrate VIA and cryotherapy within the HIV clinic</p>	<p>1. Integration was high yield. At baseline (January to December 2016), only 13 women living with HIV were screened for cervical cancer. One year after</p>

No.	Author and publication year	Title	Country	Objective	Disease condition	Integrated care model	Challenges	Opportunities
20	Stockton et al 2020	attending chronic care services in rural Malawi The impact of an integrated depression and HIV treatment program on mental health and HIV care outcomes among people newly initiating antiretroviral therapy in Malawi	Malawi	eligible) and to achieve this target within 12 months of full integration of the two services. To evaluate the program's impact on retention, viral suppression, and depression remission among patients with elevated depressive symptoms at antiretroviral therapy (ART) initiation after 6 months in care	HIV and Depression	Individual models of integrated care	solely using existing staff 1. Retention was very low in both the intervention and control groups. Providing ongoing treatment proved more challenging, and few patients received a standard course of antidepressants or attended a sufficient number of Friendship Bench therapy sessions. 2. Providers at the study sites typically rely on an electronic medical records (EMR) system to provide antiretroviral therapy (ART), which did not incorporate PHQ-9 screening or depression treatment and thus did not alert providers to re-assess depressed patients returning for care. 3. Antidepressant stock-outs were also common and problematic. 4. The clinics also found it challenging to provide proper Friendship Bench therapy, in part due to community health care workers' availability and in part due to patients' ability to return to the clinic for therapy sessions, in light of financial, time, and transport barriers	implementation of the QI project, 73% (n=547) of women aged 25 to 49 years living with HIV enrolled in HIV care were screened for cervical cancer, with 85.3% of these receiving the screening test for the first time. The number of women living with HIV accessing cervical cancer services increased almost 10 times (from four per month to 39 per month, p<0.001). 1. Nearly all participants who did remain in care and had a 6-month viral load drawn and PHQ-9 assessment achieved viral suppression and depression remission. However, the evaluation did not yield evidence that the integrated depression treatment program improved 6-month HIV care or depression outcomes among the intervention group compared to the control group.

3. Results

Overall characteristics of publications

A total of 516 published journal articles were identified, however only 478 were legit. These were screened by title and abstract for inclusion. 253 studies were included in the full-text screening after which 178 studies were excluded after lacking concrete information that could inform the review, leaving 75 records that were assessed and for data extraction. In the process of extraction, a further 55 studies were excluded. Only 20 studies were finally included for the review (Figure 1). 13 out of 20 publications, originated from Africa, five from the United States of America, one study originated from Asia and one from North America. All articles were published in peer-reviewed journals between the years 2000 and 2020. The external validity of these studies is clear because the most studies discuss the generalizability of their results. Due to the heterogeneity in study design, intervention types, participants, and outcomes, a meta-analysis was not conducted but instead, the review presents a summary of the articles and a synthesis of their results and outcomes where available. Table 1 summarizes the study characteristics and the findings.

4. Discussion

This study review provides the first direct comparison of the different models of integrated care. It offers a unique look at HIV/NCD context since populations are increasingly demonstrating comorbid NCDs, such as hypertension, diabetes, kidney disease, depression, cervical cancer, and substance abuse with HIV. Population-based models of integrated care as demonstrated by Chamie *et al* 2012 [33] and Govindasamy *et al* 2013 [34] show increased utilization of services and identified high burden of undiagnosed diseases through active case finding. The increased service utilisation can be attributed to the extensive community mobilisation that led to improved awareness and created more opportunities for access to integrated services unlike before. These findings suggest that the opportunity to increase utilization of integrated HIV/NCD services through the population-based models of integrated care needs to be embraced broadly as this may be effective in resource-constrained settings. These findings are consistent with those of study done in rural Kenya that offered community-based HPV screening at pop-up tents during a two-week phase of a community health campaign. The community health campaigns had 60% uptake compared to the control community where women were referred to their local government health facility for testing, resulting in 37% uptake [35]. Sacks *et al.* 2011 also evaluated an integrated therapeutic community aftercare program in which clients were taught to coordinate service components [HIV + mental health + substance abuse] and integrate their treatment. They also reported gains or sustained improvements during residential treatment [36]. This suggests that empowering the patients increase positive treatment outcomes while reducing

the burden on healthcare resources and capacities.

Something to note is the low male involvement levels in population-based models of integrated care. Barker 2014 hypothesizes that involving men in the HIV/NCD program addresses gender inequity, acknowledges men's capacity to act as agents of change and can support men to challenge pre-existing roles and norms surrounding masculinity, intimate partner relationships and parenting [37]. This points to the need for greater incorporation of gender-transformative conceptual approaches into population-based models of integrated care, with effective measures built in to develop the evidence base for their impact on a broad range of health and gender equity outcomes [38]. Moreover, linkage to care is a challenge in population-based models of integrated care. These findings indicate the need for intensive interventions including transport vouchers, community escorts and supportive counselling, to ensure ART-eligible patients link to care and initiate ART promptly [39].

Individual models of integrated care have been widely implemented for the integration of HIV with NCDs such as HIV/AIDS, diabetes, hypertension, epilepsy, asthma, mental illnesses, substance abuse and cancer [40,41,50–56,42–49]. The opportunities presented by the individual models of integrated care were efficiency gains in staffing and improved coverage of NCD care. Janssens *et al* 2007 showed that with integration, staff effectively assumed a multidisciplinary role and the skills to manage patients who were required to start a lifelong treatment for both HIV/AIDS and diabetic care. Doctors adapted to the role of chronic diseases specialists and gradually adopted a patient-centred approach while adherence support counsellors, a new designation that was created with expanding HIV/AIDS care supported adherence and lifestyle changes for diabetics [40]. Task shifting was also implemented by Pfaff *et al.* 2010 [42] and Wroe *et al* 2015 [43] where expert clients were used to performing screening thereby, supported existing human resources. These findings are consistent with those of Callaghan *et al* who demonstrated that task shifting is a viable and rapid response to sub-Saharan Africa's human resources crisis in HIV care [57]. However, there is a need to ensure the quality of care for HIV and NCD integrated services is not compromised by generating high rates of internal quality control failures and long turnaround times. The results highlight a need to strengthen health systems, with an emphasis on staffing, and training.

It is also evident that individual models of HIV/NCD integration translated into impressive health outcomes including increased coverage, improved medication adherence, and high rates of retention in care. Janssens *et al.* 2007 showed that at 24 months of care, 87.7% of all HIV/AIDS patients were alive and inactive follow-up. Besides, 90% of all diabetes patients who stayed more than 3 months in the cohort were still in follow-up at 24 months [40]. Daughters *et al* 2010 examined the integration of combined depression and HIV medication adherence

treatment program and reported reduced depression rates, initiation of a HAART regimen, HIV medication adherence across all cases, increased behavioural activation and environmental reward in two out of three cases [45]. Adams et al 2012a also reported high retention and exceptional fidelity of the care manager to the measurement-based care protocol for HIV and depression integration [46]. Husbands et al 2007 assessed a case management approach used to support integrated services for depressed HIV patients. They found that very depressed PLHAs on case management had a 45% improvement in social function compared with 27% deterioration by very depressed PLHAs directing their use of services [47]. However, this requires the case managers to have adequate training in the separate areas of HIV, and mental health, and are well supported, if they are to coordinate care effectively. Winiarski et al 2005 evaluated the effectiveness of an HIV mental health program integrated with primary care and reported a reduction in mental health problems and HIV symptoms, a decrease in alcohol and cocaine use and improved social functioning [49]. Hypertension care integrated into HIV clinic visits prevented redundant visits. Moreover, HIV-infected patients also received extensive counselling about daily medication adherence and retention support leading to increased adherence among HIV-infected patients [50]. Odafe et al 2013, Huchko et al 2011, Moon et al 2012 and Talama et al 2020 reported increased uptake of cervical cancer screening among HIV positive women [52–55]. These findings are consistent with those of Goldie et al (2005) who showed that the most clinically effective and cost-effective strategies for cervical cancer prevention were those that had low rates of attrition between screening and treatment, through either a reduced number of visits or strategies to improve patient follow-up [58]. Stockton et al 2020 achieved viral suppression and depression remission for nearly all participants who remained in care and had a 6-month viral load drawn and PHQ-9 assessment [56].

While service integration and linkages can improve care and reduce missed opportunities, the need for a return visit to obtain fasting blood samples led to a loss to follow up among people living with HIV and diabetes mellitus in Tanzania [41]. This was also experienced by hypertension, diabetes mellitus and HIV patients enrolled on Medication Adherence Clubs (MACs) in Kenya [44]. Kwarisiima et al 2019 also reported problems with linkage to care. Blood pressure was controlled in slightly less than half (46%) of all follow-up visits due to more frequent clinic visits precipitated by drug stock-outs [50].

Despite studies reporting staff satisfaction with the integrated services, increased staff workload [42,43], and shortage of staff [54] were other challenges reported, for individual models of integrated care. This suggests the need for incentivizing staff working within the system and training in new skills while ensuring mentoring and supervision facilitates integration. On the contrary, Lemmon and Shuff 2001 reported that high staff turnover rates had no negative impact on integration, except for within-centre

services [51].

One unique challenge with the integration of HIV and mental health services is conceptualizing the social and cultural context of the mentally ill PLWHIV. Daughters et al 2010 examined the integration of combined depression and HIV medication adherence treatment program and reported challenges with consistent homework completion due to difficulty with time management in their real-world settings, low motivation, and poor physical health. Also, there were challenges with assuring confidentiality and making clients feel comfortable returning to the residential treatment centre for outpatient follow-ups [45]. Increasing awareness and reducing stigma, especially that associated with HIV and mental illness amongst the wider population, may influence substantially the extent to which integration will be feasible and lead to better health outcomes. This calls for considerations of the social and cultural context in which depressed HIV patients conceptualize their beliefs, understand mental illness and receive treatment. Moreover, support interventions should be tailored to their gender and age, and provide them with skills to improve their livelihoods [59]. Institutional structures and infrastructure including financial resources and medical supplies were challenges experienced with individual models of integrated care. Adams et al 2012a and Kwarisiima et al 2019 reported limited availability of drugs which precipitate loss to follow up [46,50]. Cost concerns also limited access to further care leading to loss to follow up [52]. Huchko et al 2011, Talama et al 2020 and Moon et al 2012 reported infrastructure limitations, manpower shortages, equipment problems, poor paper record systems and a limited ability to follow-up patients as barriers that inhibited the quality of cervical cancer screening services [53–55]. This evidence points to the need to maximize investments and open new grant channels to specifically support these areas.

5. Study Limitations

The studies reviewed report in depth diabetes and depression integration with HIV compared to other NCDs. More research needs to be conducted to put into perspective challenges and opportunities of integrating HIV with other NCDs such as hypertension, asthma, cardiovascular disease and many more.

6. Conclusions

All (100%) body of evidence reviewed supports the notion that integrated programs addressing HIV/NCD integration provide stronger impacts on health outcomes. In contrast, 85% of the literature reviewed reported several challenges for HIV/NCD integration. Both population-based and individual-based models of integrated have notable opportunities such as increased coverage and improved health outcomes as demonstrated in the studies reviewed. However, population-based models may be more efficient

than individual based models, because they are intended for the same population and make use of the same facilities, transportation, and client contacts. Existing opportunities for leveraging and linking beneficiaries to the available population-based HIV/NCD integrated services need to be embraced since they are high yield and cost effective. While implementing population-based models, more efforts are required to improve male involvement, investing in point of care technologies, reducing the return visit rates and providing streamlined care to reduce the loss to follow up.

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