

Supplementary table 1. Summary of studies included in a priori framework analysis and identification of a priori themes

Author, year, country	Description of project/intervention	Highlighted facilitators and challenges to integration	A priori themes
Ameh <i>et al.</i> ²⁸ 2017 South Africa	Qualitative case study assessing ICDM framework implementation in 7 facilities incorporating HIV, diabetes and hypertension care. 8 focus groups with patients (n = 56). Interviews with managers (n = 8).	Facilitators: Stigma reduction through integration of chronic disease care. Challenges: Staff shortages, malfunctioning equipment, process of prepacking medication, long waiting times, transportation costs, drug stock-outs, rigid clinic appointment system, sub-optimal defaulter tracing, stigmatisation from home visits by carers, unprofessional behaviour of nursing staff.	[1], [2], [3], [4]
Angwenyi <i>et al.</i> ²⁹ 2020 Malawi	Qualitative analysis examining the implementation of Malawi's National Health Sector Strategic Plan II, NCD action plan and HIV clinical guidelines for integration of HIV and NCDs including diabetes (DM), at a district PHC level in government and NGO-sponsored facilities. Document search and analysis, structured interviews with managers and providers (n = 15) and NGOs (n = 5).	Facilitators: Integrated information system, Volunteer community-based structures. Challenges: Disparities in service access Diabetes drug stock outs Lack of clinical space Health workforce shortages Lack of national guidelines for NCD management.	[3], [4], [5], [6]
Birungi <i>et al.</i> ⁴⁶ 2021 Tanzania and Uganda	Prospective cohort study with multisite integration of chronic care for HIV and Diabetes in a primary care setting (n=2273 patients)	Facilitators: Reduced waiting times Refresher training for staff Joint clinics with specialist clinicians Active follow up after missed appointments Purchase of back-up drug supplies to ensure access to medications	[1], [3], [5]

		<p>Patient representation in project meetings Shared experiences of HIV and DM</p> <p>Challenges: Diabetes medication supply Possible stigma associated with joint clinic</p>	
<p>Chamie <i>et al.</i>³⁰ 2012 Uganda</p>	<p>Analysis of Community Health Campaign for integrated HIV and NCD rapid community screening and linkage to care at 3 months for patients identified to have HIV or diabetes either at local PHC clinic for HIV or at a district hospital clinic for diabetes treatment (n = 2323).</p>	<p>Facilitators: Employment of local community members for campaign Efficiency gains of screening for multiple diseases in same campaign HIV treatment services available at local PHC clinic HIV testing is normalised as a routine part of health care, thus reducing stigma Point-of-care (POC) testing</p> <p>Challenges: Limited capacity for diabetes treatment at local clinic, as only available at district hospital. Linkage to care after referral was low (61% of newly diagnosed diabetes cases and 34% for HIV). Stigma and transport costs reported as reasons for not linking to care</p>	[3], [6]
<p>Davis <i>et al.</i>³¹ 2013 Botswana</p>	<p>Qualitative case study of elements of general primary care package delivered to HIV positive adults at a PHC clinic incorporating screening and management for NCDs including diabetes, and known local resources and challenges to implementation.</p>	<p>Facilitators: Use of nationally available evidenced-based guidelines for management of HIV and diabetes Checklist and ongoing education to support provider adherence to guidelines HbA1c monitoring Diabetic education and counselling by a diabetes specialist nurse available Secondary care referral pathway Diabetes medications available</p> <p>Challenges: Glucometers out of stock</p>	[1], [3], [4]
<p>Edwards <i>et al.</i>³² 2015 Kenya</p>	<p>Retrospective cohort study evaluating outcomes among people living with HIV (PLHIV) and HIV negative patients attending an NGO-operated PHC clinic in an informal settlement in Nairobi providing integrated HIV and chronic disease care including diabetes care (n = 2206).</p>	<p>Facilitators: Use of clinical officers and nurses as main caregivers Standardised monitoring and treatment protocols Earlier detection of diabetes in those with HIV</p> <p>Challenges: Higher proportion of women in cohort (due to focus of NGO services) Lack of health care providers trained in NCD management Lack of relevant national guidelines, Cost of medications</p>	[1], [3]

<p>Frieden <i>et al.</i>³³ 2020 Zimbabwe</p>	<p>Qualitative case study evaluation of a nurse-led approach to the integration of diabetes and hypertension (HTN) care with HIV care in an integrated chronic care clinic, or with general outpatient care (including HIV care) at a primary care level (n = 3094 patients).</p>	<p>Facilitators: Built on well-functioning HIV infrastructure Context adaptation of guidelines and ongoing mentoring supported by NGO specialists, No user fees On and off-site decision support Regular review meetings Merging of patient records for HIV and NCDs enabled synchronisation of appointments and monitoring and evaluation POC machines for HbA1c measurement Referral system for complex cases Patient empowerment through individual and group education and counselling</p> <p>Challenges: Healthcare workforce shortages High patient demand at some sites due to lack of fees Long travel times, staff shortages and high patient volume limited mentorship time Medicines and laboratory reagents supply problems Long laboratory sample transit time, overloaded laboratories Lack of leadership and ownership by staff in some health facilities</p>	<p>[1], [2], [3], [4], [5], [6]</p>
<p>Gausi <i>et al.</i>⁴⁷ 2021 South Africa</p>	<p>Observational retrospective cohort study, multimorbid patients with HIV, HTN or diabetes enrolled in integrated clubs (IC). Adherence and disease control calculated before and after enrolment in IC (n = 247).</p>	<p>Facilitators: IC improved efficiency of resource utilisation Convenient and acceptable to patients Reduced waiting times Low loss to follow up Counselling adherence Streamlined care improved NCD control</p> <p>Challenges: Insufficient support for behavioural change for patient self-management Changes to health personnel</p>	<p>[1], [4]</p>
<p>Godongwana <i>et al.</i>⁴⁸ 2021 South Africa</p>	<p>Qualitative research to understand the experiences of comorbid patients in integrated chronic disease care in South Africa. Semi-structured interviews with key informants; adults living with HIV and either HTN or diabetes (n=12) and healthcare professionals (n=12).</p>	<p>Facilitators: Unified appointments, patient records and medication collection Stigma reduction through non-segregation of patients Support provided via adherence clubs, whatsapp groups and talks for patients</p> <p>Challenges: Under-resourced facilities, low staff capacity Lack of training and guidance on chronic care Lack of standardised guidelines</p>	<p>[2], [3], [4], [5]</p>

		<p>Concern about stigma leading to non-disclosure of HIV status</p> <p>Lack of patient understanding about medications and reasons for taking them</p> <p>Poor access to healthcare, long travel distance to clinic particularly in rural areas</p> <p>Patients moving between clinics</p>	
<p>Khabala <i>et al.</i>³⁴ 2015 Kenya</p>	<p>Retrospective descriptive study assessing the care of HIV, diabetes and HTN patients enrolled into integrated Medication Adherence Clubs (MACs), at informal settlement in Nairobi. MACs met quarterly to confirm clinical stability, have a short health talk and receive pre-packed medications. (n = 1432 patients enrolled in 47 MACs)</p>	<p>Facilitators:</p> <p>Flexible timings of MACs</p> <p>Clear protocols in place</p> <p>Clear eligibility criteria for stable patients to be included in MACs</p> <p>Support for stigmatising conditions</p> <p>Reduced clinician workload as high compliance and low loss to follow-up / need for referral back to regular clinic.</p> <p>Challenges:</p> <p>Large numbers of stable patients requiring follow-up</p> <p>Prior to MAC introduction- high clinician work load, long waiting times, and high loss to follow-up rate</p>	<p>[1], [5]</p>
<p>Matima <i>et al.</i>³⁵ 2018 South Africa</p>	<p>Qualitative study assessing ICDM framework implementation incorporating HIV and diabetes care. Interviews patients with HIV and diabetes multimorbidity (n = 10) and their healthcare providers (n = 6).</p>	<p>Facilitators:</p> <p>Educational materials appropriate to age and education levels available at clinic visits</p> <p>Access to advocacy groups</p> <p>Suggestion boxes/open door policy with feedback</p> <p>Relationship-building between patients and healthcare workers for effective clinic-based support</p> <p>Challenges:</p> <p>Separate clinics for diabetes and HIV</p> <p>Power imbalances between patient and healthcare staff</p> <p>Long waiting times, over-crowded clinics, costs of lost time to patients, travel costs, costs associated with dietary changes</p> <p>Medication stock-outs</p> <p>Staff shortages</p> <p>Lack of integrated guidelines</p>	<p>[1], [3], [4]</p>
<p>Rabkin <i>et al.</i>³⁶ 2012 Eswatini and Ethiopia</p>	<p>Assessment of diabetes program integration with HIV care in rural Eswatini in 9 clinics, 3 health centres and 3 hospitals (15 site assessments, 100 chart reviews, 72 healthcare worker questionnaires).</p>	<p>Facilitators (From Ethiopia):</p> <p>Implementation of protocols based on local HIV guidelines</p> <p>Identification of simple monitoring and evaluation indicators</p> <p>Clinical mentoring approaches</p> <p>Use of appointment books, charting tools, flow sheets, job aids</p>	<p>[2], [3], [4], [5]</p>

	Contrasted with assessment of pilot study implementing a package of strategies, at an Ethiopian urban referral hospital outpatient department which delivers diabetes and HIV care (45 clinician surveys, 260 chart reviews, patient interviews and focus groups).	Challenges (From Eswatini): Lack of formal treatment algorithms, protocols or guidelines Lack of on-site medical records for diabetes No established appointment systems Shortage of drugs and equipment Inadequate staffing Costs of medications and laboratory tests, transportation barriers	
Rawat <i>et al.</i> ³⁷ 2018 South Africa	Examining the influence of integrating HIV care into public PHC and impact on NCD care (including diabetes care) in Free State, South Africa, through examining 4 NCD indicators and 2 HIV-specific indicators over 4 years (n = 131 clinics).	Facilitators: Nurse-delivered ART Improved accessibility of ART when delivered in PHC Challenges: Increased strain on resources and higher provider workloads resulting from adding HIV services	[1]
Venables <i>et al.</i> ³⁸ 2016 Kenya	Qualitative study on patient and healthcare worker perceptions and experiences of Medication Adherence Clubs (MACs) for integrated care of stable patients with HIV, diabetes and HTN. Interviews with patients and healthcare workers (n = 19), focus groups (n = 10 groups), participant observation (n = 15).	Facilitators: Reduction in number of clinic appointments saving time for patients and clinicians Provision of additional support and education Combining of NCDs and HIV may reduce HIV stigma Challenges: Patient mis-understandings of eligibility criteria Lack of patient knowledge about MACs, lack of information at enrolment Lack of clinician time to discuss MACs/ promote service Some HIV patients concerned due to possible stigma	[1], [4]
Wroe <i>et al.</i> ³⁹ 2015 Malawi	Qualitative case study of PHC-based integrated chronic care clinic utilising a HIV program as a platform for NCD screening and treatment including diabetes. 6781 patients on ART and 721 patients with NCDs including 76 with diabetes.	Facilitators: Leveraging a well-functioning and resourced decentralised PHC-based HIV treatment programme Common recognition of importance of comprehensive care by staff No user fees Streamlined patient check-in and screening process Task-shifting to integrated care clerks Regular meetings with staff to promote quality improvement Protection of patient confidentiality Challenges: Initially high default rate, remote terrain and long distances to access clinic	[1], [2], [3], [5], [6]

		Healthcare worker shortages Increased numbers of patients at clinics	
Wroe <i>et al.</i> ⁴⁹ 2020 Malawi	Retrospective cohort study evaluating project seeking to extend access to integrated NCD and HIV care in a primary care setting in rural Malawi (n=6233 patients with HIV-NCD)	Facilitators: Building on HIV platform Community screening events Improved access through decentralisation of care reducing travel distances Attention to patient flow through clinic Task-shifting between cadres of HCWs Data management Confidentiality Mentorship of clinical staff Challenges: High volumes of patients attending clinics Complex care needs of patients with multi-morbidities	[1], [2], [3], [5], [6]

ICDM: Integrated Chronic Disease Management. [1] Effective team-working to deliver continuity and coordinated proactive care; [2] Organisational leadership, culture and mechanisms to promote quality and safety; [3] Equipped healthcare teams to deliver evidence-based patient-centred care; [4] Empowerment and support of patients for self-management and prevention; [5] Use of data collection systems to facilitate effective care and follow-up; [6] Community partnerships to promote awareness, mobilise resources and support health service provision.